

## **IIT/AIIMS - 2027 SCREENING TEST**

**QUESTION  
BOOKLET  
CODE**

**A**

**Date : 1<sup>st</sup> December 2024**

### **IMPORTANT INSTRUCTIONS**

*Please read the instructions carefully*

1. Do not break the seal of this question booklet before being instructed to do so by the invigilators
2. Please fill in all the details such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 hour** duration.  
This question booklet contains 75 questions and **Maximum Mark is 240**
4. There are three Parts. Physics, Chemistry & Mathematics having 25 questions each. Each Part consists of two Sections. **In Section A** (15 questions) each question has four options (1), (2), (3) and (4). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
5. **In Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.** Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer in Section B
6. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
7. More than one answer marked against a question will be deemed as incorrect answer.
8. No negative mark for unattended Question.
9. Question paper booklet code is printed on the right hand top of this booklet
10. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
11. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 75 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

**Roll Number**

I have read all the instructions and shall abide by them

I have verified all the information filled by the candidate

\_\_\_\_\_  
**Signature of the Candidate**

\_\_\_\_\_  
**Signature of the Invigilator**

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**SPACE FOR ROUGH WORK**

# PART I - PHYSICS

This part contains 25 questions

## SECTION - A

Physics - Question No. - (1-15)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

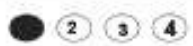








For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION 'A' QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

Physics - Question No. - (16 - 25 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In case of attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION 'B' QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

---

**SPACE FOR ROUGH WORK**

## SECTION A - PHYSICS

1. The SI unit of electric current is

1) coulomb

2) ampere

3) henry

4) farad

2. Power dissipated in a resistor is given by

1)  $P = I^2 R$

2)  $P = \frac{V}{R}$

3)  $P = IR^2$

4)  $P = \frac{V^2}{R^2}$

3. 1 kWh = ..... J

1)  $3.6 \times 10^4$

2)  $3.6 \times 10^5$

3)  $3.6 \times 10^6$

4)  $3.6 \times 10^7$

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SPACE FOR ROUGH WORK

4. Acceleration due to gravity ( $g$ ) on the surface of the Earth is given by [ $R$ -radius of the earth,  $M$  - mass of the earth,  $G$ -gravitational constant]

1)  $g = \frac{GR^2}{M}$

2)  $g = \frac{GM^2}{R^2}$

3)  $g = \frac{GR^2}{M^2}$

4)  $g = \frac{GM}{R^2}$

5. Two spheres of masses 20 kg and 16kg are separated by a distance 2m. The gravitational force between them is ( $G$  - gravitational constant)

1) 80 G

2) 60 G

3) 40 G

4) 20 G

6. An object is dropped from a height of 10m. The velocity with which it hits the ground is ( $g = 9.8 \text{ ms}^{-2}$ )

1)  $10 \text{ ms}^{-1}$

2)  $12 \text{ ms}^{-1}$

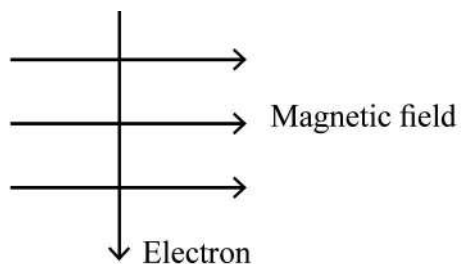
3)  $14 \text{ ms}^{-1}$

4) Zero

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SPACE FOR ROUGH WORK

7. An electron enters a magnetic field at right angles to it, as shown in the figure. The direction of force acting on the electron will be



- 1) To the right      2) To the left      3) Out of the page      4) Into the page
8. The rate of change of momentum with respect to time is called
- 1) Acceleration      2) Energy      3) Power      4) Force
9. The speed of light in vacuum is
- 1)  $3 \times 10^8 \text{ cms}^{-1}$       2)  $3 \times 10^8 \text{ ms}^{-1}$       3)  $3 \times 10^8 \text{ kms}^{-1}$       4)  $3 \times 10^8 \text{ kmh}^{-1}$

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SPACE FOR ROUGH WORK

10. Sound wave in air is .....

1) Transverse

2) Longitudinal

3) Electromagnetic

4) Either longitudinal or transverse

11. An object is placed at a distance 20 cm from a convex mirror of focal length 10 cm. The image is formed at a distance

1) 20 cm in front of the mirror

2) 6.66 cm in front of the mirror

3) 20 cm behind the mirror

4) 6.66 cm behind the mirror

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SPACE FOR ROUGH WORK



12. Which of the following is a conductor of electricity

1) Air

2) Dried wood

3) Water

4) Rubber

13. A 2A current flows through a conductor of resistance  $40\ \Omega$  for one minute. The heat generated is

1)  $9.6 \times 10^3\ \text{J}$

2)  $96 \times 10^3\ \text{J}$

3)  $960 \times 10^3\ \text{J}$

4)  $9600 \times 10^3\ \text{J}$

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SPACE FOR ROUGH WORK

14. The frequency of the audible sound is

1) 0 Hz - 30 Hz

2) 20 Hz – 20 kHz

3) 20 kHz - 20,000 kHz

4) 20 kHz - 20 MHz

15. If object is placed 15cm from a concave mirror of focal length 10cm, then the nature of the image formed will be

1) Magnified and inverted

2) Magnified and erect

3) Small in size and inverted

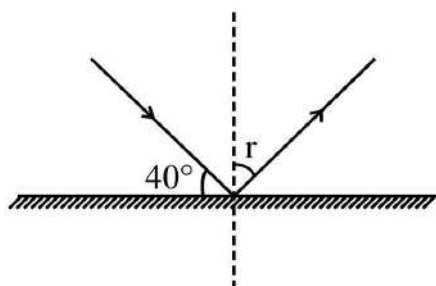
4) Small in size and erect

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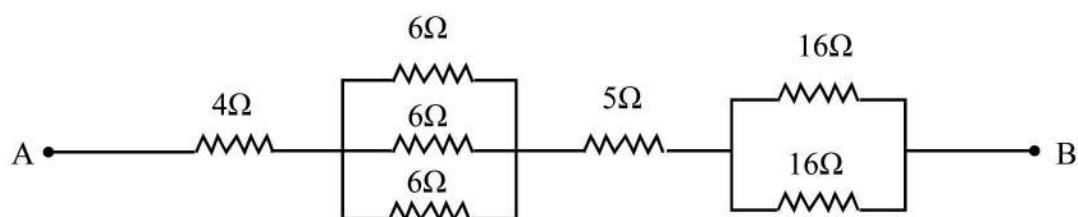
SPACE FOR ROUGH WORK

## SECTION B - PHYSICS

16. The speed of a wave in a medium is  $960 \text{ ms}^{-1}$ . If 3600 waves pass through a point in the medium in 1 minute. Then determine its wavelength (in metre)
17. Find angle of reflection in degree



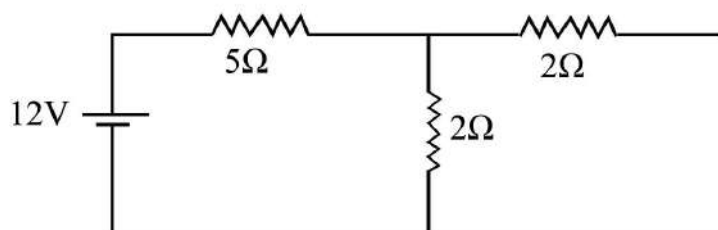
18. Find the equivalent resistance between A and B in the given figure (in ohm)



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SPACE FOR ROUGH WORK

19. Calculate the current drawn from the cell in ampere

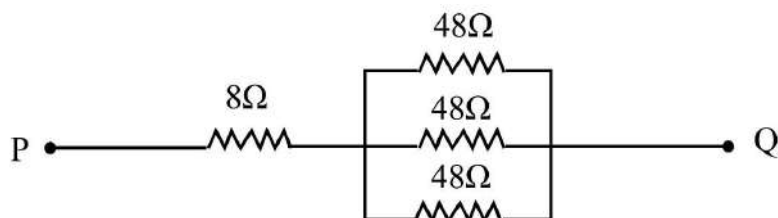


20. A body of mass 5kg is thrown vertically up with a kinetic energy of 490 J. What will be height (in metre) at which the kinetic energy of the body becomes half of the original value? ( $g = 9.8 \text{ ms}^{-2}$ )
21. If the distance between the two spherical bodies is increased to four times, then by how many times, the mass of one of the bodies is to be changed to maintain the same gravitational force?

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SPACE FOR ROUGH WORK

22. A concave mirror has radius of curvature of 24 cm. The magnitude of object distance from the mirror, if an image is formed that is virtual and 3 times the size of the object (answer should be in cm)
23. The radius of curvature of a convex mirror is 2m. Its focal length in metre is
24. A  $6\ \Omega$  resistor is connected across a 12 V battery. The current drawn from the battery in ampere is .....
25. Effective resistance between P and Q is (in ohm)



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SPACE FOR ROUGH WORK

## PART II - CHEMISTRY

This part contains 25 questions

### SECTION - A

Chemistry - Question No. - (26-40)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

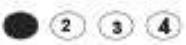








For each question, marks will be awarded in one of the following categories

Full Marks : +4 If only the bubble corresponding to the correct option is darkened fully.

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION 'A' QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

### SECTION - B

Chemistry Question No. - (41 - 50 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In case of attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened fully.

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION 'B' QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

**SECTION A - CHEMISTRY**

26. The atomic number of the elements among the following which form basic oxide are

A) 10

B) 12

C) 16

D) 19

1) A & C

2) B & C

3) C & D

4) B & D

27. For an element with atomic number 11, the 11<sup>th</sup> electron will occupy in the shell?

1) N

2) M

3) L

4) K

28. Which of the following is a compound?

1) Copper

2) Diamond

3) Bromine

4) Ice

29. Tooth decay starts when the pH of the mouth is lower than y. Find the value of  $10 - y$ ?

1) 4.5

2) 3

3) 5.5

4) 7

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SPACE FOR ROUGH WORK

30. Hydrogen gas is liberated when dilute HCl is added to

1)  $\text{CaCO}_3$

2)  $\text{NaHCO}_3$

3) Zn

4) Cu

31. Which is incorrect statement among the following?

1) Boiling water at  $100^\circ\text{C}$  have less energy than steam at the same temperature

2) The physical state of water is liquid at 298 K

3) Naphthalene balls disappear with time without leaving a solid

4) 473 K temperature is corresponds to  $373^\circ\text{C}$

32. Chlorine gas is passed through dry slaked lime to get

1) Quick lime

2) Bleaching powder

3) Soda lime

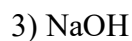
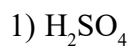
4) Baking powder

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SPACE FOR ROUGH WORK



33. Which of the following is known as 'King of chemicals'?



34. On electrolysis of Brine solution ( $\text{NaCl}$  solution), the gaseous product obtained at cathode is

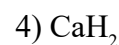
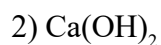
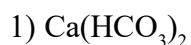
1) Oxygen

2) Hydrogen

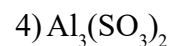
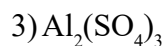
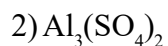
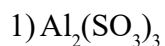
3) Chlorine

4) Nitrogen

35. On passing carbon dioxide gas through lime water a white precipitate is formed. The precipitate dissolves when excess carbon dioxide is passed through the solution. The formula of the water soluble compound formed is



36. The correct formula of the compound Aluminium sulphite is



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SPACE FOR ROUGH WORK

37. The compound X is obtained by treating calcium oxide with water. It is an example of exothermic reaction. The compound X is

1) CaO

2)  $\text{Ca}(\text{OH})_2$

3)  $\text{CaCO}_3$

4)  $\text{CaH}_2$

38. In the reaction,  $2\text{PbO} + \text{C} \longrightarrow 2\text{Pb} + \text{CO}_2$ . Which among the following are true

i) Carbon is reduced

ii) PbO is reduced

iii) Carbon is oxidised

iv) PbO is oxidised

1) i and ii

2) i & iv

3) ii & iii

4) All are correct

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SPACE FOR ROUGH WORK

39. Select the correct statements from the following

i)  ${}^{12}_6\text{C}$  &  ${}^{14}_6\text{C}$  are isobars to each other

ii)  ${}^{40}_{20}\text{Ca}$  &  ${}^{40}_{18}\text{Ar}$  are isobars to each other

iii)  ${}^1_1\text{H}$  and  ${}^3_1\text{H}$  are isotopes to each other

iv)  ${}^{23}_{11}\text{Na}$  &  ${}^{24}_{12}\text{Mg}$  are isotopes to each other

1) i, ii, iii

2) i & iv

3) ii & iii

4) ii & iv

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SPACE FOR ROUGH WORK

40. Match Column-A with Column-B

Column – A	Column – B
a) Washing soda	i) $\text{Ca(OH)}_2$
b) Baking soda	ii) $\text{CaOCl}_2$
c) Bleaching powder	iii) $\text{NaHCO}_3$
d) Slaked lime	iv) $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
	v) $\text{H}_2\text{CO}_3$

1)  $a \rightarrow \text{iii}; b \rightarrow \text{iv}; c \rightarrow \text{ii}; d \rightarrow \text{i}$

2)  $a \rightarrow \text{iv}; b \rightarrow \text{iii}; c \rightarrow \text{v}; d \rightarrow \text{ii}$

3)  $a \rightarrow \text{iv}; b \rightarrow \text{iii}; c \rightarrow \text{ii}; d \rightarrow \text{i}$

4)  $a \rightarrow \text{v}; b \rightarrow \text{iv}; c \rightarrow \text{i}; d \rightarrow \text{ii}$

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SPACE FOR ROUGH WORK

### SECTION B - CHEMISTRY

41. In the balanced chemical equation  $x\text{Fe(s)} + y\text{H}_2\text{O(g)} \longrightarrow z\text{Fe}_3\text{O}_4\text{(s)} + w\text{H}_2\text{(g)}$  .

Then  $x + y + z + w = \dots\dots\dots$

42. An element have 8 electrons in its M shell, which is the valence shell . The total number of electrons in an atom of the element is .....

43. The ion of an element M has 3 positive charges. Mass number of this atom is 27, and it has same number of neutrons as in  $^{29}_{15}\text{P}$  . The number of electrons in the given ion of element M is [Symbol M is not real] .....

44. Molecular mass of Glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) is ..... u

45. Find the number of liquid-liquid solutions among the following solutions. (Brass, Sugar solution, Vinegar, Tincture of iodine, Air)

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SPACE FOR ROUGH WORK

46. Pick the total number of metals among the following that are not found in free state.[Magnesium (Mg), Aluminium (Al), Zinc (Zn), Platinum (Pt), Lead (Pb), Silver (Ag), Iron (Fe), Gold (Au)]
47. Aqueous solution(s) of how many of the following salt at 298 K is/are having pH = 7 [Sodium chloride (NaCl), Sodium acetate ( $\text{CH}_3\text{COONa}$ ), Ammonium chloride ( $\text{NH}_4\text{Cl}$ ), Potassium sulphate ( $\text{K}_2\text{SO}_4$ ), Potassium carbonate ( $\text{K}_2\text{CO}_3$ ), Sodium nitrate ( $\text{NaNO}_3$ ), Ammonium nitrate ( $\text{NH}_4\text{NO}_3$ )]
48. How many of the following metals are more reactive than iron (Fe) as per reactivity series of metals? [Zinc(Zn), Lead (Pb), Copper (Cu), Magnesium (Mg), Aluminium (Al), Tin (Sn), Calcium (Ca), Sodium (Na)]
49. Blue vitriol is hydrated copper sulphate  $\text{CuSO}_4 \cdot x\text{H}_2\text{O}$ . The value of x is .....
50. A solution containing 48g common salt in 352 g water. The concentration of common salt in terms of mass by mass percentage of the solution is .....

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SPACE FOR ROUGH WORK

## PART III - MATHEMATICS

This part contains 25 questions

### SECTION - A

Mathematics - Question No. - (51-65)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

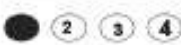








For each question, marks will be awarded in one of the following categories

Full Marks : +4 If only the bubble corresponding to the correct option is darkened fully.

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION 'A' QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

### SECTION - B

Mathematics - Question No. - (66 - 75 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In case of attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened fully.

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION 'B' QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer			
1	1	1	1
2	2	2	2
<input checked="" type="radio"/>	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
0	0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer			
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
<input checked="" type="radio"/>	9	0	0
9	0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer			
<input checked="" type="radio"/>	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	<input checked="" type="radio"/>	0	0
9	0	0	0
0	0	0	<input checked="" type="radio"/>

### SECTION A - MATHEMATICS

51. 7<sup>th</sup> term of an arithmetic sequence is 30 and its 10<sup>th</sup> term is 42. What is the first term of the sequence :

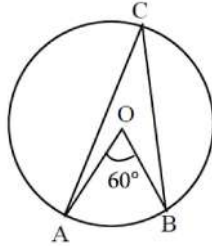
1) 6

2) 4

3) -1

4) 3

52. In the figure O is the centre of the circle.  $\angle AOB = 60^\circ$ . What is the measure of  $\angle ACB$  ?



1)  $120^\circ$

2)  $30^\circ$

3)  $60^\circ$

4)  $90^\circ$

53. The product of a number and 10 more than that number is 144. Find the number :

1) 8

2) 12

3) 36

4) 18

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SPACE FOR ROUGH WORK



54. If  $x^2 + 6x = 891$ , find the natural number represented by  $x$ .

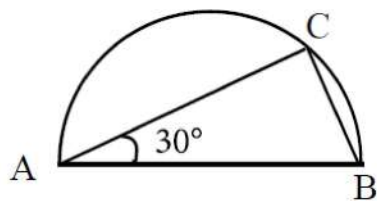
1) 30

2) 29

3) 28

4) 27

55. In the figure,  $AB$  is the diameter of the semicircle.  $\angle A = 30^\circ$ ,  $BC = 4\text{cm}$ . What is the length of  $AB$ ?



1) 4

2)  $4\sqrt{2}$

3) 8

4)  $4\sqrt{3}$

---

SPACE FOR ROUGH WORK

56.  $\frac{1}{\sqrt{3}-1}$  is equal to :

1)  $\sqrt{3}+1$

2)  $\sqrt{3}-1$

3)  $\frac{\sqrt{3}+1}{2}$

4)  $\frac{\sqrt{3}-1}{2}$

57. A circle is drawn with the line joining (1, 3) and (9, 5) as diameter. The coordinates of the centre of the circle is :

1) (0, 0)

2) (10, 8)

3) (8, 2)

4) (5, 4)

58. In a second degree polynomial  $P(x)$ ,  $P(1) = 0$  and  $P(2) = 0$ , then  $P(x)$  is :

1)  $x^2 - 3x + 2$

2)  $x^2 + x + 3$

3)  $x^2 - 3x + 3$

4)  $x^2 + 3x + 2$

---

SPACE FOR ROUGH WORK

59. The mean of the numbers, 10, 14, 18, 22, 26, 30, 34, 38, 42 :

1) 23.4

2) 26

3) 26.4

4) 30

60. 8<sup>th</sup> term of an arithmetic sequence is 12 and 12<sup>th</sup> term is 8, its 20<sup>th</sup> term is :

1) 20

2) 0

3) 1

4) -1

61. How many consecutive natural numbers starting from 1 should be added to get 300?

1) 25

2) 20

3) 24

4) 14

---

SPACE FOR ROUGH WORK

62. The distance between the point with coordinates  $(x, y)$  and the origin is :

1)  $x + y$

2)  $\sqrt{x^2 - y^2}$

3) 0

4)  $\sqrt{x^2 + y^2}$

63. The coordinates of the point dividing the line joining the points  $(1, 6)$  and  $(11, 2)$  in the ratio 3 : 5 is :

1)  $(10, 4)$

2)  $(5, 4)$

3)  $(12, 8)$

4)  $(19/4, 18/4)$

---

SPACE FOR ROUGH WORK

64. The centroid of the triangle with vertices  $(-1, 5)$ ,  $(3, 7)$ ,  $(1, 1)$  is :

1)  $(0, 0)$

2)  $(3, 13)$

3)  $(1, 13/3)$

4)  $(13, 3)$

65. The median of the numbers 15, 39, 31, 42, 27, 33, 24, 18, 36, 21, 40, 38 :

1) 32

2) 31

3) 33

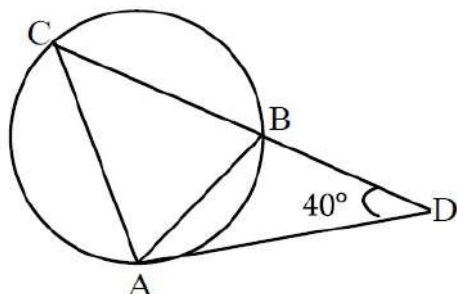
4) 27

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SPACE FOR ROUGH WORK

## SECTION B - MATHEMATICS

66. In the figure AD is a tangent,  $\angle ADB = 40^\circ$ ,  $AB = BD$ . What is the measure of  $\angle ACB$ ? (in degree)



67. Find the value of  $x - y$  when  $x + y = 9$  and  $xy = 14$
68. The sum of the ages of a mother and her daughter is 50 years. Also 5 years ago the mother's age was 7 times the age of the daughter. What is the age of the mother?
69. The radius of the largest sphere that can be carved from a cube of edge 8 cm is :

---

SPACE FOR ROUGH WORK

70.  $x - 1$  is a factor of  $x^2 + 5x - k$ . The value of  $k$  is :
71. One fourth of one third of one half of a number is 12, the number is :
72. The sum of two numbers is twice their difference. If one of the numbers is 10, the other number is :
73. The volume of a cylinder which has a height of 14 meters and base radius 3 meters is ( $\pi = 22/7$ )
74. The sum of the first 9 terms an arithmetic sequence is 99. What is its 5<sup>th</sup> term?
75. A boy buys a pen for Rs. 25 and sells it for Rs. 20, his loss percent is :

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SPACE FOR ROUGH WORK

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**SPACE FOR ROUGH WORK**



IIT/AIIMS SCREENING TEST - 01-12-24

QUESTION  
BOOKLET  
CODE

**A**

P + C + M - ANSWER KEY

**PHYSICS**

1. 2
2. 1
3. 3
4. 4
5. 1
6. 3
7. 4
8. 4
9. 2
10. 2
11. 4
12. 3
13. 1
14. 2
15. 1
16. 16
17. 50
18. 19
19. 2
20. 5
21. 16
22. 8
23. 1
24. 2
25. 24

## CHEMISTRY

26. 4      $Z = 10$  Ne  
            $Z = 12$  Mg; MgO and  $K_2O$  are basic oxides  
            $Z = 16$  S  
            $Z = 19$  K
27. 2      $Z = 11$ ; EC = 2, 8, 1  
           The last electron occupy 'M' shell
28. 4     Ice is solidified water
29. 1     Tooth decay starts when pH of the mouth is lower than 5.5
30. 3     Zinc react with HCl to form  $H_2$  gas  $Zn_{(s)} + 2HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_{2(g)}$
31. 4      $473\text{ K} = 200^\circ\text{C}$
32. 2     Chlorine gas when passed through dry slaked lime produce bleaching powder  
            $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$
33. 1     Sulphuric acid ( $H_2SO_4$ ) is known as king of chemicals
34. 2     On electrolysis of brine hydrogen gas is evolved at the cathode
35. 1      $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$   
           Lime water is turned milky due to formation of  $CaCO_3$   
            $CaCO_3 + CO_2 + H_2O \longrightarrow Ca(HCO_3)_2$   
           Milkiness due to  $CaCO_3$  dissolves on passing more  $CO_2$  due to formation of calcium bicarbonate
36. 1     Aluminium sulphite is  $Al_2(SO_3)_2$
37. 2     Reaction of CaO with water is exothermic  $CaO + H_2O \longrightarrow Ca(OH)_2$

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SPACE FOR ROUGH WORK

38. 3 In the reaction  $2\text{PbO} + \text{C} \longrightarrow 2\text{Pb} + \text{CO}_2$   
 PbO is reduced to Pb and C is oxidised to  $\text{CO}_2$   
 PbO is reduced to Pb and C is oxidised to  $\text{CO}_2$
39. 3  $^{12}_6\text{C}$  &  $^{14}_6\text{C}$  are isotopes  
 $^{40}_{20}\text{C}$  &  $^{40}_{18}\text{Ar}$  are isotopes  
 $^1_1\text{H}$  &  $^3_1\text{H}$  are isotopes  
 $^{23}_{11}\text{Na}$  &  $^{24}_{12}\text{Mg}$  are not isotopes
40. 3 Washing soda :  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$   
 Baking soda :  $\text{NaHCO}_3$   
 Bleaching powder :  $\text{CaOCl}_2$   
 Slaked lime :  $\text{Ca(OH)}_2$
41. 12 The balanced equation is  $3\text{Fe(s)} + 4\text{H}_2\text{O(g)} \longrightarrow \text{Fe}_3\text{O}_4\text{(s)} + 4\text{H}_2\text{(g)}$
42. 18 When  $Z = 18$ ; EC = 2, 8, 8  
 'K' shell 2 electrons  
 'L' shell 8 electrons  
 'M' shell 8 electrons
43. 10 No. of neutrons in  $^{29}_{15}\text{P} = 14$   
 Atomic number of  $(^{27}\text{M})^{3+} = 27 - 14 = 13$   
 No electrons in  $^{27}_{13}\text{M}^{3+} = 13 - 3 = 0$

---

SPACE FOR ROUGH WORK

44. 180 Molecular mass of glucose  $C_6H_{12}O_6 = 180$  u
45. 1 Vinegar is acetic acid dissolved in water
46. 5 Pt, Ag & Au are found in free state. Mg, Al, Zn, Pb and Fe are found in combined state
47. 3 Aqueous solutions of NaCl,  $K_2SO_4$  and  $NaNO_3$  are neutral since they are salts of strong acid and strong base.
48. 5 The arrangement as per activity series is Na, Ca, Mg, Al, Zn, Fe, Sn, Pb, Cu
49. 5 Blue vitriol is  $CuSO_4 \cdot 5H_2O$
50. 12 Mass of solute = 48g  
Mass of solvent = 352 g  
Mass of solution =  $48 + 352 = 400$  g
- $$\% \text{ of solute} = \frac{48}{400} \times 100 = 12\%$$

### **MATHEMATICS**

51. 1
52. 2
53. 1
54. 4
55. 3
56. 3

---

SPACE FOR ROUGH WORK

- 57. 4
- 58. 1
- 59. 2
- 60. 2
- 61. 3
- 62. 4
- 63. 4
- 64. 3
- 65. 1
- 66. 40
- 67. 5
- 68. 40
- 69. 4
- 70. 6
- 71. 288
- 72. 30
- 73. 396 sq.m
- 74. 11
- 75. 20

---

SPACE FOR ROUGH WORK

**PART I - PHYSICS**

1. A ball is dropped from a bridge 122.5 m above a river. After the ball has been falling for two second, a second ball is thrown straight down after it. What must its initial velocity be so that both hit the water at the same time? [ $g = 9.8 \text{ m/s}^2$ ]

- 1) 49 m/s                      2) 55.5 m/s                      3) 26.1 m/s                      4) 9.8 m/s

**Ans. 3**

For the dropped ball  $t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 122.5}{9.8}} = 5 \text{ s}$

For the second ball  $t = 5 - 2 = 3 \text{ s}$

$$s = ut + \frac{at^2}{2}, 122.5 = u \times 3 + \frac{9.8}{2} \times 9; u = 26.1 \text{ m/s}$$

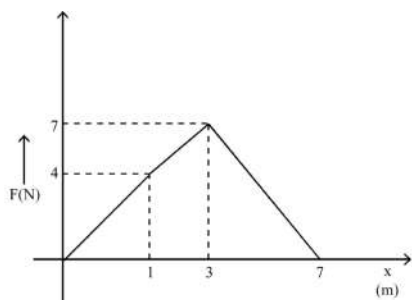
2. When we catch a cricket ball then after catching it, we keep moving the hands in the same direction for a while. Why is it done?

- 1) To increase the impulse on ball  
2) To decrease the impulse on the ball  
3) To increase the time of contact so that force magnitude may increase  
4) To increase the time of contact so that force magnitude may decrease

**Ans. 4**

$$\text{Impulse, } Ft = \text{change in momentum} = \Delta P; t = \frac{\Delta P}{F}$$

3. What is the workdone in displacing the body from  $x = 1\text{m}$  to  $x = 7\text{m}$ ?



- 1) 7 J                      2) 14 J                      3) 49 J                      4) 25 J

**Ans. 4**

$$W = \text{area under graph} \quad W = 2 \times 4 + \frac{1}{2} \times 3 \times 2 + \frac{1}{2} \times 4 \times 7 = 8 + 3 + 14 = 25 \text{ J}$$

4. 1 ampere current is equivalent to

- 1)  $6.25 \times 10^{18} \text{ electrons s}^{-1}$   
 2)  $2.25 \times 10^{18} \text{ electrons s}^{-1}$   
 3)  $6.25 \times 10^{14} \text{ electrons s}^{-1}$   
 4)  $2.25 \times 10^{14} \text{ electrons s}^{-1}$

**Ans. 1**

$$I = \frac{Q}{t} = \frac{ne}{t}; \quad n = \frac{It}{e} = \frac{1 \times 1}{1.6 \times 10^{-19}}; \quad n = 6.28 \times 10^{18}$$

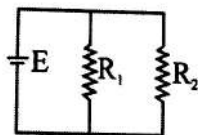
5. The diameter of two planets are in the ratio 4 : 1 and their mean densities are in the ratio 1:2. The acceleration due to gravity on the planets will be in the ratio

- 1) 1 : 2                      2) 2 : 3                      3) 2 : 1                      4) 4 : 1

**Ans. 3**

$$g = \frac{GM}{R^2} = \frac{G}{R^2} \frac{4}{3} \pi R^3 \rho = \frac{4}{3} \pi G R \rho; \quad \frac{g_1}{g_2} = \frac{R_1}{R_2} \frac{\rho_1}{\rho_2} = \frac{4}{1} \times \frac{1}{2} = 2$$

6. In the given circuit, if the resistance  $R_2$  is decreased:



- 1) The current through  $R_1$  increases
- 2) The current through  $R_1$  is constant
- 3) The voltage drop across  $R_2$  decreases
- 4) The power dissipation by  $R_2$  decreases

**Ans. 2**  $I_1 = \frac{E}{R_1}$ ,  $I_2 = \frac{E}{R_2}$ ; Power  $P_1 = \frac{E^2}{R_1}$ ;  $P_2 = \frac{E^2}{R_2}$

When  $R_2$  is decreased  $I_1 = \text{constant}$ ,  $P_1 = \text{constant}$

$I_2$  and  $P_2$  increases

7. A positive charge is moving upward in a magnetic field which is towards north. The particle will be deflected towards

- 1) East
- 2) West
- 3) North
- 4) South

**Ans. 2**

8. A stone is dropped into a well. If the depth of the water below the top be 200m and velocity of sound in air is 340 m/s, then after what time the splash of sound is heard. ( $g = 10 \text{ m/s}^2$ )

- 1) 6s
- 2) 7s
- 3) 8s
- 4) 5s

**Ans. 2**  $t = \sqrt{\frac{2h}{g}} + \frac{h}{v} = \sqrt{\frac{2 \times 200}{10}} + \frac{200}{340} = \sqrt{40} + \frac{20}{34} = 7\text{s}$

9. A cube of ice is floating in a liquid of relative density 1.25 contained in a beaker. When the ice melts, the level of the liquid in the beaker?

- 1) Rises
- 2) Falls
- 3) Remains unchanged
- 4) Falls at first and then rises to the same height as before

**Ans. 1**



10. If the frequency of human heart beat is 1.25 Hz, the number of heart beats in 1 minute is

- 1) 80                      2) 65                      3) 48                      4) 75

**Ans. 4**      $N = ft = 1.25 \times 60 = 75$

11. A wavelength 0.60 cm is produced in air and it travels at a speed of  $300 \text{ ms}^{-1}$ . It will be an

- 1) Audible wave  
2) Infrasonic wave  
3) Ultrasonic wave  
4) None of the above

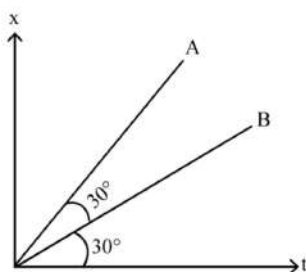
**Ans. 3**     Frequency  $\nu = \frac{V}{\lambda} = \frac{300}{0.6 \times 10^{-2}} = 50000 \text{ Hz}$

12. An object is placed at a distance of 10 cm from a convex lens of power 5D. Find the position of the image

- 1) -20 cm                      2) 30 cm                      3) 20 cm                      4) -30 cm

**Ans. 1**     Focal length  $f = \frac{100}{P} = \frac{100}{5} = 20 \text{ cm}$ ;  $\frac{1}{V} = \frac{1}{f} + \frac{1}{u} = \frac{1}{20} - \frac{1}{10}$ ;  $V = -20 \text{ cm}$

13. Find the ratio of velocity  $V_A/V_B$  from the given position time graph



- 1) 3                      2)  $\frac{1}{3}$                       3) 2                      4)  $\frac{1}{2}$

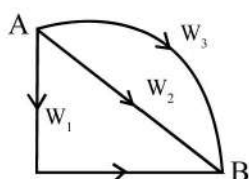
**Ans. 1**      $V = \text{slope of the graph}; V = \tan \theta$ ;  $\frac{V_A}{V_B} = \frac{\tan 60}{\tan 30} = \frac{\sqrt{3}}{\frac{1}{\sqrt{3}}} = 3$

14. The force experienced by a charge in a magnetic field is

- 1) Directly proportional to square of the charge
- 2) Independent of velocity of the charge
- 3) Perpendicular to velocity of the charge
- 4) Directly proportional to mass of the charge

**Ans. 3**  $\vec{F} = q(\vec{V} \times \vec{B}) \therefore$  force is perpendicular to  $\vec{V}$  and  $\vec{B}$

15. A particle is moving from A to B along three different paths as shown in figure. If the work done against conservative forces along the paths are  $W_1$ ,  $W_2$  and  $W_3$ , then



- 1)  $W_1 \neq W_2 = W_3$
- 2)  $W_3 > W_1 > W_2$
- 3)  $W_1 = W_2 \neq W_3$
- 4)  $W_1 = W_2 = W_3$

**Ans. 4** Work done against conservative force is independent of the path

### SECTION B - PHYSICS

16. A train 200m long moving at constant acceleration crosses a bridge 300 m long. It enters the bridge with a speed of 3 m/s and leaves it with a speed of 5 m/s. The time taken to cross the bridge in second is

**Ans. 125** Average velocity  $V_{av} = \frac{u + v}{2} = \left[ \frac{3 + 5}{2} \right] = 4 \text{ m/s}$ ;  $t = \frac{\text{displacement}}{\text{time}} = \frac{300 + 200}{4} = 125 \text{ s}$

17. A particle of mass 2kg is stationary under the action of three forces  $F_1 = 3\text{N}$ ,  $F_2 = 5\text{N}$  and  $F_3 = 10\text{N}$ . If the force  $F_3$  is removed, then the magnitude of acceleration of the particle in  $\text{m/s}^2$  is

**Ans. 5**

When the particle is stationary net force is zero. So  $F_3$  is equal and opposite to the resultant of  $F_1$  and  $F_2$ . When  $F_3$  is removed, the only forces are  $F_1$  and  $F_2$  therefore net force = resultant of  $F_1$  and  $F_2$  which is equal to  $F_3$

$$\therefore a = \frac{F_3}{m} = \frac{10}{2} = 5 \text{ m/s}^2$$

18. A mass of 25 kg is lifted to a height 1m. Work done against gravity in J is ( $g = 10 \text{ m/s}^2$ )

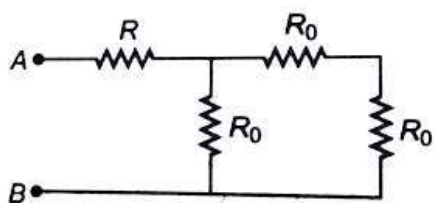
**Ans. 250**  $W = mgh = 25 \times 1 \times 10 = 250 \text{ J}$

19. An object is placed in front of a concave mirror of focal length 30cm and its image three times the size of the object is formed on the same side. The magnitude of object distance in cm is

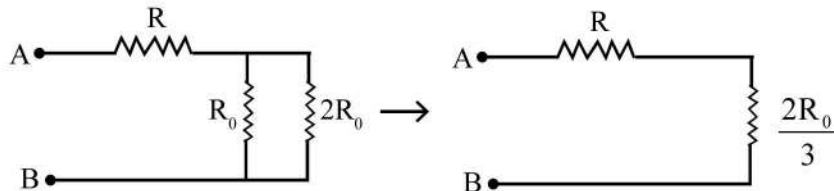
**Ans. 40** Image is real and inverted  $\therefore$  magnification  $m = -3$ ;  $m = \frac{f}{f - u}$

$$-3 = \frac{-30}{-30 - u}, -30 - u = 10; u = -40 \text{ cm}; |u| = 40 \text{ cm}$$

20. In the circuit shown in figure, the total resistance between points A and B is  $R_0$ . The value of resistance R is  $\frac{R_0}{x}$ . The value of x is



**Ans. 3**



$$R_{AB} = R + \frac{2R_0}{3} = R_0; R = R_0 - \frac{2R_0}{3} = \frac{R_0}{3}$$

21. A boy is standing at a distance 50cm in front of a plane mirror. The distance of image of the boy from the boy in cm is

**Ans. 100** Image distance from the mirror  $V = 50 \text{ cm}$ ;  $\therefore$  distance of image from boy  $= 50 + 50 = 100 \text{ cm}$

22. The minimum distance of reflector surface from the source for listening the echo of sound is Speed of sound is 300 m/s. [Answer should be in meter]

**Ans. 15**  $2d = Vt; d = \frac{Vt}{2} = \frac{300}{2} \times \frac{1}{10}; d = 15 \text{ m}$

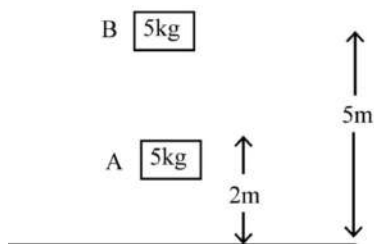
23. A car accelerates from rest at constant rate for first 10 seconds and covers a distance  $x$ . It covers a distance  $y$  in next 10s at the same acceleration. If  $y = ax$ , then value of  $a$  is

**Ans. 3** In first 10 second,  $x = \frac{at^2}{2} = \frac{a}{2} \times 100 = 50a$

In 20 seconds  $x' = \frac{a}{2} \times 20^2 = 200a$

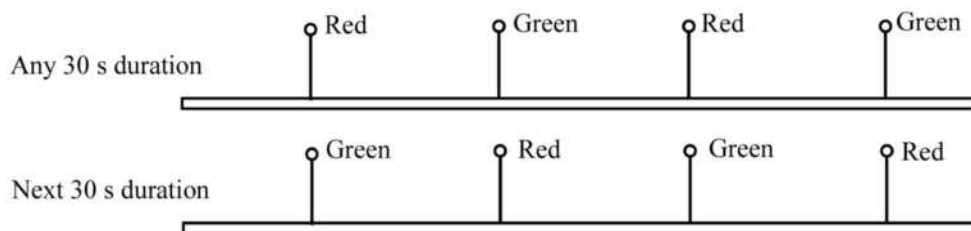
$y = x' - x = 200a - 50a = 150a = 50a \times 3; y = 3x$

24. A particle of mass 5kg is taken from A to B as shown in the figure. The change in potential energy of the mass in joule is [ $g = 10\text{m/s}^2$ ]



**Ans. 150**  $W = mg(h_2 - h_1) = 5[5 - 2] 10 = 150 \text{ J}$

25. Traffic signals are installed at every  $s = 1.00 \text{ km}$  on a long straight road. A signal remains red for  $\tau = 30 \text{ s}$  and green for next  $\tau = 30 \text{ s}$ . The signals are synchronized in such a way that at a time, alternate signals remain red and the other remain green. The scheme is shown in the following figure.



The maximum possible constant speed at which a vehicle can run on this road without a stop is  $x \text{ km/h}$ . The value of  $x$  is

**Ans. 120**

Suppose,

**Case-I :** A car crosses a green signal just when its duration is started. Then if in 30 sec it covers 1km and by this time the next signal which was in red turns to be in green. The car when approaches to the next signal will find it in green.

**Case-II :** A car crosses a green signal just when its duration is started. Then if in 90 sec ( $3 * 30$ ) it covers 1km and by this time the next signal which was in red turns to be in green. The car when approaches to the next signal will find it in green. Explanation : In the interval of 90 sec, in first 30 sec the next signal will be in red, the next 30 sec it will be in green, then the next 30 sec it will be red and when the car just approaches the next signal, it will turn into green.

So, in summary we found that all signals will be in green if the car travels the 1km distance in odd multiple of  $r (=30 \text{ sec})$  i.e.

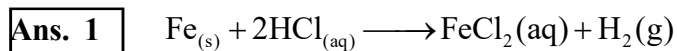
$$\text{Velocity, } v = \frac{s}{[r(2n+1)]} = 120 \text{ Km / h, } 40 \text{ Km / h, } 24 \text{ km / h.....}$$

where,  $n = 0, 1, 2, 3, \dots$

## PART II - CHEMISTRY

26. When dilute hydrochloric acid is added to iron filings

- 1) Hydrogen gas and iron chloride are formed
- 2) Chlorine gas and iron hydroxide are formed
- 3) Iron chloride and water are formed
- 4) No reaction takes place



27. Which among the following will not displace silver from silver nitrate solution?

- 1) Copper (Cu)      2) Gold (Au)      3) Lead (Pb)      4) Zinc (Zn)

**Ans. 2** Gold is less reactive than silver

28. Mixing of an acid with water results in

- 1) Decrease in concentration of  $\text{H}_3\text{O}^+$  ions per unit volume
- 2) An increase in concentration of  $\text{H}_3\text{O}^+$  ions per unit volume
- 3) No change in concentration of  $\text{H}_3\text{O}^+$  ions per unit volume
- 4) Cooling of the solution since the process of dilution of acid is endothermic in nature

**Ans. 1** Dilution of acid leads to decrease in concentration of  $\text{H}_3\text{O}^+$

29. Match List-I (Position of metal in the activity series) with List-II (Related reduction process) and select the correct option using codes given below

<b>List-I</b> (Position of metal in the activity series)	<b>List-II</b> (Related reduction process)
A) the bottom of the series	I) Electrolysis
B) the top of the series	II) Found in native state
C) the lower region of the series	III) Reduction using carbon or some other reducing agent
D) the middle of the series	IV) Reduction by heat alone

- 1) A → II; B → III; C → IV; D → I                      2) A → II; B → I; C → IV; D → III  
 3) A → III; B → I; C → II; D → IV                      4) A → III; B → I; C → IV; D → II

**Ans. 2**

Metal at the bottom of the activity series-least reactive : Found in free state

Metal at the top of the activity series-highly reactive : Electrolysis

Metal at the middle of the activity series - moderately reactive : Reduction using carbon

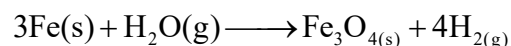
Metals at lower region of the activity series (eg Cu, Hg) : Reduction by heat

30. Which metal among the following do not react either with cold or hot water but react with steam to form metal oxide and hydrogen?

- 1) Calcium (Ca)                      2) Magnesium (Mg)                      3) Copper (Cu)                      4) Iron (Fe)

**Ans. 4**

Metals like Al, Fe and Zn do not react with cold or hot water but react with steam



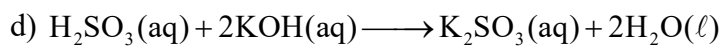
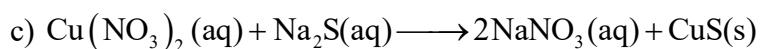
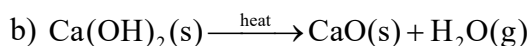
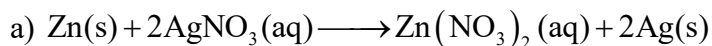
31. Which among the following aqueous solution has the lowest pH value at 298 K?

- 1) 0.1 Molar sodium chloride (NaCl) solution  
 2) 0.1 Molar sodium hydrogen carbonate (NaHCO<sub>3</sub>) solution  
 3) 0.1 Molar sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>) solution  
 4) 0.1 Molar sodium hydroxide (NaOH) solution

**Ans. 1**

pH of NaCl is 7. All other solutions have pH > 7

32. Consider the following reactions



Identify the choice where type of each reaction is related correctly

(a)	(b)	(c)	(d)
1) Precipitation	Neutralisation	Decomposition	Redox reaction
2) Neutralisation	Precipitation	Redox reaction	Decomposition
3) Redox reaction	Decomposition	Precipitation	Neutralisation
4) Decomposition	Redox reaction	Neutralisation	Precipitation

**Ans. 3** (a) = Redox reaction; (b) = Decomposition reaction; (c) = Precipitation reaction; (d) = Neutralisation

33. In the combustion reaction  $\text{C}_n\text{H}_{2n+2} + x\text{O}_2 \longrightarrow z\text{CO}_2 + y\text{H}_2\text{O}$

The values of x, y and z in the given balanced equation are

1)  $x = 2n$ ;  $y = (n+1)$ ;  $z = n$

2)  $x = (3n + 2)$ ;  $y = (n - 1)$ ;  $z = \frac{n}{2}$

3)  $x = \left(\frac{3n+1}{2}\right)$ ;  $y = (n+1)$ ;  $z = n$

4)  $x = \left(\frac{3n-1}{2}\right)$ ;  $y = (n-1)$ ;  $z = n$

**Ans. 3** The balanced equation is  $\text{C}_n\text{H}_{2n+2} + \left(\frac{3n+1}{2}\right)\text{O}_2 \longrightarrow n\text{CO}_2 + (n+1)\text{H}_2\text{O}$



34. Which among the following statement is incorrect?

- 1) 473 K temperature corresponds to 273°C
- 2) The physical state of water at 298 K is liquid
- 3) Naphthalene balls disappear with time without leaving any solid
- 4) Ice at 273 K is more effective in cooling than water at the same temperature

**Ans. 1**      $473\text{ K} = 473 - 273 = 200^\circ\text{C}$

35. Which among the following is not true regarding Dalton's atomic theory?

- 1) All matter whether an element a compound or a mixture is composed of small particles called atoms
- 2) Atoms cannot be created but can be destroyed in a chemical reaction
- 3) Atoms of a given element are identical in mass and chemical properties
- 4) Atoms of different elements have different mass and chemical properties

**Ans. 2**     Atoms cannot be created or destroyed in a chemical reaction

36. For an element with atomic number 19, the 19<sup>th</sup> electron will occupy

- 1) L shell
- 2) M shell
- 3) K shell
- 4) N shell

**Ans. 4**     The E.C. of the atom is 2, 8, 8, 1. The last electron occupy N shell

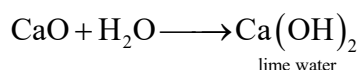
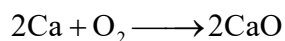
37. Select the correct options from the following statements:-

- i)  $^{12}_6\text{C}$  and  $^{14}_6\text{C}$  are isotones to each other
  - ii)  $^{12}_6\text{C}$  react with  $^{16}_8\text{O}$  to form a product which dissolves in water to form a solution of  $\text{pH} > 7$
  - iii)  $^{40}_{20}\text{Ca}$  and  $^{40}_{18}\text{Ar}$  are isobars to each other
  - iv)  $^{40}_{20}\text{Ca}$  reacts with  $^{16}_8\text{O}$  to form a compound whose aqueous solution is known as lime water
- 1) i and ii
  - 2) i and iii
  - 3) iii and iv
  - 4) i and iv

**Ans. 3**     C-12 and C-14 are isotopes

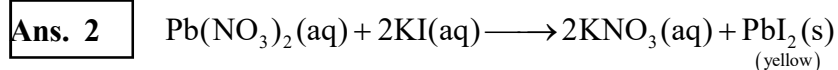
$\text{CO}_2$  dissolves in water to form carbonic acid. Here  $\text{pH} < 7$

Ca-40 and Ar-40 are isobars



38. When aqueous solutions of Lead (II) nitrate and potassium iodide are mixed together. The colour of the precipitate formed and the compound precipitated are respectively

- 1) Yellow : Potassium nitrate
- 2) Yellow : Lead iodide
- 3) White : Lead iodide
- 4) Green : Potassium nitrate



39. Based on his experiments, Rutherford concluded that positive charge on an atom is

- 1) Spread over the atom
- 2) Revolves around the atom in orbits
- 3) Exists within the atom in empty space between orbits
- 4) Present in the nucleus

**Ans. 4** According to Rutherford, the positively charged centre in an atom is called nucleus

40. Which among the following elements form basic oxides

- a) element with atomic number 10
  - b) element with atomic number 12
  - c) element with atomic number 16
  - d) element with atomic number 19
- 1) a and c                      2) b and c                      3) c and d                      4) b and d

**Ans. 4** Atomic number 10 = Ne, At. No. 12 = Mg

At number 16 = S; At. No. 19 = K

Both MgO and K<sub>2</sub>O are basic oxides

## SECTION B - CHEMISTRY

41. How many of the following do not conduct electricity?

- i) Aqueous solution of glucose
- ii) Ethyl alcohol
- iii) Hydrochloric acid
- iv) Dilute sulphuric acid
- v) Aqueous saturated solution of calcium hydroxide
- vi) Cane sugar dissolved in water
- vii) Water solution of sodium chloride

**Ans. 3**      Glucose solution, cane sugar solution and ethylalcohol do not conduct electricity

42. Tooth decay starts when the pH of the mouth is lower than 'y'. Give the value of 10y

**Ans. 55**       $y = 5.5$ ;       $10y = 55$

43. How many of the following are obtained when electricity is passed through an aqueous solution of sodium chloride?

- i) Sodium hydroxide      ii) Oxygen gas      iii) Sodium metal
- iv) Hydrogen gas      v) Chlorine gas

**Ans 3**       $2\text{NaCl}(\text{aq}) + 2\text{H}_2\text{O}(\ell) \longrightarrow 2\text{NaOH}(\text{aq}) + \text{Cl}_2(\text{g}) + \text{H}_2(\text{g})$

44. How many atoms are there in one formula unit of calcium hydrogen carbonate (Calcium bicarbonate)?

**Ans. 11**      Calcium hydrogen carbonate is  $\text{Ca}(\text{HCO}_3)_2$

There are 6 oxygens, 2 carbons, 2 hydrogens and 1 Ca atom in one formula unit

45. Hydrated copper sulphate is  $\text{CuSO}_4 \cdot x\text{H}_2\text{O}$ , washing soda is  $\text{Na}_2\text{CO}_3 \cdot y\text{H}_2\text{O}$  and Gypsum  $\text{CaSO}_4 \cdot z\text{H}_2\text{O}$ . Give the value of  $x + y + z$

**Ans. 17**       $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ,  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  and  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$  are the hydrated species considered

46. A solution contains 48g common salt in 352 g water. The concentration of common salt in terms of mass by mass percentage of the solution is .....

**Ans. 12**

Mass of solute = 48g

Mass of solvent = 352 g

Mass of solution = 400 g

$$\text{Mass \% of salt} = \frac{48}{400} \times 100 = 12\%$$

47. The ion of an element has three (3) positive charges. Mass number of the atom is 27 and number of neutrons present is 14. What is the number of electrons in the ion?

**Ans. 10**

The ion is  $\left[ {}^{27}_{13}\text{M} \right]^{3+}$

Atomic number = 13

No. of electrons in neutral atom = 13

No. of electrons in tripositive ion = 10

48. If K, L, M and N shells of an atom are completely filled. The total number of electrons in the atom would be .....

**Ans. 60**

No. of electrons in K shell = 2

No. of electrons in L shell = 8

No. of electrons in M shell = 18

No. of electrons in N shell = 32

Total = 60

49. How many of the following metals are more reactive than Iron (Fe) as per activity series?

A) Zinc (Zn)

B) Lead (Pb)

C) Copper (Cu)

D) Magnesium (Mg)

**Ans. 2**

Mg, Zn, Fe, Pb, Cu is the decreasing order of reactivity of the metals given

50. How many of the following are metalloids?

i) Gold (Au)

ii) Mercury (Hg)

iii) Boron (B)

iv) Oxygen (O)

v) Silicon (Si)

vi) Carbon (C)

vii) Iodine (I)

viii) Silver (Ag)

ix) Bromine (Br)

x) Germanium (Ge)

xi) Gallium (Ga)

xii) Iron (Fe)

xiii) Copper (Cu)

xiv) Caesium (Cs)

**Ans. CANCELED**

Boron is a typical non metals which is not updated in your school textbooks. But it is already updated in NCERT 11 and 12. Those students who strictly follow 8, 9 and 10 classes NCERT got confused. So in order to maintain equality we cancelled the respective question.

## PART III - MATHEMATICS

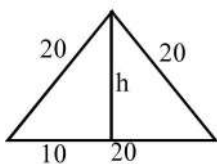
**Instruction:** For calculations you can use following values  $\left( \sqrt{2} = 1.41; \sqrt{3} = 1.73; \pi = \frac{22}{7} \text{ or } 3.14 \right)$

51. Altitude of an equilateral triangle having side of length 20cm is

- 1) 14.1 cm                      2) 17.3 cm                      3) 18.6 cm                      4) 21.3 cm

**Ans. 2**

$$20^2 = 10^2 + h^2; h^2 = 20^2 - 10^2; h^2 = 300; h = 10\sqrt{3} = 17.3$$



52. If  $\sqrt{m} = 9$ , then the value of  $\sqrt{2m+38}$ , is

- 1) 14.1                      2) 17.3                      3) 18.6                      4) 21.3

**Ans. 1**

$$\sqrt{m} = 9 \Rightarrow m = 81; \therefore \sqrt{2m+38} = \sqrt{200} = 14.1$$

53. Area of a semi circular plate having diameter 42 cm, is

- 1) 936 cm<sup>2</sup>                      2) 639 cm<sup>2</sup>                      3) 369 cm<sup>2</sup>                      4) 693 cm<sup>2</sup>

**Ans. 4**

$$2r = 42 \Rightarrow r = 21$$

$$\text{Area} = \frac{1}{2} \pi r^2 = \frac{1}{2} \times \frac{22}{7} \times 21 \times 21 = 693$$

54. Which of the following is a polynomial

- 1)  $2x + \frac{1}{2x}$                       2)  $\frac{3}{2}x^2 + \frac{x}{\pi} + \sqrt{3}$                       3)  $\left( \sqrt{3x} + \frac{1}{\sqrt{2}} \right)^2$                       4)  $5x^2 + 3x^{-2} + 7$

**Ans. 2**

Power of the variable should be a whole number

55. Age of three persons A, B and C are 26 years, 27 years and 28 years respectively. In what ratio of amount they must invest in a Bank, at which compound interest may compute annually at 10%, so that each of them will get same sum of amount at the age of 60, when they will retire from a company?

- 1) 10 : 11 : 12                      2) 110 : 111 : 112                      3) 100 : 110 : 111                      4) 100 : 110 : 121

**Ans. 4**

$$\text{Amount of A} = A(1+r)^{34}$$

$$\text{Amount of B} = B(1+r)^{33}$$

$$\text{Amount of C} = C(1+r)^{32}; \text{ where } r = 0.1$$

$$\text{Given } A(1+r)^{34} = B(1+r)^{33} = C(1+r)^{32}$$

$$\Rightarrow A(1+r)^2 = B(1+r) = C$$

$$A(1.1)^2 = B(1.1) = C$$

$$A.121 = B.110 = C.100$$

$$A : B : C = \frac{1}{121} : \frac{1}{110} : \frac{1}{100}$$

$$A : B : C = 100 : 110 : 121 \text{ (multiply by 12100)}$$

56. If the diagonal of a rectangle is 61 cm and its perimeter is 142 cm, then the area of the rectangle is

- 1) 660 cm<sup>2</sup>                      2) 600 cm<sup>2</sup>                      3) 661 cm<sup>2</sup>                      4) 666 cm<sup>2</sup>

**Ans. 1**

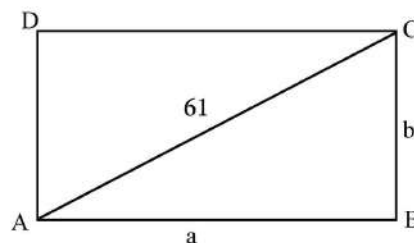
$$\text{Given } a^2 + b^2 = 61^2 \text{ and } 2(a+b) = 142$$

$$\therefore a+b = 71$$

$$(a+b)^2 = a^2 + b^2 + 2ab = 71^2$$

$$\therefore 2ab = 71^2 - 61^2 = (71+61)(71-61)$$

$$2ab = 132 \times 10; ab = 660$$



57. How many zeroes are required to write all natural members between 100 and 1000 in order on a paper?

1) 171

2) 178

3) 168

4) 169

**Ans. 2**

No. having only 'one' zero between 100 and 1000 are listed below

	no	
101, 102.....109, 110, 120.....190.....	18	} Total = $9 \times 18 = 162$
201, 202.....209, 210, 220.....290.....	18	
.....		
.....		
901, 902.....909, 910, 920.....990.....	18	

No having two zero\ between 100 and 1000 are

200, 300, 400 ..... 900  $\Rightarrow 8$ ;  $\therefore$  Total zero =  $8 \times 2 = 16$

$\therefore$  No.of zeros required =  $162 + 16 = 178$

58. If 75% of y is x, then what percentage of 3x is y?

1) 60%

2)  $66\frac{1}{3}\%$

3)  $44\frac{4}{9}\%$

4) 45%

**Ans. 3**

Given 75% of y = x

$$\text{ie } y \times \frac{75}{100} = x \Rightarrow \frac{3y}{4} = x; \therefore 3x = \frac{9}{4}y$$

$$\text{Let } K\% \text{ of } 3x = y; \therefore 3x \times \frac{K}{100} = y; \text{ ie } \frac{9}{4}y \times \frac{K}{100} = y$$

$$\therefore K = \frac{400}{4} = 44\frac{4}{9}$$

59. If  $\frac{3}{4} + x + \frac{7}{5} = \frac{13}{14}$ , then 140x is

1) -157

2) -137

3) -179

4) -171

**Ans. 4**

LCM = 140;

$$\therefore 140 \times \frac{3}{4} + 140x + 140 \times \frac{7}{5} = 140 \times \frac{13}{14}$$

$$105 + 140x + 196 = 130$$

$$140x = -171$$

60. An equilateral triangle of perimeter 36 cm is inscribed in a circle as in the figure. Then the area of the shaded region in the figure, is

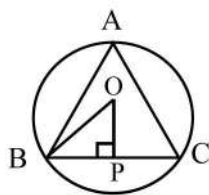


- 1) 19.48                      2) 29.48                      3) 30.48                      4) 31.48

**Ans. 2** Length of the side of triangle,  $a = \frac{36}{3} = 12\text{cm}$

$$\therefore \text{Area of triangle} = \frac{\sqrt{3}a^2}{4} = \sqrt{3} \times \frac{12^2}{4} = 36\sqrt{3}$$

Draw  $OP \perp BC$ , the  $OB$  is radius of the circle



In triangle OBP,  $\angle O = 60^\circ$ ,  $\angle B = 30^\circ$ ,  $\angle P = 90^\circ$

$\therefore$  Opposite sides are in the ratio  $1 : \sqrt{3} : 2$

$$OP : PB : OB = 1 : \sqrt{3} : 2$$

$$\Rightarrow \frac{PB}{OB} = \frac{\sqrt{3}}{2}; PB = \frac{1}{2} \times 12 = 6$$

$$\frac{6}{OB} = \frac{3}{2} \Rightarrow OB = \frac{12}{\sqrt{3}} = 4\sqrt{3} = r$$

$$\therefore \text{Area of Circle} = \pi r^2 = \pi (4\sqrt{3})^2 = 48\pi$$

$$\therefore \text{Area of shaded region} = 48\pi - 36\sqrt{3}$$

$$\therefore \text{required area} = 16\pi - 12\sqrt{3} = 16 \times 3.14 - 12 \times 1.73 = 29.48$$





61. If a, b, c are relative prime integers (there is no common factor between a, b and c), and  $4 + \sqrt{3}$  is one of the root of  $ax^2 + bx + c = 0$ , then which of the following relation provide a perfect square?

- 1)  $a + b - c$                       2)  $b - c - a$                       3)  $b + c - a$                       4)  $c - a - b$

**Ans. 3** One root is  $4 + \sqrt{3}$  then other root is  $4 - \sqrt{3}$  since a, b, c are integers

$$\therefore \text{sum of roots} = 4 + \sqrt{3} + 4 - \sqrt{3} = 8$$

$$\text{Product of roots } (4 + \sqrt{3})(4 - \sqrt{3}) = 13$$

$$\therefore \text{equation is } x^2 - 8x + 13 = 0$$

$a = 1, b = -8, c = 13$ , since a, b, c are co-primes

$$\therefore a + b - c = -20, b - c - a = -22$$

$$b + c - a = 4, c - a - b = 20$$

62. If A (3, -5) and B (-2, 7) are end points of a diameter of a circle. Then circumference of the circle is

- 1) 38.46                      2) 42.32                      3) 40.82                      4) 36.42

**Ans. 3**  $AB = \sqrt{(3-2)^2 + (-5-7)^2} = \sqrt{25+144} = \sqrt{160} = 13 = 2r; \therefore r = \frac{13}{2}$

$$\text{Circumference} = 2\pi r = 13\pi = 40.82 \text{ units}$$

63. Value of  $20^2 - 19^2 + 18^2 - 17^2 + 16^2 - 15^2 + \dots + 2^2 - 1^2$  is

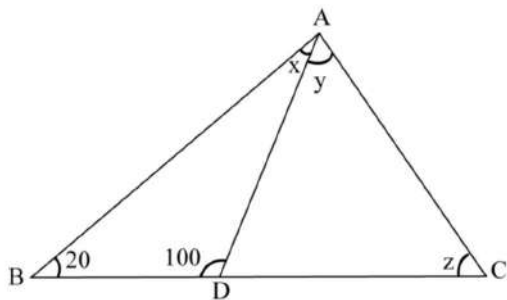
- 1) 210                      2) 220                      3) 230                      4) 240

**Ans. 1**  $a^2 - b^2 = (a + b)(a - b)$

$$S = 39.1 + 35.1 + 31.1 + \dots + 7.1 + 3.1 = 3 + 7 + 11 + \dots + 35 + 39$$

$$= \frac{10}{2} [3 + 39] = 5 \times 42 = 210$$

64. Find  $x + y + z$  from the  $\triangle ABC$



1) 160

2) 140

3) 100

4) 130

**Ans. 1**  $x + y + z + 20 = 180 \Rightarrow x + y + z = 160$

65. Largest number which divide both 444 and 1295 is

1) 74

2) 35

3) 37

4) 44

**Ans. 3** Find HCF

### SECTION B - MATHEMATICS

**Instruction:** For calculations you can use following values  $\left( \sqrt{2} = 1.41; \sqrt{3} = 1.73; \pi = \frac{22}{7} \text{ or } 3.14 \right)$

66. Sum of all prime numbers between 10 and 50

**Ans. 311**  $11+13+17+19+23+29+31+37+41+43+47$

67. If A (2, 3) and B(-1, -1) then AB = .....

**Ans. 5**  $AB = \sqrt{(2-1)^2 + (3-1)^2} = \sqrt{3^2 + 4^2} = 5$

68. A truck has a container having dimensions of size  $1.5 \text{ m} \times 3 \text{ m} \times 2 \text{ m}$ . How many bricks can be loaded inside the container so that the length, breadth and width of the bricks are 45 cm, 25 cm and 16 cm respectively?

**Ans. 500** No.of bricks =  $\frac{150 \times 300 \times 200}{45 \times 25 \times 16} = 500$

69. If  $P(x) = Q(x) + R(x) - S(x)$  where

$$Q(x) = 7 + 2x - 3x^2 + 8x^3$$

$$R(x) = 11 - 5x + x^2 - 5x^3$$

$$S(x) = 21 + 15x - 8x^2 + 3x^3$$

Then the degree of  $P(x)$  is

**Ans. 2**

$$Q(x) = 7 + 2x - 3x^2 + 8x^3$$

$$R(x) = 11 - 5x + x^2 - 5x^3$$

$$Q(x) + R(x) = 18 - 3x - 2x^2 + 3x^3$$

$$S(x) = 21 + 15x - 8x^2 + 3x^3$$

$$P(x) = -3 - 18x + 6x^2 + 0x^3$$

70. Coefficient of largest powered term in the expansion of  $(2x^3 - 4x^2 + 2x - 1)^4$  is

**Ans. 16**

Largest powered term in the expansion is  $(2x^3)^4 = 2^4 \cdot x^{12} = 16x^{12}$

71. An isosceles triangle ABC with base BC is inscribed in a circle of centre 'O'. If  $\angle B = 50^\circ$ , then degree measure of  $\angle A + \angle BOC$  is equal to

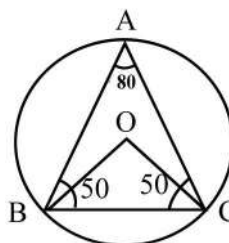
**Ans. 240**

$$\angle B = \angle C = 50$$

$$\therefore \angle A = 180 - (50 + 50) = 80$$

$$\therefore \angle BOC = 2 \times \angle A = 2 \times 80 = 160$$

$$\therefore \angle A + \angle BOC = 80 + 160 = 240^\circ$$



72. Constant term in the expansion of  $\left(x + \frac{1}{x}\right)^2 - \left(x - \frac{1}{x}\right)^2$  is

**Ans. 4**

$$\left(x + \frac{1}{x}\right)^2 - \left(x - \frac{1}{x}\right)^2 = \left(x^2 + \frac{1}{x^2} + 2\right) - \left(x^2 + \frac{1}{x^2} - 2\right) = 2 - (-2) = 4$$

73. Last digit of  $3^{11}$  is

**Ans. 7**

Last digit of  $3^1 = 3$

Last digit of  $3^2 = 9$

Last digit of  $3^3 = 7$

Last digit of  $3^4 = 1$

$\therefore$  last digit repeats in the order 3, 9, 7, 1 etc

74. Value of  $x$  satisfying  $3x - 2y = 1$  and  $7x + y = 25$  is

**Ans. 3**

Solving  $x = 3$

75. 12<sup>th</sup> term in the sequence 7, 18, 29 ..... is

**Ans. 128**

$$t_{12} = 7 + 11 \times 11 = 128$$

## IIT/AIIMS - 2026 SCREENING TEST

QUESTION  
BOOKLET  
CODE

**A**

Date : 03<sup>rd</sup> December 2023

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. Do not break the seal of this question booklet before being instructed to do so by the invigilators
2. Please fill in all the details such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 hour** duration.  
This question booklet contains 75 questions and **Maximum Mark is 240**
5. There are three Parts. Physics, Chemistry & Mathematics having 25 questions each. Each Part consists of two Sections. In **Section A** (15 questions) each question has four options (1), (2), (3) and (4). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. In **Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.** Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer in Section B
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 75 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

**Roll Number**

I have read all the instructions and shall abide by them

I have verified all the information filled by the candidate

\_\_\_\_\_  
Signature of the Candidate

\_\_\_\_\_  
Signature of the Invigilator

---

**SPACE FOR ROUGH WORK**

# PART I - PHYSICS

This part contains 25 questions

## SECTION - A

Physics - Question No. - (1-15)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

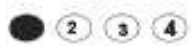








For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION 'A' QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

Physics - Question No. - (16 - 25 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In case of attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION 'B' QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

---

**SPACE FOR ROUGH WORK**



## **SECTION A - PHYSICS**

1. An athlete completes one round of a circular track of radius  $R$  in 40 s. What will be his displacement at the end of 2 min 20 s
  - 1) Zero
  - 2)  $2R$
  - 3)  $2\pi R$
  - 4)  $7\pi R$
  
2. Production of induced emf involves
  - 1) Conversion of electrical energy into mechanical energy
  - 2) Conversion of electrical energy into chemical energy
  - 3) Conversion of chemical energy into electrical energy
  - 4) Conversion of mechanical energy into electrical energy

---

**SPACE FOR ROUGH WORK**

3. Speed of two identical cars are  $u$  and  $4u$  at a specific instant. The ratio of the respective distances in which the two cars are stopped from that instant, when stopping forces are same
- 1) 1 : 1                      2) 1 : 4                      3) 1 : 8                      4) 1 : 16
4. Which one of the following is not the unit of time?
- 1) Leap year
- 2) Shake
- 3) Parallaxic second
- 4) Lunar month
5. When a magnet is moved its north polarity towards a coil placed in a closed circuit, then the nearer face of the coil
- 1) Shows south polarity
- 2) Shows north polarity
- 3) Shows sometimes south polarity
- 4) Shows sometimes north and sometimes south polarity

---

SPACE FOR ROUGH WORK

6. A body of mass 3kg is under a force which causes a displacement in it, given  $S = \frac{t^2}{3}$  (in m). The work done by the force in 2 seconds
  - 1) 2J
  - 2) 3.8 J
  - 3) 5.2 J
  - 4) 2.6 J
7. The diameter of two planets are in the ratio 4 : 1 and their mean densities in the ratio 1 : 2. The acceleration due to gravity on the planets will be in ratio
  - 1) 1 : 2
  - 2) 2 : 3
  - 3) 2 : 1
  - 4) 4 : 1
8. If a force of 250 N acts on a body, the momentum change is 125 kgm/s. What is the period for which force acts on the body?
  - 1) 0.2 s
  - 2) 1 s
  - 3) 0.25 s
  - 4) 0.5 s

## SPACE FOR ROUGH WORK

9. Of the two bulbs in a house hold circuit, one glows brighter than the other, which of the two bulbs has a large resistance?
- 1) The bright bulb
  - 2) The dim bulb
  - 3) Both have the same resistance
  - 4) The brightness does not depend upon the resistance
10. According to Ohm's law the graph of potential difference and current is .....
- 1) Straight line passing through origin
  - 2) Curved
  - 3) Line having an intercept on X-axis
  - 4) Circular

---

SPACE FOR ROUGH WORK

11. If a force is conservative
- 1) Work is path independent
  - 2) Work is path dependent
  - 3) Potential energy remains constant
  - 4) None of these
12. Work done per unit time is called
- 1) Power
  - 2) Pressure
  - 3) Momentum
  - 4) Force
13. Which of the following is not a scalar
- 1) Density
  - 2) Volume
  - 3) Velocity
  - 4) Speed

---

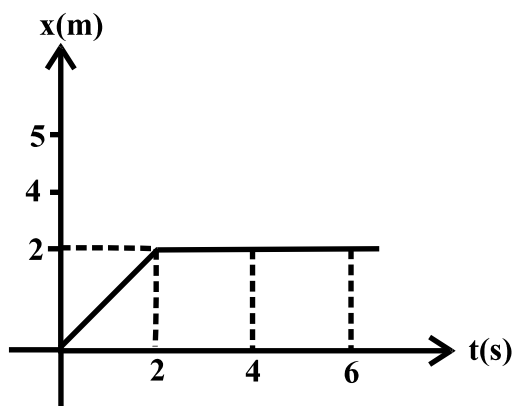
SPACE FOR ROUGH WORK

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- ## SPACE FOR ROUGH WORK

## SECTION B - PHYSICS

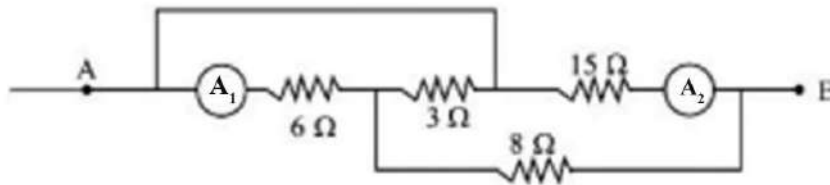
16. An engineer works at a factory out of town. A car is sent for him from the factory everyday and arrives at the railway station at the same time as the train. One day the engineer arrived at the station one hour before his usual time and without waiting for the car, started walking towards factory. On this way he met the car and reached his factory 10 minutes before the usual time. For how much time (in minutes) did the engineer walk before he met the car? The car moves with the same speed everyday.
17. In the figure given, the position-time graph of a particle of mass 5kg shown. The magnitude of impulse at  $t = 2\text{s}$  in  $\text{kg m/s}$  is



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SPACE FOR ROUGH WORK

18. Figure shows the part of a larger circuit. All ammeters are ideal. If the ammeter  $A_1$  reads 1 A. The reading of ammeter  $A_2$  in ampere is



19. A force of 10N is acting on a body of mass 5 kg at rest. The distance travelled by the body in third second is (answer should be in meter)
20. A rubber balloon of negligible mass is filled with 500 g of water. Its apparent weight in water will be (in gram)

---

SPACE FOR ROUGH WORK



21. If two plane mirrors are kept at  $60^\circ$  to each other, then the number of images that can be seen is
22. If a body loses half of its velocity on penetrating 3 cm in a wooden block, then how much will it penetrate more before coming to rest? (Answer should be in cm)
23. Induced emf produced in a closed loop of resistance  $2\ \Omega$  is 30 V. Induced current flows through the loop in ampere is
24. Two spheres of mass  $m$  and  $M$  are situated in air and the gravitational force between them is  $F$ . The space around the masses is now filled with a liquid of density  $3 \times 10^3\ \text{kg/m}^3$ . The gravitational force now will be  $\frac{45F}{n}$ . The value of  $n$  is
25. A convex lens of focal length 10 cm produces a real image twice the size as that of the object. The magnitude of object distance in cm is

---

SPACE FOR ROUGH WORK

## PART II - CHEMISTRY

This part contains 25 questions

### SECTION - A

Chemistry - Question No. - (26-40)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

Full Marks : +4 If only the bubble corresponding to the correct option is darkened fully.

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION 'A' QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

### SECTION - B

Chemistry Question No. - (41 - 50 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In case of attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened fully.

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION 'B' QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

## **SECTION A - CHEMISTRY**

26. Which one of the following element is not a metalloid?

1) Arsenic (As)

2) Silicon (Si)

3) Boron (B)

4) Copper (Cu)

27. Tooth enamel is made up of

1) Calcium phosphate

2) Calcium sulphate

3) Calcium carbonate

4) Calcium silicate

28. A solution turns red litmus blue. It's pH is likely to be

1) 1

2) 4

3) 5

4) 10

---

SPACE FOR ROUGH WORK

29. Equal volumes of solutions containing 1 mole of an acid and 1 mole of a base are mixed. Which of the following mixtures will give pH more than 7?
- 1) Sodium hydroxide and acetic acid
  - 2) Potassium hydroxide and sulphuric acid
  - 3) Ammonium hydroxide and sulphuric acid
  - 4) Sodium hydroxide and hydrochloric acid
30. Which of the following oxide is insoluble in water?
- 1)  $\text{Na}_2\text{O}$
  - 2)  $\text{CuO}$
  - 3)  $\text{K}_2\text{O}$
  - 4)  $\text{CaO}$
31. What happens when dilute hydrochloric acid is added to iron fillings?
- 1) Chlorine gas and iron hydroxide are produced
  - 2) Hydrogen gas and iron chloride are produced
  - 3) Iron salt and water are produced
  - 4) No reaction take place

---

SPACE FOR ROUGH WORK

32. In the reaction  $\text{CuO}_{(s)} + \text{H}_{2(g)} \longrightarrow \text{Cu}_{(s)} + \text{H}_2\text{O}_{(\ell)}$ . The substance reduced is

1) CuO

2)  $\text{H}_2\text{O}$

3) Cu

3)  $\text{H}_2$

33. Which one of the following metals do not corrode easily?

1) Iron

2) Copper

3) Magnesium

4) Platinum

34. Vinegar on reaction with baking soda produces a gas which when passed through lime water turns it milky. The milkiness is due to the formation of

1) Calcium oxalate

2) Calcium hydroxide

3) Calcium carbonate

4) Calcium bicarbonate

---

SPACE FOR ROUGH WORK

35. Which among the following elements are found in liquid state at room temperature ( $25^{\circ}\text{C}$ )
- 1) Gallium (Ga) and Iodine (I)
  - 2) Gallium (Ga) and Bromine (Br)
  - 3) Mercury (Hg) and Bromine (Br)
  - 4) Mercury (Hg) and Sulphur (S)
36. Given below are two statements one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**
- Assertion A :** Elements and compounds are examples of pure substances.
- Reason (R) :** The properties of a compound are different from those of its constituent elements.
- In the light of the above statements choose the most appropriate answer from options given below.
- 1) Both A and R are correct and R is the correct explanation of A
  - 2) Both A and R are correct and R is not the correct explanation of A
  - 3) A is correct but R is not correct
  - 4) A is not correct but R is correct

---

SPACE FOR ROUGH WORK

37. Which of the following is correct with respect to silver metal?

i) Malleable

ii) Melts at 303 K

iii) Ductile

iv) Electrical conductor

1) i, ii and iv

2) i, iii and iv

3) ii, iii and iv

4) i, ii, iii and iv

38. Which metal among the following is more reactive than hydrogen?

1) Mercury (Hg)

2) Copper (Cu)

3) Silver (Ag)

4) Tin (Sn)

---

SPACE FOR ROUGH WORK

39. Match List-I with List-II

<b>List-I (Colloid)</b>	<b>List-II (Dispersed phase- Dispersion medium)</b>
i) Gem stones	a) Liquid - Gas
ii) Shaving cream	b) Liquid - Solid
iii) Cheese	c) Solid - Solid
iv) Cloud	d) Gas - Liquid

Choose the correct answer from options given below

1) i  $\rightarrow$  c; ii  $\rightarrow$  d; iii  $\rightarrow$  b; iv  $\rightarrow$  a

2) i  $\rightarrow$  c; ii  $\rightarrow$  b; iii  $\rightarrow$  d; iv  $\rightarrow$  a

3) i  $\rightarrow$  c; ii  $\rightarrow$  d; iii  $\rightarrow$  a; iv  $\rightarrow$  b

4) i  $\rightarrow$  c; ii  $\rightarrow$  a; iii  $\rightarrow$  b; iv  $\rightarrow$  d

---

SPACE FOR ROUGH WORK



40. Which of the following compound is responsible for tarnishing of silver?

1) Silver oxide ( $\text{Ag}_2\text{O}$ )

2) Silver carbonate ( $\text{Ag}_2\text{CO}_3$ )

3) Silver sulphide ( $\text{Ag}_2\text{S}$ )

4) Silver Nitride ( $\text{Ag}_3\text{N}$ )

### **SECTION B - CHEMISTRY**

41. How many of the following metals are less malleable compared to gold?

i) Tin

ii) Lead

iii) Iron

iv) Nickel

v) Copper

vi) Zinc

vii) Aluminium

42. How many of the following will dissolve in dilute hydrochloric acid?

i) Copper (II) oxide

ii) Copper

iii) Lime stone

iv) Zinc

v) Zinc oxide

---

SPACE FOR ROUGH WORK

43. pH of how many of the following are greater than 7 at 298 K?
- |                              |                   |
|------------------------------|-------------------|
| i) Sodium hydroxide solution | ii) Lemon juice   |
| iii) Blood                   | iv) Pure water    |
| v) Milk of magnesia          | vi) Gastric juice |
44. Water of crystallisation in Gypsum and plaster of paris are m and n respectively. Give the value of  $m \times n$
45. How many different types of oxides are formed when anhydrous ferrous sulphate is heated in a dry boiling tube over a flame?
46. Considering the naturally occurring elements, how many are gases at one atmosphere pressure and room temperature (298 K)?
47. The number of atoms present in one formula unit of calcium bicarbonate is .....
48. The mass of  $3.011 \times 10^{23}$  molecules of dinitrogen ( $N_2$ ) is ..... (Nearest integer)
49. The sum of smallest whole number co-efficients x, y and z in the balanced equation  $xH_{2(g)} + yO_{2(g)} \longrightarrow zH_2O_{(l)}$  is .....
50. Pure gold is ..... carats

---

SPACE FOR ROUGH WORK

## PART III - MATHEMATICS

This part contains 25 questions

### SECTION - A

Mathematics - Question No. - (51-65)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION 'A' QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

### SECTION - B

Mathematics - Question No. - (66 - 75 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In case of attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION 'B' QUESTIONS

**If Single Digit Answer**

If answer is 3

Example 1

Single Digit Answer			
1	1	1	1
2	2	2	2
●	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
0	0	0	0

**If Two Digit Answer**

If answer is 90

Example 2

Two Digit Answer			
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
●	9	9	9
0	0	0	0

**If Three Digit Answer**

If answer is 180

Example 3

Three Digit Answer			
●	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	●	8	8
9	9	9	9
0	0	0	0

**SECTION A - MATHEMATICS**

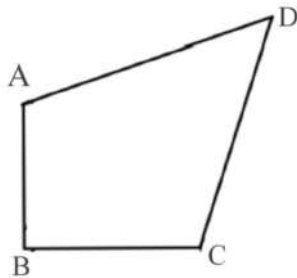
51. The weight of a dog is 8 kg plus one third of its weight. What is the weight of the dog?

- 1) 12 kg                      2) 11 kg                      3) 14 kg                      4) 15 kg

52.  $100^{100}$  is divided by  $50^{50}$  then the quotient is

- 1)  $50^{50}$                       2)  $50^{100}$                       3)  $200^{50}$                       4)  $400^{50}$

53. In  $\square ABCD$ ,  $\angle ABC = 90^\circ$  and  $\angle ADC = 40^\circ$ . If  $\overrightarrow{DA}$  and  $\overrightarrow{DC}$  are produced so that they meet  $\overrightarrow{CB}$  and  $\overrightarrow{AB}$  at E and F respectively. Then  $\angle DEC + \angle DFA$  is



- 1) 50                      2) 40                      3) 60                      4) 70

---

SPACE FOR ROUGH WORK

54. If  $P(x) = x^2 - x + 1$  then  $\frac{P(2) - P(-2)}{P(1) - P(-1)} =$

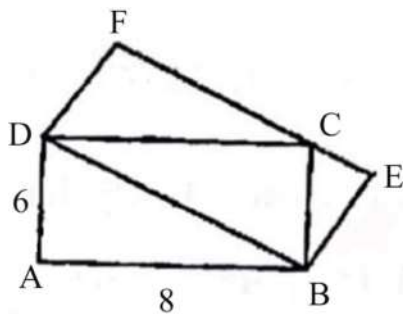
1) 0

2) 2

3) 4

4) 5

55. Two rectangles ABCD and DBEF are as shown in the figure.  $AB = 8$  cm and  $AD = 6$  cm. Then square root of  $25BF^2 - 51$  is



1) 250

2) 3025

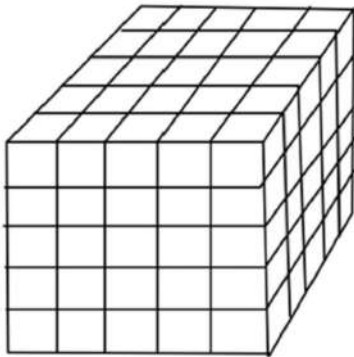
3) 65

4) 55

---

SPACE FOR ROUGH WORK

56. **a, b, c** and **d** are real numbers such that  $\mathbf{a} - 2025 = \mathbf{b} + 2022 = \mathbf{c} - 2023 = \mathbf{d} + 2025$ , then which of the following relation is true
- 1)  $\mathbf{a} < \mathbf{b} < \mathbf{c} < \mathbf{d}$       2)  $\mathbf{a} > \mathbf{c} > \mathbf{b} > \mathbf{d}$       3)  $\mathbf{a} > \mathbf{b} > \mathbf{c} > \mathbf{d}$       4)  $\mathbf{a} > \mathbf{d} > \mathbf{c} > \mathbf{b}$
57. A cone of height 6 cm has base radius 4cm, then the volume of the cone is
- 1)  $48\pi$       2)  $64\pi$       3)  $32\pi$       4)  $46\pi$
58. A cube of edge side 5cm is painted in red colour externally. It is then cut into one cm cubes as shown below. How many of these do not have red paint on any face?



- 1) 8      2) 25      3) 27      4) 36

---

SPACE FOR ROUGH WORK

59. The value of  $\frac{1}{27}$  of  $15^{27}$  is

1)  $125 \times 15^{24}$

2)  $15^9$

3)  $25 \times 15^{26}$

4)  $5^{27}$

60. Three identical rectangles are overlapping as in figure 1. The length and breadth of each rectangles are respectively 2023 cm and 24cm. The area of each of the shaded square portions is  $64 \text{ cm}^2$ . The perimeter of the outer boundary of figure-2 in cm is

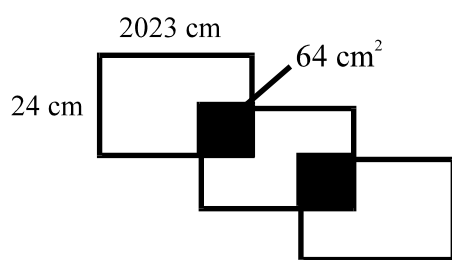


Figure-1

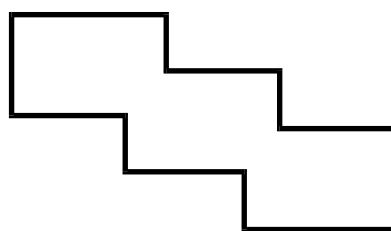


Figure-2

1) 12218

2) 12918

3) 11298

4) 12198

---

SPACE FOR ROUGH WORK

61. If  $\alpha$  and  $\beta$  be the roots of the equations which are given in the Column-I.

I	II	III
A) $x^2 - 6x + 9 = 0$	I) $\alpha + \beta$	1) 0
B) $x^2 - 9 = 0$	II) $ \alpha - \beta $	2) 6
C) $x^2 - 6x + 8 = 0$	III) $ \alpha \beta $	3) 8
D) $x^2 - 8x + 16 = 0$	IV) $ \alpha^2 - \beta^2 $	4) 9

Match Column-II and III. Then which among the following is false?

- 1)  $A \rightarrow I \rightarrow 2$ ;  $B \rightarrow II \rightarrow 2$ ;  $C \rightarrow I \rightarrow 2$ ;  $D \rightarrow I \rightarrow 3$
- 2)  $A \rightarrow III \rightarrow 4$ ;  $B \rightarrow I \rightarrow 1$ ;  $C \rightarrow III \rightarrow 3$ ;  $D \rightarrow II \rightarrow 1$
- 3)  $A \rightarrow II \rightarrow 1$ ;  $B \rightarrow I \rightarrow 1$ ;  $C \rightarrow III \rightarrow 3$ ;  $D \rightarrow I \rightarrow 3$
- 4)  $A \rightarrow IV \rightarrow 1$ ;  $B \rightarrow III \rightarrow 4$ ;  $C \rightarrow II \rightarrow 2$ ;  $D \rightarrow II \rightarrow 1$

---

SPACE FOR ROUGH WORK



62. Volume of the sphere of diameter 'd' is

1)  $\frac{4}{3}\pi d^3$

2)  $\frac{1}{3}\pi d^3$

3)  $\frac{1}{4}\pi d^3$

4)  $\frac{1}{6}\pi d^3$

63.  $\sin 45^\circ + \cos 45^\circ + \tan 45^\circ + \cot 45^\circ$  is

1)  $1 + \sqrt{2}$

2)  $2 + \sqrt{2}$

3)  $\frac{1}{2} + \sqrt{2}$

4)  $\frac{1}{2} + 2\sqrt{2}$

64.  $4x - 1$ ,  $4x + 2$  and  $6x + 1$  are three consecutive terms of an arithmetic progression, then  $5x + 1$  is

1) 7

2) 9

3) 11

4) 13

65. The population of a town increases by 5% annually. If its population in the end of the year 2020 was 120000. What will be the population of the town in the end of the year 2023

1) 1,30,125

2) 1,38,915

3) 1,34,315

4) 1,38,175

---

SPACE FOR ROUGH WORK

## **SECTION B - MATHEMATICS**

66. The distance between two points  $(0, -1)$  and  $(x, 3)$  is 5. Find positive value of  $x$
67. Two triangles ABC and PQR are similar. If  $BC : CA : AB = 1 : 2 : 3$ ; and  $\frac{QR}{PR}$  is  $\frac{a}{b}$ , where  $a, b$  are coprimes, then  $a + b$  is
68. Smallest two digit prime number is
69. If numerical value of volume and surface area of a cube are equal, then length of the side of the cube is
70. Area of a rectangle is  $60\text{cm}^2$ . Then the length of the diagonal, which has an integral value is

---

SPACE FOR ROUGH WORK

71. Sum of 15 terms of the series  $1 + 3 + 5 + 7 + \dots$  is

72. If  $\frac{a}{b} + \frac{b}{a} = 7$ . Then  $\frac{a^2}{b^2} + \frac{b^2}{a^2}$  is

73. Arithmetic mean of 15, 17, 19, 21, 23 is

74.  $(3\sqrt{2} + 2\sqrt{3})^2 + (6 - \sqrt{6})^2 =$

75. Value of  $2^3 + 3^4 + 4^2$  is

---

SPACE FOR ROUGH WORK

**PHYSICS**

1. 2 Time in one revolution = 40s

$$\text{Number of revolutions } N = \frac{t}{T} = \frac{2 \text{ minute } 20 \text{ s}}{40 \text{ s}}$$

$$N = \frac{140}{40} = 3.5$$

∴ Particle completes three and half revolutions, so displacement = 2R

2. 4

3. 4 Stopping distance  $S = \frac{u^2}{2a} = \frac{mu^2}{2F}$

$$S \propto u^2$$

$$\frac{S_1}{S_2} = \left( \frac{u_1}{u_2} \right)^2 = \left( \frac{u}{4u} \right)^2 = \frac{1}{16}$$

4. 3

5. 2 From Lens's law repulsive force between magnet and the coil

6. 4  $S = \frac{at^2}{2} = \frac{t^2}{3}; \quad \frac{a}{2} = \frac{1}{3}$

$$\therefore \text{Acceleration } a = \frac{2}{3} \text{ m/s}^2$$

$$\text{Velocity } V = at = \frac{2}{3}t$$

$$\text{Workdone } W = \text{change in K.E.} = \frac{mV^2}{2}$$

$$W = \frac{m}{2} \times \frac{4}{9} t^2 = \frac{3 \times 2}{9} \times 4 = 2.6 \text{ J}$$

7. 3  $g = \frac{GM}{R^2} = \frac{G}{R^2} \frac{4}{3} \pi R^3 \rho$

$$g = \frac{4}{3} \pi G R \rho$$

$$\frac{g_1}{g_2} = \frac{R_1}{R_2} \frac{\rho_1}{\rho_2} = \frac{4}{1} \times \frac{1}{2} = 2$$

8. 4  $F = \frac{\Delta P}{\Delta t}$

$$\Delta t = \frac{\Delta P}{F} = \frac{125 - 0}{250} = \frac{1}{2} = 0.5 \text{ s}$$

9. 2 Bulbs are in parallel.  $\therefore$  Power  $P = \frac{V^2}{R}$

$\therefore$  Larger resistance consumes less power

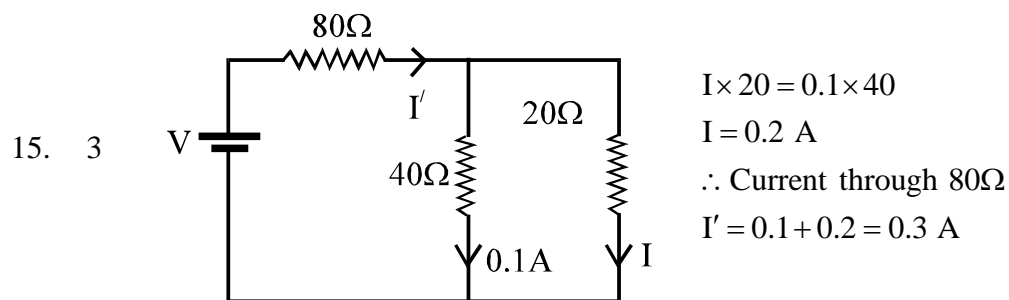
10. 1

11. 1

12. 1 Power =  $\frac{\text{Work done}}{\text{time}}$

13. 3

14. 2  $V = at = 5 \times 3 = 15 \text{ m/s}$



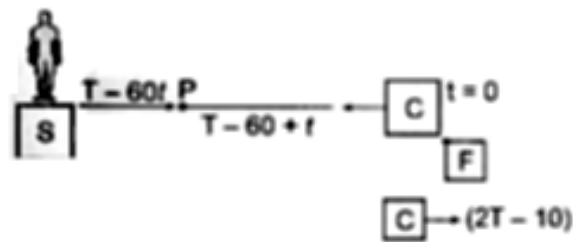
16. 55

In the figures  $S \rightarrow$  station,  $F \rightarrow$  Factory and ' $P$ ' is the place where he meets the car.

Usual day :  $\boxed{S}^T = \text{station}$   $\boxed{F}^{t=0}_{2T} = \text{Factory}$

car starts from  $F$  at  $t = 0$ , reaches station at  $T$  and again reaches at the factory at time  $2T$ .

**This day :**



Person reaches ' $S$ ' at  $T - 60$ . Car starts at  $t = 0$  from  $F$ .

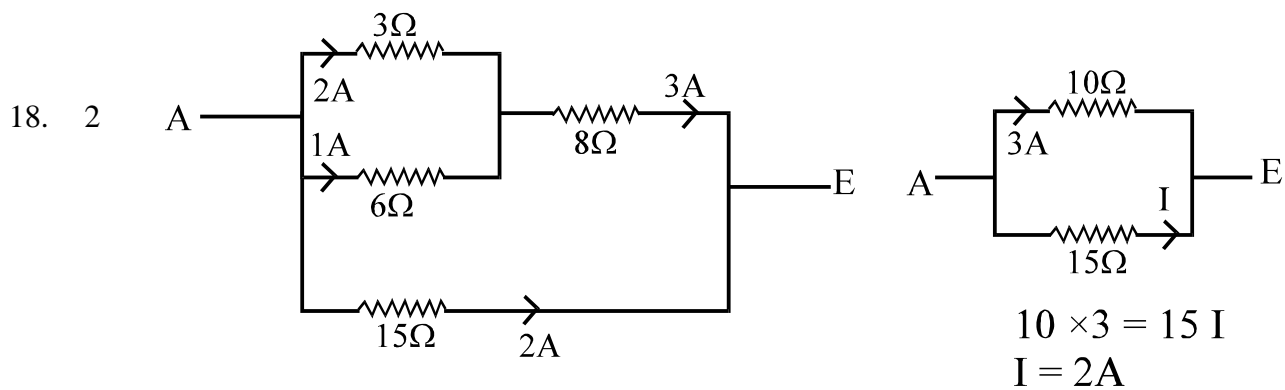
Person walks for time  $t$  and reaches point  $P$  at time  $T - 60 + t$ . At this time car also reaches ' $P$ '. Car comes back at ' $F$ ' at time  $(2T - 10)$ . That means car takes time  $T - 5$  from  $F$  to  $P$ . That means car reach at ' $P$ ' at time  $T - 5$ .

Now  $T - 5 = T - 60 + t$

$\Rightarrow t = 55 \text{ min.}$

17. 5 Impulse = change in momentum

$$= mv - 0 = 5 \times \frac{2}{2} = 5 \text{ kgm/s}$$



19. 5 Acceleration  $a = \frac{F}{m} = \frac{10}{5} = 2 \text{ m/s}^2$

$$S = \frac{a}{2}(2n - 1) = \frac{2}{2}(2 \times 3 - 1)$$

$$S = 5\text{m}$$

20. 0

21. 5  $\frac{360}{\theta} = \frac{360}{60} = 6$

$$N = 6 - 1 = 5$$

22. 1  $S = \frac{V^2 - u^2}{2a}$ ; for first 3m

$$3 = \frac{\frac{u^2}{4} - u^2}{2a}; 2a = \frac{-3u^2}{4 \times 3}$$

For entire motion

$$S = \frac{0 - u^2}{2a} = \frac{-u^2}{-\frac{u^2}{4}} = 4\text{cm}$$

$$\therefore \text{further distance} = 4 - 3 = 1 \text{ cm}$$

23. 15  $I = \frac{E}{R} = \frac{30}{2} = 15 \text{ A}$

24. 45 Gravitational force is independent of the medium  $\therefore \text{force} = F$

$$25. \quad 15 \quad m = \frac{f}{f + u}$$

$$-2 = \frac{10}{10 + u}$$

$$10 + u = -5$$

$$u = -15 \text{ cm}$$

### **CHEMISTRY**

26. 4 As, Si and B are metalloids
27. 1 Tooth enamel is made up of calcium phosphate
28. 4 Basic solution turn red litmus blue
29. 1 Strong base and weak acid; Sodium acetate solution is basic
30. 2 CuO is insoluble in water
31. 2  $\text{Fe}_{(s)} + 2\text{HCl}_{(aq)} \longrightarrow \text{FeCl}_{2(aq)} + \text{H}_{2(g)}$
32. 1 CuO is reduced to Cu
33. 4 Platinum is a noble metal, it is not easily corroded
34. 3 Baking soda produce  $\text{CO}_2$  which when passed through lime water turns its milky due to formation of  $\text{CaCO}_3$
35. 3 Mercury and Bromine are two liquid elements at 298 K
36. 2 Both A and R are correct and R is not the correct explanation of A
37. 2 Silver is a metal. It is a solid at  $30^\circ\text{C}$
38. 4 The standard electrode potential of Sn is negative
39. 1 Gem stone - Solid-solid  
Shaving cream - Gas - liquid  
Cheese - Liquid-solid  
Cloud - Liquid-gas
40. 3 Silver articles become black due to formation of a coating of silver sulphide
41. 7 Sn, Pb, Fe, Ni, Cu, Zn and Al are less malleable compared to Au
42. 4 CuO,  $\text{CaCO}_3$ , Zn & ZnO dissolve in dil. HCl
43. 3 NaOH solution, blood and milk of magnesia have  $\text{pH} > 7$
44. 1 Gypsum is  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Plaster of paris is  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$

$$m = 2, n = \frac{1}{2} \quad (m \times n) = 1$$

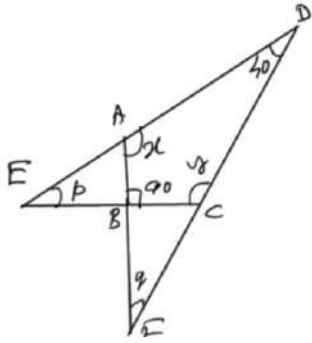


45. 3  $2\text{FeSO}_{4(s)} \xrightarrow{\text{heat}} \text{Fe}_2\text{O}_{3(s)} + \text{SO}_{2(g)} + \text{SO}_{3(g)}$
46. 11 Considering naturally occurring elements-11 are gases at room temperature
47. 11  $\text{Ca}(\text{HCO}_3)_2$  contain 1-Ca, 2-H, 2-C and 6-O atoms
48. 14 Molar mass of  $\text{N}_2 = 28 \text{ g mol}^{-1} = \text{mass of } 6.022 \times 10^{23} \text{ molecules}$
49. 5 The balanced equation is  $2\text{H}_{2(g)} + \text{O}_{2(g)} \longrightarrow 2\text{H}_2\text{O}_{(\ell)}$
50. 24 Pure gold is 24 carat

### **MATHEMATICS**

51. 1 Let weight of dog is x;  $\therefore 8 + \frac{1}{3}x = x \Rightarrow 8 = x - \frac{1}{3}x = \frac{2}{3}x$   
 $\Rightarrow 24 = 2x \Rightarrow x = 12 \text{ kg}$
52. 3 Required quotient =  $\frac{100^{100}}{50^{50}} = \frac{2^{100} \times 50^{100}}{50^{50}} = 2^{100} \times 50^{50} = 4^{50} \times 50^{50} = 200^{50}$

53. 1 In  $\triangle ECD$   $p + y + 40 = 180$



$p + y = 140$ ..... (1)

In  $\triangle FAD$ ,  $q + x = 140$  .....(2)

In  $\square ABCD$ ,  $x + y + 90 + 90 = 360$

$x + t = 230$  ...../(3)

$(1) + (2) + (3) \Rightarrow p + q = 140 + 140 - 230 = 50$

54. 2  $p(x) = x^2 - x + 1$

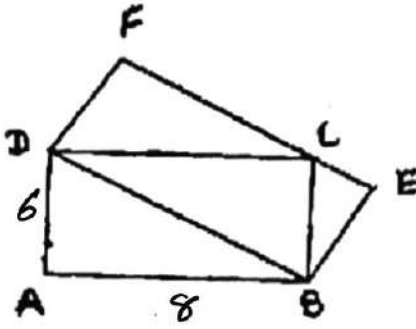
$p(2) = 4 - 2 + 1 = 3$        $p(-2) = 7$

$p(1) = 1 - 1 + 1 = 1$        $p(-1) = 3$

---

SPACE FOR ROUGH WORK

55. 4  $DB = \sqrt{6^2 + 8^2} = 10$



Area of ABCD =  $6 \times 8 = 48$

Area of BDFE =  $2 \times \text{Area of } \triangle DBC = 2 \times \frac{1}{2} \times 6 \times 8 = 48$

Again area of BDFE =  $BD \times DE = 48$ ;  $DE = \frac{48}{10} = \frac{24}{5}$

$BF^2 = BD^2 + DE^2 = 10^2 + \frac{24^2}{5^2} = \frac{2500 + 5 + 6}{25}$

$25BF^2 = 3076$

$25BF^2 - 51 = 3025$

$\sqrt{25BF^2 - 51} = \sqrt{3025} = 55$

---

SPACE FOR ROUGH WORK

56. 2 Let  $a - 2025 = b + 2022 = c - 2023 = d + 2024 = k$

$$\therefore a = k + 2025$$

$$b = k - 2022$$

$$c = k + 2023$$

$$d = k - 2024$$

$$\text{Now, } k + 2025 > k + 2023 > k - 2022 > k - 2024$$

$$\Rightarrow a > b > c > d$$

57. 3 Volume of the cone  $= \frac{1}{2} \pi r^2 h = \frac{1}{3} \times \pi \times 16 \times 6 = 32\pi \text{ cm}^3$

58. 3 Remove one layer from each space, then this cube induced to  $3 \times 3 \times 3 \text{ cm}^3$   
 $\therefore$  There are 27 cubes having no point on its face

59. 1  $\frac{1}{27} \times (3 \times 5)^{27} = \frac{1}{3^3} \times 3^{27} \times 5^{27} = 3^{24} \times 5^{27} = 3^{24} \times 5^{24} \times 5^3 = 125 \times 15^{24}$

---

**SPACE FOR ROUGH WORK**

60. 1

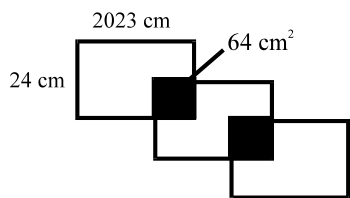


Figure-1

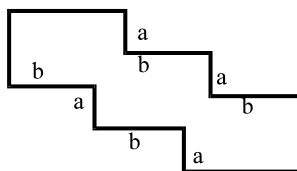


Figure-2

Side length of shaded square is 8 cm.  $\therefore b = 2023 - 8 = 2015$ ;  $a = 24 - 8 = 16$

Perimeter =  $(2023 + 24) 2 + 4(a + b)$

$$= 2047 \times 2 + 4(2016 + 16) = 4094 + 8124 = 12218$$

61. 4

62. 4  $V = \frac{43}{3} \pi r^3, r = \frac{d}{2} \Rightarrow V = \frac{4}{3} \left( \frac{d}{2} \right)^3 = \frac{\pi}{6} d^3$

63. 2  $\sin 45^\circ = \frac{1}{\sqrt{2}}; \cos 45^\circ = 1; \cot 45^\circ = 1$

$$\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} + 1 + 1 = 2 + \frac{2}{\sqrt{2}} = 2 + \sqrt{2}$$

64. 3 If a, b, c are in AP  $b - a = c - b$

$$\Rightarrow 26 = 9 + 5$$

$$\Rightarrow 4x - 1 + 6x + 1 = 2(4x + 2)$$

$$10x = 8x + 4 \Rightarrow x = 2$$

$$5x + 1 = 5 \times 2 + 1 = 11$$

---

SPACE FOR ROUGH WORK

65. 2 In the end of 2020 - 120000

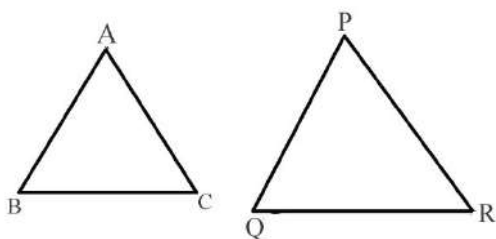
$$\text{End of 2021} = 120000 \times \frac{105}{100}$$

$$\text{End of 2022} = 120000 \times \frac{105}{100} \times \frac{105}{100}$$

$$\text{End of 2023} = 120000 \times \frac{105}{100} \times \frac{105}{100} \times \frac{105}{100} = 120000 \times 1.05^3 = 138915$$

66. 3  $\sqrt{(x-0)^2 + (3-1)^2} = 5$   
 $\sqrt{x^2 + 16} = 5 \Rightarrow x^2 + 16 = 25; x = \pm 3$

67. 3



$$BC : CA : AB = QR : RP : PQ = 1 : 2 : 3$$

$$\frac{QR}{PR} = \frac{1}{2} \Rightarrow a + b = 3$$

---

SPACE FOR ROUGH WORK

68. 11

69. 6      $6a^2 = a^3 \Rightarrow a = b$

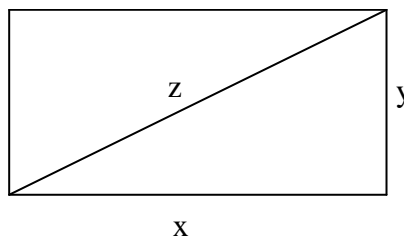
70. 13

$$xy = 60$$

$x^2 + y^2$  is a perfect square.

Then  $x = 5$  and  $y = 12$

$$\therefore z = 13$$



71. 225

$$a = 1; \quad b = 2; \quad n = 15$$

$$S_{15} = \frac{n}{2} [2a + (n-1)d] = \frac{15}{2} [2 \times 1 + 14 \times 2] = 15 \times 15 = 225$$

72. 47

$$\left( \frac{a}{b} + \frac{b}{a} \right)^2 = \frac{a^2}{b^2} + \frac{b^2}{a^2} + 2$$

$$49 = \frac{a^2}{b^2} + \frac{b^2}{a^2} + 2$$

$$\Rightarrow \frac{a^2}{b^2} + \frac{b^2}{a^2} = 47$$

---

SPACE FOR ROUGH WORK

73. 19 Arithmetic mean =  $\frac{15+17+19+21+23}{5}$

74. 72  $(3\sqrt{2} + 2\sqrt{3})^2 + (6 - \sqrt{6})^2 = 18 + 12 + 12\sqrt{6} + 36 + 6 - 12\sqrt{6} = 72$

75. 105  $2^3 + 3^4 + 4^2 = 8 + 81 + 16$

---

SPACE FOR ROUGH WORK



# Brilliant STUDY CENTRE PALA

## IIT/AIIMS - 2026 SCREENING TEST

QUESTION  
BOOKLET  
CODE

**A**

Date : 1<sup>st</sup> October 2023

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. Do not break the seal of this question booklet before being instructed to do so by the invigilators
2. Please fill in all the details such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 hour** duration.  
This question booklet contains 75 questions and **Maximum Mark is 240**
5. There are three Parts. Physics, Chemistry & Mathematics having 25 questions each. Each Part consists of two Sections. In **Section A** (15 questions) each question has four options (1), (2), (3) and (4). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. In **Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.** Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer in Section B
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 75 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

**Roll Number**

I have read all the instructions and shall abide by them

I have verified all the information filled by the candidate

\_\_\_\_\_  
Signature of the Candidate

\_\_\_\_\_  
Signature of the Invigilator

---

**SPACE FOR ROUGH WORK**

# PART I - PHYSICS

This part contains 25 questions

## SECTION - A

Physics - Question No. - (1-15)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION 'A' QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

Physics - Question No. - (16 - 25 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In case of attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION 'B' QUESTIONS

If Single Digit Answer

If Two Digit Answer

If Three Digit Answer

If answer is 3

If answer is 90

If answer is 180

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

---

**SPACE FOR ROUGH WORK**

## **SECTION A - PHYSICS**

- A particle is moving with uniform acceleration has initial velocity 5 m/s and final velocity 10 m/s. The time of motion is 2s. The displacement in the given time interval is

1) 30 m

2) 15m

3) 10 m

4) 20 m
- Total work done by all the forces on a body is equal to

1) Change in potential energy

2) Change in mechanical energy

3) Change in kinetic energy

4) – (Change in potential energy)

## SPACE FOR ROUGH WORK

3. Rate of change in momentum with respect to time is equal to

1) mass  $\times$  velocity

2) mass  $\times$  displacement

3)  $\frac{\text{mass}}{\text{velocity}}$

4) mass  $\times$  acceleration

4. In a region  $10^{19}$   $\alpha$  particles and  $10^{19}$  protons move to the left, while  $10^{19}$  electrons move to the right per second. The current is

1) 3.2 A towards left

2) 3.2 A towards right

3) 6.4 A towards left

4) 6.4 A towards right

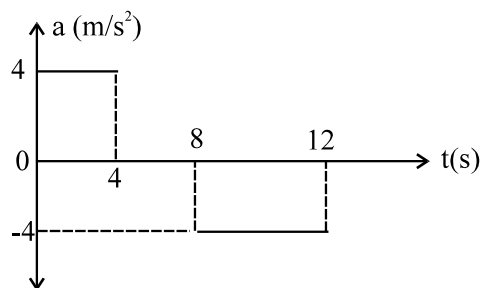
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SPACE FOR ROUGH WORK

5. A 5 kg ball when falls through a height of 20m acquires a speed of 10 m/s. Find the work done by air resistance [Take  $g = 10 \text{ m/s}^2$ ]

1) -750 J                      2) Zero                      3) -250 J                      4) -1250 J

6. A lift starts from rest. Its acceleration is plotted against time in the following graph. When it comes to rest, its height in meter above its starting point is



1) 64                      2) 128                      3) 32                      4) 164

7. A particle moving with velocity 10 m/s decelerates at a constant rate of  $4 \text{ m/s}^2$ . The displacement of the particle in the 3rd second is

1) 1m                      2) 2m                      3) 0.5 m                      4) Zero

---

SPACE FOR ROUGH WORK

8. A man getting down a running bus falls forward because

1) Due to inertia of rest, road is left behind and man reaches forward

2) Due to inertia of motion, upper part of body continues to be in motion in forward direction while feet come to rest as soon as they touch the road

3) He leans forward as a matter of habit

4) Of the combined effect of all the three factors stated in A, B and C

9. The mass of moon is 1% of the mass of earth. The ratio of gravitational pull of the earth on moon to that of the moon on earth will be

1) 1 : 1

2) 1 : 10

3) 1 : 100

4) 2 : 1

---

SPACE FOR ROUGH WORK



10. Slope of momentum time graph gives

1) Force

2) Acceleration

3) Work done

4) Power

11. Pressure exerted by a liquid of height  $h$  and density  $\rho$  is  $P$ . The height  $h$  is

1)  $P\rho g$

2)  $\frac{P\rho}{g}$

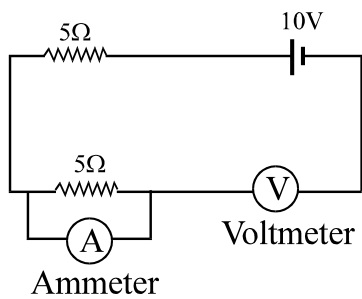
3)  $\frac{Pg}{\rho}$

4)  $\frac{P}{\rho g}$

---

SPACE FOR ROUGH WORK

12. A voltmeter and an ammeter are connected in a circuit as shown in the diagram. The reading of the ammeter in ampere will be



- 1) 1A                      2) 3A                      3) 5A                      4) Zero
13. Induced emf produced in a closed circuit can be found by using
- 1) Coulomb's law                      2) Kirchoff's law
- 3) Faraday's law                      4) Newton's law

---

SPACE FOR ROUGH WORK

14. Area under current-time graph gives

1) Charge flows

2) Potential difference

3) Electrostatic force

4) Work done

15. The spring balance does not read properly after its long use because

1) The elasticity of spring increases

2) The elasticity of spring decreases

3) Its plastic power decreases

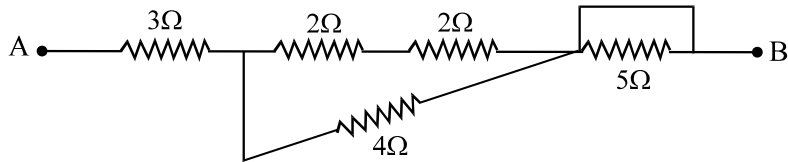
4) Its plastic power increases

---

SPACE FOR ROUGH WORK

## **SECTION B - PHYSICS**

16. The effective resistance in ohm between the points A and B in the given circuit is

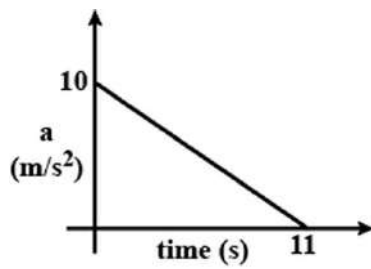


17. A convex lens of focal length 30 cm produces a real image three times the size of the object. The magnitude of object distance (in cm) from the lens is
18. A body starts from rest and moving with uniform acceleration  $2 \text{ m/s}^2$ . Velocity of the body at 3<sup>rd</sup> second in m/s is
19. Frequency of sound wave is 300 Hz and velocity of sound wave in a medium is 600 m/s. The wavelength of the wave in the medium in meter is

---

SPACE FOR ROUGH WORK

20. A particle is initially at rest, it is subjected to a linear acceleration 'a', as shown in the figure. The maximum speed attained by the particle in m/s is



21. Acceleration produced by a force on a 2kg mass is  $8 \text{ m/s}^2$ . The force acting on the particle in newton is
22. If force and velocity are doubled then, the power produced by the force becomes x times the initial power. The value of x is
23. A uniform wire of resistance R is stretched until its length becomes twice the initial value. Then the change in resistance is xR. The value of x is
24. The minimum separation between object and its real image in cm for a concave mirror of focal length 5 cm is
25. Potential difference applied across a resistance of  $2 \Omega$  is 20 V. Current through the resistor in ampere is:

---

SPACE FOR ROUGH WORK

## PART II - CHEMISTRY

This part contains 25 questions

### SECTION - A

Chemistry - Question No. - (26-40)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

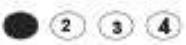








For each question, marks will be awarded in one of the following categories

Full Marks : +4 If only the bubble corresponding to the correct option is darkened fully.

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION 'A' QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

### SECTION - B

Chemistry Question No. - (41 - 50 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In case of attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened fully.

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION 'B' QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer									
1	1	1	2	2	2	3	3	3	3
4	4	4	5	5	5	6	6	6	6
7	7	7	8	8	8	9	9	9	9
0	0	0	0	0	0	0	0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer									
1	1	1	2	2	2	3	3	3	3
4	4	4	5	5	5	6	6	6	6
7	7	7	8	8	8	9	9	9	9
0	0	0	0	0	0	0	0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer									
1	1	1	2	2	2	3	3	3	3
4	4	4	5	5	5	6	6	6	6
7	7	7	8	8	8	9	9	9	9
0	0	0	0	0	0	0	0	0	0

## **SECTION A- CHEMISTRY**

26. Which among the following is a compound?

1) Ice

2) Bromine

3) Diamond

4) Copper

27. Hydrogen gas is liberated when dilute hydrochloric acid is added to

1)  $\text{CaCO}_3$

2)  $\text{NaHCO}_3$

3) Cu

4) Zn

28. Which among the following is not classified as a metalloid?

1) Silicon

2) Lead

3) Arsenic

4) Germanium

---

SPACE FOR ROUGH WORK

29. Tyndall effect is observed in

- 1) Aqueous solution of glucose
- 2) Acetic acid diluted with water
- 3) Milk diluted with water
- 4) Sodium chloride dissolved in water

30. Chlorine gas is passed through dry slaked lime to get

- 1) Soda lime                      2) Bleaching powder      3) Quick lime                      4) Baking powder

31. Which one of the following is a non metal and also a solid at 298 K and 1 atm pressure?

- 1) Iodine                      2) Mercury                      3) Bromine                      4) Hydrogen

32. Which among the following is usually known as 'King of chemicals'?

- 1) Sulphuric acid                      2) Hydrochloric acid      3) Sodium hydroxide      4) Nitric acid

---

SPACE FOR ROUGH WORK



33. You are provided with aqueous solutions of three salts X, Y and Z. 2-3-drops of blue litmus solution, red litmus solution and phenolphthalein were added to each of these solutions in separate experiments. The change in colours of different indicators were recorded in the following tables

Sample	with blue litmus solution	with red litmus solution	with phenolphthalein
X	no change	no change	no change
Y	turns red	no change	no change
Z	no change	turns blue	turns pink

On the basis of the above observations identify X, Y and Z from the following options

- 1) X =  $\text{NH}_4\text{Cl}$       Y =  $\text{NaCl}$       Z =  $\text{CH}_3\text{COONa}$
- 2) X =  $\text{NH}_4\text{Cl}$       Y =  $\text{CH}_3\text{COONa}$       Z =  $\text{NaCl}$
- 3) X =  $\text{NaCl}$       Y =  $\text{NH}_4\text{Cl}$       Z =  $\text{CH}_3\text{COONa}$
- 4) X =  $\text{CH}_3\text{COONa}$       Y =  $\text{NH}_4\text{Cl}$       Z =  $\text{NaCl}$

---

SPACE FOR ROUGH WORK

34. In the combustion reaction of the hydrocarbon  $C_xH_y$

$C_xH_y + zO_2 \longrightarrow xCO_2 + wH_2O$  the values of co-efficients  $z$  and  $w$  in the balanced equation are

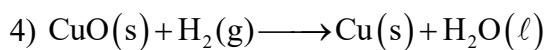
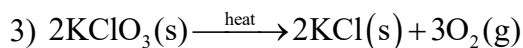
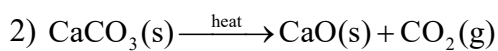
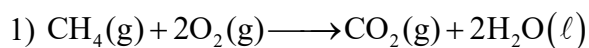
1)  $z = (x + y) \quad w = \left(\frac{y}{2}\right)$

2)  $z = \left(\frac{x + y}{2}\right) \quad w = (2y)$

3)  $z = \left(x + \frac{y}{4}\right) \quad w = \left(\frac{y}{2}\right)$

4)  $z = \left(x + \frac{y}{2}\right) \quad w = \left(\frac{y}{4}\right)$

35. Which among the following is not a redox reaction?



---

SPACE FOR ROUGH WORK

36. Chlorine gas is liberated from HCl by the action of

1) Fe

2) ZnO

3)  $\text{MnO}_2$

4) MgO

37. Match the chemicals given in Column-I with the raw material for their preparation in Column-II and their use/property in Column-III

Column- I (Chemical)	Column-II (Raw material)	Column-III (Use/property)
a) Baking soda	i) Gypsum	p) Oxidising agent in industry
b) Bleaching powder	ii) Sodium chloride	q) for making surfaces smooth
c) Plaster of paris	iii) Slaked lime	r) mild non corrosive basic salt

1)  $a \rightarrow (ii) - (r)$ ;  $b \rightarrow (iii) - q$ ;  $c \rightarrow (i) - p$

2)  $a \rightarrow (ii) - (r)$ ;  $b \rightarrow (iii) - p$ ;  $c \rightarrow (i) - q$

3)  $a \rightarrow (iii) - (p)$ ;  $b \rightarrow (i) - r$ ;  $c \rightarrow (ii) - q$

4)  $a \rightarrow (i) - (q)$ ;  $b \rightarrow (iii) - r$ ;  $c \rightarrow (ii) - p$

---

SPACE FOR ROUGH WORK

38. Pure gold is

1) 18 carat

2) 20 Carat

3) 22 Carat

4) 24 Carat

39. Tooth enamel is made up of calcium phosphate, the hardest substance in the body. The formula of calcium phosphate is

1)  $\text{Ca}_3\text{PO}_4$

2)  $\text{Ca}(\text{PO}_4)_2$

3)  $\text{Ca}_3\text{P}_2$

4)  $\text{Ca}_3(\text{PO}_4)_2$

---

SPACE FOR ROUGH WORK

40. Match List-I (Elements) with List-II (Physical state at 298 K and 1 atm pressure of product of combustion) and List-III (nature of product of combustion)

<b>List-I (Elements)</b>	<b>List-II (Physical state at 298 K &amp; 1 atm of product of combustion)</b>	<b>List-III (Nature of product of combustion)</b>
a) Aluminium	i) Liquid	p) Acidic
b) Graphite	ii) Gas	q) Basic
c) Hydrogen	iii) Solid	r) Neutral
		s) Amphoteric

Select the appropriate match from the options given below

- 1)  $a \rightarrow (iii) - (r)$ ;  $b \rightarrow (ii) - (q)$ ;  $c \rightarrow (i) - (s)$
- 2)  $a \rightarrow (ii) - (q)$ ;  $b \rightarrow (iii) - (p)$ ;  $c \rightarrow (i) - (r)$
- 3)  $a \rightarrow (i) - (p)$ ;  $b \rightarrow (iii) - (q)$ ;  $c \rightarrow (ii) - (s)$
- 4)  $a \rightarrow (iii) - (s)$ ;  $b \rightarrow (ii) - (p)$ ;  $c \rightarrow (i) - (r)$

---

SPACE FOR ROUGH WORK

## **SECTION B - CHEMISTRY**

41. How many of the following are pure substances?

i) Ice

ii) Milk

iii) 24 Carat gold

iv) Calcium oxide

v) Mercury

vi) Air

vii) Vinegar

viii) Gold amalgam

42. Blue vitriol is hydrated copper sulphate  $\text{CuSO}_4 \cdot x\text{H}_2\text{O}$ . The value of x is .....

43. Give the number of elements among the following that liberates hydrogen gas from very dilute nitric acid?

i) Magnesium

ii) Zinc

iii) Copper

iv) Iron

v) Aluminium

vi) Manganese

---

**SPACE FOR ROUGH WORK**

44. Deoxyribose is  $C_5H_{10}O_4$ . Its molar mass is .....  $g\ mol^{-1}$  (nearest integer)

45. Number of metal atoms present in one formula unit of sodium zincate is .....

46. How many of the following elements are present in baking powder?

i) Hydrogen

ii) Potassium

iii) Sodium

iv) Carbon

v) Oxygen

vi) Calcium

vii) Nitrogen

viii) Chlorine

ix) Sulphur

47. How many metals among the following are more reactive than iron?

i) Magnesium

ii) Lead

iii) Copper

iv) Zinc

v) Calcium

vi) Silver

vii) Mercury

viii) Aluminium

ix) Sodium

---

SPACE FOR ROUGH WORK

48. In the balanced chemical equation  $x\text{Fe(s)} + y\text{H}_2\text{O(g)} \longrightarrow z\text{Fe}_3\text{O}_4\text{(s)} + w\text{H}_2\text{(g)}$ . The total number of atoms on the reactant side is .....
49. How many of the following metals are found in the free state as well as in combined state as their oxide or sulphide ores?
- |                |               |
|----------------|---------------|
| i) Calcium     | ii) Magnesium |
| iii) Aluminium | iv) Gold      |
| v) Silver      | vi) Platinum  |
| vii) Copper    | viii) Iron    |
50. How many different products are produced when electricity is passed through an aqueous solution of sodium chloride in chlor-alkali process?

---

SPACE FOR ROUGH WORK



## PART III - MATHEMATICS

This part contains 25 questions

### SECTION - A

Mathematics - Question No. - (51-65)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

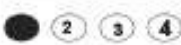






For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION 'A' QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

### SECTION - B

Mathematics - Question No. - (66 - 75 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In case of attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened fully.

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION 'B' QUESTIONS

**If Single Digit Answer**

If answer is 3

Example 1

Single Digit Answer			
1	1	1	1
2	2	2	2
●	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
0	0	0	0

**If Two Digit Answer**

If answer is 90

Example 2

Two Digit Answer			
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
●	0	0	0
0	●	0	0

**If Three Digit Answer**

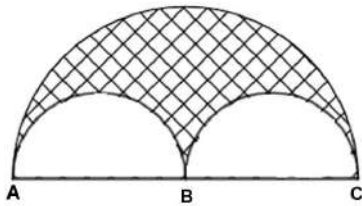
If answer is 180

Example 3

Three Digit Answer			
●	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	●	8	8
9	9	9	9
0	0	●	0

### SECTION A - MATHEMATICS

51. The distance between two given points  $(K, 5)$  and  $(2K, -3)$  is  $4\sqrt{5}$ , then one value of  $K$  is
- 1) 1                      2) 2                      3) 3                      4) 4
52. Value of  $\frac{1}{\sqrt{32}-\sqrt{18}} + \frac{1}{\sqrt{98}-\sqrt{72}}$  is
- 1)  $\sqrt{2}$                       2)  $\frac{1}{\sqrt{2}}$                       3)  $\frac{1}{2\sqrt{2}}$                       4)  $2\sqrt{2}$
53. If  $x + \frac{1}{x} = 5$  then  $x^2 + \frac{1}{x^2} =$
- 1) 26                      2) 23                      3) 27                      4) 32
54. Three semi circles are drawn as in the figure such that  $AB$ ,  $BC$  and  $AC$  are diameters. If  $AB = 20$  cm, then the area of shaded region is



- 1)  $100\pi$                       2)  $25\pi$                       3)  $50\pi$                       4)  $75\pi$

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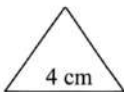
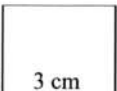

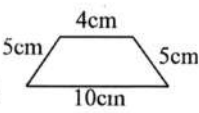
SPACE FOR ROUGH WORK

55. A number obtained by increasing 75% of a given two digit number is 8 more than half of another two digit number formed by reversing the digits of the given number. Then sum of the digits of the given number is
- 1) 10                      2) 13                      3) 9                      4) 11
56. Value of N, where  $N = \frac{123^2 - 111^2}{234}$
- 1) 10                      2) 11                      3) 12                      4) 13
57. Sum of smallest and largest two digit prime numbers is
- 1) 103                      2) 105                      3) 108                      4) 106
58. The value of  $\frac{x^{a+b} \cdot x^{b+c} \cdot x^{c+a}}{(x^a \cdot x^b \cdot x^c)^2}$  is
- 1)  $x^{a+b+c}$                       2)  $x$                       3)  $x^0$                       4)  $x^2$
59. If  $\alpha, \beta$  be the roots of  $3x^2 - 2x + 1 = 0$ , then  $\frac{1}{\alpha} + \frac{1}{\beta} =$
- 1) 3                      2)  $\frac{1}{3}$                       3)  $\frac{1}{2}$                       4) 2

---

SPACE FOR ROUGH WORK

60. Match the following  $\left( \text{Use } \pi = \frac{22}{7} \right)$

I (Figures)	II (Required measure)	III
A)  Equilateral triangle	I) Area	1) 88 units
B)  Square	II) Perimeter	2) 9 units
C)  Circle	III) Circumference	3) 28 units
D)  Isosceles trapezium	iv) Diagonals	4) 12 units

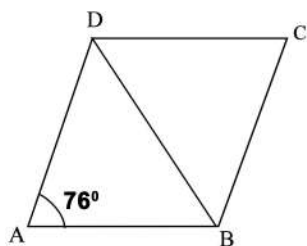
Then, which among the following is true?

- 1)  $A \rightarrow I \rightarrow 3$ ;  $B \rightarrow II \rightarrow 4$ ;  $C \rightarrow I \rightarrow 1$ ;  $D \rightarrow II \rightarrow 3$
- 2)  $A \rightarrow II \rightarrow 4$ ;  $B \rightarrow I \rightarrow 2$ ;  $C \rightarrow III \rightarrow 1$ ;  $D \rightarrow I \rightarrow 3$
- 3)  $A \rightarrow II \rightarrow 1$ ;  $B \rightarrow I \rightarrow 4$ ;  $C \rightarrow III \rightarrow 3$ ;  $D \rightarrow IV \rightarrow 3$
- 4)  $A \rightarrow I \rightarrow 4$ ;  $B \rightarrow III \rightarrow 3$ ;  $C \rightarrow II \rightarrow 2$ ;  $D \rightarrow II \rightarrow 1$

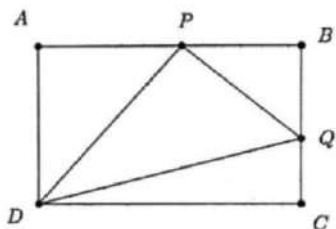
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SPACE FOR ROUGH WORK

61. In the given figure, ABCD is a rhombus. The measure of  $\angle CDB$ , is



- 1)  $50^\circ$                       2)  $57^\circ$                       3)  $52^\circ$                       4)  $56^\circ$
62. Which among the following point lies on y axis?
- 1)  $(0, -3)$                       2)  $(-3, 0)$                       3)  $(1, 1)$                       4)  $(1, -1)$
63. ABCD is a rectangle. P and Q are points on AB and BC respectively such that the area of triangle APD =  $7\text{ cm}^2$  area of triangle PBQ =  $6\text{ cm}^2$  and area of triangle QCD =  $5\text{ cm}^2$ . Then the area of the triangle DPQ in square units is



- 1)  $\sqrt{46}\text{ cm}^2$                       2)  $2\sqrt{46}\text{ cm}^2$                       3)  $\sqrt{92}\text{ cm}^2$                       4)  $3\sqrt{46}\text{ cm}^2$

---

SPACE FOR ROUGH WORK

64. The number of pair of natural numbers  $(x, y)$  which satisfy the equation  $\frac{7}{x} + \frac{6}{y} = 1$  is
- 1) 4                      2) 8                      3) 5                      4) 10
65. 3600 is expressed as  $2^a \times 3^b \times 5^c$  and 3240 is expressed as  $2^d \times 3^e \times 5^f$ , where  $a, b, c, d, e, f$  are positive integers. Then the remainder when 2024 is divided by  $a + b + c + d + e + f$ , is
- 1) 9                      2) 10                      3) 7                      4) 8

### **SECTION B- MATHEMATICS**

66. ABCD is a parallelogram. If the two diagonals are equal then the degree measure of  $\angle ABC$  is .....
67. If  $x^2 + x - 30 = (x - k)(x + 6)$  then the value of  $k$  is .....
68. Number of terms in the expansion of  $(a + b)^2 + (a - b)^2$  is

---

SPACE FOR ROUGH WORK

69. If  $x = 2 - \sqrt{3}$ , then the value of  $x + \frac{1}{x} = \dots\dots\dots$
70. The mean of 10 numbers is 34, then the sum of all 10 numbers is .....
71. Find the area (in  $\text{cm}^2$ ) of one side of a semi-circular plate of diameter 14 cm.  $\left(\pi = \frac{22}{7}\right)$
72. Sachin purchased a laptop that costs him Rs. 40,000 and sold it at Rs. 50,000 after a few days. If profit is  $x\%$  then  $x$  is .....
73. Ages of Sreeraj and Rahul are in the ratio 5 : 7. Four years later the sum of their ages will be 56 years. Then the age of Rahul is .....
74. If  $\sqrt{m} = 16$ , then the value of  $2m + 1$  is
75. Largest 2 digit number divisible by 5 is

---

SPACE FOR ROUGH WORK

---

**SPACE FOR ROUGH WORK**



**PHYSICS**

1. 2 Displacement  $S = \text{Average velocity} \times \text{Time}$ ;  $S = \left(\frac{u+v}{2}\right)t = \left(\frac{5+10}{2}\right)2 = 15 \text{ m}$
2. 3 From work–energy theorem work done by all the forces = change in K.E.
3. 4 From Newton's second law  $F = \frac{\text{Change in momentum}}{\text{Time}} = \frac{\Delta P}{\Delta t} = m \frac{\Delta V}{\Delta t}$ ;  $F = ma$
4. 3 Current  $I = \frac{\text{Charge}}{\text{Time}} = \frac{Nq}{t} = nq$

$$n = \frac{N}{t} = \text{Number of charged particles flows per second}$$

$q = \text{Charge of one particle}$

$$n_{\alpha}q_{\alpha} + n_pq_p + n_eq_e = n_{\alpha}2e + n_pe + n_ee = 10^{19} [2e + e + e] = 4e10^{19}$$

$$= 4 \times 1.6 \times 10^{-19} \times 10^{19} = 6.4 \text{ A}$$

Direction of current is in the direction of motion of positive charge.  $\therefore$  towards left

5. 1  $W = \text{Change in mechanical energy} = -mgh + \frac{mv^2}{2} = -5 \times 10 \times 20 + \frac{5}{2} \times 100$ ;  $W = -750 \text{ J}$
6. 2  $t = 0 \text{ to } 4\text{s}$

$$S_1 = \frac{at^2}{2} = \frac{4}{2} \times 16 = 32\text{m}; t = 4\text{s to } 8\text{s}$$

$$S_2 = Vt = (at)t = 4 \times 4(8-4) = 64\text{m}; t = 8\text{s to } 12 \text{ s}$$

$$S_3 = \frac{at^2}{2} = \frac{4}{2} \times 4^2 = 32\text{m}$$

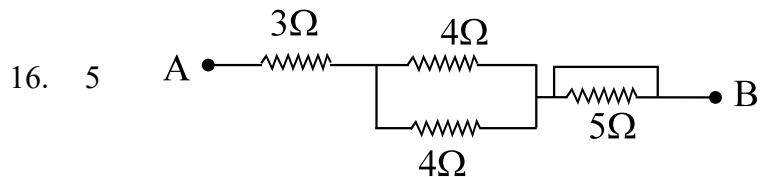
$$\text{Total height } h = S_1 + S_2 + S_3 = 128 \text{ m}$$

7. 4 Displacement in  $n^{\text{th}}$  second

$$S_n = u + \frac{a}{2}(2n-1) = 10 - \frac{4}{2}(2 \times 3 - 1)$$

$$S_n = 10 - 10 = 0$$

8. 2  
 9. 1 Force exerted by moon on earth and earth on moon are equal in magnitude  
 10. 1 Rate of change of momentum gives force  
 11. 4 Pressure  $P = h\rho g$   
 12. 4 For an ideal voltmeter resistance is infinity.  $\therefore$  current through the circuit is zero  
 13. 3  
 14. 1  
 15. 2



$5\Omega$  is short circuited.  $\therefore$  it can be removed



17. 40 Magnification  $m = \frac{f}{f + u}$

Image is real and inverted  $\therefore m = -3$

$$-3 = \frac{30}{30 + u}; 30 + u = -10, u = -40 \text{ cm}$$

18. 6  $V = u + at = 0 + 2 \times 3; V = 6 \text{ m/s}$

19. 2 Wavelength  $= \frac{\text{speed}}{\text{frequency}}; \lambda = \frac{600}{300} = 2 \text{ m}$

20. 55 Change in velocity = area under the graph

$$V - 0 = \frac{1}{2} \times 10 \times 11 = 55 \text{ m/s}$$

21. 16  $F = ma = 2 \times 8 = 16 \text{ N}$

22. 4 Power  $P = FV$

$$P' = (2F)(2V) = 4P$$

23. 3  $L' = 2L$ ; Resistance  $R' = 2^2 R = 4R$ ;  $\therefore \Delta R = 4R - R = 3R$

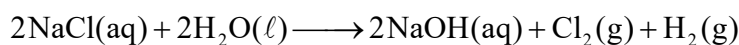
24. 0

25. 10  $I = \frac{V}{R} = \frac{20}{2} = 10 \text{ A}$

## CHEMISTRY

26. 1 Ice is solid water
27. 4  $\text{Zn(s)} + 2\text{HCl(aq)} \longrightarrow \text{ZnCl}_2\text{(aq)} + \text{H}_2\text{(g)}$
28. 2 Lead is not a metalloid
29. 3 Milk is liquid in liquid colloid (emulsion)
30. 2 Bleaching powder is obtained by the action of chlorine on dry slaked lime
31. 1 Iodine is a solid non metal
32. 1 Sulphuric acid is usually known as king of chemicals
33. 3  $\text{NaCl} \Rightarrow$  Salt of strong acid and strong base – neutral solution  
 $\text{NH}_4\text{Cl} \Rightarrow$  Salt of strong acid and weak base – acidic solution  
 $\text{CH}_3\text{COONa} \Rightarrow$  Salt of weak acid and strong base – basic solution
34. 3 The balanced equation is  $\text{C}_x\text{H}_y + \left(x + \frac{y}{4}\right)\text{O}_2 \longrightarrow x\text{CO}_2 + \frac{y}{2}\text{H}_2\text{O}$
35. 2 Thermal decomposition of  $\text{CaCO}_3$  is not a redox reaction
36. 3  $\text{MnO}_2 + 4\text{HCl} \longrightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$
37. 2  $\text{NaHCO}_3$  is prepared from  $\text{NaCl}$   
 $\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2 + \text{NH}_3 \rightarrow \text{NH}_4\text{Cl} + \text{NaHCO}_3$   
It is a mild non corrosive basic salt. Bleaching powder is prepared from dry slaked lime and is used as oxidising agent. Plaster of paris is obtained by heating gypsum and it is used for making surfaces smooth
38. 4 Pure gold is 24 carat
39. 4  $\text{Ca}^{2+}$  and  $\text{PO}_4^{3-}$  are the cation and anion. The compound is  $\text{Ca}_3(\text{PO}_4)_2$
40. 4  $\text{Al(s)} \longrightarrow \text{Al}_2\text{O}_3\text{(s)} \rightarrow$  Amphoteric  
 $\text{C(s)} \longrightarrow \text{CO}_2\text{(g)} \rightarrow$  Acidic  
 $\text{H}_2\text{(g)} \longrightarrow \text{H}_2\text{O(g)} \rightarrow$  Neutral
41. 4 Milk, Air, Vinegar and Gold amalgam are mixtures
42. 5 Blue vitriol is  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
43. 2 Magnesium and Manganese give hydrogen gas with very dilute nitric acid
44. 134  $(5 \times 12) + (10 \times 1) + (4 \times 16) = 60 + 10 + 64 = 134 \text{ gmol}^{-1}$
45. 3 Sodium zincate is  $\text{Na}_2\text{ZnO}_2$
46. 4 Baking powder is  $\text{NaHCO}_3$  containing edible acid such as tartaric acid. There are only four elements present Na, H, C and O

47. 5 The reactivity series is K, Na, Ca, Mg, Al, Zn, Fe, Pb, Cu, Hg, Ag, Au
48. 15 The balanced equation is  $3\text{Fe(s)} + 4\text{H}_2\text{O(g)} \longrightarrow \text{Fe}_3\text{O}_4\text{(s)} + 4\text{H}_2\text{(g)}$
49. 2 Silver and copper are found in free state. They also occur as their sulphide or oxide ores
50. 3 On electrolysis of aqueous NaCl, NaOH(aq),  $\text{Cl}_2\text{(g)}$  and  $\text{H}_2\text{(g)}$  are produced



### MATHEMATICS

51. 4  $\sqrt{(2K - K)^2 + (-3 - 5)^2} = 4\sqrt{5}$   
 $K^2 + 64 = 80 \Rightarrow K^2 = 16, K = \pm 4$
52. 1  $\frac{1}{\sqrt{32} - \sqrt{18}} + \frac{1}{\sqrt{98} - \sqrt{22}} = \frac{1}{4\sqrt{2} - 3\sqrt{2}} + \frac{1}{3\sqrt{2} - 6\sqrt{2}} = \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$
53. 2  $\left(x + \frac{1}{x}\right)^2 = 25$   
 $x^2 + \frac{1}{x^2} + 2 = 25$   
 $x^2 + \frac{1}{x^2} = 23$
54. 1  $AB = 20 \text{ cm} \Rightarrow AC = 40 \text{ cm}$   
 $\therefore \text{Required Area} = \frac{1}{2}\pi\left(\frac{40}{2}\right)^2 - 2\left[\frac{1}{2}\pi\left(\frac{20}{2}\right)^2\right]$   
 $= \frac{1}{2}\pi \times 400 - 2\left[\frac{1}{2}\pi \times 100\right]$   
 $= 200\pi - 100\pi = 100\pi$
55. 1 Let given number =  $10a + b = N$   
 $\therefore (10a + b) + \frac{3}{4}(10a + b) = 8 + \frac{10b + a}{2}$

$$4(10a + b) + 3(10a + b) = 32 + 20b + 2a$$

$$40a + 4b + 30a + 3b = 32 + 20b + 2a$$

$$68a = 13b + 32$$

$$13b = 68a - 32$$

$$= 4(17a - 8) = M(4)$$

$$\Rightarrow b = M(4) \Rightarrow b = 4 \text{ or } 8$$

$$\text{When } b = 4, 13 \times 4 = 4(17a - 8)$$

$$13 = 17a - 8$$

$$17a = 21 \Rightarrow \text{no value of } a$$

$$\text{When } b = 8, 26 = 17a - 8$$

$$17a = 34 \Rightarrow a = 2$$

$\therefore$  Number is 28

$$\begin{aligned} 56. \quad 3 \quad \frac{123^2 - 111^2}{234} &= \frac{(123 + 111)(123 - 111)}{234} \\ &= \frac{234 \times 12}{234} = 12 \end{aligned}$$

$$57. \quad 3 \quad 11 + 97 = 108$$

$$58. \quad 3 \quad \frac{x^{a+b+b+c+c+a}}{(x^{a+b+c})^2} = \frac{x^{2a+2b+2c}}{x^{2a+2b+2c}} = x^0$$

$$\begin{aligned} 59. \quad 4 \quad \alpha + \beta &= \frac{2}{3} \quad \alpha\beta = \frac{1}{3} \\ \frac{1}{\alpha} + \frac{1}{\beta} &= \frac{\alpha + \beta}{\alpha\beta} = \frac{\frac{2}{3}}{\frac{1}{3}} = 2 \end{aligned}$$

$$60. \quad 2 \quad (\text{A}) \quad \text{Area} = \frac{\sqrt{3} \times 16}{4} = 4\sqrt{3}$$

$$\text{Perimeter} = 3a = 12$$

$A \rightarrow \Pi \rightarrow 4$  is True

(B)  $\text{Area} = 9\text{cm}^2$

$\text{Perimeter} = 12\text{cm}^2$   $B \rightarrow I \rightarrow 2$  is True

$\text{Diagonal} = 3\sqrt{2}$   $B \rightarrow II \rightarrow 4$  is True

(C)  $\text{Area} = \frac{22}{7} \times 14 \times 14 = 616$

$\text{Perimeter or circumference} = 2 \times \frac{22}{7} \times 14 = 88$

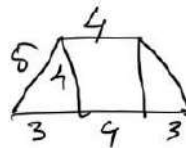
$C \rightarrow II \rightarrow I$  True

$C \rightarrow III \rightarrow I$

(D)  $\text{Area} = \frac{1}{2} \times 4(10 + 4 = 28)$

$\text{Perimeter} = 24$

$D \rightarrow I \rightarrow 3$

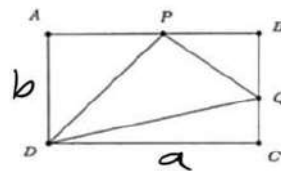


61. 3  $\angle BAD + \angle ADC = 180 \Rightarrow \angle ADC = 180 - 76 = 104$

$\therefore \angle CDB = \frac{1}{2} \times 104 = 52$

62. 1 x-coordinate of the point on y-axis is zero

63. 2 Let  $DC = a$ ,  $AD = b$ ,  $BP = x$ ,  $BQ = y$



$\therefore AP = a - x$ ;  $CQ = b - y$

Given  $APD = 7 \Rightarrow \frac{1}{2}b(a - x) - 7 \Rightarrow ab - bx = 14$

$$PBQ = 6 \Rightarrow \frac{1}{2}XY = 6 \Rightarrow XY = 12$$

$$QCD = 5 \Rightarrow \frac{1}{2}a(b-y) = S \Rightarrow ab - ay = 10$$

$$\therefore (ab-14)(ab-10) = bx \cdot ay = 12ab$$

$$z^2 - 10z - 14z + 140 - 12z = 0$$

$$z^2 - 36z + 140 = 0$$

$$z = \frac{36 \pm \sqrt{2b^2 - 4 \times 140}}{2}$$

$$= \frac{36 \pm \sqrt{4^2 + 9^2 - 4^2 \times 35}}{2}$$

$$ab = z = \frac{36 \pm 4\sqrt{81-35}}{2} = 18 \pm 2\sqrt{46}$$

$$\text{Area of DPQ} = 18 + 2\sqrt{46} - (6 + 7 + 5) = 2\sqrt{46}$$

64. 2  $7y + 6x = xy \Rightarrow xy - 6x - 7y = 0$

$$xy - 6x - 7y + 42 = 42$$

$$(x-6)(y-7) = 42 \dots\dots\dots(1)$$

$$\text{Divisor of } 42 = 1, 2, 3, 6, 7, 14, 21, 42$$

$$42 \rightarrow (1, 42), (2, 21), (3, 14), (6, 7), (42, 1), (21, 2), (14, 3), (7, 6)$$

$$\therefore x-6=1 \text{ and } y-7=42 \Rightarrow x=7, y=44$$

$$(x, y) \rightarrow (7, 44), (8, 28) \dots\dots\dots \text{these are eight pairs of } (x, y)$$

65. 4  $3600 = 2^4 \times 3^2 \times 5^2 \Rightarrow a=4, b=2, c=2$

$$3240 = 2^3 \times 3^4 \times 5 \Rightarrow d=3, e=4, f=1$$

$$a+b+c+d+e+f = 4+2+2+3+4+1 = 16$$

$$\therefore 2024 = 126 \times 16 + 8$$

66. 90 If diagonals are equal, the parallelogram is a reactangle

67. 5  $x^2 + x - 30 = (x+6)(x-5) \Rightarrow k=5$

$$68. \quad 2 \quad \begin{aligned} (a+b)^2 &= a^2 + 2ab + b^2 \\ (a-b)^2 &= a^2 - 2ab + b^2 \\ \hline (a+b)^2 + (a-b)^2 &= 2a^2 + 2b^2 \end{aligned}$$

$$69. \quad 4 \quad x = 2 - \sqrt{3}, \frac{1}{x} = \frac{1}{2 - \sqrt{3}} = \frac{2 + \sqrt{3}}{(2 - \sqrt{3})(2 + \sqrt{3})} = \frac{2 + \sqrt{3}}{4 - 3} = 2 + \sqrt{3}, \quad n + \frac{1}{n} = 2 - \sqrt{3} + 2 + \sqrt{3} = 4$$

$$70. \quad 340 \quad \text{Mean} = \frac{\text{Sum of all observation}}{\text{Total number}}$$

$$34 = \frac{\text{Sum of all}}{10}; \therefore \text{Required sum} = 340$$

$$71. \quad 77 \quad A = \frac{1}{2} \pi r^2 = \frac{1}{2} \times \frac{22}{7} \times 7^2 = 11 \times 7 = 77$$

$$72. \quad 25 \quad \text{Pr ofit} = 50000 - 40000 = 10000$$

$$\% \text{ of profit} = \frac{10000}{40000} \times 100 = 25$$

$$x\% = 25\% \Rightarrow n = 25$$

$$73. \quad 28 \quad \text{Age of Sreeraj} = 5n$$

$$\text{Age of Rahul} = 7n$$

$$\text{Four year after } (5n + 4) + (7n + 4) = 56$$

$$12n + 8 = 56$$

$$12n = 48 \Rightarrow n = 4$$

$$\text{Age of Rahul} = 7 \times 4 = 28$$

$$74. \quad 513 \quad \sqrt{m} = 16 \Rightarrow m = 256$$

$$2m + 1 = 2 + 256 + 1 = 513$$

$$75. \quad 95$$



Date : 14<sup>th</sup> May 2023

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2½ hour** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 300**
5. There are three Parts. Physics, Chemistry & Mathematics having 30 questions each. Each Part consists of two Sections. In **Section A** (20 questions) each question has four options (1), (2), (3) and (4). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. In **Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions.** In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be **evaluated**. Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

I have read all the instructions and shall abide by them

\_\_\_\_\_  
Signature of the Candidate

**Roll Number**

I have verified all the information filled by the candidate

\_\_\_\_\_  
Signature of the Invigilator



# PART I - PHYSICS

This part contains 30 questions

**SECTION A - Question No. Physics - (1-20)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

## CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Physics - (21 - 30 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

## CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
<input checked="" type="radio"/>	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
<input checked="" type="radio"/>	9	9
0	<input checked="" type="radio"/>	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer		
<input checked="" type="radio"/>	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	<input checked="" type="radio"/>	8
9	9	9
0	0	<input checked="" type="radio"/>

### **SECTION -A (PHYSICS)**

1. The normal force acting on a surface of area  $30 \text{ cm}^2$  is  $900 \text{ N}$ . The pressure on the surface is
- 1)  $3 \times 10^2 \text{ N/m}^2$
- 2)  $30 \text{ N/m}^2$
- 3)  $3 \times 10^5 \text{ N/m}^2$
- 4)  $3 \times 10^3 \text{ N/m}^2$
2. Two objects having mass in  $1 : 4$  ratio are dropped from the same height. The relation between their velocity when they strike the ground is
- 1) Both objects will have the same velocity
- 2) The velocity of the first object is twice that of the second one
- 3) The velocity of the 2<sup>nd</sup> object is one fourth of that of the 1<sup>st</sup> object
- 4) The velocity of the 2<sup>nd</sup> object is 4 times that of the 1<sup>st</sup> one

## SPACE FOR ROUGH WORK

3. The work done by a force on a body will be positive if the body
- 1) Moves perpendicular to the direction of applied force
  - 2) Does not move
  - 3) Moves along the direction of applied force
  - 4) Moves opposite to the direction of applied force
4. A bullet of mass 2 gm moving with velocity 50 m/s hits normally on a wooden block. The velocity of the bullet reduces to zero after penetrating 10 cm. The average force experienced by the block is :
- 1) 25 N
  - 2) 50 N
  - 3) 30 N
  - 4) 100 N
5. Two masses of 1 g and 4 g are moving with equal kinetic energies. The ratio of the magnitudes of their linear momentum is
- 1) 4 : 1
  - 2)  $\sqrt{2}$  : 1
  - 3) 1 : 2
  - 4) 1 : 6

---

**SPACE FOR ROUGH WORK**

6. Which of the statement is true ?

A) Field lines due to a bar magnet start from the north pole and end on the south pole. Any number of field lines can pass through a point.

B) Field lines due to a bar magnet start from the north pole and end on the south pole. Only one field line passes through a point.

C) Field lines due to a bar magnet are continuous lines passing inside and outside the magnet. Only one field line passes through a point.

D) Field lines due to a bar magnet are continuous lines passing inside and outside the magnet. Any number of field lines can pass through a point.

1) A

2) B

3) C

4) C, D

7. Which of the following is a conservative force ?

1) gravitational force

2) induced electric force

3) frictional force

4) viscous force

---

**SPACE FOR ROUGH WORK**

8. The radii of two planets are respectively  $R_1$  and  $R_2$  and their densities are respectively  $\rho_1$  and  $\rho_2$ . The ratio of the accelerations due to gravity at their surface is

1)  $g_1 : g_2 = \frac{\rho_1}{R_1^2} : \frac{\rho_2}{R_2^2}$

2)  $g_1 : g_2 = R_1 R_2 : \rho_1 \rho_2$

3)  $g_1 : g_2 = R_1 \rho_2 : R_2 \rho_1$

4)  $g_1 : g_2 = R_1 \rho_1 : R_2 \rho_2$

9. Electrostatic force between two identical charges at a separation  $r$  is  $F$ . If 25% of charge is transferred one to another then the new force between the charges at same separation is :

1)  $\frac{F}{4}$

2)  $\frac{3F}{4}$

3)  $\frac{15F}{16}$

4)  $\frac{5F}{14}$

10. On a planet whose size (including radii) is the same and mass is 4 times as that of our earth. Then the amount of work done to lift 3 kg mass vertically upwards through 3 m distance on that planet is (g on the surface of earth is  $10 \text{ m/s}^2$ )

1) 360 J

2) 40 kg

3) 360 kg

4) 40 J

---

SPACE FOR ROUGH WORK

11. Passage of current through a straight conductor display some fixed pattern. Which of the following statements is wrong ?
- 1) Magnitude of the magnetic field produced at a given point increases as the current through wire increases
  - 2) The magnetic field produced by a given current in the conductor increases as the distance from it decreases
  - 3) Direction of the field lines is in accordance with the right hand thumb rule
  - 4) Field lines are unaffected by the quantity of current flowing
12. A particle completes two revolutions in 50 seconds in a circular path of radius 7m. Distance covered and displacement in two revolutions will be, respectively
- 1) 44m, 14m
  - 2) 88m, 44m
  - 3) 44m, zero
  - 4) 88m, zero

---

**SPACE FOR ROUGH WORK**



13. The gravitational force between two objects each of mass  $m$ , separated by a distance  $r$ , is  $F$ . Gravitational force between two objects each of mass  $2m$  separated by a distance  $2r$ , will be

1)  $\frac{F}{2}$

2)  $F$

3)  $2F$

4)  $4F$

14. If half of a convex lens is blackened, then which of the following statements is correct?

1) Image will be formed fully but intensity becomes half

2) Image formed will be half of size of the object and intensity will be unchanged

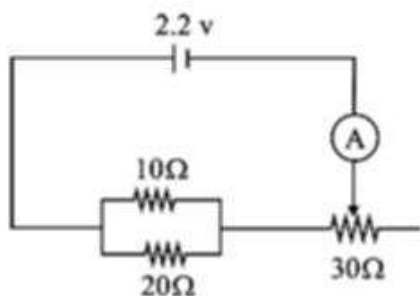
3) Image will not be formed

4) Image will be formed fully and intensity will be unchanged

---

SPACE FOR ROUGH WORK

15. The resistance of rheostat shown in the figure is  $0 - 30\ \Omega$ . Neglecting the resistance of ammeter and connecting wire the minimum and maximum currents through the ammeter will be



- 1) (0.08 A, 0.33 A)      2) (0.06A, 0.08 A)      3) (0.06 A, 0.33 A)      4) (0.33 A, 0.09 A)
16. Two objects of masses 100g and 200g are moving along the same line and direction with velocities of  $2\text{ms}^{-1}$  and  $1\text{ms}^{-1}$  respectively. Ratio of their momenta is
- 1) 4 : 1                      2) 1 : 1                      3) 2 : 1                      4) 1 : 2
17. When a ball is thrown upward in the condition of negligible air resistance then its total energy.
- 1) Increases    2) Decreases
- 3) Remains constant    4) Becomes zero at the highest point of its journey

---

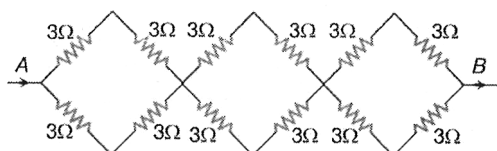
SPACE FOR ROUGH WORK

18. The electrical resistivity of the material of conductor is  $\rho$ . If its length is doubled and area of cross-section is tripled, then its electrical resistivity will be
- 1)  $\rho$
- 2)  $2\rho$
- 3)  $3\rho$
- 4)  $4\rho$
19. If work, force and time are represented by x, y and z respectively, then the term  $\left(\frac{x}{yz^2}\right)$  will represent
- 1) acceleration
- 2) velocity
- 3) displacement
- 4) momentum
20. A particle of mass 0.3 kg is subjected to a force  $F = Kx$  with  $K = 15 \text{ N/m}$ . What will be its initial acceleration if it is released from a point  $x = 20 \text{ cm}$
- 1)  $1 \text{ m/s}^2$
- 2)  $10 \text{ m/s}^2$
- 3)  $100 \text{ m/s}^2$
- 4)  $0.1 \text{ m/s}^2$

## SPACE FOR ROUGH WORK

### SECTION - B (PHYSICS)

21. An object is released from height 20 m from ground. 25% of energy loss is produced due to impact. The maximum height attained after first impact in m is :
22. In the network of resistance shown in the adjoining figure, the equivalent resistance between A and B in ohm is

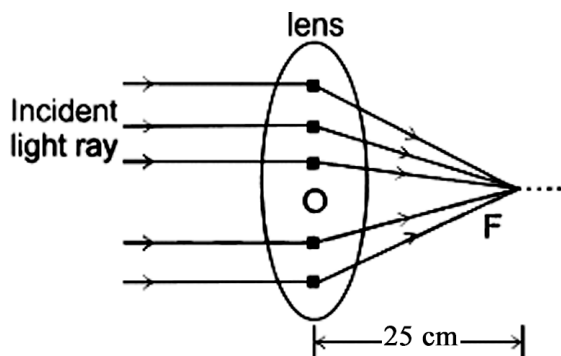


23. A body of mass 10 kg at rest is acted upon simultaneously by two horizontal forces 4 N and 3 N at right angles to each other. The kinetic energy of the body at the end of 10 sec in J is
24. A particle is thrown vertically upward with a speed 10 m/s. The average speed when the particle reaches back to the starting point in m/s is :
25. Convex lens produces a real image same size as that of the object. If the object is placed at a distance 30 cm from the lens then the focal length of the lens in cm is :

---

SPACE FOR ROUGH WORK

26. When an electric bulb is connected to a source of 220 V then current flowing through it is 0.5 A. Power of the bulb in watt is
27. In diopetre, power of lens in the given ray diagram will be



28. A sound wave has frequency of 4 kHz and wavelength 25 cm. Then distance travelled by sound in 2sec (in km) will be
29. Weight of a body of mass 10 kg in newton will be ( $g = 9.8 \text{ m/s}^2$ )
30. A water pumps lifts water from a level 10m below the ground. The water is pumped at the rate of 30 kg/minute with negligible velocity. Calculate the minimum power the pump should have to do this work [ $g = 9.8 \text{ m/s}^2$  and answer should be in J/s]

---

SPACE FOR ROUGH WORK

## PART II - CHEMISTRY

This part contains 30 questions

**SECTION A - Question No. Chemistry- (31-50)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Chemistry - (51 - 60 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer									
1	1	1	2	2	2	3	3	3	3
4	4	4	5	5	5	6	6	6	6
7	7	7	8	8	8	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer									
1	1	1	2	2	2	3	3	3	3
4	4	4	5	5	5	6	6	6	6
7	7	7	8	8	8	9	9	9	9
0	0	0	0	0	0	0	0	0	0

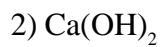
**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer									
1	1	1	2	2	2	3	3	3	3
4	4	4	5	5	5	6	6	6	6
7	7	7	8	8	8	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**SECTION - A (CHEMISTRY)**

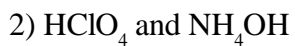
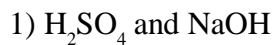
31. The compound [X] is obtained by treating calcium oxide with water. The molecular formula of compound [X] is



32. Lewis base among the following is



33. Which among the following represent strong acid and weak base respectively



---

**SPACE FOR ROUGH WORK**

34. Which of the following are correct in respect of silver metal?

i) Malleable

ii) Melts at 303 K

iii) Ductile

iv) Electric conductors

1) i, iii, iv

2) i, ii, iii

3) i, ii, iv

4) i, ii, iii, iv

35. Match the following

Colloid	Dispersed phase-medium
i) Gemstone	A) Liquid-Gas
ii) Shaving cream	B) Liquid - solid
iii) Cheese	C) Solid - solid
iv) Cloud	D) Gas - liquid

1) i → C, ii → D; iii → B; iv → A

2) i → C, ii → D; iii → A; iv → B

3) i → C, ii → D; iii → D; iv → A

4) i → C; ii → A; iii → B; iv → D

---

SPACE FOR ROUGH WORK



36. In the reaction,  $2\text{PbO} + \text{C} \rightarrow 2\text{Pb} + \text{CO}_2$

i) Carbon is reduced

ii) PbO is reduced

iii) PbO is oxidized

iv) Carbon is oxidized

Which among the following are true?

1) i and ii

2) i and iii

3) ii and iv

4) ii and iii

37. The correct formula of the compound aluminium sulphite is

1)  $\text{Al}_2(\text{SO}_4)_3$

2)  $\text{Al}_3(\text{SO}_3)_2$

3)  $\text{Al}_2(\text{SO}_3)_3$

4)  $\text{Al}_3(\text{SO}_4)_2$

38. Physical change among the following is

1)  $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$

2)  $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$

3)  $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow 2\text{HI}(\text{g})$

4)  $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{l})$

---

SPACE FOR ROUGH WORK

39. The process of formation of solid crystal from a saturated solution is called

- 1) Distillation                      2) Sublimation                      3) Crystallisation                      4) Filtration

40. Number of molecules present in 0.36 g of water is

- 1)  $12.044 \times 10^{21}$                       2)  $12.044 \times 10^{20}$                       3)  $12.044 \times 10^{23}$                       4)  $12.044 \times 10^{25}$

41. Assertion (A) : Elements and compounds are the examples of pure substances

Reason (R) : The properties of a compound are different from those of its constituent elements

- 1) Both A and R are correct and R is the correct explanation of A  
2) Both A and R are correct and R is not the correct explanation of A  
3) A is true and R is false  
4) Both A and R are false

---

SPACE FOR ROUGH WORK

42. Which of the following shows the Tyndall effect ?

i) Common salt solution

ii) Milk

iii) Copper sulphate solution

iv) Starch solution

1) (i) and (ii)

2) (ii) and (iv)

3) (iii) and (iv)

4) (ii) and (iii)

43. When a metal is added to dil. HCl solution, there is no evolution of any gas. The metal is

1) K

2) Zn

3) Fe

4) Ag

44. Which of the following statement is correct ?

1) In a physical change, heat is always absorbed whereas in a chemical change, heat is always evolved

2) In a physical change, heat is neither absorbed nor evolved

3) In a chemical change, heat is always absorbed

4) In some physical changes, heat is either absorbed or evolved

---

SPACE FOR ROUGH WORK

45. A mixture of sulphur and sand can be separated by using
- 1) Water                      2) Alcohol                      3) Carbon disulphide      4) Sulphuric acid
46. Aqueous solution of a salt is acidic in nature. It is a salt formed from
- 1) Strong acid and strong base                      2) Weak acid and strong base
- 3) Strong acid and weak base                      4) Weak acid and weak base
47. Antioxidants are
- 1) Reducing agents      2) Oxidising agents      3) Dehydrating agents      4) Hydrating agents
48. Which of the following are used as an antacid to reduce acidity in stomach ?
- 1) Sodium carbonate and magnesium hydroxide
- 2) Magnesium hydroxide and sodium hydroxide
- 3) Sodium bicarbonate and calcium hydroxide
- 4) Sodium bicarbonate and magnesium hydroxide

---

**SPACE FOR ROUGH WORK**

49. Which of the following sets of phenomena would increase on raising the temperature ?

a) Evaporation of liquid

b) Sublimation of solid

c) Solubility of NaCl in water

d) Solubility of gases in water

1) a, b

2) a, b, c, d

3) a, c

4) a, b, c

50. Among the first hundred elements known, the number of gaseous elements is

1) 6

2) 10

3) 11

4) 13

**SECTION-B (CHEMISTRY)**

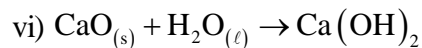
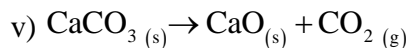
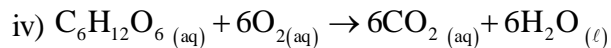
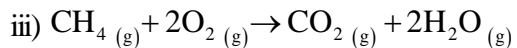
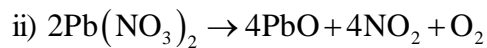
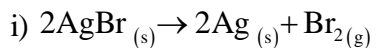
51. In the balanced equation  $a\text{Fe} + b\text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + c\text{H}_2$

the sum of co-efficient ( $a + b + c$ ) is \_\_\_\_\_

---

**SPACE FOR ROUGH WORK**

52. How many of the following are endothermic reactions ?



53. How many moles of baking soda (sodium hydrogen carbonate) is to be heated to get 10 moles of sodium carbonate. ?

54. A ring weighing 24 g is made of 24 carat gold. How many grams of gold are present in the ring ?

55. How many grams of plaster of paris can be theoretically obtained when 1 mole (172 g) pure gypsum is heated to 393 K ? (given: atomic mass of Ca = 40 u, S = 32 u, O = 16 u, H = 1 u)

56. pH of pure water at 298 K is .....

---

SPACE FOR ROUGH WORK

57. How many metals among the following are more reactive than hydrogen according to activity series?

i) Gold

ii) Zinc

iii) Iron

iv) Mercury

v) Magnesium

vi) Lead

vii) Copper

viii) Potassium

ix) Aluminium

x) Silver

58. The number of grams of  $\text{KHCO}_3$  that contain 1g hydrogen is ..... (Given Atomic mass of K = 39u, H = 1u, C = 12u, O = 16 u)

59. Atomicity of helium molecules = x

Atomicity of oxygen molecule = y

Atomicity of ozone molecule = z

The value of  $(x + y + z) = \dots\dots\dots$

60. 1 mole  $\text{Ca(OH)}_2$  contain  $x \times 6.02 \times 10^{23}$  atoms x = .....

---

SPACE FOR ROUGH WORK

## PART III - MATHEMATICS

This part contains 30 questions

**SECTION A - Question No. Mathematics- (61-80)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Mathematics - (81 - 90 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Three Digit Answer**  
If answer is 180

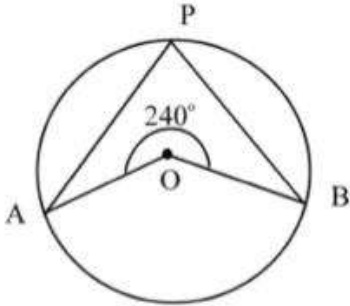
**Example 3**

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0



**SECTION - A (MATHEMATICS)**

61. In the given figure, the reflex  $\angle AOB$  is  $240^\circ$ . Then the angle  $\angle APB$  is

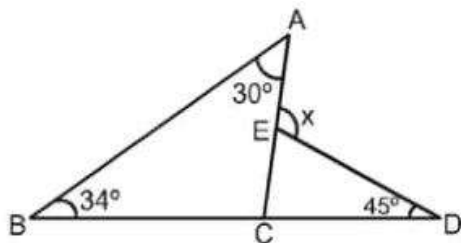


- 1)  $60^\circ$                       2)  $30^\circ$                       3)  $90^\circ$                       4)  $45^\circ$
62. Which of the following is not a polynomial?
- 1)  $\left(x + \frac{1}{x}\right)^2$                       2)  $\frac{3}{2}x^3 - 5x^2 - \frac{1}{\sqrt{2}}x - 1$
- 3)  $\sqrt{3}x^2 - 2\sqrt{3}x + 3$                       4)  $5x^2 - 3x + \sqrt{2}$
63. The mean of the given data 3, 5, 7, 3, 4, 2, 2, 3, 5 is .....
- 1) 5.77                      2) 4.77                      3) 2.77                      4) 3.77
64. How many spherical balls, each of radius 1cm can be made from a solid sphere of lead of radius 8cm?
- 1) 64                      2) 512                      3) 510                      4) 215

---

**SPACE FOR ROUGH WORK**

65. In the given figure, the value of  $x$  is



- 1)  $120^\circ$                       2)  $115^\circ$                       3)  $111^\circ$                       4)  $109^\circ$

66. If  $x + y + z = 0$ , then  $\frac{xyz}{(x+y)(y+z)(z+x)} =$

- 1)  $-1$                       2)  $1$                       3)  $3$                       4)  $-3$

67. Based on the following table, which combination is wrong

Shape and measurement	Area	Perimeter
I) Square of side $2r$	(A) $\pi r^2$	(a) $2\pi r$
II) Equilateral triangle of side $2r$	(B) $4r^2$	(b) $6r$
III) Circle of radius $2r$	(C) $4\pi r^2$	(c) $8r$
IV) Circle of radius $r$	(D) $\sqrt{3} r^2$	(d) $8\pi r$

- 1) I  $\rightarrow$  (B), (c)              2) II  $\rightarrow$  (D), (b)              3) III  $\rightarrow$  (C), (d)              4) IV  $\rightarrow$  (A), (a)

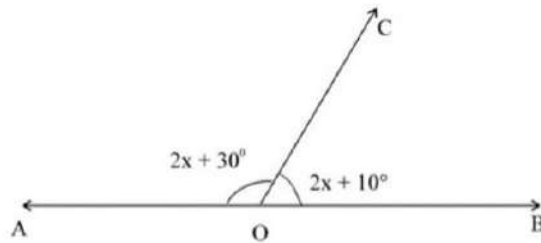
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**SPACE FOR ROUGH WORK**

68. If  $x - \frac{1}{x} = 3$ , then the value of  $x^2 + \frac{1}{x^2}$  is

- 1) 9                                      2) 27                                      3) 3                                      4) 11

69. In the given figure, if AOB is a straight line, then  $\angle BOC$  is



- 1)  $80^\circ$                                       2)  $70^\circ$                                       3)  $60^\circ$                                       4)  $35^\circ$

70. The height of an equilateral triangle ABC of perimeter 30 cm is

- 1)  $10\sqrt{3}$                                       2)  $5\sqrt{3}$                                       3)  $3\sqrt{3}$                                       4)  $7\sqrt{3}$

71. First term of an A.P. is 5 and the common difference is 7, then the 22<sup>nd</sup> term is

- 1) 132                                      2) 154                                      3) 152                                      4) 160

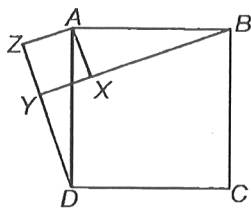
72. The angles of a triangle are in the ratio 1 : 5 : 3, the smallest angle of the triangle is

- 1)  $20^\circ$                                       2)  $90^\circ$                                       3)  $60^\circ$                                       4)  $100^\circ$

---

SPACE FOR ROUGH WORK

73. In the given figure, X is a point in the interior of square ABCD and AXYZ is also a square. If  $DY = 3\text{cm}$  and  $AZ = 2\text{cm}$ , then the length of BY is

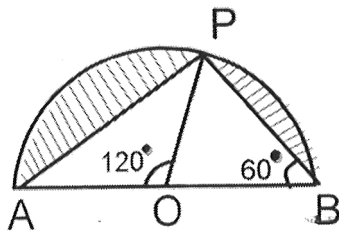


- 1) 5 cm                      2) 6 cm                      3) 7 cm                      4) 8 cm
74. The distance of origin from the point  $P(3, -2)$  is
- 1)  $\sqrt{2}$  units              2)  $\sqrt{15}$  units              3)  $\sqrt{13}$  units              4)  $\sqrt{11}$  units
75. The volume of regular cylindrical wire of diameter 2 mm is 99 cubic cm, then the length of wire in metres.  
 $\left(\pi = \frac{22}{7}\right)$
- 1) 53.1                      2) 31.5                      3) 35.1                      4) 51.3

---

**SPACE FOR ROUGH WORK**

76. In the figure, a semi circle with centre O is drawn on AB. The ratio of the largest shaded segment area to the smallest shaded segment area is

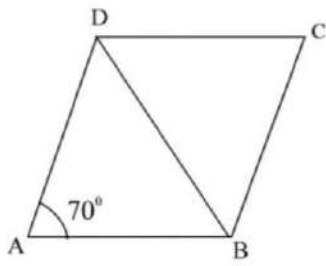


- 1)  $\frac{4\pi - 2\sqrt{3}}{2\pi - 2\sqrt{3}}$       2)  $\frac{4\pi - 3\sqrt{3}}{3\pi - 3\sqrt{3}}$       3)  $\frac{4\pi - 3\sqrt{3}}{2\pi - 3\sqrt{3}}$       4)  $\frac{3\pi - 2\sqrt{3}}{2\pi - 3\sqrt{3}}$
77. If a right triangle is with sides a, b and hypotenuse c, and altitude drawn on the hypotenuse is k, then
- 1)  $k^2 = ab$       2)  $k^2 = a^2 + b^2$       3)  $\frac{1}{k^2} = \frac{1}{a^2} + \frac{1}{b^2}$       4)  $k = a + b$
78. Integers x and y with  $x > y > 0$  satisfy  $x + y + xy = 80$  then x is :
- 1) 10      2) 13      3) 15      4) 26
79. The height and slant height of a cone are 21cm and 28cm respectively. Then the volume of the cone is
- 1)  $9546\text{cm}^3$       2)  $896\text{cm}^3$       3)  $546\text{cm}^3$       4)  $7546\text{cm}^3$

---

**SPACE FOR ROUGH WORK**

80. In the given figure, ABCD is a rhombus. Find  $\angle CDB$



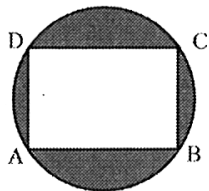
- 1)  $45^\circ$   
2)  $55^\circ$   
3)  $65^\circ$   
4)  $75^\circ$

## **SECTION-B (MATHEMATICS)**

81. Which one of the following numbers is NOT a prime number? 29, 37, 73, 93
82. If  $x + y = 9$  and  $xy = 8$ , then  $x^2 + y^2 =$
83. Value of  $\sin^2 45^\circ + \tan^2 45^\circ + \cos^2 45^\circ + \sec^2 45^\circ$
84. Find the value  $\frac{1}{2 + \sqrt{3}} + \frac{2}{\sqrt{5} - \sqrt{3}} + \frac{1}{2 - \sqrt{5}}$

## SPACE FOR ROUGH WORK

85. Find the distance between the pair of points  $P(6,8)$  and  $Q(-9,-12)$
86. If ABCD is a square of side 14 cm circumscribed by a circle, then area of shaded region (given  $\pi = 22/7$ )



87. If the quadratic equation  $x^2 + bx + 72 = 0$  has two distinct integer roots, then the number of all possible values for 'b' is
88. The first term of an A.P is 2. If the sum of its first five terms is equal to one-third of the sum of the next five terms, then the sum of its first 15 terms is -
89. The digit in the unit place of  $3^{73} + 7^{37}$  is
90. The number of straight line(s) drawn from one point to any other given point is

---

**SPACE FOR ROUGH WORK**

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**SPACE FOR ROUGH WORK**



# IIT/AIIMS SCREENING TEST - 14-05-23

QUESTION  
BOOKLET  
CODE

D

## P + C + M - ANSWER KEY

### PHYSICS

1. 3
2. 1
3. 3
4. 1
5. 3
6. 3
7. 1
8. 4
9. 3
10. 1
11. 4
12. 4
13. 2
14. 1
15. 3
16. 2
17. 3
18. 1
19. 1
20. 2
21. 15
22. 9
23. 125
24. 5
25. 15
26. 110
27. 4
28. 2
29. 98
30. 49

### CHEMISTRY

31. 2
32. 3
33. 2
34. 1
35. 1
36. 3
37. 3
38. 4
39. 3
40. 1
41. 2
42. 2
43. 4
44. 2
45. 3
46. 3
47. 1
48. 4
49. 4
50. 3
51. 11
52. 3
53. 20
54. 24
55. 145
56. 7
57. 6
58. 100
59. 6
60. 5

### MATHEMATICS

61. 1
62. 1
63. 4
64. 2
65. 4
66. 1
67. 3
68. 4
69. 1
70. 2
71. 3
72. 1
73. 3
74. 3
75. 2
76. 3
77. 3
78. 4
79. 4
80. 2
81. 93
82. 65
83. 4
84. 0
85. 25
86. 112
87. 12
88. 450
89. 0
90. 1

Date : 16<sup>th</sup> April 2023

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2½ hour** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 300**
5. There are three Parts. Physics, Chemistry & Mathematics having 30 questions each. Each Part consists of two Sections. In **Section A** (20 questions) each question has four options (1), (2), (3) and (4). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. In **Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions.** In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be **evaluated**. Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

I have read all the instructions and shall abide by them

\_\_\_\_\_  
Signature of the Candidate

**Roll Number**

I have verified all the information filled by the candidate

\_\_\_\_\_  
Signature of the Invigilator



# PART I - PHYSICS

This part contains 30 questions

**SECTION A - Question No. Physics - (1-20)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

## CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Physics - (21 - 30 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

## CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
9	●	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

### SECTION - A (PHYSICS)

1. An iron block of dimensions  $8\text{cm} \times 10\text{cm} \times 15\text{cm}$  has to be pushed along the floor. The force required will be minimum when the surface in contact with ground is:
- 1)  $(10\text{ cm} \times 15\text{ cm})$  surface
  - 2)  $(8\text{ cm} \times 15\text{ cm})$  surface
  - 3)  $(10\text{ cm} \times 8\text{ cm})$  surface
  - 4) Force is same for all surfaces
2. A cube of side  $0.2\text{ m}$  rests on the floor, as shown. Given that the cube has a mass of  $100\text{ kg}$ , the pressure exerted by the cube on the floor is \_\_\_\_\_. (Take  $g = 10\text{ N kg}^{-1}$ )



- 1)  $15000\text{ Nm}^{-2}$     2)  $25000\text{ Nm}^{-2}$     3)  $22500\text{ Nm}^{-2}$     4)  $12500\text{ Nm}^{-2}$

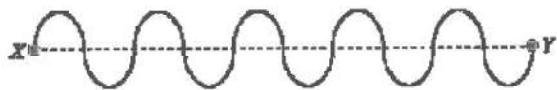
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SPACE FOR ROUGH WORK

3. Speed of sound wave in a given medium is

- 1) Directly proportional to its frequency
- 2) Inversely proportional to its frequency
- 3) Directly proportional to the squares of frequency
- 4) Independent of its frequency

4. A particle follows a path XY as shown in the given figure. If the radius of semi-circular path is 5 cm then the approximate value of distance covered and displacement of the particle are respectively.



- 1) 157 cm and 100 cm
- 2) 100 cm and 100cm
- 3) 63 cm and 40 cm
- 4) 140 cm and 100 cm

---

**SPACE FOR ROUGH WORK**

5. If  $I$  is the current through a wire and  $e$  is the charge of electron, then the number of electrons flows in 't' second will be given by:

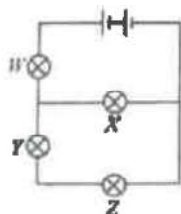
1)  $\frac{Ie}{t}$

2)  $Ite$

3)  $\frac{e}{It}$

4)  $\frac{It}{e}$

6. A battery lights up all the four lamps as shown in the figure. When one of the lamps fuses, the other three lamps stay on. Identify the fused lamp.



1) W

2) X

3) Y

4) Z

---

SPACE FOR ROUGH WORK

7. A body moves in a straight line with velocity  $v_1$  for  $1/3^{\text{rd}}$  time and for remaining time with  $v_2$ . Find average velocity.

1)  $\frac{v_1}{3} + \frac{2v_2}{3}$

2)  $\frac{v_1}{3} + \frac{v_2}{3}$

3)  $\frac{2v_1}{3} + \frac{v_2}{3}$

4)  $v_1 + \frac{2v_2}{3}$

8. According to work-energy theorem, the work done by the net force on a particle is equal to the change in its

1) kinetic energy

2) potential energy

3) linear momentum

4) angular momentum

---

SPACE FOR ROUGH WORK



9. The weight of a body of mass 3 kg at the centre of the earth is \_\_\_\_

- 1) 9.75 N                      2) 1.46 N

- 3) zero    4) 4.36 N

10. An engine develops 10 kW power. How much time will it take to lift a mass of 200 kg to a height of 40 m? (take  $g = 10 \text{ m s}^{-2}$ )

- 1) 10 s                      2) 20 s                      3) 7 s                      4) 8 s

11. Hydraulic brakes are the application of:

- 1) Newton's law

- 2) law of gravitation

- ### 3) Pascal's law

- #### 4) Toricelli law

## SPACE FOR ROUGH WORK

12. If  $72.8 \times 10^{-15}$  g of mass is transferred when fur is rubbed with silk. Find the number of electrons lost by fur?  
(Mass of electron =  $9.1 \times 10^{-31}$  kg)
- 1)  $36.4 \times 10^{18}$
- 2)  $9.1 \times 10^{21}$
- 3)  $8 \times 10^{13}$
- 4)  $4 \times 10^{13}$
13. The approximately height of a geostationary satellite is : (Given that time period of satellite is 24 hr.)
- 1) 6400 km
- 2) 12800 km
- 3) 7200 km
- 4) 36000 km

---

SPACE FOR ROUGH WORK

14. If a body is projected vertically up from a point and it returns to the same point, its

- 1) average speed is zero, but not average velocity
- 2) Both average speed and average velocity are zero
- 3) average velocity is zero but not average speed
- 4) Both average speed and velocity depend upon the path

15. A sound wave propagates in a medium which has the property/properties of

- 1) inertia
- 2) elasticity
- 3) Both 1 and 2
- 4) Neither 1 nor 2

---

**SPACE FOR ROUGH WORK**

16. Two spheres of masses  $m$  and  $M$  are situated in air and the gravitational force between them is  $F$ . The space around the masses is now filled with a liquid of specific gravity 3. The gravitational force will now be
- 1)  $3F$                       2)  $F$                       3)  $\frac{F}{3}$                       4)  $\frac{F}{9}$
17. A given wire is stretched to double of its original length. What would be the new resistance if initial value was  $R$ .
- 1)  $2R$                       2)  $R$                       3)  $4R$                       4)  $R/2$
18. Kilowatt hour is the unit of :
- 1) Power                      2) Energy                      3) Voltage                      4) Current
19. The velocity of sound in air is  $340 \text{ m/s}$ . The wavelength of sound waves generated by a tuning fork of frequency  $500 \text{ Hz}$  is
- 1)  $0.68 \text{ m}$                       2)  $1.47 \text{ m}$                       3)  $0.34 \text{ m}$                       4)  $1.82 \text{ m}$

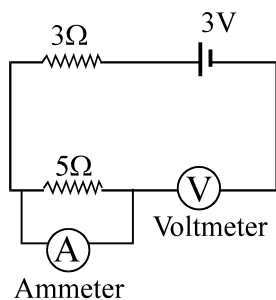
---

SPACE FOR ROUGH WORK

20. In a home, 5 bulbs of 60 watt glow for 8 hours everyday, 3 tube light of 40 watt glow for 5 hours everyday and a cooler of 100 watt is used for 6 hours everyday, then electric bill cost of 30 days will be (If 1 unit cost = 3 Rs.)
- 1) 108 Rs.                      2) 324 Rs.                      3) 127 Rs.                      4) 270 Rs.

**SECTION - B (PHYSICS)**

21. If the angle of incidence is  $30^\circ$ , then the angle between the directions of incident ray and the reflected ray in degree is
22. If a ball is thrown vertically up attains a maximum height of 80 m, then its velocity of projection in m/s is ( $g = 10 \text{ ms}^{-2}$ )
23. A voltmeter and an ammeter are connected in a circuit as shown in the diagram. The reading of the voltmeter in volt will be close to:



---

SPACE FOR ROUGH WORK

24. An object travels 20 m in 5s and then another 10m in 1s. The average speed of the object is (in m/s)
25. A 60kg mass is subjected to a constant force of 120 N. How much time will it take to acquire a speed of 30m/s. (in second)
26. Calculate the amount of work done when a man is standing with 15kg mass on his head ( $g = 10\text{ms}^{-2}$ ) :
27. What will be the power consumed by a  $50\Omega$  wire if it is kept across a potential difference of 200V? (in W)
28. A 50 V battery is connected across a 10 ohm resistor. The current through the resistor in ampere is:
29. An athlete weighing 60 kg runs up a staircase having 10 steps each of 0.5 m in 30 seconds. The power of the athlete is in watt is: ( $g = 10 \text{ m/s}^2$ )
30. The 10N force acting on the object produces a displacement of 5m in the direction of the force. The work done by the force in joule is:

---

SPACE FOR ROUGH WORK

## PART II - CHEMISTRY

This part contains 30 questions

SECTION A - Question No. Chemistry- (31-50)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

### SECTION - B

Question No. Chemistry - (51 - 60 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

If Single Digit Answer  
If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer  
If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
9	●	0

If Three Digit Answer  
If answer is 180

Example 3

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

**SECTION - A (CHEMISTRY)**

31. The non-metal which is liquid at room temperature is

1) bromine

2) chlorine

3) iodine

4) carbon

32. Which substance is used for making pencil lead?

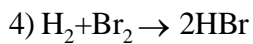
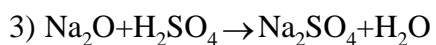
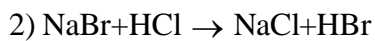
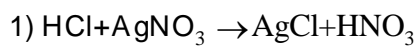
1) Sulphur

2) Silicon

3) Graphite

4) Aluminium

33. Which one is a redox reaction?



---

**SPACE FOR ROUGH WORK**



34. Match the oxides in Column-I with the nature of oxides in Column-II and features given in Column-III and select the most appropriate match from the choices given:

Column-I (Oxides)	Column-II (Nature of oxides)	Column-III (Features)
(a) ZnO	(i) acidic	(p) forms lime water
(b) CaO	(ii) amphoteric	(q) turns lime water milky
(c) CO <sub>2</sub>	(iii) basic	(r) formed by roasting sulphide

1) (a) → (ii), (r)    (b) → (iii), (q)    (c) → (i), (p)

2) (a) → (ii), (r)    (b) → (iii), (p)    (c) → (i), (q)

3) (a) → (iii), (r)    (b) → (ii), (p)    (c) → (i), (q)

4) (a) → (i), (q)    (b) → (ii), (r)    (c) → (iii), (p)

---

SPACE FOR ROUGH WORK

35. Lead nitrate on heating produces brown fumes of

- 1) Nitrogen dioxide      2) Oxygen      3) Lead oxide      4) Nitrous oxide

36. Examples of neutral oxides are :

- 1)  $\text{ZnO}$ ,  $\text{Al}_2\text{O}_3$       2)  $\text{ZnO}$ ,  $\text{CO}$       3)  $\text{CO}$ ,  $\text{N}_2\text{O}$       4)  $\text{Al}_2\text{O}_3$ ,  $\text{N}_2\text{O}$

37. The formula of magnesium nitride is :

- 1)  $\text{MgN}$       2)  $\text{MgN}_2$       3)  $\text{Mg}_3\text{N}$       4)  $\text{Mg}_3\text{N}_2$

38. Aluminium is more reactive than iron, but aluminium is less easily corroded than iron because :

1) Oxygen forms a protective oxide layer in aluminium

2) Aluminium is a noble metal

3) Iron undergoes reaction easily with water

4) iron forms mono and divalent ions

---

SPACE FOR ROUGH WORK

39. Which of the following has smallest mass?

1)  $6.022 \times 10^{23}$  atoms of He

2) 1 atom of He

3) 1 gram atom of He

4) All have equal mass

40. Sol and gel are examples of

1) Solid in solid colloid

2) Sol is a solid in liquid colloid and gel is liquid in solid colloid

3) Sol is solid in solid colloid and gel is solid in liquid colloid

4) Sol is a liquid in solid colloid and gel is a solid in liquid colloid

---

**SPACE FOR ROUGH WORK**

41. Which of the following is considered to be pure substance?

1) granite

2) sodium chloride

3) muddy water

4) milk of magnesia

42. Which of the following is a liquid metal at 310 K?

1) Hg

2) Cs

3) Ga

4) All

43. Which among the following is the poorest conductor of heat?

1) Silver

2) Gold

3) Copper

4) Lead

---

**SPACE FOR ROUGH WORK**

44. Match the Column I with Column II and choose the correct option using the codes given below.

Column I

Column II

a) Used in thermometers

i) Iodine

b) Present in fertilisers

ii) Mercury

c) Used to disinfect water

iii) phosphorus

d) Used as an antisaptic

iv) Chlorine

1) a- iii; b-i; c-ii; d- iv    2) a- ii; b- iii; c- iv; d- i

3) a-i; b- ii; c-iii; d- iv    4) a- iv; b-ii; c- i; d- iii

45. The only non- metal included in the reactivity series of metals, is:

1) H

2) Cl

3) He

4) Br

---

SPACE FOR ROUGH WORK

46. Combustion is a

1) physical process

2) chemical process

3) biological process

4) mechanical process

47. A process in which gaseous state directly converts to solid state is known as \_\_\_\_\_

1) sublimation

2) deposition

3) evaporation

4) condensation

48. Which among the following is an exothermic process?

i) Reaction of water with quick lime

ii) Dilution of an acid

iii) Evaporation of water

iv) Sublimation of camphor

1) i and ii

2) ii and iii

3) i and iv

4) iii and iv

---

**SPACE FOR ROUGH WORK**

49. The non-metal that is lustrous is

1) Sulphur

2) Phosphorous

3) Silicon

4) Iodine

50. Which of the following gases can be separated completely from a mixture of the two by using water as solvent?

1)  $\text{CO}_2$  and  $\text{O}_2$

2)  $\text{N}_2$  and  $\text{NH}_3$

3)  $\text{CO}_2$  and  $\text{NH}_3$

4)  $\text{H}_2$  and  $\text{N}_2$

### **SECTION - B (CHEMISTRY)**

51. How many different oxides are produced or liberated when green coloured ferrous sulphate crystals are heated strongly in a dry boiling tube?

52. How many of the following conduct electricity?

Aqueous solution of glucose, Brine, ethanol in water, dilute hydrochloric acid, dilute acetic acid, dilute nitric acid, lime water

---

**SPACE FOR ROUGH WORK**

53. Iron (Fe) react with steam to form  $\text{Fe}_3\text{O}_4$ . How many grams of water as steam is required to form one mole  $\text{Fe}_3\text{O}_4$  from pure iron? (Given molecular mass of  $\text{H}_2\text{O} = 18 \text{ u}$ )
54. Copper can be extracted from aqueous solution of copper sulphate by treating the solution with how many elements among the following?
- Ag, Hg,  $\text{H}_2$ ,  $\text{Cl}_2$ , Zn, Fe, Pt, Au,  $\text{F}_2$
55. How many grams of carbon are present in one mole cane sugar ( $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ )? (Given : Atomic mass of carbon = 12u, Hydrogen = 1u, Oxygen = 16u)
56. How many oxygen atoms are there in a molecule of water?
57. Washing soda in  $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$ . The value of x is .....
58. Total number of atoms present in a molecule of Ammonium Chloride is .....
59. Atomic number of Hydrogen is .....
60. The volume of 0.5 M NaOH required to neutralize 10 ml of 2 M HCl is ..... mL

---

SPACE FOR ROUGH WORK



## PART III - MATHEMATICS

This part contains 30 questions

**SECTION A - Question No. Mathematics- (61-80)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Mathematics - (81 - 90 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**SECTION - A (MATHEMATICS)**

61. If  $x = \sqrt{3+2\sqrt{2}}$ , then find the value of  $x^4 + \frac{1}{x^4} =$

1) 30

2) 32

3) 34

4) 35

62. If  $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$ , then show that  $(a + b + c)^3 =$

1)  $abc$

2)  $3abc$

3)  $9abc$

4)  $27abc$

63. Let  $N = 55^3 + 17^3 - 72^3$  then N is divisible by:

1) both 7 and 13

2) both 3 and 13

3) both 17 and 7

4) both 3 and 17

---

**SPACE FOR ROUGH WORK**

64. If  $x/y = 6/5$  then  $\frac{x^2 + y^2}{x^2 - y^2}$  is :

1)  $\frac{36}{25}$

2)  $\frac{25}{36}$

3)  $\frac{11}{61}$

4)  $\frac{61}{11}$

65. If  $7\sin^2 \theta + 3\cos^2 \theta = 4$  then  $\tan \theta =$

1)  $\frac{1}{\sqrt{3}}$

2)  $2\sqrt{3}$

3)  $\sqrt{3}$

4) 1

66. If  $P(x) = x^2 + x + 1$  then  $\frac{P(2) + P(-2)}{P(1) - P(-1)} =$

1) 0

2) 2

3) 4

4) 5

67. If  $\frac{1}{x+2}, \frac{1}{x+3}, \frac{1}{x+5}$  are in AP then the value of x is

1)  $\frac{1}{2}$

2) 0

3) 1

4) -1

---

SPACE FOR ROUGH WORK

68. The age of A, B and C together totals 185 years. B is twice as old as A and C is 17 years older than A. What is the age of A

1) 84

2) 59

3) 42

4) 82

69. Value of  $\left(\frac{x^a}{x^b}\right)^{a+b} \left(\frac{x^b}{x^c}\right)^{b+c} \left(\frac{x^c}{x^a}\right)^{c+a}$

1) 1

2) x

3)  $x^{a+b+c}$

4) a

70. If  $(1^2 + 2^2 + 3^2 + 4^2 + 5^2)^2 = \frac{1}{p}$  then p is

1) 3025

2)  $\frac{1}{3025}$

3) 3125

4)  $\frac{1}{3125}$

71.  $\frac{1}{\sqrt{2} + \sqrt{3}} - \frac{2}{\sqrt{5} - \sqrt{3}} + \frac{3}{\sqrt{5} - \sqrt{2}} =$

1)  $\sqrt{2} - 2\sqrt{5} + 3\sqrt{3}$

2)  $\sqrt{5} - \sqrt{2} - \sqrt{3}$

3)  $2\sqrt{5} - 3\sqrt{3}$

4) 0

---

SPACE FOR ROUGH WORK

72.  $\left(x - \frac{1}{x}\right)\left(x + \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2}\right)\left(x^4 + \frac{1}{x^4}\right) =$

1)  $x^8 - \frac{1}{x^8}$

2)  $x^8 + \frac{1}{x^8}$

3)  $x^4 - \frac{1}{x^4}$

4)  $x^4 + \frac{1}{x^4}$

73. If  $\sqrt{m} = 24$  then find the value of  $2m + 1$

1) 25

2) 1153

3) 12

4) 1150

74. If you subtract  $\frac{1}{2}$  from a number and multiply the result by  $\frac{1}{2}$ , you get  $\frac{1}{8}$ . Then the number is

1)  $\frac{4}{3}$

2)  $\frac{1}{3}$

3)  $\frac{3}{4}$

4)  $\frac{1}{4}$

---

SPACE FOR ROUGH WORK

75. The largest number of the three consecutive natural numbers is  $x + 1$ . Then the smallest number is

1)  $x + 2$

2)  $x + 1$

3)  $x$

4)  $x - 1$

76. Sachin purchased a laptop that cost him Rs. 45,000 and sold it at Rs. 50,000 after a few days. Find the profit percentage

1)  $11\frac{1}{9}\%$

2)  $2\%$

3)  $16\frac{2}{3}\%$

4)  $5\frac{5}{9}\%$

77. A card is drawn from a pack of 52 playing cards. The probability that it is a queen is

1)  $1/52$

2)  $1/13$

3)  $4/13$

4)  $1/4$

78.  $\frac{1 - \tan^2 45^\circ}{1 + \tan^2 45^\circ}$  is equal to

1)  $\tan 90^\circ$

2)  $1$

3)  $\sin 45^\circ$

4)  $0$

---

SPACE FOR ROUGH WORK

79.  $\triangle ABC$  and  $\triangle DEF$  are similar such that  $2AB = DE$  and  $BC = 8\text{cm}$  then  $EF =$

- 1) 16cm                      2) 12 cm                      3) 8cm                      4) 4cm

80. The volume of a cone of height 4cm and diameter of the base 6 cm is

- 1)  $48\pi$                       2)  $64\pi$                       3)  $12\pi$                       4)  $46\pi$

**SECTION - B (MATHEMATICS)**

81. The mean of 15 numbers is 25. If each number is multiplied by 4, mean of the new numbers is

82. If  $\alpha, \beta, \gamma$  are the zeroes of the polynomial  $2x^3 + x^2 - 13x - 6$ , then the value of  $\alpha\beta\gamma$  is

83. The degree of the polynomial  $p(x) = (x-7)^3 - x^3$  is:

---

**SPACE FOR ROUGH WORK**

84. If  $x = (2 + \sqrt{3})$ , find the value of  $x + \frac{1}{x}$
85. The mean of 20 numbers is 43, then the sum of all 20 numbers is
86. If  $a \cos \theta + b \sin \theta = 4$  and  $a \sin \theta - b \cos \theta = 3$ , then  $a^2 + b^2 =$
87. If  $x + y + z = 9$  and  $xy + yz + zx = 23$ , then the value of  $(x^3 + y^3 + z^3 - 3xyz) = ?$
88. If  $(2, 0)$  is a solution of the linear equation  $2x + 3y = K$ , then the value of  $K$  is
89. What is the remainder when  $(x^4 + 1)$  is divided by  $(x - 2)$ ?
90. Find the median of following data:

973, 927, 946, 975, 923, 912, 909, 899, 998, 856, 894, 943, 916, 958

---

SPACE FOR ROUGH WORK



---

**SPACE FOR ROUGH WORK**

# IIT/AIIMS SCREENING TEST - 16-04-23

QUESTION  
BOOKLET  
CODE

A

## P + C + M - ANSWER KEY

### PHYSICS

1. 4
2. 2
3. 4
4. 1
5. 4
6. 2
7. 1
8. 1
9. 3
10. 4
11. 3
12. 3
13. 4
14. 3
15. 3
16. 2
17. 3
18. 2
19. 1
20. 2
21. 120
22. 40
23. 3
24. 5
25. 15
26. 0
27. 800
28. 5
29. 100
30. 50

### CHEMISTRY

31. 1
32. 3
33. 4
34. 2
35. 1
36. 3
37. 4
38. 1
39. 2
40. 2
41. 2
42. 4
43. 4
44. 2
45. 1
46. 2
47. 2
48. 1
49. 4
50. 2
51. 4
52. 5
53. 72
54. 3
55. 144
56. 1
57. 10
58. 6
59. 1
60. 40

### MATHEMATICS

61. 3
62. 4
63. 4
64. 4
65. 1
66. 4
67. 3
68. 3
69. 1
70. 2
71. 4
72. 1
73. 2
74. 3
75. 4
76. 1
77. 2
78. 4
79. 1
80. 3
81. 100
82. 3
83. 2
84. 4
85. 860
86. 25
87. 108
88. 4
89. 17
90. 925

Date : 2<sup>nd</sup> April 2023

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2½ hour** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 300**
5. There are three Parts. Physics, Chemistry & Mathematics having 30 questions each. Each Part consists of two Sections. **In Section A** (20 questions) each question has four options (1), (2), (3) and (4). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions.** In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be **evaluated**. Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

I have read all the instructions and shall abide by them

\_\_\_\_\_  
Signature of the Candidate

**Roll Number**

I have verified all the information filled by the candidate

\_\_\_\_\_  
Signature of the Invigilator



# PART I - PHYSICS

This part contains 30 questions

SECTION A - Question No. Physics - (1-20)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

## CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

Question No. Physics - (21 - 30 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

## CORRECT METHOD FOR MARKING SECTION B QUESTIONS

If Single Digit Answer  
If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer  
If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

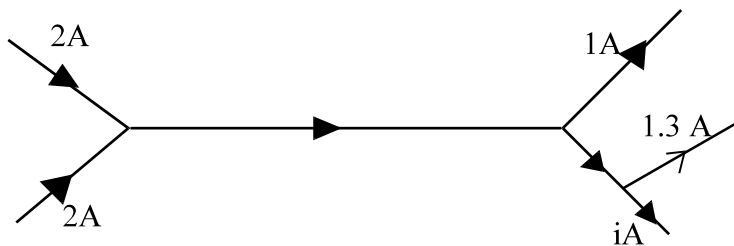
If Three Digit Answer  
If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

### **SECTION - A (PHYSICS)**

1. Figure shows, current in a part of electrical circuit, then the value of current is



- 1) 1.7 A                      2) 3.7 A
- 3) 13 A                        4) 1.0 A

2. A wire of resistance  $R$  is stretched to double its length, its resistivity will be

- 1) the double of the original resistivity
- 2) the half of the original resistivity
- 3) the same as the original resistivity
- 4) zero

## SPACE FOR ROUGH WORK

3. The permanent magnets are kept with soft iron pieces at ends as keepers.

- 1) to magnetise the soft iron pieces
- 2) to increase the strength of the magnets
- 3) to avoid self demagnetisation
- 4) for physical safety of the magnets

4. Lenz's law depends on the conservation of:

- 1) Mass
- 2) Energy
- 3) Charge
- 4) None of these

5. Magnetic field is a:

- 1) Vector quantity
- 2) scalar quantity
- 3) scalar as well as vector quantity
- 4) neither vector nor scalar

---

**SPACE FOR ROUGH WORK**

6. In comparison of a lighter body, the inertia of a heavy body will be
- 1) less
  - 2) more
  - 3) does not depends on mass
  - 4) None of these
7. The work done by all the forces (external and internal) on a system equals the change in
- 1) total energy
  - 2) kinetic energy
  - 3) potential energy
  - 4) none of these
8. When a body falls freely towards the earth, then its total energy
- 1) Increases
  - 2) Decreases
  - 3) Remain constant
  - 4) First increases and then decreases

---

**SPACE FOR ROUGH WORK**



9. Sound waves are
- 1) mechanical waves
  - 2) electromagnetic waves
  - 3) radio waves
  - 4) none of these
10. The work done on an object does not depend upon the
- 1) displacement
  - 2) force applied
  - 3) angle between force and displacement
  - 4) initial velocity of the object

---

**SPACE FOR ROUGH WORK**

11. An athlete completes one round of a circular track of diameter 40m in 12 s. What will be the distance covered at the end of 54s?  $\left(\pi = \frac{22}{7}\right)$
- 1) 525.6 m                      2) 550 m                      3) 565.7 m                      4) 535.7 m
12. If both the velocity and acceleration of an object are negative, then the speed of the object will
- 1) decrease
- 2) increase
- 3) steady
- 5) None of the above
13. The gravitational force between two objects at a separation 'r' is 49 N. The force between them becomes double when the separation changes to
- 1)  $r\sqrt{2}$                       2)  $\frac{r}{\sqrt{2}}$
- 3) 2r                      4) 3r

---

SPACE FOR ROUGH WORK

14. Two thigh bones (femur) each of cross-sectional area  $15 \text{ cm}^2$  support the upper part of a human body of mass  $42 \text{ kg}$ . Then the average pressure sustained by femur will be ( $g = 10 \text{ m/s}^2$ )
- 1)  $3 \times 10^5 \text{ Pa}$
  - 2)  $1.4 \times 10^5 \text{ Pa}$
  - 3)  $1.4 \times 10^3 \text{ Pa}$
  - 4)  $1.2 \times 10^5 \text{ Pa}$
15. A body floats with  $\frac{2}{5}$  of its volume above the surface of water. Then the density of the material of the body will be
- 1)  $200 \text{ kg/m}^3$
  - 2)  $400 \text{ kg/m}^3$
  - 3)  $600 \text{ kg/m}^3$
  - 4)  $800 \text{ kg/m}^3$

---

**SPACE FOR ROUGH WORK**

16. A girl is carrying a school bag of 3 kg mass on her back and moves 200 m on a horizontal road. The work done against the gravitational force will be ( $g = 10 \text{ ms}^{-2}$ )
- 1)  $6 \times 10^3 \text{ J}$
  - 2) 6 J
  - 3) 0.6 J
  - 4) 0
17. The value of 'g'
- 1) Increases as we go above the earth's surface
  - 2) Decreases as we go to the centre of the earth
  - 3) Remains constant
  - 4) Is more at equator and less at poles

---

**SPACE FOR ROUGH WORK**

18. SI unit of average speed is

- 1) m/s                      2) km/h                      3) km/min                      4) cm/s

19. An iron sphere of mass 10 kg has the same diameter as an aluminium sphere of mass is 3.5 kg. Both sphere are dropped simultaneously from a tower. When they are 10 m above the ground, they have the same

- 1) acceleration  
2) momentum  
3) potential energy  
4) kinetic energy

20. Voltage is a form of :

- 1) Kinetic energy  
2) Potential energy  
3) Both potential and kinetic energy  
4) None of the above

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**SPACE FOR ROUGH WORK**

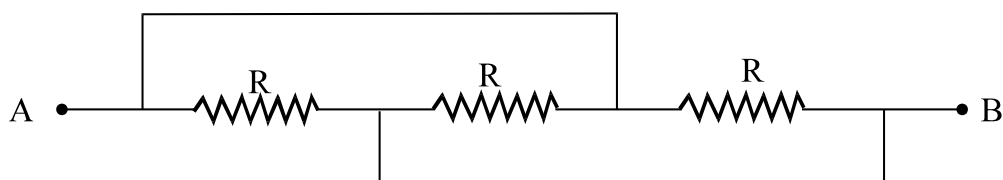
### **SECTION - B (PHYSICS)**

21. A body moving with uniform velocity is stopped in 0.25 second by applying retarding force of 200 Newton. The initial momentum of the body in kg m/s will be:
22. Speed of 90 km/h when expressed in m/s is
23. A body of mass 3 kg is accelerated by a constant force to  $3\text{m/s}^2$ . The force acted on it in newton will be
24. A ball is moving with a velocity 0.5 m/s. Its velocity decreases at a rate of  $0.05\text{ m/s}^2$ . How much time in second will it take to stop ?
25. A 200 m long train crosses a 1400 m long bridge with a uniform speed of  $72\text{ kmh}^{-1}$ . Calculate the time in second taken by the train to cross the bridge
26. The average distance of the sun from a planet is four times in comparison to its distance from the earth. In how many years that planet will complete one revolution around the sun?

---

**SPACE FOR ROUGH WORK**

27. A hospital uses an ultrasonic scanner to locate tumours in a tissue. The wavelength of sound in a tissue in which the speed of sound is  $1.7 \text{ km/s}$  will be  $y \times 10^{-4} \text{ m}$ . The value of  $y$  in integer is : [Given the operating frequency of the scanner is  $4.2 \text{ MHz}$  and  $1 \text{ MHz} = 10^6 \text{ Hz}$ ]
28. The charge flows through a closed circuit in  $4 \text{ s}$  is  $16 \text{ C}$ . The average value of current through the circuit in ampere is
29. The change in magnetic flux in a closed loop of resistance  $10 \Omega$  is  $20 \text{ Webber}$ . The induced charge flows through the loop in coulomb is
30. The effective resistance of the combination of resistors as shown in figure is  $R_{AB} = \frac{R}{n}$ . The value of  $n$  is




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SPACE FOR ROUGH WORK

## PART II - CHEMISTRY

This part contains 30 questions

**SECTION A - Question No. Chemistry- (31-50)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Chemistry - (51 - 60 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0



**SECTION - A (CHEMISTRY)**

31. The reaction  $\text{CuO} + \text{H}_2 \longrightarrow \text{H}_2\text{O} + \text{Cu}$  is an example of

- 1) Redox reaction
- 2) Synthesis reaction
- 3) Neutralisation reaction
- 4) Double displacement reaction

32. In neutralization reaction

- 1) Heat is absorbed
- 2) Heat is evolved
- 3) Oxidation takes place
- 4) None of these

---

**SPACE FOR ROUGH WORK**

33. Formation of  $\text{NH}_3$  from  $\text{N}_2$  and  $\text{H}_2$  is
- 1) an endothermic reaction
  - 2) an exothermic reaction
  - 3) both exothermic reaction and endothermic reaction
  - 4) neither exothermic reaction nor endothermic reaction
34. Colour of phenolphthalein in acidic solution is
- 1) Pink
  - 2) Orange
  - 3) Colourless
  - 4) Golden yellow
35. Calamine is the ore of
- |         |           |
|---------|-----------|
| 1) Tin  | 2) Copper |
| 3) Zinc | 4) Lead   |

---

SPACE FOR ROUGH WORK

36. A form of matter has no fixed shape, but it has a fixed volume at 298 K and 1 atm pressure. An example of this form of matter is
- 1) Krypton                      2) Kerosene
  - 3) Carbon dioxide          4) Carbon steel
37. Which condition out of the following will increase the evaporation of water ?
- 1) Increase in temperature of water
  - 2) Decrease in temperature of water
  - 3) Less exposed surface area of water
  - 4) Adding common salt to water
38. CNG is
- 1) Complete natural gas
  - 2) Compressed natural gas
  - 3) Complicated natural gas
  - 4) Condensed natural gas

---

**SPACE FOR ROUGH WORK**

39. Dry ice is :
- 1) Solid ammonia
  - 2) Solid carbondioxide
  - 3) Solid sulphurdioxide
  - 4) Normal ice
40. Which has maximum number of molecules?
- 1) 1g of  $\text{CO}_2$
  - 2) 1g of  $\text{H}_2$
  - 3) 1g of  $\text{N}_2$
  - 4) 1g of  $\text{CH}_4$
41. Which among the following elements can form distinctly acidic oxide?
- 1) Carbon
  - 2) Lithium
  - 3) Beryllium
  - 4) Magnesium
42. When solids are powdered their \_\_\_\_\_ increases
- 1) melting point
  - 2) intermolecular attractive force
  - 3) Surface area
  - 4) Density

---

SPACE FOR ROUGH WORK

43. Which of the following is the lightest metallic element ?

1) Magnesium

2) Aluminium

3) Lithium

4) Manganese

44. In the chemical reaction

Fat + ?  $\rightarrow$  Soap + glycerol

Which of the following reactants is missing ?

1) Oil

2) Water

3) Alkali

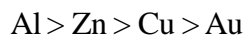
4) Acid

---

SPACE FOR ROUGH WORK

45. The order of the reactivity of some metals are given

Answer the following questions by analyzing it



a) Which metal is produced by the electrolysis of its molten salt ?

b) Metal produced by the self oxidation-reduction reaction is

1) a - Al, b - Cu

2) a - Cu, b - Al

3) a - Au, b - Zn

4) a - Zn, b - Au

46. Clay, cryolite and bauxite are the minerals of aluminium. Which among them is the principal ore of aluminium ? What is its chemical formula ?

1) Cryolyte -  $\text{Al}_2\text{O}_3 \cdot x\text{H}_2\text{O}$

2) Bauxite -  $\text{Al}_2\text{O}_3 \cdot x\text{H}_2\text{O}$

3) Cryolite -  $\text{Na}_3\text{AlF}_6$

4) Bauxite -  $\text{Na}_3\text{AlF}_6$

---

SPACE FOR ROUGH WORK

47. Pick out 1M NaOH solution from the samples given below

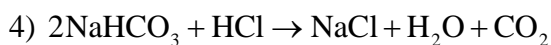
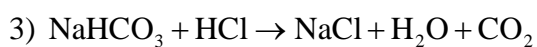
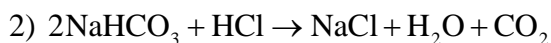
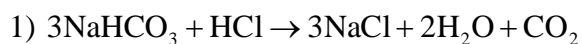
1) 1L solution containing 20g NaOH

2) 1L solution containing 10g NaOH

3) 500 mL solution containing 20g NaOH

4) 500 mL solution containing 10g NaOH

48. The correct balanced equation for the reaction of dil. HCl with sodium hydrogen carbonate is



49. A salt can be produced by reaction between

a) a weak acid and weak base

b) metal oxide and water

c) metal and a mineral acid

d) metal oxide and a mineral acid

1) a, b and c

2) b, c and d

3) c, d and a

4) d, a and b

---

SPACE FOR ROUGH WORK

50. 5 moles of  $\text{H}_2\text{SO}_4$  and 10 moles of  $\text{NaOH}$  are mixed together, behaviour of the resulting solution will be:

- 1) basic                      2) acidic                      3) neutral                      4) none of these

**SECTION - B (CHEMISTRY)**

51. In graphite each carbon atom is bonded to how many other carbon atoms?

52. Number of moles of  $\text{H}_2$  in  $9.033 \times 10^{24}$  molecules of  $\text{H}_2$  is .....

53. Mass of 7 moles of sodium sulphite ( $\text{Na}_2\text{SO}_3$ ) is ..... g (Given Atomic mass of  $\text{Na} = 23\text{u}$ ,  $\text{S} = 32\text{u}$ ,  $\text{O} = 16\text{u}$ )

54. What is the pH value of pure water at 298 K?

55. How many oxygen atoms are there in one formula unit of washing soda?

56. Molecular mass of  $\text{CaSO}_4$  is 136 u and that of  $\text{H}_2\text{O}$  is 18 u. How many grams of plaster of paris contain 18g water in it?

57. How many of the following are acidic oxides?

- |                  |                   |                            |                   |
|------------------|-------------------|----------------------------|-------------------|
| i) $\text{SO}_2$ | ii) $\text{SO}_3$ | iii) $\text{Na}_2\text{O}$ | iv) $\text{CaO}$  |
| v) $\text{NO}_2$ | vi) $\text{NO}$   | vii) $\text{CO}_2$         | viii) $\text{CO}$ |

---

**SPACE FOR ROUGH WORK**



58. Different metals show different reactivities towards oxygen. How many of the following metal(s) do not react with oxygen even at high temperatures?

i) Aluminium

ii) Copper

iii) Lead

iv) Zinc

v) Silver

vi) Iron

vii) Potassium

viii) Gold

59. How many metal(s) among the following can displace copper from an aqueous solution of copper sulphate?

i) Silver

ii) Mercury

iii) Iron

iv) Lead

v) Zinc

60. Aqueous solutions of five different salts are given below

i) Sodium chloride

ii) Ammonium chloride

iii) Sodium acetate

iv) Sodium sulphate

v) Sodium carbonate

How many of these solutions turn red litmus blue?

---

**SPACE FOR ROUGH WORK**

## PART III - MATHEMATICS

This part contains 30 questions

**SECTION A - Question No. Mathematics- (61-80)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Mathematics - (81 - 90 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**SECTION - A (MATHEMATICS)**

61. If  $a + \frac{1}{a} = \sqrt{3}$  then  $a^3 + \frac{1}{a^3} =$

1) 0

2) 1

3) 2

4) 3

62. Which rational expression should be added to  $\frac{x-x^2+2}{x(x^2-1)}$  to get  $\frac{x+1}{x^2-1}$

1)  $\frac{2}{x}$

2)  $\frac{x}{2}$

3)  $2x$

4)  $x^2$

63. The number of real roots of the equation  $(x-1)^2 + (x-2)^2 + (x-3)^2 = 0$  is

1) 2

2) 1

3) 0

4) 3

64. The value of  $\frac{\sin \theta - 2 \sin^3 \theta}{2 \cos^3 \theta - \cos \theta} =$

1)  $\cot \theta$

2)  $\tan \theta$

3)  $\sin \theta$

4)  $\operatorname{cosec} \theta$

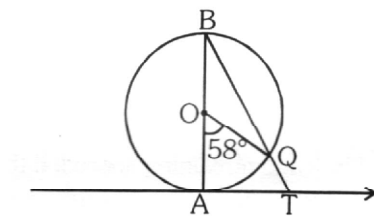
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**SPACE FOR ROUGH WORK**

65. The value of  $\tan(1^\circ) \tan(2^\circ) \tan(3^\circ) \dots \tan(89^\circ) =$

- 1) 1                      2) 0                      3)  $\infty$                       4)  $\frac{1}{2}$

66. In the given figure, AB is the diameter of a circle with centre O and AT is a tangent. If  $\angle AOQ = 58^\circ$ , then the value of  $\angle ATQ$  is -----



- 1)  $52^\circ$                       2)  $61^\circ$                       3)  $46^\circ$                       4)  $75^\circ$

67. If the numbers  $3k+4$ ,  $7k+1$  and  $12k-5$  are in A.P, then the value of k is

- 1) 2                      2) 3                      3) 4                      4) 5

---

SPACE FOR ROUGH WORK

68. The mean of the first 'n' natural numbers is

1)  $\frac{n}{2}$

2)  $\frac{n+1}{2}$

3)  $\frac{n}{2} + 1$

4)  $\frac{n^2 + n + 1}{2n}$

69. The distance between two parallel chords of lengths 8cm and 6cm in a circle of diameter 10cm, if the chords are on the same side of the centre, is

1) 1cm

2) 2cm

3) 3 cm

4) 4cm

70. In a single throw of a die, what is the probability of getting a number greater than 4

1)  $\frac{1}{2}$

2)  $\frac{1}{3}$

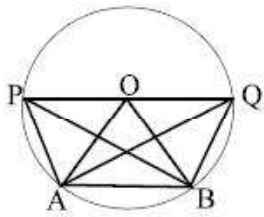
3)  $\frac{2}{3}$

4)  $\frac{1}{4}$

---

SPACE FOR ROUGH WORK

71. O is the centre of circle.  $PQ \parallel AB$ . Area of  $\triangle AOB$  is  $24 \text{ cm}^2$ . Then the area of  $\triangle APB$  is



- 1)  $24 \text{ cm}^2$                       2)  $12 \text{ cm}^2$                       3)  $48 \text{ cm}^2$                       4)  $30 \text{ cm}^2$
72. If one of the zero of the polynomial  $x^2 + ax - 4$  is 1, then the other zero is
- 1) 2    2) -3
- 3) -4    4) 1
73. Find the perimeter of an equilateral triangle with vertices on a circle of diameter 8 cm.
- 1)  $12\sqrt{3} \text{ cm}$     2)  $9\sqrt{3} \text{ cm}$
- 3)  $4\sqrt{16} \text{ cm}$     4)  $4\sqrt{3} \text{ cm}$

---

SPACE FOR ROUGH WORK

74. Area of the shaded portion in the figure (O is centre of the circle), is



- 1)  $20 \text{ cm}^2$                       2)  $25 \text{ cm}^2$                       3)  $28.50 \text{ cm}^2$                       4)  $30 \text{ cm}^2$

75. The mean of 5 observations is 30. The first four values are 10, 15, 30 and 35. Then the fifth observation is

- 1) 50                      2) 60                      3) 70                      4) 40

76. The ratio in which x-axis divides internally the line segment, joining the points (5, 3) and (−3, −2) is

- 1) 2 : 3                      2) 3 : 4                      3) 4 : 3                      4) 3 : 2

77. If  $x = (2 + \sqrt{3})$ , find the value of  $\left(x^3 + \frac{1}{x^3}\right)$

- 1) 50                      2) 54                      3) 52                      4) 49

---

SPACE FOR ROUGH WORK

78. The distance between the points  $(\cos \theta, \sin \theta)$  and  $(\sin \theta - \cos \theta)$  is

1)  $\sqrt{3}$

2)  $\sqrt{2}$

3) 2

4) 1

79. Equation of a line which is at a distance of 5 units above the x-axis is

1)  $x = 5$

2)  $x + 5 = y$

3)  $y - 5 = 0$

4)  $x - y = 0$

80. A die has faces numbered with 0, 1, 7, 3, 5 and 9. If it is thrown, the probability of getting an odd face is

1) 1

2)  $2/3$

3)  $5/6$

4)  $1/6$

**SECTION - B (MATHEMATICS)**

81. The last digit of  $(253)^{1002}$  is

82. The radius of a circle is 13 cm and length of one of its chords is 10 cm. The distance of the chord from the centre is :-

---

**SPACE FOR ROUGH WORK**



83. Area of triangle having sides 3cm, 4 cm and 5 cm, is
84. A vertical stick 30 m long casts a shadow 15 m long on the ground. At the same time, a tower casts a shadow 75 m long on the ground. Then the height of the tower is :
85. The number of solid spheres, each of diameter 6 cm that could be moulded from a cylindrical solid metal of height 45 cm and diameter 4 cm, is
86. If  $x = \frac{4}{3}$  is a zero of the polynomial  $f(x) = 6x^3 - 11x^2 + kx - 20$ , then the value of 'k' is
87. If the sum of the ages of a father and his son in years is 65 and twice the difference of their ages in years is 50, then the age of the father in years is:
88. Value of  $(256)^{0.16} \times (256)^{0.09}$  is :
89. The distance between the points (5, 3) and (5, -3) is
90. The mean of 10 numbers is 12. Each number is divided by  $\frac{1}{2}$ . Then the new mean is

---

SPACE FOR ROUGH WORK

---

**SPACE FOR ROUGH WORK**

# IIT/AIIMS SCREENING TEST - 02-04-23

QUESTION  
BOOKLET  
CODE

A

## P + C + M - ANSWER KEY

### PHYSICS

1. 1
2. 3
3. 3
4. 2
5. 1
6. 2
7. 2
8. 3
9. 1
10. 4
11. 3
12. 2
13. 2
14. 2
15. 3
16. 4
17. 2
18. 1
19. 1
20. 2
21. 50
22. 25
23. 9
24. 10
25. 80
26. 8
27. 4
28. 4
29. 2
30. 3

### CHEMISTRY

31. 1
32. 2
33. 2
34. 3
35. 3
36. 2
37. 1
38. 2
39. 2
40. 2
41. 1
42. 3
43. 3
44. 3
45. 1
46. 2
47. 3
48. 3
49. 3
50. 3
51. 3
52. 15
53. 882
54. 7
55. 13
56. 290
57. 4
58. 2
59. 3
60. 2

### MATHEMATICS

61. 1
62. 1
63. 3
64. 2
65. 1
66. 2
67. 2
68. 2
69. 1
70. 2
71. 1
72. 3
73. 1
74. 3
75. 2
76. 4
77. 3
78. 2
79. 3
80. 2
81. 1
82. 12
83. 6
84. 150
85. 5
86. 19
87. 45
88. 4
89. 6
90. 24

## IIT/AIIMS - 2025 SCREENING TEST

QUESTION  
BOOKLET  
CODE

**A**

Date : 26<sup>th</sup> March 2023

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2½ hour** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 300**
5. There are three Parts. Physics, Chemistry & Mathematics having 30 questions each. Each Part consists of two Sections. In **Section A** (20 questions) each question has four options (1), (2), (3) and (4). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. In **Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions.** In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be **evaluated**. Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

**Roll Number**

I have read all the instructions and shall abide by them

I have verified all the information filled by the candidate

\_\_\_\_\_  
Signature of the Candidate

\_\_\_\_\_  
Signature of the Invigilator



# PART I - PHYSICS

This part contains 30 questions

SECTION A - Question No. Physics - (1-20)

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

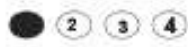








For each question, marks will be awarded in one of the following categories

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

## CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

Question No. Physics - (21 - 30 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

## CORRECT METHOD FOR MARKING SECTION B QUESTIONS

If Single Digit Answer  
If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer  
If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
0	0	0

If Three Digit Answer  
If answer is 180

Example 3

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	0

**SECTION - A (PHYSICS)**

1. The image formed by a concave mirror is virtual and magnified, when object is placed
  - 1) at infinity
  - 2) at centre of curvature of concave mirror
  - 3) at focal point of concave mirror
  - 4) in between the principal focus and the pole of concave mirror
  
2. Rajesh placed juice bottle at a distance of 20 cm in front of a convex mirror which has a focal length of 20 cm. Where is the image likely to form?
  - 1) At focus behind the mirror
  - 2) At focus in front of the mirror
  - 3) At a distance of 10 cm behind the mirror
  - 4) At a distance of 10 cm in front the mirror

---

**SPACE FOR ROUGH WORK**

3. When light slows down in going from liquid to glass, it means that [ $\mu$  = refractive index]

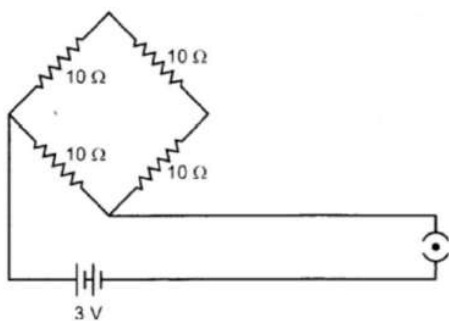
1)  $\mu_{\text{glass}} = \mu_{\text{liquid}}$

2)  $\mu_{\text{glass}} > \mu_{\text{liquid}}$

3)  $\mu_{\text{glass}} < \mu_{\text{liquid}}$

4) None of these

4. Find the current drawn from the battery by the network of four resistors shown in the figure.



1) 0.3A

2) 0.4A

3) 0.2A

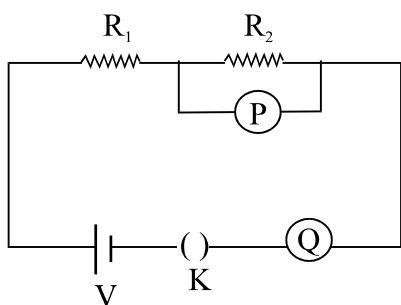
4) 0.1A

---

SPACE FOR ROUGH WORK



5. Which are the instruments labelled as P and Q in the given circuit



1) p - ammeter                      Q - voltmeter

2) p - voltmeter                      Q - ammeter

3) p - ammeter                      Q - ammeter

4) p - voltmeter                      Q - voltmeter

6. Which of the following is an electrical safety device?

1) Electric heater

2) Electric fuse

3) Electric switch

4) Electric transformers

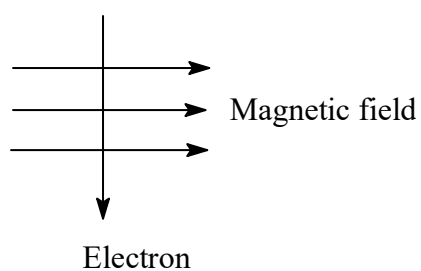
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SPACE FOR ROUGH WORK

7. A magnetic field line is used to find the direction of

- 1) South-north
- 2) A compass needle
- 3) A bar magnet
- 4) Magnetic field

8. An electron enters a magnetic field at right angles to it, as shown in figure. The direction of force acting on the electron will be



- 1) to the right
- 2) to the left
- 3) out of the page
- 4) into the page

---

SPACE FOR ROUGH WORK

9. The principle of AC generator is
- 1) magnetic effect of electric current
  - 2) Electromagnetic induction
  - 3) Heating effect of electric current
  - 4) None of these
10. If a bullet of mass 5 gm moving with velocity 100 m/sec, penetrates the wooden block upto 10 cm. Then the average force imposed by the bullet on the block is :
- 1) 500 N
  - 2) 400 N
  - 3) 250 N
  - 4) Zero
11. The echo of a gun shot is heard 8 sec. after the gun is fired. How far from him is the surface that reflects the sound (velocity of sound in air = 350 m/s)
- 1) 1400 m
  - 2) 2800 m
  - 3) 700 m
  - 4) 350 m

---

SPACE FOR ROUGH WORK

12. What is the value of the minimum resistance which can be made by connecting four resistors each of  $1/4\Omega$ ?

1)  $1/4\Omega$

2)  $1/8\Omega$

3)  $1\Omega$

4)  $1/16\Omega$

13. When kinetic energy of a body is doubled

1) Its momentum is doubled

2) Its momentum is  $\sqrt{2}$  times the initial value

3) Its potential energy is doubled

4) Its momentum is  $\frac{1}{2}$  times the initial value

14. A vehicle starting from rest attains a speed of 20 m/s after covering a distance of 200 m. If the mass of the vehicle is 500 kg, the force exerted on the vehicle is

1) 100 N

2) 500 N

3) 2000 N

4) 1000 N

---

SPACE FOR ROUGH WORK

15. Which of the following pair have same unit?

1) Velocity and momentum

2) Force and power

3) Work and energy

4) Work and power

16. Number of electrons forming 1 coulomb charge is equal is :

1) 6.25

2)  $6.25 \times 10^{-18}$

3)  $6.25 \times 10^{18}$

4)  $6.25 \times 10^{-19}$

---

SPACE FOR ROUGH WORK

17. Which of the following has least inertia?

1) An iron ball of mass 10 kg

2) An aluminium ball of mass 7 kg

3) An iron ball of mass 5 kg

4) An iron block of mass 3 kg

18. A convex lens of focal length 10 cm form a real image of the same size as the object. The distance between object and its image will be

1) 8 cm

2) 20 cm

3) 10 cm

4) 40 cm

19. The frequency of a man's voice is 300 Hz and its wavelength is 1 meter. If the wavelength of a child's voice is 1.5 m, then the frequency of the child's voice is :

1) 200 Hz

2) 150 Hz

3) 400 Hz

4) 350 Hz

---

SPACE FOR ROUGH WORK

20. We can derive Newton's

- 1) Second and third laws from the first law
- 2) First and second laws from the third law
- 3) Third and first laws from the second law
- 4) All the three laws are independent of each other

**SECTION - B (PHYSICS)**

21. How many resistors of  $176\Omega$  should be connected in parallel to get 5A current from 220V supply?
22. An electric iron of resistance  $20\Omega$  takes a current of 5A. The heat energy developed in kW in 30 seconds will be:
23. A body starts from rest and has an acceleration of  $20 \text{ cm/s}^2$ . The distance covered by the body in first 8 s in cm is :

---

SPACE FOR ROUGH WORK

24. Consider two spherical planets of same average density. Planet 2 is 8 times as massive as planet. The ratio of the acceleration due to gravity on the second planet to that on the first is
25. A body of mass 50 kg has momentum of 300 kg-m/sec. Then its kinetic energy in joule is :
26. Electrostatic force between two point charges at a separation  $r$  is  $F$ . If the magnitude of each charge is doubled then the force between the charges at the same separation is  $yF$ . The value of  $y$  is :
27. The force acting on a particle is 10 N. The power produced by the force, in S.I. unit when the velocity of the particle 5 m/s is :
28. The magnetic field produced by an infinitely long straight current carrying conductor at distances  $r$  and  $2r$  are  $B_1$  and  $B_2$  respectively. The ration  $\frac{B_1}{B_2}$  is:
29. The focal length of a convex mirror of radius of curvature 50 m in meter is :
30. The pressure exerted by a normal force of 100 N when applied on a surface of area 25 m<sup>2</sup> in N/m<sup>2</sup> is:

---

SPACE FOR ROUGH WORK



## PART II - CHEMISTRY

This part contains 30 questions

**SECTION A - Question No. Chemistry- (31-50)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Chemistry - (51 - 60 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

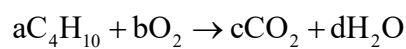
**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

### SECTION - A : CHEMISTRY

31. In the balanced equation



The values of a, b, c, d are respectively

1) 1, 6, 4, 5

2) 2, 11, 8, 10

3) 2, 13, 8, 10

4) 2, 10, 6, 8

32.  $2\text{HgO}_{(s)} + \text{Heat} \rightarrow 2\text{Hg}_{(\ell)} + \text{O}_{2(g)}$  is an example of

1) Precipitation reaction

2) Exothermic reaction

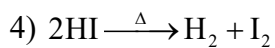
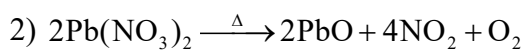
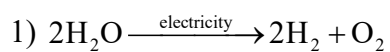
3) Endothermic reaction

4) Combination reaction

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SPACE FOR ROUGH WORK

33. Which of the following is not a decomposition reaction ?



34.  $4\text{HCl} + \text{MnO}_2 \xrightarrow{\text{heat}} \text{MnCl}_2 + 2\text{H}_2\text{O} + 2\text{Cl}_2$ . In this reaction, the reducing agent is



---

SPACE FOR ROUGH WORK

35.  $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ . This equation is a / an

i) Neutralisation reaction

ii) Double displacement reaction

iii) Decomposition reaction

iv) Addition reaction

1) i, ii, iii and iv

2) i and iii

3) i and ii

4) iii and iv

36. Which of the following is not a physical change?

1) Bursting of balloons

2) Melting of ice

3) Condensation of water vapour

4) Combustion of LPG

---

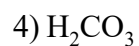
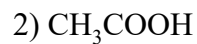
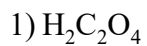
SPACE FOR ROUGH WORK

37. When lead nitrate solution is mixed with potassium iodide solution a yellow precipitate is formed. The formula of yellow precipitate is
- 1)  $\text{Pb}_2\text{I}$                       2)  $\text{PbI}_2$                       3)  $\text{Pb}_3\text{I}_2$                       4)  $\text{PbI}_4$
38. A substance X is used in white- washing and is obtained by heating limestone in the absence of air. Identify X
- 1)  $\text{CaOCl}_2$                       2)  $\text{Ca(OH)}_2$                       3)  $\text{CaO}$                       4)  $\text{CaCO}_3$
39. What type of chemical reaction takes place when electricity is passed through water?
- 1) displacement                      2) Combination
- 3) Decomposition                      4) Double displacement
40. When copper powder is heated in air it forms a black oxide of formula
- 1)  $\text{CuCO}_3$                       2)  $\text{CuO}$
- 3)  $\text{CuO}_2$                       4)  $\text{CuCl}_2$

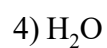
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SPACE FOR ROUGH WORK

41. Which of the following is an example of mineral acid ?



42.  $\text{Zn}_{(\text{s})} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{A}$ . A is



43. Which of the following is a monobasic acid?

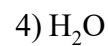
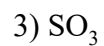
1) Nitric acid

2) Sulphuric acid

3) Carbonic acid

4) Oxalic acid

44.  $\text{Ca}(\text{OH})_2 + \text{SO}_2 \rightarrow \text{CaSO}_3 + \text{A}$ . What is A?



---

SPACE FOR ROUGH WORK

45. Example of a salt formed by mixing strong acid and strong base is



46. The property by which salts absorb moisture from the atmosphere without dissolving in it is

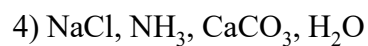
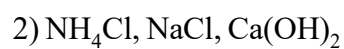
1) Deliquescence

2) Hygroscopic

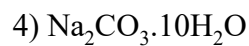
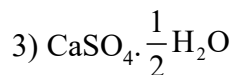
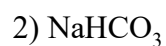
3) Efflorescence

4) Evaporation

47. The raw materials required for the manufacture of  $\text{Na}_2\text{CO}_3$  by Solvay process are



48. Chemical formula of washing soda is



---

SPACE FOR ROUGH WORK

49. Which one of the following is not an allotrope of carbon?

1) Diamond

2) Benzene

3) Graphite

4) Fullerene

50. From which of the following substance pencil lead is formed?

1) Charcoal

2) Wood

3) Lead

4) Graphite

**SECTION - B : CHEMISTRY**

51.  $p\text{MnO}_2 + q\text{Al} \longrightarrow r\text{Mn} + s\text{Al}_2\text{O}_3$

The value of  $(p + q + r + s)$  is \_\_\_\_\_

52.  $3\text{Fe} + x\text{H}_2\text{O} \longrightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$ . The value of  $x$  is \_\_\_\_\_

53. The number of water molecules present in each formula unit of ferrous sulphate crystals is \_\_\_\_\_

54. Degree of dissociation of strong acid and strong base is nearly equal to \_\_\_\_\_ (nearest integer)

---

SPACE FOR ROUGH WORK



55. How many electrons are there in the outermost shell of carbon atom ?
56. How many compounds among the following are produced/liberated when green coloured ferrous sulphate crystals are heated strongly?

- |                      |                                     |                       |                        |
|----------------------|-------------------------------------|-----------------------|------------------------|
| (i) FeO              | (ii) Fe <sub>2</sub> O <sub>3</sub> | (iii) H <sub>2</sub>  | (iv) O <sub>2</sub>    |
| (v) H <sub>2</sub> O | (vi) H <sub>2</sub> O <sub>2</sub>  | (vii) SO <sub>2</sub> | (viii) SO <sub>3</sub> |

57. How many grams of glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) contain 12 g hydrogen in it?

(Given : Atomic mass of C = 12 u, H = 1 u, O = 16 u)

58. How many elements among the following are liquids at human body temperature (310 K) ?

- |                  |                    |                    |               |
|------------------|--------------------|--------------------|---------------|
| i) Lithium (Li)  | ii) Sodium (Na)    | iii) Potassium (K) |               |
| iv) Caesium (Cs) | v) Magnesium (Mg)  | vi) Gallium (Ga)   |               |
| vii) Sulphur (S) | viii) Mercury (Hg) | ix) Bromine (Br)   | x) Iodine (I) |

---

SPACE FOR ROUGH WORK

59. How many elements among the following liberate dihydrogen gas from dilute hydrochloric acid at 298 K?

i) Lead (Pb)

ii) Silver (Ag)

iii) Gold (Au)

iv) Iron (Fe)

v) Copper (Cu)

vi) Mercury (Hg)

vii) Magnesium (Mg)

viii) Sodium (Na)

ix) Potassium (K)

60. How many ionic compounds among the following melt below 1000 K at one atmosphere pressure?

i) NaCl

ii) LiCl

iii)  $\text{CaCl}_2$

iv)  $\text{MgCl}_2$

v) CaO

---

SPACE FOR ROUGH WORK

## PART III - MATHEMATICS

This part contains 30 questions

**SECTION A - Question No. Mathematics- (61-80)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS




For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Mathematics - (81 - 90 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

### **SECTION - A : MATHEMATICS**

61. The linear equation  $3x - 11y = 10$  has:

1) Unique solution

2) Two solutions

3) Infinitely many solutions

4) No solutions

62. Equation of a line passing through origin is

1)  $x + y = 1$

2)  $x = 2y - 4$

3)  $x + y = 0$

4)  $y = x - 1$

63. If  $\frac{1}{2(x+2y)} + \frac{5}{3(3x-2y)} = -\frac{2}{3}$ ,  $\frac{5}{4(x+2y)} - \frac{3}{5(3x-2y)} = \frac{19}{40}$  where  $x + 2y \neq 0$  and  $3x - 2y \neq 0$ . Then what will be the value of  $x$  and  $y$ ?

1)  $3/2, 1/4$

2)  $1/3, 2/3$

3)  $1/3, 1/4$

4)  $1/2, 5/4$

64. A quadratic polynomial whose zeros are  $-3$  and  $4$  is

1)  $x^2 - x + 12$

2)  $x^2 + x + 12$

3)  $2x^2 + 2x - 24$

4) None of these

---

SPACE FOR ROUGH WORK

65. If  $\frac{x}{2} + \frac{y}{4} = 3$  and  $2x - y = 4$  then y is

1) 1

2) 2

3) 3

4) 4

66.  $M^2 - 1$  is divisible by 8 if M is

1) An even integer

2) An odd integer

3) A natural number

4) A whole number

67. The number  $\pi$  is

1) a natural number

2) a rational number

3) an irrational number

4) rational or irrational

68. The largest number which divides 60 and 75 leaving remainders 8 and 10 respectively is

1) 260

2) 75

3) 65

4) 13

---

SPACE FOR ROUGH WORK

69. Two natural numbers whose sum is 85 and their LCM is 102, are

- 1) 30 & 85                      2) 17 & 68                      3) 35 & 55                      4) 51 & 34

70. For some integer  $m$ , every odd integer is of the form

- 1)  $m$                       2)  $m + 1$                       3)  $2m$                       4)  $2m + 1$

71. The product of two consecutive natural numbers is always :

- 1) Prime number                      2) Even number                      3) Odd number                      4) Even or odd

72. In an equilateral triangle of side  $a$ , the length of altitude is:

- 1)  $\frac{a}{2}$                       2)  $\frac{\sqrt{a}}{2}$                       3)  $\frac{\sqrt{3}}{2}a$                       4)  $\frac{2}{\sqrt{3}}a$

73. When a die is thrown, the probability of getting an odd number less than 3 is:

- 1)  $\frac{1}{6}$                       2)  $\frac{1}{3}$                       3)  $\frac{1}{2}$                       4) 0

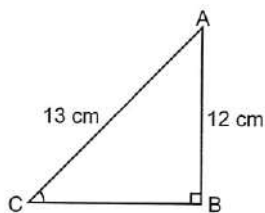
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SPACE FOR ROUGH WORK

74. If  $\sin A = \frac{1}{2}$ , then the value of  $\cot A$  is:

- 1)  $\sqrt{3}$                       2)  $\frac{1}{\sqrt{3}}$                       3)  $\frac{\sqrt{3}}{2}$                       4)  $\frac{3}{2}$

75. In the figure,  $\tan A \cot C$  is equal to:



- 1)  $-1$                       2)  $1$                       3)  $0$                       4)  $\frac{1}{2}$

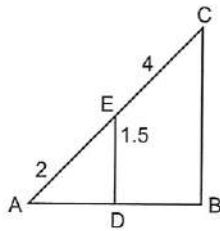
76. The perimeter of a quadrant of a circle of radius  $\frac{7}{2}$  cm is:  $\left( \text{Given } \pi = \frac{22}{7} \right)$

- 1) 6.5 cm                      2) 5.5 cm                      3) 12.5 cm                      4) 14 cm

---

SPACE FOR ROUGH WORK

77. In the figure, if  $\triangle ABC \sim \triangle ADE$ , then the length of BC is:



- 1) 3cm                      2) 3.2 cm                      3) 3.9 cm                      4) 4.5 cm

78. The distance between the points (0,5) and  $(-5, 0)$  is:

- 1) 5 units                      2)  $5\sqrt{2}$  units                      3)  $2\sqrt{5}$  units                      4) 10 units

79. If  $A(5,1)$ ,  $B(1,5)$  and  $C(-3,-1)$  are the vertices of  $\triangle ABC$ , then the length of median AD is :

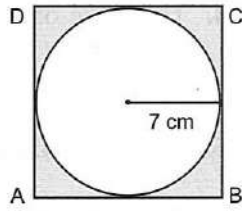
- 1)  $\sqrt{35}$  units                      2)  $\sqrt{37}$  units                      3)  $\sqrt{33}$  units                      4)  $\sqrt{31}$  units

---

SPACE FOR ROUGH WORK



80. In the figure, a circle of radius 7 cm is inscribed in a square. Then the area of the shaded region is:



$$\left( \text{Given } \pi = \frac{22}{7} \right)$$

- 1)  $42\text{cm}^2$                       2)  $44\text{ cm}^2$                       3)  $35\text{cm}^2$                       4)  $30\text{ cm}^2$

### **SECTION -B : MATHEMATICS**

81. The value of  $k$  for which  $(-4)$  is a zero of the polynomial  $x^2 - x - (2k + 2)$  is
82. The sum of two numbers is 11. Find the larger number, if two times of one of them exceeds three times the other number by 2
83. The sum of two natural numbers is 240 and their ratio is  $3 : 5$ . Then the greater number is
84. If the arithmetic mean of 5, 7, 9,  $x$  is 9, then the value of  $x$  is

---

SPACE FOR ROUGH WORK

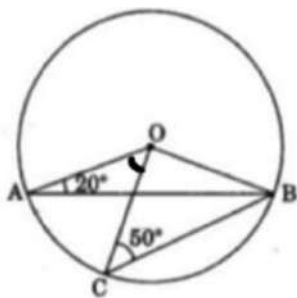
85. The H.C.F of 441, 567 and 693 is

86. The distance of the point P(8,5) from the x- axis is:

87. Term independent of x in the expansion of  $\left(x + \frac{1}{x}\right)^2$  is

88. The value of  $8\sin 30^\circ \times \cos 45^\circ \times \cot 45^\circ \times \sin 45^\circ$  is

89. In the given figure, O is the centre of a circle in which  $\angle OAB = 20^\circ$  and  $\angle OCB = 50^\circ$ . Then  $\angle AOC =$



90. If  $x + y = 9$  and  $xy = 8$ , then  $x^2 + y^2 =$

---

SPACE FOR ROUGH WORK

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**SPACE FOR ROUGH WORK**

# IIT/AIIMS SCREENING TEST - 26-03-23

QUESTION  
BOOKLET  
CODE

A

## P + C + M - ANSWER KEY

### PHYSICS

1. 4
2. 3
3. 2
4. 2
5. 2
6. 2
7. 4
8. 4
9. 2
10. 3
11. 1
12. 4
13. 2
14. 2
15. 3
16. 3
17. 4
18. 4
19. 1
20. 3
21. 4
22. CANCELLED
23. 640
24. 2
25. 900
26. 4
27. 50
28. 2
29. 25
30. 4

### CHEMISTRY

31. 3
32. 3
33. 3
34. 2
35. 3
36. 4
37. 2
38. 3
39. 3
40. 2
41. 4
42. 3
43. 1
44. 4
45. 1
46. 2
47. 4
48. 4
49. 2
50. 4
51. 12
52. 4
53. 7
54. 1
55. 4
56. 4
57. 180
58. 4
59. 5
60. 2

### MATHEMATICS

61. 3
62. 3
63. 1
64. 4
65. 4
66. 2
67. 3
68. 4
69. 4
70. 4
71. 2
72. 3
73. 1
74. 1
75. CANCELLED
76. 3
77. 4
78. 2
79. 2
80. 1
81. 9
82. 7
83. 150
84. 15
85. 63
86. 5
87. 2
88. 2
89. 60
90. 65

Date : 05<sup>th</sup> February 2023

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2½ hour** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 300**
5. There are three Parts. Physics, Chemistry & Mathematics having 30 questions each. Each Part consists of two Sections. In **Section A** (20 questions) each question has four options (1), (2), (3) and (4). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. In **Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions.** In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be **evaluated**. Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

I have read all the instructions and shall abide by them

\_\_\_\_\_  
Signature of the Candidate

**Roll Number**

I have verified all the information filled by the candidate

\_\_\_\_\_  
Signature of the Invigilator



# PART I - PHYSICS

This part contains 30 questions

**SECTION A - Question No. Physics - (1-20)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

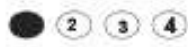








For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

## CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Physics - (21 - 30 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

## CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
9	●	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

**SECTION - A (PHYSICS)**

1. The least distance of distinct vision of a young adult with normal vision is  

1) 25m2) 20m3) 25cm4) 20 cm
  
2. SI unit of acceleration is  

1)  $\text{m/s}^2$ 2)  $\text{km/h}^2$

3)  $\text{m/s}$ 4)  $\text{km/s}$
  
3. A car starts from rest and accelerates in a straight line at a constant rate of  $4\text{m/s}^2$  for 2 second. Final velocity of the car is  

1)  $8\text{m/s}$ 2)  $28.8\text{km/h}$

3)  $12\text{m/s}$ 4) Both 1 and 2
  
4. A bus starting from rest and moving with uniform acceleration attains a speed of  $30\text{m/s}$  in 2 minutes. The displacement of the bus is  

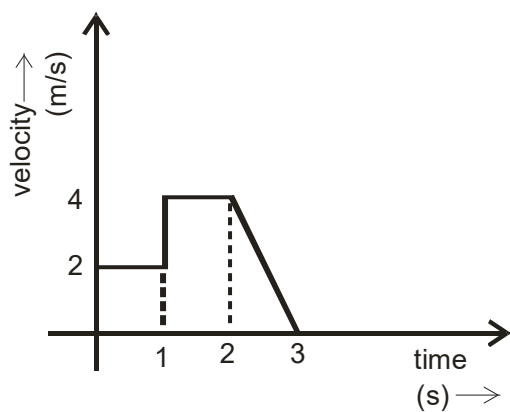
1)  $1.8\text{km}$ 2)  $2.4\text{km}$ 3)  $0.5\text{km}$ 4)  $5.2\text{km}$

---

SPACE FOR ROUGH WORK



5. From the following graph, displacement of the body when  $t = 2$  second is:



- 1) 8m                      2) 4m                      3) 9m                      4) 6m
6. A concave mirror of focal length 20cm forms an image having twice the size of object. For the virtual position of object, the position of object will be at
- 1) 25 cm                      2) 40 cm                      3) 10cm                      4) at infinity
7. The magnetic effect of current was discovered by
- 1) Maxwell                      2) Fleming                      3) Oersted                      4) Faraday

---

SPACE FOR ROUGH WORK

8. A positively charged particle projected towards west is deflected towards north by a magnetic field. The direction of magnetic field is
- 1) towards south      2) towards east      3) downwards      4) upward
9. No force acts on a current carrying conductor when it is placed
- 1) perpendicular to the magnetic field
- 2) parallel to the magnetic field
- 3) far away from the magnetic field
- 4) inside a magnetic field
10. An electromagnetic radiation of frequency  $n$ , wavelength  $\lambda$ , travelling with velocity  $v$  in air, enters a glass slab of refractive index  $\mu$ . The frequency, wavelength and velocity of light in the glass slab will be respectively.
- 1)  $\frac{n}{\mu}, \frac{\lambda}{\mu}$  and  $\frac{v}{\mu}$
- 2)  $n, \frac{\lambda}{\mu}$  and  $\frac{v}{\mu}$
- 3)  $n, 2\lambda$  and  $\frac{v}{\mu}$
- 4)  $\frac{2n}{\mu}, \frac{\lambda}{\mu}$  and  $v$

---

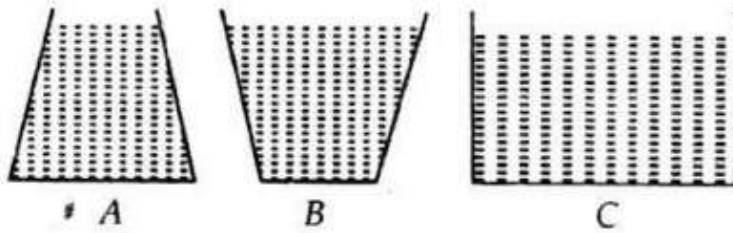
SPACE FOR ROUGH WORK

11. Which of the following is wrong?
- 1) Rate of change of velocity is acceleration
  - 2) If acceleration and velocity are in opposite direction, then speed decreases
  - 3) If a body moves in the same direction then magnitude of displacement is greater than distance travelled
  - 4) Uniform circular motion is an accelerated motion
12. If one ampere current flows through a conductor, the number of electrons flowing across the cross section of the conductor in 2 seconds is \_\_\_\_\_. (Take the charge on electron =  $1.6 \times 10^{-19} \text{ C}$ )
- 1)  $1.6 \times 10^{-19}$                       2)  $1.25 \times 10^{19}$                       3)  $6.25 \times 10^8$                       4)  $3.2 \times 10^{18}$
13. Which of the following phenomena contributes significantly to the reddish appearance of the sun at sunrise or sunset?
- 1) Dispersion of light
  - 2) Scattering of light
  - 3) Total internal Reflection of light
  - 4) Reflection of light from earth

---

SPACE FOR ROUGH WORK

14. Three vessels A, B and C of different shapes contain a water upto the same height as shown in the figure,  $P_A$ ,  $P_B$  and  $P_C$  be the pressure exerted by the water at the bottom of the vessels A, B and C respectively. Then



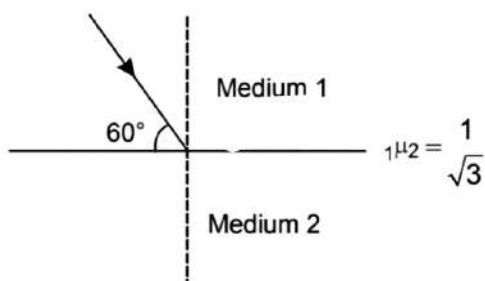
- $$\begin{array}{ll} 1) P_A > P_B > P_C & 2) P_B > P_C > P_A \\ 3) P_C > P_B > P_A & 4) P_A = P_B = P_C \end{array}$$

15. Production of induced emf involves

- 1) Conversion of electrical energy into mechanical energy
- 2) Conversion of mechanical energy into electrical energy
- 3) Conversion of chemical energy into electrical energy
- 4) Conversion of electrical energy into chemical energy

## SPACE FOR ROUGH WORK

16. A convex mirror of radius of curvature 1.6m has an object placed at a distance of 1m from it. The image is formed at a distance of
- 1)  $\frac{8}{13}$  m in front of the mirror
  - 2)  $\frac{8}{13}$  m behind the mirror
  - 3)  $\frac{4}{9}$  m in front of the mirror
  - 4)  $\frac{4}{9}$  m behind the mirror
17. Consider the figure shown below & find out the angle of refraction



1)  $0^\circ$

2)  $30^\circ$

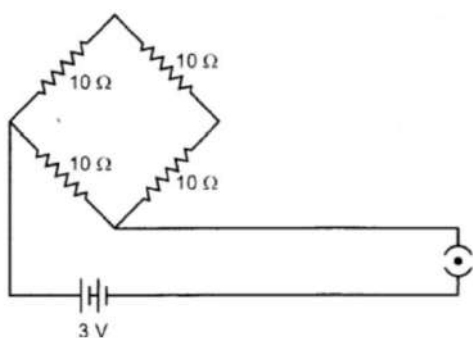
3)  $45^\circ$

4)  $60^\circ$

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SPACE FOR ROUGH WORK

18. Find the current drawn from the battery by the network of four resistors shown in the figure.



- 1) 0.3A                      2) 0.4A                      3) 0.2A                      4) 0.1A

19. Match the column

Column I

1. Electric bulb
2. Mixi
3. Electric iron
4. Storage battery while charging

Column II

- p. Electric energy to heat
- q. Electric energy to light
- r. Electric energy to chemical energy
- s. Electric energy to mechanical energy

1) 1 - s, 2 - r, 3 - q, 4 - p

2) 1 - q, 2 - s, 3 - p, 4 - r

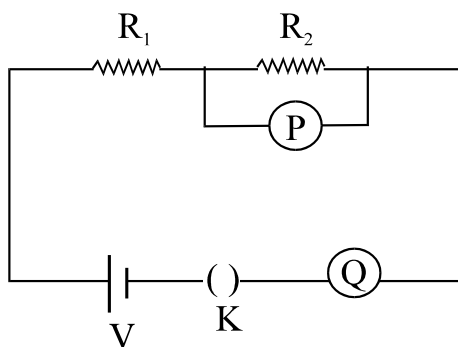
3) 1 - s, 2 - q, 3 - p, 4 - r

4) 1 - p, 2 - q, 3 - s, 4 - r

---

SPACE FOR ROUGH WORK

20. Which are the instruments labelled as P and Q in the given circuit



1) p - ammeter                      Q - voltmeter

2) p - voltmeter                      Q- ammeter

3) p - ammeter                      Q - ammeter

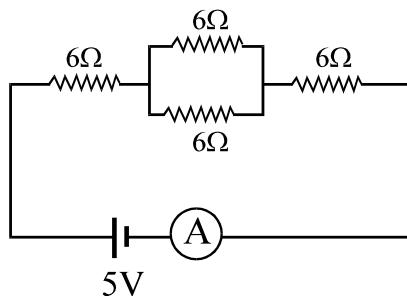
4) p - voltmeter                      Q - voltmeter

---

SPACE FOR ROUGH WORK

**SECTION - B (PHYSICS)**

21. A particle starts from rest and moves with a constant acceleration  $2 \text{ m/s}^2$ . Displacement of the particle in first 4 seconds in meter is
22. Gravitational force between two particles at a separation  $r$  is  $F$ . If the separation between the particles increases to  $2r$  and one of the masses is halved then force between the two particles is  $\frac{F}{n}$ . The value of  $n$  is
23. Mohan is observing his image in a plane mirror. The distance between the mirror and his image is  $5\text{m}$ . If he moves  $1\text{m}$  towards the mirror, then the distance between Mohan and his image in meter will be
24. Find the effective resistance of the circuit



---

SPACE FOR ROUGH WORK



25. A body moving with an initial velocity of 5m/s, undergoes a uniform acceleration. After 5 second its velocity becomes 25 m/s. Then average velocity of the body is
26. The average induced emf produced in a closed loop in 2s is 5V. The magnitude of change in flux in SI unit is
27. A charge enters into a uniform magnetic field of 2T. Initial kinetic energy of the charge is 15J. Kinetic energy of the charge after 10s is  $\frac{30}{x}$  J. The value of x is
28. An electric bulb marked 15 V is connected to a battery of 15 V which has a negligible resistance. If the resistance offered by the bulb is  $5\ \Omega$  the power of the bulb is \_\_\_\_\_ W.
29. The odometer of a car reads 30,000km at the start of a trip and 31200km at the end of the trip. Let 50km/h be the average speed of the driver and each day he travels only 6 hours, then how many days he took for the entire journey?
30. A block of mass 2kg is moving along a horizontal surface. Work done by the gravity in joule when the block moves through a distance 5cm along the suraface is ( $g = 10\text{ m/s}^2$ )

---

SPACE FOR ROUGH WORK

## PART II - CHEMISTRY

This part contains 30 questions

**SECTION A - Question No. Chemistry- (31-50)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Chemistry - (51 - 60 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
9	●	0

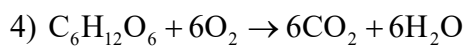
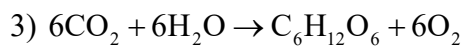
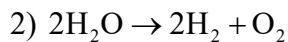
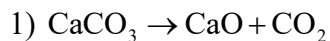
**If Three Digit Answer**  
If answer is 180

**Example 3**

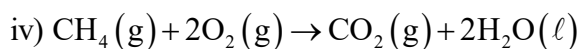
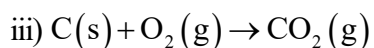
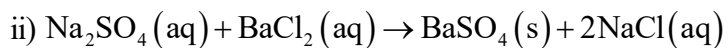
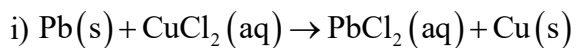
Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
9	9	●

**SECTION-A(CHEMISTRY)**

31. Which of the following is not an endothermic reaction?



32. Which amongst the following is (are) double displacement reaction?



1) i and iv

2) ii only

3) i and ii

4) iii and iv

---

SPACE FOR ROUGH WORK

33 Three beakers labelled as A, B and C each containing 25 mL of water. A small amount of NaOH, anhydrous  $\text{CuSO}_4$  and NaCl were added to the beakers A, B and C respectively. It was observed that there was an increase in the temperature of the solutions contained in beakers A and B, whereas in case of beaker C, the temperature of the solution fall. Which one of the following statement(s) is(are) correct?

i) In beakers A and B, exothermic reaction has occurred

ii) In beakers A and B, endothermic reaction has occurred

iii) In beaker C exothermic reaction has occurred

iv) In beaker C endothermic reaction has occurred

1) i only

2) ii only

3) i and iv

4) ii and iii

34. What happens when a solution of an acid is mixed with a solution of a base in a test tube?

i) The temperature of the solution increases

ii) The temperature of the solution decreases

iii) The temperature of the solution remains the same

iv) Salt formation takes place

1) i only

2) i and iii

3) ii and iii

4) i and iv

---

SPACE FOR ROUGH WORK

35. Reaction between X and Y, forms compound Z. The substance, X loses an electron and Y gains an electron. Which of the following properties is not shown by Z?
- 1) Has high melting point
  - 2) Has low melting point
  - 3) Conducts electricity in molten state
  - 4) Occurs as solid
36. A substance X is used in white- washing and is obtained by heating limestone in the absence of air. Identify X
- 1)  $\text{CaOCl}_2$
  - 2)  $\text{Ca}(\text{OH})_2$
  - 3)  $\text{CaO}$
  - 4)  $\text{CaCO}_3$
37. What type of chemical reaction take place when electricity is passed through water?
- 1) displacement
  - 2) Combination
  - 3) Decomposition
  - 4) Double displacement
- 

SPACE FOR ROUGH WORK

38. Which of the following is incorrect about chemical equation?
- 1) Reactants are written on the left hand side
  - 2) Products are written on the right hand side
  - 3) Both 1 and 2
  - 4) None of these
39. Calcium oxide react vigorously with water to produce -----
- 1) Calcium carbonate
  - 2) Calcium hydroxide
  - 3) Calcium sulphate
  - 4) Calcium nitrate
40. When lead nitrate solution is mixed with potassium iodide solution to form an yellow precipitate. The resultant yellow precipitate compound is
- 1) Lead iodide
  - 2) lead acetate
  - 3) lead carbonate
  - 4) lead oxide

---

SPACE FOR ROUGH WORK

41. Match the chemical substances given in Column (A) with their appropriate application given in Column (B)

Column (A)

Column (B)

a) Bleaching powder

i) Preparation of glass

b) Baking soda

ii) Production of  $H_2$  and  $Cl_2$

c) Washing soda

iii) Decolourisation

d) Sodium chloride

iv) Antacid

1) a-ii; b-i; c-iv; d-iii

2) a-iii; b-ii; c-iv; d-i

3) a-iii; b-iv; c-i; d-ii

4) a-ii; b-iv; c-i; d-iii

42. Which of the following is an example of mineral acid?

1)  $H_2C_2O_4$

2)  $CH_3COOH$

3)  $HCOOH$

4)  $H_2CO_3$

43.  $Ca(OH)_2 + SO_2 \longrightarrow CaSO_3 + A$ . What is A

1)  $O_2$

2)  $H_2$

3)  $SO_3$

4)  $H_2O$

---

SPACE FOR ROUGH WORK

44. The raw material require for the manufacture of  $\text{Na}_2\text{CO}_3$  by solvay process are

A)  $\text{CaCl}_2$ ,  $(\text{NH}_4)_2\text{CO}_3$ ,  $\text{NH}_3$

2)  $\text{NH}_4\text{Cl}$ ,  $\text{NaCl}$ ,  $\text{Ca}(\text{OH})_2$

3)  $\text{NaCl}$ ,  $(\text{NH}_4)_2\text{CO}_3$ ,  $\text{NH}_3$

4)  $\text{NaCl}$ ,  $\text{NH}_3$ ,  $\text{CaCO}_3$ ,  $\text{H}_2\text{O}$

45. Which one of the following is not an allotrope of carbon?

1) Diamond

2) Benzene

3) Graphite

4) Fullerene

46. Rancidity can be prevented by adding

1) antirust solution

2) antioxidants

3) Oxygen

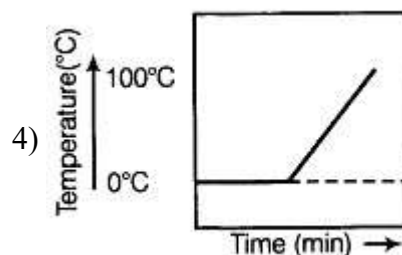
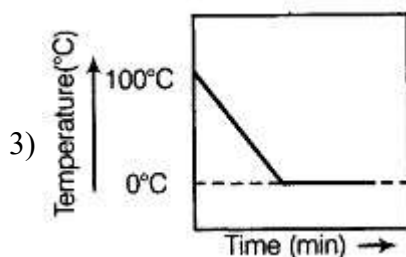
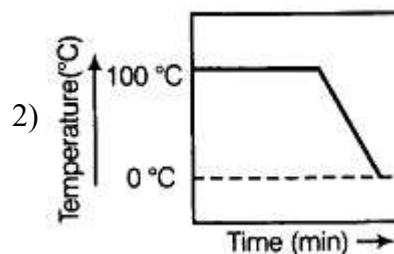
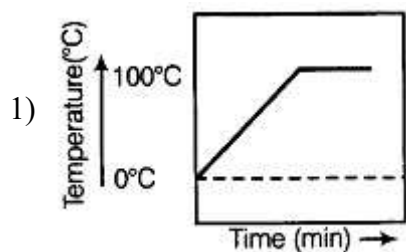
4) Hydrogen

---

SPACE FOR ROUGH WORK



47. When a beaker containing ice and water is heated, then which of the following graph would correctly justify the result



---

SPACE FOR ROUGH WORK

48. Match the following with SI unit's of given quantity

A

B

p) volume

i) g/mL

q) density

ii) L

r) mass

iii) kg

s) pressure

iv) g

v) kg/m<sup>3</sup>

vi) pascal

vii) bar

viii) m<sup>3</sup>

1) p - (ii), q - (i), r - (iv), s - (vii)

2) p - (ii), q - (v), r - (iii), s - (vii)

3) p - (viii), q - (v), r - (iii), s - (vi)

4) p - (viii), q - (i), r - (iii), s - (vi)

---

SPACE FOR ROUGH WORK

49. Which one of the following statements is not true ?
- 1) The molecules in a solid vibrate about a fixed position
  - 2) The molecules in a liquid are arranged in a regular pattern
  - 3) The molecules in a gas exerts negligibly small forces on each other, except during collisions
  - 4) The molecules of a gas occupy all the space available
50. CNG is
- 1) Complete natural gas
  - 2) Compressed natural gas
  - 3) Complicated natural gas
  - 4) Condensed natural gas

**SECTION-B (CHEMISTRY)**

51. Number of atoms present in one formula unit of magnesium phosphate is .....
52. A solution is prepared by dissolving 30g urea ( $\text{NH}_2\text{CONH}_2$ ) in 315 g water ( $\text{H}_2\text{O}$ ). The total number moles present in the solution is ..... (Given atomic mass of C = 12u, O = 16u, N = 14u, H = 1u)

---

SPACE FOR ROUGH WORK

53.  $3\text{Fe} + x\text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$ . The value of x is .....
54.  $x\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + y\text{H}_2\text{O}$ . The sum of (x + y) is .....
55.  $\text{H}_2\text{SO}_4 + x\text{KOH} \rightarrow \text{K}_2\text{SO}_4 + \text{H}_2\text{O}$  the value of x in the balanced equation is .....
56. How many of the following are solids at 37°C and 1 atm pressure?
- |                 |                   |                 |                  |
|-----------------|-------------------|-----------------|------------------|
| i) Lead (Pb)    | ii) Mercury (Hg)  | iii) Zinc (Zn)  | iv) Bromine (Br) |
| v) Caesium (Cs) | vi) Gallium (Ga)  | vii) Xenon (Xe) | viii) Iodine (I) |
| ix) Uranium (U) | x) Phosphorus (P) |                 |                  |
57. How many grams of pure carbon can theoretically be obtained by dehydration of one mole cane sugar? (Sucrose,  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ ). Given atomic mass of C = 12 u, H = 1u, O = 16u)
58. The number of water molecules present per formula unit in ferrous sulphate crystal is.....
59. Boiling point of water at sealevel is ..... K
60. How many electrons are there in the outermost shell of carbon?

---

SPACE FOR ROUGH WORK

## PART III - MATHEMATICS

This part contains 30 questions

**SECTION A - Question No. Mathematics- (61-80)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Mathematics - (81 - 90 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer									
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0

**SECTION -A (MATHEMATICS)**

61. Which of the following is not a polynomial?

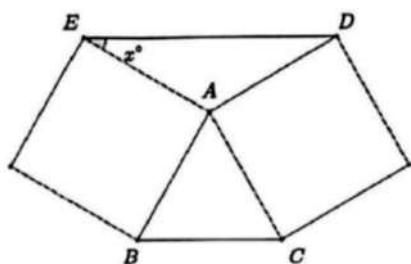
1)  $\sqrt{3}x^2 - 2\sqrt{3x} + 3$

2)  $\frac{3}{2}x^3 - 5x^2 - \frac{1}{\sqrt{2}}x - 1$

3)  $x + \frac{1}{x}$

4)  $5x^2 - 3x + \sqrt{2}$

62. ABC is an equilateral triangle. Squares are described on the sides AB and AC as shown. The value of x is



1) 20

2) 30

3) 45

4) 50

63. What is the central angle of a semicircle?

1)  $180^\circ$

2)  $360^\circ$

3)  $90^\circ$

4)  $270^\circ$

---

SPACE FOR ROUGH WORK

64. The co-ordinate of any point on y-axis are of the form
- 1)  $(x, 0)$                       2)  $(0, y)$                       3)  $(0, 0)$                       4) None of these
65. The relationship between the zeroes  $\alpha$ ,  $\beta$  and coefficient of the quadratic polynomial  $ax^2 + bx + c$  is
- 1)  $\alpha + \beta = \frac{c}{a}$                       2)  $\alpha + \beta = \frac{-b}{a}$                       3)  $\alpha + \beta = \frac{-c}{a}$                       4)  $\alpha + \beta = \frac{b}{a}$
66. If  $\sqrt{m} = 24$  then find the value of  $2m + 1$
- 1) 25                      2) 1153                      3) 12                      4) 1150
67. The present ages of Sreeraj and Rhaul are in the ratio 5 : 7. After four years the sum of their ages will be 56 years. Then their present ages are
- 1) 18 and 30                      2) 22 and 26                      3) 20 and 28                      4) 21 and 27
68. If you subtract  $\frac{1}{2}$  from a number and multiply the result by  $\frac{1}{2}$ , you get  $\frac{1}{8}$ . Then the number is
- 1)  $\frac{4}{3}$                       2)  $\frac{1}{3}$                       3)  $\frac{3}{4}$                       4)  $\frac{1}{4}$

---

SPACE FOR ROUGH WORK

69. Which of the following is a true statement?

1)  $\pi$  and  $\frac{22}{7}$  are both rationals

2)  $\pi$  and  $\frac{22}{7}$  are both irrational

3)  $\pi$  is rational and  $\frac{22}{7}$  is irrational

4)  $\pi$  is irrational and  $\frac{22}{7}$  is rational

70. If  $x = (2 + \sqrt{3})$ , find the value of  $x + \frac{1}{x}$

1) 5

2) 4

3) 2

4) 9

71. For any integer n, odd number can be represented as in the form

1) n

2) 2n

3) 2n + 1

4) n + 1

72.  $0.6 \times 0.6 \times 0.6 = ?$

1) 216

2) 0.216

3) 21.6

4) 2.16

---

SPACE FOR ROUGH WORK



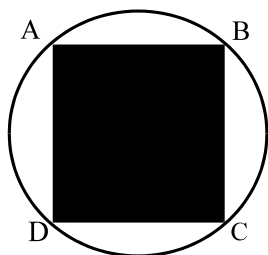
73. Which of the following is a pythagorian triplet?

- 1) 16, 18, 20                      2) 1, 2, 3                      3) 30, 40, 50                      4) 50, 51, 52

74. First term of an A.P. is 5, the common difference is 7, then the 22nd term is

- 1) 132                      2) 154                      3) 160                      4) 152

75. In the figure  $\square ABCD$  is a square, which is inscribed in the circle of area  $16\pi\text{cm}^2$ . Then the area of square ABCD is



- 1)  $16\text{ cm}^2$                       2)  $32\text{ cm}^2$                       3)  $48\text{ cm}^2$                       4)  $64\text{ cm}^2$

76.  $y - 4 = 0$  is the equation of a line

- 1) Parallel to x-axis and passing through (4, 0)  
2) Parallel to x-axis and passing through (0, 4)  
3) Parallel to y-axis and passing through (0, 4)  
4) None of these

---

SPACE FOR ROUGH WORK

77. The radii of the bases of a cylinder and a cone are in the ratio 4 : 3 and their heights are same then the ratio of their volume is
- 1) 16 : 9                      2) 16 : 3                      3) 4 : 9                      4) 4 : 3
78. If  $m$  is a real number such that  $m^2 + 1 = 3m$ , the value of  $\frac{2m^5 - 5m^4 + 2m^3 - 8m^2}{m^2 + 1}$  is
- 1) 1                      2) 2                      3) -1                      4) -2
79. The perimeter of the triangle formed by the points (0, 0), (1, 0) and (0, 1) is
- 1)  $\sqrt{2} - 1$                       2)  $\sqrt{2} + 1$                       3) 3                      4)  $2 + \sqrt{2}$
80. Five real numbers  $x_1, x_2, x_3, x_4, x_5$  are such that

$$\sqrt{x_1 - 1} + 2\sqrt{x_2 - 4} + 3\sqrt{x_3 - 9} + 4\sqrt{x_4 - 16} + 5\sqrt{x_5 - 25} = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{2}. \text{ Then } \sum_{i=1}^5 x_i \text{ is}$$

- 1) 25                      2) 55                      3) 110                      4) 210

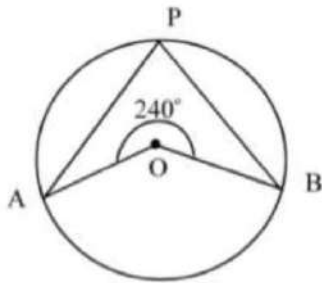
### **SECTION-B (MATHEMATICS)**

81. Smallest two digit prime number is .....
82. The radius of the circle is 5cm and the distance of a chord from its centre is 4cm. Then the length of the chord is

---

**SPACE FOR ROUGH WORK**

83. If  $2x + 3y = 12$  and  $x - y = 1$ , then  $x + y$  is
84. The sum of two natural numbers is 240 and their ratio is 3 : 5. Then the largest number is
85. The mode of the distribution 3, 5, 7, 4, 2, 1, 4, 3, 4 is
86. The degree measures of three angles of a triangle are  $x$ ,  $y$  and  $z$ . If  $z = \frac{x + y}{2}$ , then the value of  $z$  is
87. Largest 3 digit even perfect square number is
88. Find the distance between  $-5$  and  $8$  on the number line?
89. In the given figure, the reflex  $\angle AOB$  is  $240^\circ$ . Then the angle  $\angle APB$  is



90. Value of  $\sin^2 45^\circ + \tan^2 45^\circ + \cos^2 45^\circ + \sec^2 45^\circ$  is

---

SPACE FOR ROUGH WORK

---

**SPACE FOR ROUGH WORK**

IIT/AIIMS SCREENING TEST - 05-02-23

QUESTION  
BOOKLET  
CODE

C

P + C + M - ANSWER KEY

PHYSICS

1. 3
2. 1
3. 4
4. 1
5. 4
6. Cancelled
7. 3
8. 4
9. 2
10. 2
11. 3
12. 2
13. 2
14. 4
15. 2
16. 4
17. 4
18. 2
19. 2
20. 2
21. 16
22. 8
23. 8
24. 15
25. 15
26. 10
27. 2
28. 45
29. 4
30. 0

CHEMISTRY

31. 4
32. 2
33. 3
34. 4
35. 2
36. 3
37. 3
38. 4
39. 2
40. 1
41. 3
42. 4
43. 4
44. 4
45. 2
46. 2
47. 4
48. 3
49. 2
50. 2
51. 13
52. 18
53. 4
54. 4
55. 2
56. 5
57. 144
58. 7
59. 373
60. 4

MATHEMATICS

61. 1 or 3
62. 2
63. 1
64. 2
65. 2
66. 2
67. 3
68. 3
69. 4
70. 2
71. 3
72. 2
73. 3
74. 4
75. 2
76. 2
77. 2
78. 3
79. 4
80. Cancelled
81. 11
82. 6
83. 5
84. 150
85. 4
86. 60
87. 900
88. 13
89. 60
90. 4

Date : 04<sup>th</sup> December 2022

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2½ hour** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 300**
5. There are three Parts. Physics, Chemistry & Mathematics having 30 questions each. Each Part consists of two Sections. In **Section A** (20 questions) each question has four options (1), (2), (3) and (4). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. In **Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.** Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

\_\_\_\_\_

**I have read all the instructions and shall abide by them**

\_\_\_\_\_  
**Signature of the Candidate**

**Roll Number**

\_\_\_\_\_

**I have verified all the information filled by the candidate**

\_\_\_\_\_  
**Signature of the Invigilator**



# PART I - PHYSICS

This part contains 30 questions

**SECTION A - Question No. Physics - (1-20)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

## CORRECT METHOD FOR MARKING SECTION A QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## SECTION - B

**Question No. Physics - (21 - 30 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

## CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
<input checked="" type="radio"/>	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
<input checked="" type="radio"/>	0	0
0	<input checked="" type="radio"/>	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer		
<input checked="" type="radio"/>	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	<input checked="" type="radio"/>	8
9	9	9
0	0	<input checked="" type="radio"/>



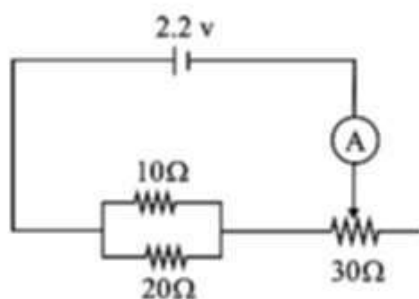
### **SECTION A - PHYSICS**

1. A rectangular coil of copper wire is rotated in a plane perpendicular to the magnetic field. The direction of induced current reverses once in each
  - 1) two rotations
  - 2) one rotation
  - 3) one fourth rotations
  - 4) half rotation
2. A particle completes two revolutions in 50 seconds in a circular path of radius 7m. Distance covered and displacement in two revolutions will be, respectively
  - 1) 44m, 14m
  - 2) 88m, 44m
  - 3) 44m, zero
  - 4) 88m, zero
3. The gravitational force between two objects each of mass  $m$ , separated by a distance  $r$ , is  $F$ . Gravitational force between two objects each of mass  $2m$  separated by a distance  $2r$ , will be
  - 1)  $\frac{F}{2}$
  - 2)  $F$
  - 3)  $2F$
  - 4)  $4F$
4. When a sheet of paper and stone are dropped in vacuum freely, then which of the following statement is correct?
  - 1) Both reach at the same time on the earth
  - 2) Sheet of paper reaches earlier than the stone on the earth
  - 3) Stone reaches earlier than the sheet of paper on the earth
  - 4) Sheet of paper stops but stone reaches on the earth

---

**SPACE FOR ROUGH WORK**

5. If half of a convex lens is blackened, then which of the following statements is correct?
- 1) Image will be formed fully but intensity becomes half
  - 2) Image formed will be half of size of the object and intensity will be unchanged
  - 3) Image will not be formed
  - 4) Image will be formed fully and intensity will be unchanged
6. A force of 100 N acts on a body so that the body acquire a velocity of 10 m/s after some time. Now the force of 100 N is replaced by another force  $F$  which decelerates the body and body come to the rest then
- 1)  $F > 100 \text{ N}$
  - 2)  $F < 100 \text{ N}$
  - 3)  $F = 100 \text{ N}$
  - 4) All options are possible
7. The resistance of rheostat shown in the figure is  $0 - 30 \Omega$ . Neglecting the resistance of ammeter and connecting wire the minimum and maximum currents through the ammeter will be



- 1) (0.08 A, 0.33 A)
- 2) (0.06A, 0.08 A)
- 3) (0.06 A, 0.33 A)
- 4) (0.33 A, 0.09 A)

---

SPACE FOR ROUGH WORK

8. In case of a convex lens, what is the minimum distance between an object and its real image?

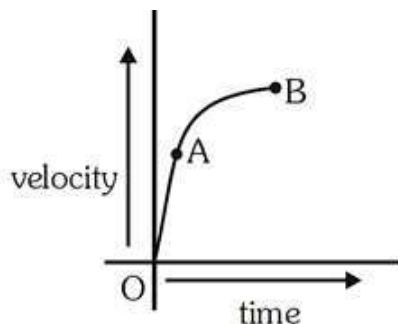
1) 2.5 times of focal length

2) 2 times of focal length

3) 4 times of focal length

4) equal to focal length

9. An object is moving along a straight line. The velocity time graph is given as shown



1) In part OA acceleration is increasing

2) In part AB acceleration is increasing

3) In part OA acceleration is decreasing

4) In part AB acceleration is decreasing

10. For hearing distinct echoes the minimum distance of the obstacle from the source of sound in meter must be [Speed of sound in air is 340 m/s]

1) 17m

2) 34 m

3) 3.4 m

4) 1.7 m

11. Two objects of masses 100g and 200g are moving along the same line and direction with velocities of  $2\text{ms}^{-1}$  and  $1\text{ms}^{-1}$  respectively. Ratio of their momenta is

1) 4 : 1

2) 1 : 1

3) 2 : 1

4) 1 : 2

---

SPACE FOR ROUGH WORK

12. When we place an iron nail on the surface of water the nail sinks. This means that
- 1) upthrust on iron nail is more than its weight
  - 2) upthrust on iron nail is less than its weight
  - 3) upthrust on iron nail is same as its weight
  - 4) density of iron nail is less than that of water
13. When a ball is thrown upward in the condition of negligible air resistance then its total energy.
- 1) Increases
  - 2) Decreases
  - 3) Remains constant
  - 4) Becomes zero at the highest point of its journey
14. Work done in reducing the velocity from  $20 \text{ ms}^{-1}$  to  $10 \text{ ms}^{-1}$  of a mass of  $0.5 \text{ kg}$  is
- 1)  $7.5 \text{ J}$
  - 2)  $75 \text{ J}$
  - 3)  $50 \text{ J}$
  - 4)  $25 \text{ J}$
15. A compass needle just above a wire in which electrons are moving towards east will point towards
- 1) South
  - 2) East
  - 3) North
  - 4) West
16. The electrical resistivity of the material of conductor is  $\rho$ . If its length is doubled and area of cross-section is tripled, then its electrical resistivity will be
- 1)  $\rho$
  - 2)  $2\rho$
  - 3)  $3\rho$
  - 4)  $4\rho$

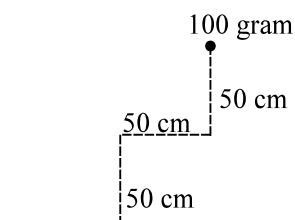
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SPACE FOR ROUGH WORK

17. If work, force and time are represented by x, y and z respectively, then the term  $\left(\frac{x}{yz^2}\right)$  will represent

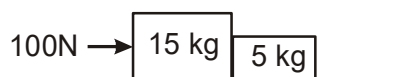
- |                 |             |
|-----------------|-------------|
| 1) acceleration | 2) velocity |
| 3) displacement | 4) momentum |

18. In the diagram value of potential energy of the body is



- |               |              |              |                |
|---------------|--------------|--------------|----------------|
| 1) 0.98 joule | 2) 9.8 joule | 3) 980 joule | 4) 98000 joule |
|---------------|--------------|--------------|----------------|

19. In the given figure, acceleration of the system is:



- |                        |                        |                       |                        |
|------------------------|------------------------|-----------------------|------------------------|
| 1) 15 m/s <sup>2</sup> | 2) 10 m/s <sup>2</sup> | 3) 5 m/s <sup>2</sup> | 4) 20 m/s <sup>2</sup> |
|------------------------|------------------------|-----------------------|------------------------|

20. A particle of mass 0.3 kg is subjected to a force  $F = Kx$  with  $K = 15 \text{ N/m}$ . What will be its initial acceleration if it is released from a point  $x = 20 \text{ cm}$

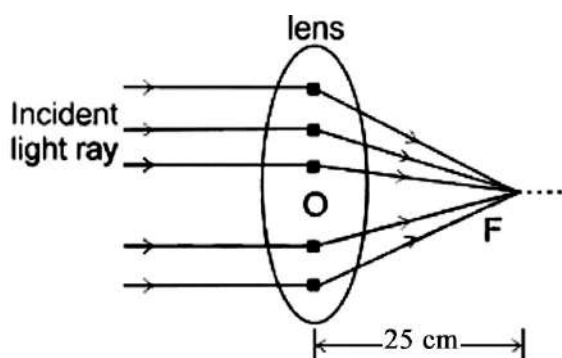
- |                       |                        |                         |                         |
|-----------------------|------------------------|-------------------------|-------------------------|
| 1) 1 m/s <sup>2</sup> | 2) 10 m/s <sup>2</sup> | 3) 100 m/s <sup>2</sup> | 4) 0.1 m/s <sup>2</sup> |
|-----------------------|------------------------|-------------------------|-------------------------|

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SPACE FOR ROUGH WORK

## SECTION B - PHYSICS

21. Magnitude of radius of curvature of a concave mirror of focal length 10 cm whose aperture is small, is [Answer should be in cm]
22. When an electric bulb is connected to a source of 220 V then current flowing through it is 0.5 A. Power of the bulb in watt is
23. In diopetre, power of lens in the given ray diagram will be

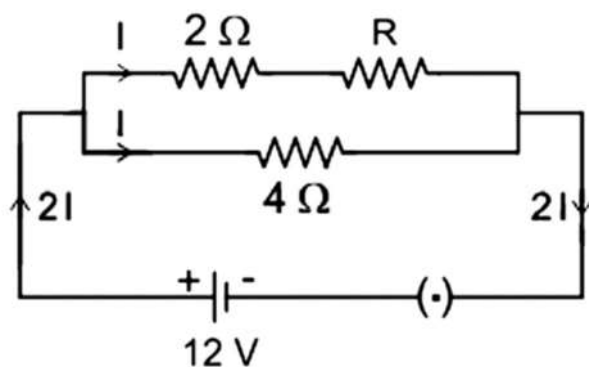


24. A player kicks 0.5 kg football and gives it a velocity of 10 m/s starting from rest. The contact between the foot and the ball lasts for  $\frac{1}{50}$  sec. The force of impact in newton is
25. Three resistors of equal resistance are connected first in series and then in parallel. If the equivalent resistances in both cases are  $R_s$  and  $R_p$  respectively, then the value of  $\frac{R_s}{R_p}$  will be

---

SPACE FOR ROUGH WORK

26. What will the value of  $R$  in ohm in the following electric circuit?



27. A sound wave has frequency of 4 kHz and wavelength 25 cm. Then distance travelled by sound in 2sec (in km) will be
28. Weight of a body of mass 10 kg in newton will be ( $g = 9.8 \text{ m/s}^2$ )
29. A plane mirror is approaching you at a speed of 5 cm/s. The image will approach you with a speed is (Answer should be in cm/s)
30. A water pumps lifts water from a level 10m below the ground. The water is pumped at the rate of 30 kg/minute with negligible velocity. Calculate the minimum power the pump should have to do this work [ $g = 9.8 \text{ m/s}^2$  and answer should be in J/s]

---

SPACE FOR ROUGH WORK

## **PART II - CHEMISTRY**

This part contains 30 questions

**SECTION A - Question No. Chemistry- (31-50)**

Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

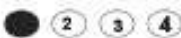








For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### **CORRECT METHOD FOR MARKING SECTION A QUESTIONS**

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK



**SECTION - A (CHEMISTRY)**

31. The suitable method for purification of two miscible liquids not having sufficient difference in their boiling points is
- 1) Filtration
  - 2) Fractional distillation
  - 3) Sublimation
  - 4) Differential extraction
32. The compound [X] is obtained by treating calcium oxide with water. The molecular formula of compound [X] is
- |                    |                      |
|--------------------|----------------------|
| 1) CaO             | 2) $\text{Ca(OH)}_2$ |
| 3) $\text{CaCO}_3$ | 4) $\text{CaSO}_4$   |
33. Lewis base among the following is
- |                  |                    |
|------------------|--------------------|
| 1) $\text{BF}_3$ | 2) $\text{AlCl}_3$ |
| 3) $\text{Cl}^-$ | 4) $\text{Na}^+$   |
34. Arrange the following elements in increasing order of their reactivity: Mg, K, Zn, Cu
- 1)  $\text{K} < \text{Mg} < \text{Zn} < \text{Cu}$
  - 2)  $\text{Zn} < \text{Mg} < \text{Cu} < \text{K}$
  - 3)  $\text{Cu} < \text{Zn} < \text{Mg} < \text{K}$
  - 4)  $\text{Mg} < \text{K} < \text{Zn} < \text{Cu}$

---

SPACE FOR ROUGH WORK



38. Which of the following are correct in respect of silver metal?

i) Malleable

ii) Melts at 303 K

iii) Ductile

iv) Electric conductors

1) i, iii, iv

2) i, ii, iii

3) i, ii, iv

4) i, ii, iii, iv

39. Match the following

Colloid	Dispersed phase-medium
i) Gemstone	A) Liquid-Gas
ii) Shaving cream	B) Liquid - solid
iii) Cheese	C) Solid - solid
iv) Cloud	D) Gas - liquid

1) i → C, ii → D; iii → B; iv → A

2) i → C, ii → D; iii → A; iv → B

3) i → C, ii → D; iii → D; iv → A

4) i → C; ii → A; iii → B; iv → D

---

SPACE FOR ROUGH WORK

40. In the reaction,  $2\text{PbO} + \text{C} \rightarrow 2\text{Pb} + \text{CO}_2$
- i) Carbon is reduced    ii) PbO is reduced  
iii) PbO is oxidized    iv) Carbon is oxidized
- Which among the following are true?
- 1) i and ii                          2) i and iii                          3) ii and iv                          4) ii and iii
41. The correct formula of the compound aluminium sulphite is
- 1)  $\text{Al}_2(\text{SO}_4)_3$                           2)  $\text{Al}_3(\text{SO}_3)_2$                           3)  $\text{Al}_2(\text{SO}_3)_3$                           4)  $\text{Al}_3(\text{SO}_4)_2$
42. ‘King of chemicals’ is
- 1) Hydrochloric acid    2) Sulphuric acid  
3) Sodium carbonate    4) Sodium hydroxide
43. If the ratio of two isotopes  $^{14}_7\text{X}$  and  $^{15}_7\text{X}$  of an element X is 4 : 1, its average atomic mass will be
- 1) 16.00 u                          2) 17.75 u                          3) 12.84 u                          4) 14.20 u
44. The pH values of four solutions A, B, C and D are 12, 4, 7 and 2 respectively. Which of the following statements is false for these solutions?
- 1) Solution A is basic  
2) Solution B and D are acidic  
3) Solution D has minimum concentration of  $\text{H}^+$  ions  
4) The concentrations of  $\text{H}^+$  and  $\text{OH}^-$  ions are equal in solution C

## SPACE FOR ROUGH WORK

45. Which one of the following properties does not belong to ionic compounds?
- 1) Hard and brittle
  - 2) High melting and boiling points
  - 3) Usually water soluble
  - 4) Good conductor of electricity in solid state
46. Allotrope of carbon used as superconductor at high temperature is
- 1) Diamond
  - 2) Graphite
  - 3) Charcoal
  - 4) Fullerene
47. Physical change among the following is
- 1)  $\text{C(s)} + \text{O}_2\text{(g)} \rightarrow \text{CO}_2\text{(g)}$
  - 2)  $\text{CaCO}_3\text{(s)} \rightarrow \text{CaO(s)} + \text{CO}_2\text{(g)}$
  - 3)  $\text{H}_2\text{(g)} + \text{I}_2\text{(g)} \rightarrow 2\text{HI(g)}$
  - 4)  $\text{H}_2\text{O(s)} \rightarrow \text{H}_2\text{O(l)}$
48. The process of formation of solid crystal from a saturated solution is called
- 1) Distillation
  - 2) Sublimation
  - 3) Crystallisation
  - 4) Filtration
49. Number of molecules present in 0.36 g of water is
- 1)  $12.044 \times 10^{21}$
  - 2)  $12.044 \times 10^{20}$
  - 3)  $12.044 \times 10^{23}$
  - 4)  $12.044 \times 10^{25}$
50. Assertion (A) : Elements and compounds are the examples of pure substances  
Reason (R) : The properties of a compound are different from those of its constituent elements
- 1) Both A and R are correct and R is the correct explanation of A
  - 2) Both A and R are correct and R is not the correct explanation of A
  - 3) A is true and R is false
  - 4) Both A and R are false

---

SPACE FOR ROUGH WORK

## SECTION - B

Question No. Chemistry - (51 - 60 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**  
If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
0	●	0

**If Three Digit Answer**  
If answer is 180

Example 3

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

SPACE FOR ROUGH WORK

**SECTION - B (CHEMISTRY)**

51. The number of moles of water in 488 g  $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$  is ..... (Atomic mass of Ba = 137 u, Cl = 35.5 u, H = 1u, O = 16 u)
52. How many grams of  $\text{CO}_2$  gas is produced when 25g pure  $\text{CaCO}_3$  is heated?  
(Given atomic mass of Ca = 40u, C = 12u, O = 16u)
53. pH of pure water at 298 K is .....
54. Iron react with steam according to the equation  $\text{Fe(s)} + a \text{H}_2\text{O(g)} \longrightarrow b \text{X(s)} + c \text{H}_2\text{(g)}$  where a, b and c are co-efficients in balanced equation. How many atoms are there in a molecule of X
55. How many metals among the following are more reactive than hydrogen according to activity series?
- |               |                 |
|---------------|-----------------|
| i) Gold       | ii) Zinc        |
| iii) Iron     | iv) Mercury     |
| v) Magnesium  | vi) Lead        |
| vii) Copper   | viii) Potassium |
| ix) Aluminium | x) Silver       |

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SPACE FOR ROUGH WORK

56. The number of grams of  $\text{KHCO}_3$  that contain 1g hydrogen is ..... (Given Atomic mass of K = 39u, H = 1u, C = 12u, O = 16 u)
57. Atomicity of helium molecules = x
- Atomicity of oxygen molecule = y
- Atomicity of ozone molecule = z
- The value of  $(x + y + z) = \dots\dots\dots$
58.  $3.011 \times 10^{23}$  molecules of methane gas ( $\text{CH}_4$ ) has a mass of .....g (Given atomic mass of C = 12u, H = 1u)
59. 1 mole  $\text{Ca}(\text{OH})_2$  contain  $x \times 6.02 \times 10^{23}$  atoms x = .....
60.  $\text{Al}_2\text{O}_3 + x\text{NaOH} \rightarrow y\text{NaAlO}_2 + 2\text{H}_2\text{O}$  (x + y + z) in the balanced equation is .....

---

SPACE FOR ROUGH WORK



## **PART III - MATHEMATICS**

**This part contains 30 questions**

**SECTION A - Question No. Mathematics- (61-80)**

**Each question has FOUR options [1], [2], [3] and [4]. ONLY ONE of these four options is correct**

**For each question, darken the bubble corresponding to the correct option in the ORS**












**For each question, marks will be awarded in one of the following categories**

**Full Marks : +4 If only the bubble corresponding to the correct option is darkened**

**Zero Marks : 0 If none of the bubbles is darkened**

**Negative Marks : -1 In all other cases**

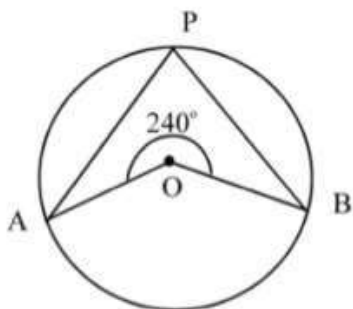
### **CORRECT METHOD FOR MARKING SECTION A QUESTIONS**

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
 2  3  4								

**SPACE FOR ROUGH WORK**

**SECTION - A (MATHEMATICS)**

61. In the given figure, the reflex  $\angle AOB$  is  $240^\circ$ . Then the angle  $\angle APB$  is



- 1)  $60^\circ$                       2)  $30^\circ$                       3)  $90^\circ$                       4)  $45^\circ$
62. Which of the following is not a polynomial?

1)  $\left(x + \frac{1}{x}\right)^2$

2)  $\frac{3}{2}x^3 - 5x^2 - \frac{1}{\sqrt{2}}x - 1$

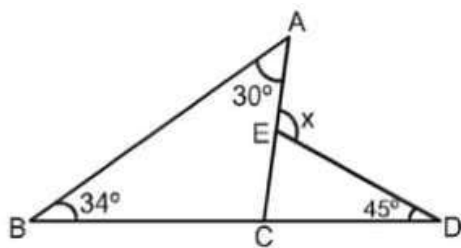
3)  $\sqrt{3}x^2 - 2\sqrt{3}x + 3$

4)  $5x^2 - 3x + \sqrt{2}$

---

SPACE FOR ROUGH WORK

63. The mean of the given data 3, 5, 7, 3, 4, 2, 2, 3, 5 is .....
- 1) 5.77                      2) 4.77                      3) 2.77                      4) 3.77
64. The radii of the bases of a cylinder and a cone are in the ratio 3 : 4 and their heights are in the ratio 2 : 3. Then, their volumes are in the ratio
- 1) 9 : 8                      2) 8 : 9                      3) 3 : 4                      4) 4 : 3
65. How many spherical balls, each of radius 1cm can be made from a solid sphere of lead of radius 8cm?
- 1) 64                      2) 512                      3) 510                      4) 215
66. In the given figure, the value of x is

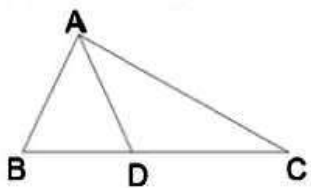


- 1) 120°                      2) 115°
- 3) 111°                      4) 109°

---

SPACE FOR ROUGH WORK

67. In the given figure, AD is the bisector of  $\angle BAC$ . If  $AB = 10$  cm,  $AC = 6$  and  $BC = 12$  cm, find BD:



- 1) 4.5 cm                      2) 9 cm                      3) 7.5 cm                      4) 3 cm
68. If  $x + y + z = 0$ , then  $\frac{xyz}{(x+y)(y+z)(z+x)} =$
- 1) -1                      2) 1                      3) 3                      4) -3
69. Based on the following table, which combination is wrong

Shape and measurement	Area	Perimeter
I) Square of side $2r$	(A) $\pi r^2$	(a) $2\pi r$
II) Equilateral triangle of side $2r$	(B) $4r^2$	(b) $6r$
III) Circle of radius $2r$	(C) $4\pi r^2$	(c) $8r$
IV) Circle of radius $r$	(D) $\sqrt{3} r^2$	(d) $8\pi r$

- 1) I  $\rightarrow$  (B), (c)              2) II  $\rightarrow$  (D), (b)              3) III  $\rightarrow$  (C), (d)              4) IV  $\rightarrow$  (A), (a)

---

SPACE FOR ROUGH WORK

70. Which rational expression should be added with  $\frac{x - x^2 + 2}{x(x^2 - 1)}$  to get  $\frac{x + 1}{x^2 - 1}$ ?

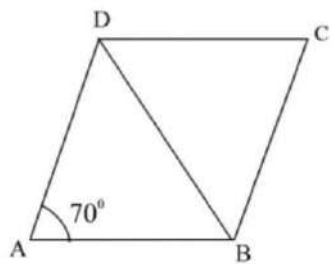
1)  $\frac{x}{2}$

2)  $\frac{2}{x}$

3)  $2x$

4)  $x^2$

71. In the given figure, ABCD is a rhombus. Find  $\angle CDB$



1)  $45^\circ$

2)  $55^\circ$

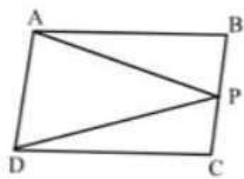
3)  $65^\circ$

4)  $75^\circ$

---

SPACE FOR ROUGH WORK

72. If the area of parallelogram ABCD (shown in figure) is  $80 \text{ cm}^2$ , then area of  $\triangle ADP$  is



1)  $20 \text{ cm}^2$

2)  $40 \text{ cm}^2$

3)  $60 \text{ cm}^2$

4)  $80 \text{ cm}^2$

73. If  $a = 2$ ,  $b = 3$ , then the value of  $(a^b + b^a)^{-1}$  is

1)  $\frac{1}{72}$

2)  $\frac{1}{71}$

3) 17

4)  $\frac{1}{17}$

---

SPACE FOR ROUGH WORK

74. If  $x - \frac{1}{x} = 3$ , then the value of  $x^2 + \frac{1}{x^2}$  is

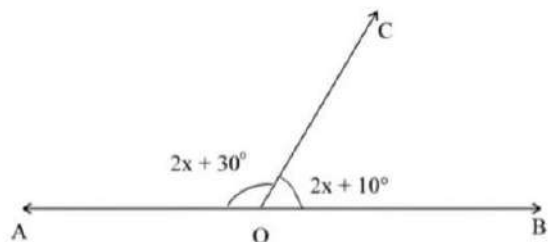
1) 9

2) 27

3) 3

4) 11

75. In the given figure, if AOB is a straight line, then  $\angle BOC$  is



1)  $80^\circ$

2)  $70^\circ$

3)  $60^\circ$

4)  $35^\circ$

76. The height of an equilateral triangle ABC of perimeter 30 cm is

1)  $10\sqrt{3}$

2)  $5\sqrt{3}$

3)  $3\sqrt{3}$

4)  $7\sqrt{3}$

77. First term of an A.P. is 5 and the common difference is 7, then the 22<sup>nd</sup> term is

1) 132

2) 154

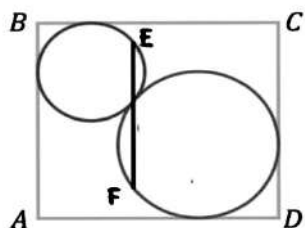
3) 152

4) 160

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SPACE FOR ROUGH WORK

78. In a rectangle ABCD, two circles touches each other and sides of ABCD as in the figure. If  $AB \parallel EF$  and  $AB = 16$  cm,  $EF = 12$  cm. Then area of  $\Delta ABCD$  is



- 1)  $256 \text{ cm}^2$                       2)  $244 \text{ cm}^2$                       3)  $288 \text{ cm}^2$                       4)  $216 \text{ cm}^2$
79. The height and slant height of a cone are 21cm and 28cm respectively. Then the volume of the cone is

- 1)  $9546 \text{ cm}^3$                       2)  $896 \text{ cm}^3$                       3)  $546 \text{ cm}^3$                       4)  $7546 \text{ cm}^3$

80.  $\frac{1}{12.15.18} + \frac{1}{15.18.21} + \frac{1}{18.21.24} + \frac{1}{21.24.27} = \frac{K}{12 \times 15 \times 18}$  then  $K =$

- 1)  $\frac{19}{6}$                       2)  $\frac{17}{6}$
- 3)  $\frac{13}{6}$                       4)  $\frac{11}{6}$

---

SPACE FOR ROUGH WORK



## SECTION - B

Question No. Mathematics - (81 - 90 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

**If Single Digit Answer**

If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**

If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Three Digit Answer**

If answer is 180

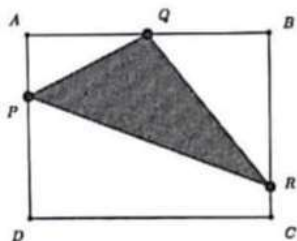
**Example 3**

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

**SECTION - B (MATHEMATICS)**

81. If  $\alpha$  and  $\beta$  are the zeros of  $f(x) = px^2 - 2x + 3p$  and  $p \neq 0$ , then the value of  $\alpha\beta$  is
82. ABCD is a rectangle,  $AB = 8$  cm and  $BC = 6$  cm. Q is the midpoint of AB. P and R are on AD and BC respectively such that  $AP = 2$  cm and  $CR = 1$  cm. Then area of the shaded triangle in square cms is



83. Which one of the following numbers is NOT a prime number? 29, 37, 73, 93
84. If  $A(2, -1)$ ,  $B(3, 4)$ ,  $C(-7, 0)$  are vertices of  $\triangle ABC$ . Then the length of median of  $\triangle ABC$  through the vertex A is

---

SPACE FOR ROUGH WORK

85. Find the value  $\frac{1}{2+\sqrt{3}} + \frac{2}{\sqrt{5}-\sqrt{3}} + \frac{1}{2-\sqrt{5}}$
86. Find the value of:  $48 \left| \left( \frac{1}{4} \right)^3 + \left( \frac{1}{3} \right)^3 - \left( \frac{7}{12} \right)^3 \right|$
87. If  $x + y = 9$  and  $xy = 8$ , then  $x^2 + y^2 =$
88. The median of 10, 14, 11, 9, 8, 12, 6 is
89. The degree of the polynomial  $p(x) = (x-7)^3 - x^3$  is
90. Value of  $\sin^2 45^\circ + \tan^2 45^\circ + \cos^2 45^\circ + \sec^2 45^\circ$

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SPACE FOR ROUGH WORK

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**SPACE FOR ROUGH WORK**

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**SPACE FOR ROUGH WORK**

# IIT/AIIMS SCREENING TEST - 04-12-22

**QUESTION  
BOOKLET  
CODE**

**B**

## P + C + M - ANSWER KEY

### PHYSICS

1. 4
2. 4
3. 2
4. 1
5. 1
6. 4
7. 3
8. 3
9. 4
10. 1
11. 2
12. 2
13. 3
14. 2
15. 3
16. 1
17. 1
18. 1
19. 3
20. 2
21. 20
22. 110
23. 4
24. 250
25. 9
26. 2
27. 2
28. 98
29. 10
30. 49

### CHEMISTRY

31. 2
32. 2
33. 3
34. 3
35. 2
36. 2
37. 1
38. 1
39. 1
40. 3
41. 3
42. 2
43. 4
44. 3
45. 4
46. 4
47. 4
48. 3
49. 1
50. 2
51. 4
52. 11
53. 7
54. 7
55. 6
56. 100
57. 6
58. 8
59. 5
60. 5

### MATHEMATICS

61. 1
62. 1
63. 4
64. 1
65. 2
66. 4
67. 3
68. 1
69. 3
70. 2
71. 2
72. 2
73. 4
74. 4
75. 1
76. 2
77. 3
78. 3
79. 4
80. 3
81. 3
82. 14
83. 93
84. 5
85. 0
86. 7
87. 65
88. 10
89. 2
90. 4

# Brilliant STUDY CENTRE PALA

## IIT/AIIMS - 2025 SCREENING TEST

QUESTION  
BOOKLET  
CODE

**A**

Date : 02<sup>nd</sup> October 2022

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2½ hour** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 300**
5. There are three Parts. Physics, Chemistry & Mathematics having 30 questions each. Each Part consists of two Sections. In **Section A** (20 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. In **Section B** (10 questions). **Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.** Each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

I have read all the instructions and shall abide by them

\_\_\_\_\_  
Signature of the Candidate

**Roll Number**

I have verified all the information filled by the candidate

\_\_\_\_\_  
Signature of the Invigilator





# **PART I -PHYSICS**

This part contains 30 questions

**SECTION A - Question No. Physics - (1-20)**

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

## **CORRECT METHOD FOR MARKING SECTION A QUESTIONS**

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## **SECTION - B**

**Question No. Physics - (21 - 30 )**

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

## **CORRECT METHOD FOR MARKING SECTION B QUESTIONS**

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0



## SECTION A - PHYSICS

1. Count the number of correct statements from the following
- i) An object may have varying velocity without having varying speed
  - ii) An object may have non zero acceleration without having varying speed
  - iii) If the position and velocity have opposite sign, then the particle is moving towards origin
  - iv) If the velocity is zero for a time interval, the acceleration can be zero at any instant within the time interval

A) 1                                  B) 2                                  C) 3                                  D) 4

**Ans: D**

2. An athlete takes 5s to reach his maximum speed of 36 km/h. The magnitude of average acceleration is
- A) 8.2 m/s<sup>2</sup>                          B) 2 m/s<sup>2</sup>                          C) 3 m/s<sup>2</sup>                          D) 10 m/s<sup>2</sup>

**Ans: B**

Average acceleration      $a = \frac{v - u}{t} = \frac{36 \times \frac{5}{18} - 0}{5}$

3. A stone is thrown vertically upward with an initial velocity  $u$  from the top of a tower, reaches ground with a speed  $2u$ . The height of the tower is

A)  $\frac{3u^2}{g}$                                   B)  $\frac{4u^2}{g}$                                   C)  $\frac{3u^2}{2g}$                                   D)  $\frac{u^2}{2g}$

**Ans: C**

$$v^2 = u^2 + 2gh, \quad 4u^2 - u^2 = 2gh, \quad h = \frac{3u^2}{2g}$$

4. A bullet moving with a velocity 50 m/s penetrate wooden block upto 5 cm. The mass of the bullet is 200 gm. The average force exerted by the bullet on the block is

A) 500 N                                  B) 5000 N                                  C) 50 N                                  D) 250 N

**Ans. B**

$$F = ma = \frac{mu^2}{2s} = \frac{200 \times 10^{-3} \times 2500}{2 \times 5 \times 10^{-2}} = 5000 \text{ N}$$

5. The acceleration due to gravity at a distance  $\frac{R}{2}$  from the centre of the earth is  $E_1$ . At a height  $\frac{R}{2}$  from the surface of the earth the acceleration due to gravity is  $E_2$ . Then  $\frac{E_1}{E_2}$  is

- A)  $\frac{8}{9}$                       B)  $\frac{4}{9}$   
 C)  $\frac{9}{4}$                       D)  $\frac{9}{8}$

**Ans: D**

$$E_1 = \frac{Gm}{R^3} = \frac{Gm}{R^3} \cdot \frac{R}{2} = \frac{Gm}{2R^2}$$

$$E_2 = \frac{Gm}{\left(R + \frac{R}{2}\right)^2} = \frac{4Gm}{9R^2}, \quad \frac{E_1}{E_2} = \frac{9}{8}$$

6. A man sitting in a boat which is floating in a pond. If the man drinks some water from the pond, the level of water in the pond  
 A) increases

- B) remains unchanged
- C) decreases
- D) increases or decreases depend upon the weight of man

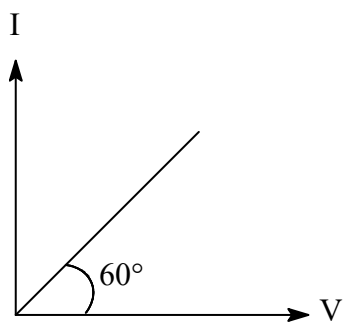
**Ans: B**

7. Electrostatic force between two point charges can be calculated by

- A) Kirchoff's law
- B) Coulomb's law
- C) Newton's law
- D) Faradays law

**Ans: B**

8. The variation of current (I) with potential difference (V) is shown in the graph. The resistance of the conductor is



A)  $\sqrt{3}$  units

B)  $\frac{1}{\sqrt{3}}$  units

C) 3 units

D)  $\frac{1}{3}$  units

**Ans: B**

$$E_1 = \frac{Gmr}{R^3} = \frac{Gm}{R^3} \frac{R}{2} = \frac{Gm}{2R^2}$$

$$E_2 = \frac{Gm}{\left(R + \frac{R}{2}\right)^2} = \frac{4Gm}{9R^2}$$

$$\frac{E_1}{E_2} = \frac{9}{8}$$

9. Of the two bulbs in a house hold circuit, one glows brighter than the other, which of the two bulbs has a large resistance?
- A) The bright bulb  
B) The brightness does not depend upon the resistance  
C) The dim bulb  
D) Both have the same resistance

**Ans: C**

Power  $P = \frac{V^2}{R}$ , household circuit is parallel  $\therefore V$  is same and  $P \propto \frac{1}{R}$ . So dim bulb has large resistance and less power

10. A negative charge is moving upward in a magnetic field which is towards north. The particle will deflected towards:
- A) West  
B) East  
C) North  
D) South

**Ans: B**

11. The kinetic energy of a charge entering into a uniform magnetic field of 1T is 10J. The kinetic energy of the charge after 10s is

A) less than 10 J

B) Greater than 10 J

C) Less than or greater than 10 J

D) 10 J

**Ans: D**

Work done by the magnetic force is zero. Thus K.E. of the charge remains constant.

12. Direction of induced current can be determined by

A) Fleming's right hand rule

B) Fleming's left hand rule

C) Faradays law

D) Gauss's law

**Ans: A**

13. Which of the following is a Scalar quantity

A) Force

B) Momentum

C) Work done

D) Displacement

**Ans: C**

14. A wire is stretched so that its resistance becomes 16 times the initial value before stretching. The radius of the wire after stretching will be

A)  $\frac{1}{4}$ <sup>th</sup> of the initial value

B) 4 times the initial value

C) 2 times the initial value

D)  $\frac{1}{2}$  times the initial value

**Ans: D**



New resistance  $R' = 16 R$

When the wire is stretched so that length  $L' = nL$

$$R' = n^2 R \quad \therefore n = 4$$

$$\text{So area } A' = \frac{A}{4}, \quad \pi r'^2 = \frac{\pi r^2}{4} \quad r' = \frac{r}{2}$$

15. A magnetic field

- A) Always exerts a force on a charged particle
- B) Never exerts a force on a charged particle
- C) Exerts a force, if the charged particle is moving across the magnetic field lines
- D) Exerts a force, if the charged particle is moving along the magnetic field lines

**Ans: C**

$$F = qvB \sin \theta$$

When  $\theta = 0$  and  $\theta = 180^\circ$  force  $F = 0$

$\theta = 90^\circ$  force is maximum

16. Radius of curvature of a concave mirror is 50 cm. The focal length of the mirror in water is

- A) -25 cm
- B) 25 cm
- C) -18.75 cm
- D) 18.75 cm

**Ans: A**

$$f = \frac{-R}{2} = -25 \text{ cm}$$

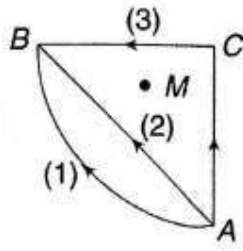
17. Focal length of concave mirror is 10 cm. An object is placed at 15 cm from mirror. Image distance is

- A) -6 cm
- B) 30 cm
- C) -30 cm
- D) 6 cm

**Ans: C**

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{a} = \frac{-1}{10} + \frac{1}{15} \quad v = -30 \text{ cm}$$

18. In a region of space a particle experiences only gravitational force due to a fixed mass 'M'. The particle is shifted from A to B via three different paths as shown in the figure. The work done in different paths are  $W_1$ ,  $W_2$  and  $W_3$  respectively, then



- A)  $W_1 = W_2 = W_3$       B)  $W_1 = W_2 > W_3$       C)  $W_1 > W_2 = W_3$       D)  $W_1 > W_2 > W_3$

**Ans: A**

19. A satellite orbiting close to the surface of earth does not fall down because the gravitational pull of earth  
 A) is balanced by the gravitational pull of moon  
 B) is balanced by the gravitational pull of sun  
 C) provides the necessary acceleration for its motion along the circular path  
 D) None of these

**Ans: C**

Gravitational force is conservative. So work done is independent of the path

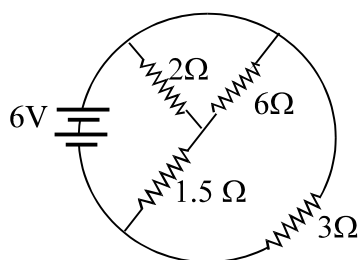
20. A copper ring, having a cut such as not to form a complete loop, is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet  
 A) is  $g$   
 B) is less than  $g$   
 C) is more than  $g$

D) depends on the relative size of the cut

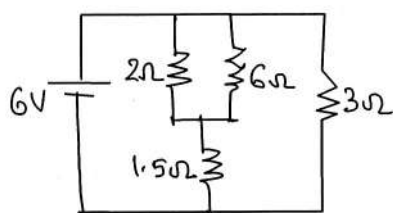
**Ans: A**

### SECTION B - PHYSICS

21. The total current supplied to the circuit by the battery in the given circuit in ampere is



**Ans: 4**



$$R = (1.5 + 1.5) \text{ parallel } 3\Omega$$

$$R = \frac{3}{2} \Omega$$

$$I = \frac{V}{R} = \frac{6}{\frac{3}{2}} = 4 \text{ A}$$

22. A concave lens of focal length 20cm produces an image same size as that of the object. The magnitude object distance from the lens in cm is

**Ans: 40**

$$\text{Object distance} = 2f = 40 \text{ cm}$$

23. 10N force is acting on a particle of mass 500 gm. The acceleration of the particle in  $\text{m/s}^2$  is

**Ans: 20**

$$a = \frac{F}{m} = \frac{10}{500 \times 10^{-3}} = \frac{100}{50} = 20 \text{ m/s}^2$$

24. Initial velocity and velocity at the mid point of the motion are 5 m/s and 10 m/s respectively. The final velocity of motion  $\sqrt{x}$  m/s. The value of x is (Particle is moving with constant acceleration)

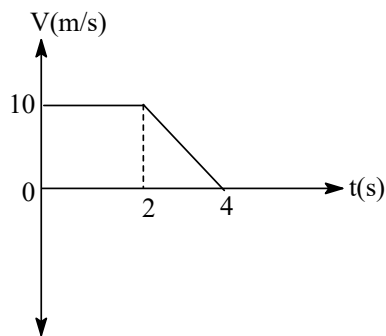
**Ans: 175**

$$\text{Velocity at the midpoint } v_m = \sqrt{\frac{u^2 + v^2}{2}}$$

$$\therefore 2v_m^2 = v^2 + u^2 \quad v^2 = 2v_m^2 - u^2$$

$$v = \sqrt{2 \times 100 - 25} = \sqrt{175}$$

25. Velocity time graph of a particle is shown in figure. The change in position of the particle in 4s is (Answer should be in meter)



**Ans: 30**

displacement = change in position = area under  $v - t$  graph

26. A particle is thrown vertically upward with a velocity 10 m/s. The distance travelled by it in the last second of ascend in m is [ $g = 10 \text{ m/s}^2$ ]

**Ans: 5**

distance in last second of ascend = distance in first second of descend

$$\therefore S = \frac{gt^2}{2} = \frac{10}{2} \times 1^2 = 5 \text{ cm}$$

27. How much water in kg, a pump of 1kW can raise in one minute to a height of 20m. [ $g = 10 \text{ m/s}^2$ ]

**Ans: 300**

$$mgh = pt \quad m = \frac{pt}{gh} = \frac{1 \times 10^3 \times 60}{10 \times 20} = 300 \text{ kg}$$

28. A 5N force produces 10 m displacement to a particle. The angle between the force and displacement is  $60^\circ$ . The work done by the force in joule is

**Ans: 25**

$$W = FS \cos \theta = 5 \times 10 \times \cos 60 = 25 \text{ J}$$

29. 20C of charge flows through a conductor in 5s. The current flows through the conductor in ampere is

**Ans: 4**

$$I = \frac{Q}{t} = \frac{20}{5} = 4 \text{ A}$$

30. Pressure exerted by a water column of height 2mm in pascal is  $\left[ \rho_{\text{water}} = 10^3 \text{ kg / m}^3 \text{ and } g = 10 \text{ m / s}^2 \right]$

**Ans: 20**

$$P = h\rho g = 2 \times 10^{-3} \times 10^3 \times 10 = 20 \text{ Pa}$$

## **PART II - CHEMISTRY**

**This part contains 30 questions**

**SECTION A - Question No. Chemistry - (31-50)**

**Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct**

**For each question, darken the bubble corresponding to the correct option in the ORS**










**For each question, marks will be awarded in one of the following categories**

**Full Marks : +4 If only the bubble corresponding to the correct option is darkened**

**Zero Marks : 0 If none of the bubbles is darkened**

**Negative Marks : -1 In all other cases**

### **CORRECT METHOD FOR MARKING SECTION A QUESTIONS**

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

31. Three isotopes of Neon are found in nature. Their relative abundances are

Isotopes	$^{20}\text{Ne}$	$^{21}\text{Ne}$	$^{22}\text{Ne}$
Relative abundance (%)	90.5%	1%	8.5%

The average atomic mass of Neon is

A) 21.00 u

B) 20.18 u

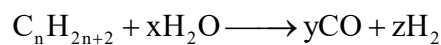
C) 21.20 u

D) 20.82 u

**Ans: B**

$$\frac{20u \times 90.5}{100} + 21u \times \frac{1}{100} + 22u \times \frac{8.5}{100} \\ = 20.18 u$$

32. The correct co-efficients x, y and z for the following balanced equation is



A)  $x = n$       $y = n$       $z = 3n + 1$

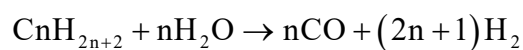
B)  $x = n$       $y = 2n$       $z = 2n + 1$

C)  $x = n$       $y = n + 1$       $z = 2n + 1$

D)  $x = n$       $y = n$       $z = 2n + 1$

**Ans: D**

The balanced equation is



33. Which among the following is not a mixture but a pure substance?

A) Kerosene

B) Sea water

C) Cheese

D) Glucose

**Ans: D**

Glucose is a pure substance

34. Which among the following is a metal?

- A) Sulphur  
C) Potassium

- B) Carbon  
D) Bromine

**Ans: C**

Potassium is a metal

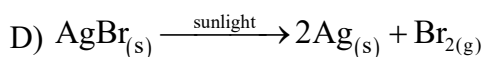
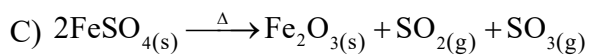
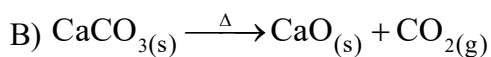
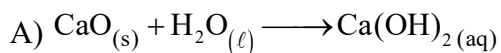
35. Tyndall effect is observed in water containing

- A) Copper-sulphate dissolved in it  
B) Milk mixed with it  
C) Ethyl alcohol mixed with it  
D) Cane sugar dissolved in it

**Ans: B**

Milk is a colloidal dispersion

36. Which reaction among the following is exothermic?





**Ans: A**

Slaking of lime is exothermic

37. Which among the following is not true regarding milk of magnesia?

- A) It is magnesium hydroxide suspended in water
- B) It is a mild base
- C) It is milk mixed with magnesium sulphate solution
- D) It is an antacid

**Ans: C**

Milk of magnesia is a suspension of magnesium hydroxide in water. It is a mild base and an antacid

38. Which among the following is not a redox reaction?

- A)  $\text{ZnO}_{(s)} + \text{C}_{(s)} \xrightarrow{\Delta} \text{Zn}_{(s)} + \text{CO}_{(g)}$
- B)  $\text{MnO}_{2(s)} + 4\text{HCl}_{(aq)} \xrightarrow{\Delta} \text{MnCl}_{2(aq)} + 2\text{H}_2\text{O}_{(\ell)} + \text{Cl}_{2(g)}$
- C)  $\text{Pb}_{(s)} + \text{CuCl}_{2(aq)} \longrightarrow \text{PbCl}_{2(aq)} + \text{Cu}_{(s)}$
- D)  $2\text{NaHCO}_{3(s)} \xrightarrow{\Delta} \text{Na}_2\text{CO}_{3(s)} + \text{H}_2\text{O}_{(\ell)} + \text{CO}_{2(g)}$

**Ans: D**

Thermal decomposition of  $\text{NaHCO}_3$  is not a redox reaction

39. Reaction of which metal among the following with dilute hydrochloric acid is the most exothermic?

- A) Mg
- B) Al
- C) Zn
- D) Fe

**Ans: A**

Reaction of Mg with dil. HCl is the most exothermic

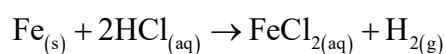
40. Hydrogen gas is not liberated when zinc react with
- A) dil. HNO<sub>3</sub>
- B) dil. H<sub>2</sub>SO<sub>4</sub>
- C) dil. HCl
- D) Aqueous NaOH

**Ans: A**

Only Mg and Mn react with very dil.  $\text{HNO}_3$  to evolve  $\text{H}_2$  gas

41. When dilute hydrochloric acid is added to iron fillings
- A) Hydrogen gas and Iron (II) chloride are formed
  - B) Chlorine gas and Iron (III) chloride are formed
  - C) Iron (II) chloride and water are formed
  - D) No reaction occurs

**Ans: A**



42. Anodising is a process of
- A) Coating iron with zinc
  - B) Forming thick oxide layer of aluminium
  - C) Forming a thin carbide layer of iron
  - D) Coating copper with tin

**Ans: B**

Anodising is a process of forming a thick oxide layer of Aluminium.

43. A malleable and ductile brown coloured element which is a good conductor of electricity becomes black on heating in air. The element and the black coloured compound are respectively

A) Red phosphorus,  $P_4O_{10}$

B) Copper,  $CuO$

C) Graphite,  $CO_2$

D) Iron,  $Fe_2O_3$

**Ans: B**

The brown coloured malleable element is copper and black coloured compound is  $CuO$

44. 1.80g glucose ( $C_6H_{12}O_6$ ) was dissolved in 36g water, the number of oxygen atoms in the solution is (Given relative atomic mass of C = 12u, H = 1u, O = 16u)

A)  $6.68 \times 10^{23}$

B)  $12.40 \times 10^{22}$

C)  $6.68 \times 10^{22}$

D)  $12.40 \times 10^{23}$

**Ans: D**

$$\left[ \frac{1.80g}{180g\text{mol}^{-1}} \times 6.02 \times 10^{23} \text{mol}^{-1} \times 6 \right] + \left[ \frac{36g}{18g\text{mol}^{-1}} \times 6.02 \times 10^{23} \text{mol}^{-1} \times 1 \right] = 1.24 \times 10^{24}$$
$$= 12.4 \times 10^{23} \text{ oxygen atoms}$$

45. Which of the following are the best suited conditions for drying up clothes?

A) Temperature =  $40^\circ\text{C}$  : Humidity = 10% : wind speed =  $45 \text{ ms}^{-1}$

B) Temperature =  $25^\circ\text{C}$  : Humidity = 20% : wind speed =  $35 \text{ ms}^{-1}$

C) Temperature =  $20^\circ\text{C}$  : Humidity = 30% : wind speed =  $25 \text{ ms}^{-1}$

D) Temperature =  $15^\circ\text{C}$  : Humidity = 40% : wind speed =  $15 \text{ ms}^{-1}$

**Ans: A**

Rate of evaporation increases when temperature and speed of wind increases. Rate of evaporation decreases

with increase of humidity

46. Match List-I (mixture) and list-II (type) and list (III) (example) and select the correct answer from the combinations given below

List-I (Mixture)	List-II (Type)	List-III (Example)
i) Liquid in gas	1) Emulsion	I) Mist
ii) Liquid in liquid	2) Aerosol	II) Sponge
iii) Gas is solid	3) Foam	III) Face cream
	4) Gel	IV) Butter

- A) i  $\rightarrow$  3 – II;    ii)  $\rightarrow$  2 – III    iii)  $\rightarrow$  4 – IV  
B) i  $\rightarrow$  2 – I;    ii)  $\rightarrow$  1 – III    iii)  $\rightarrow$  3 – II  
C) i  $\rightarrow$  1 – III;    ii)  $\rightarrow$  2 – I    iii)  $\rightarrow$  3 – I  
D) i  $\rightarrow$  1 – II;    ii)  $\rightarrow$  4 – I    iii)  $\rightarrow$  2 – III

**Ans: B**

Liquid in liquid – Emulsion – Face cream

Liquid in gas – aerosol – mist

Gas in solid – foam – sponge

47. Which among the following is a salt?

A) HCl

B) NaOH

C) NaCl

D)  $\text{CH}_3\text{COOH}$

**Ans: C**

NaCl is the salt formed between acid HCl and base NaOH

48. Match the chemical reactions given in *List-I* with type of chemical reactions given in *List-II* and select the correct answer using options given below.

<b>List - I</b> (Reaction)	<b>List - II</b> (Type of chemical reaction)
i) Formation of ammonia from $\text{N}_2$ and $\text{H}_2$	p) decomposition
ii) Calcination of zinc carbonate	q) double displacement
iii) Reaction of aqueous solution of $\text{BaCl}_2$ solution with dilute $\text{H}_2\text{SO}_4$	r) combination
iv) Rancidity of oils	s) redox
	t) displacement

A)  $i \rightarrow p$ ;  $ii \rightarrow t$ ;  $iii \rightarrow r$ ;  $iv \rightarrow s$

B)  $i \rightarrow r$ ;  $ii \rightarrow s$ ;  $iii \rightarrow q$ ;  $iv \rightarrow p$

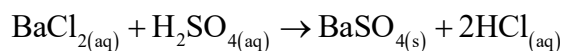
C)  $i \rightarrow s$ ;  $ii \rightarrow r$ ;  $iii \rightarrow t$ ;  $iv \rightarrow p$

D) i → r; ii → p; iii → q; iv → s

**Ans: D**

Formation of  $\text{NH}_3$  from  $\text{N}_2$  &  $\text{H}_2$  – Combination

Calcination of  $\text{ZnCO}_3$  – decomposition



double displacement

Rancidity of oils – redox reaction

49. You are provided with aqueous solutions of three salts (P), (Q) and (R). 2 - 3 drops of blue litmus solution, red litmus solution and phenolphthalein were added to each of these solutions in separate experiments. The change in colours of different indicators were recorded in the following table

Sample	with blue litmus solution	with red litmus solution	with phenolphthalein
P)	No change	No change	No change
Q)	Turns red	No change	No change
R)	No change	Turns blue	Turns pink

On the basis of above observation identify P, Q, and R from the following options

A)  $\text{P} \rightarrow \text{NH}_4\text{Cl}$ ;  $\text{Q} \rightarrow \text{NaCl}$ ;  $\text{R} \rightarrow \text{CH}_3\text{COONa}$

B)  $\text{P} \rightarrow \text{NH}_4\text{Cl}$ ;  $\text{Q} \rightarrow \text{CH}_3\text{COONa}$ ;  $\text{R} \rightarrow \text{NaCl}$

C)  $\text{P} \rightarrow \text{NaCl}$ ;  $\text{Q} \rightarrow \text{NH}_4\text{Cl}$ ;  $\text{R} \rightarrow \text{CH}_3\text{COONa}$

D)  $\text{P} \rightarrow \text{CH}_3\text{COONa}$ ;  $\text{Q} \rightarrow \text{NH}_4\text{Cl}$ ;  $\text{R} \rightarrow \text{NaCl}$

**Ans: C**

$\text{NaCl}_{(\text{aq})} \rightarrow \text{neutral}$

(salt of strong acid and strong base)

$\text{NH}_4\text{Cl}_{(\text{aq})} \rightarrow \text{acidic}$

(salt of strong acid and weak base)

$\text{CH}_3\text{COONa}_{(\text{aq})} \rightarrow \text{basic}$

(salt of strong base and weak acid)

50. Read the factual information given below and choose the correct answer

If you take Barium hydroxide and ammonium chloride together in a test tube, mix it with a glass rod and touch the bottom of the test tube with your palm, what do you feel? Will there be any chemical reaction? If there is a reaction, is it exothermic or endothermic?

- A) No heating or cooling effect, there is no chemical reaction
- B) Test tube becomes hot and there is a chemical reaction that is exothermic
- C) Test tube becomes cold and there is a chemical reaction that is endothermic
- D) Test tube becomes hot and there is a chemical reaction that is endothermic

**Ans: C**

Reaction of Barium hydroxide with ammonium chloride forming Barium chloride ammonia and water is an endothermic reaction

## **SECTION B - CHEMISTRY**

Question No. Chemistry - (51 - 60 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive  
For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

**CORRECT METHOD FOR MARKING SECTION B QUESTIONS**

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

51. 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If



we take 20 mL of the same solution of NaOH, the amount of HCl (the same solution as before) required to neutralise it will be ..... mL

**Ans: 16**

10mL NaOH = 8mLHCl

20mL NaOH = 16mLHCl

52. A solution contain 40g common salt in 210 g water. The concentration of common salt in terms of the mass percentage is ..... %

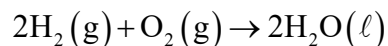
**Ans: 16**

$$\text{Mass percentage} = \frac{\text{mass of solute}}{\text{mass of}} \times 100$$

$$= \frac{40}{(40 + 210)} \times 100 = 16\%$$

53. When 2g hydrogen gas burn completely in oxygen 'x' g water is produced. The value of 'x' is .....  
(Given : Relative atomic mass of H = 1u, O = 16 u)

**Ans: 18**



4g H<sub>2</sub> form 36g H<sub>2</sub>O

2g H<sub>2</sub> form 18g H<sub>2</sub>O

54. Mass of 0.8 moles of glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) is ..... g (Given : Relative atomic mass of H = 1u, C = 12u, O = 16u)

**Ans: 144**

$$1 \text{ mole } C_6H_{12}O_6 = 180g$$

$$0.8 \text{ mole } C_6H_{12}O_6 = 180g \text{ mol}^{-1} \times 0.8 \text{ mol} = 144g$$

55. Atomic mass of Helium is 4u. How many moles are there in 52g Helium?

**Ans: 13**

$$\text{Molar mass of helium} = 4g \text{ mol}^{-1}$$

$$52g \text{ helium} = \frac{52g}{4g \text{ mol}^{-1}} = 13 \text{ mol}$$

56. At ordinary temperature how many of the following metals are covered with a thin layer of oxide?

- |              |          |               |
|--------------|----------|---------------|
| i) Aluminium | ii) Zinc | iii) Silver   |
| iv) Lead     | v) Gold  | vi) Magnesium |

**Ans: 4**

Mg, Al, Zn and Pb are covered with a thin layer of oxide at room temperature

57. How many of the following metals liberate hydrogen gas from dilute hydrochloric acid?

- |        |        |         |
|--------|--------|---------|
| i) K   | ii) Ca | iii) Cu |
| iv) Zn | v) Ag  | vi) Mg  |

**Ans: 4**

K, Ca, Zn and Mg liberate  $H_2$  gas from dil. HCl

58. How many of the following are non metals?

- |               |                 |                 |
|---------------|-----------------|-----------------|
| i) Neon       | ii) Sodium      | iii) Phosphorus |
| iv) Iron      | v) Iodine       | vi) Tin         |
| vii) Nitrogen | viii) Magnesium | ix) Cobalt      |
|               |                 | (x) Sulphur     |

**Ans: 5**

Na, Fe, Sn, Mg and Co are metals

59. Calculate the mass of one mole of Baking soda. (Given relative atomic mass of Na = 23u, H = 1u, C = 12u, O = 16u)

**Ans: 84**

Baking soda is  $\text{NaHCO}_3$ . Its molar mass =  $23 + 1 + 12 + (16 \times 3) = 84 \text{ g mol}^{-1}$

60. How many of the metals is/are liquid (s) at human body temperature (310 K) ?

i) Mercury (Hg)                      ii) Lithium (Li)                      iii) Potassium (K)  
iv) Caesium (Cs)                      v) Tin (Sn)                      vi) Gallium (Ga)                      vii) Barium (Ba)

**Ans: 3**

Only Hg, Cs and Ga have melting points lower than 310 K

### **PART III - MATHEMATICS**

This part contains 30 questions

**SECTION A - Question No. Mathematics- (61-80)**

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

#### **CORRECT METHOD FOR MARKING SECTION A QUESTIONS**

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
 B C D								

61. Which of the following points will be collinear with the points  $(2, -1)$  and  $(3, 2)$ ?

- A)  $(0, 0)$                       B)  $(7, 14)$                       C)  $(0, -1)$                       D)  $(3, 1)$

**Ans: B**

Mark the point  $A(2, -1)$  and  $B(3, 2)$  on  $xy$  plane and draw the line  $AB$  and check the point which lies on the line

62. Which of the following number is irrational?

- A)  $(5 + \sqrt{4})$     B)  $(5 + \sqrt{3})(5 - \sqrt{3})$   
C)  $(5 + \sqrt{4})(5 - \sqrt{4})$     D)  $(5 + \sqrt{3})$

**Ans: D**

63. Altitude of an equilateral triangle of side 20 is

- A)  $10\sqrt{3}$                       B)  $4\sqrt{3}$                       C)  $5\sqrt{3}$                       D) 10

**Ans: A**

64. Area of a circle of radius 'r' is :

- A)  $2\pi r$                       B)  $2\pi r^2$                       C)  $\pi r^2$                       D)  $\pi r$

**Ans: C**

65. The radii of the bases of a cylinder and a cone are in the ratio 2 : 3 and their heights are in the ratio 3 : 4. Then, their volumes are in the ratio
- A) 9 : 8                      B) 8 : 9                      C) 3 : 4                      D) 1 : 1

**Ans: D**

66. The denominator of a fraction is 1 more than twice the numerator. When both the numerator and denominator are increased by 7 then the denominator becomes 2 units more than the numerator. Determine the fraction
- A)  $\frac{11}{23}$                       B)  $\frac{7}{15}$                       C)  $\frac{3}{7}$                       D)  $\frac{4}{9}$

**Ans: C**

Generally a simple fraction is in the form  $\frac{x}{y}$ , with both x and y are co-prime given,  $y = 2x + 1 \dots (1)$  from second condition fraction became  $\frac{x+7}{y+7}$ .

Let HCF of  $(x+7, y+7) = k$

$$\therefore \frac{y+7}{k} - \frac{x+7}{k} = 2 \text{ ie } y - x = 2k \dots (2)$$

from (1) and (2)  $2x + 1 - x = 2k$ ;  $x + 1 = 2k$ ;  $x = 2k - 1$

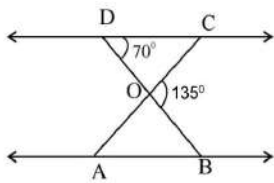
When  $k = 1$   $x = 1$   $y = 3$ ; but  $\frac{1}{3}$  is not given, When  $k = 2$ ,  $x = 3$   $y = 7$  and  $\frac{3}{7}$  is given

$\left( \text{ie, } \frac{3+7}{7+7} = \frac{10}{14} = \frac{5}{7}; \text{HCF} = 2 \right)$ , (Denominator is 2 unit more then numerator)

67. What is the central angle of a semicircle?
- A)  $180^\circ$                       B)  $360^\circ$                       C)  $90^\circ$                       D)  $270^\circ$

**Ans: A**

68. In the figure  $\triangle ODC \sim \triangle OBA$ ;  $\angle BOC = 135^\circ$  and  $\angle CDO = 70^\circ$ . Find  $\angle OAB$



- A)  $55^\circ$                       B)  $45^\circ$                       C)  $65^\circ$                       D)  $75^\circ$

**Ans: C**

69. Which one of the following number is **NOT** the sum of two prime numbers?
- A) 24                      B) 19                      C) 57                      D) 21

**(BOOKLET CODE: A)**

**Ans: C**

$$24 = 7 + 17$$

$$19 = 17 + 2$$

$$21 = 19 + 2$$

sum of two odd primes is always even and  $2 + 55 = 57$ . So 57 cannot be written as sum of two primes

70. Find the distance between  $-5$  and  $18$  on the number line?

A)  $-13$

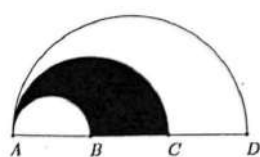
B)  $-3$

C)  $-23$

D)  $23$

**Ans: D**

71. In the figure, we have semicircles having diameters AB, AC and AD so that  $AB = BC = CD$ . Then the ratio of the shaded area to the unshaded area is .....



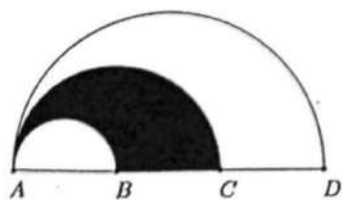
A)  $2 : 1$

B)  $2 : 3$

C)  $3 : 1$

D)  $1 : 2$

**Ans: D**



Let  $B = 2r$

$$AC = 2r + 2r = 4r$$

$$AD = 2r + 2r + 2r = 6r$$

$$\text{area of semicircle on AD} = \frac{9}{2} \pi r^2$$

$$\text{area of semicircle on AC} = \frac{4}{2} \pi r^2$$

$$\text{area of semicircle on AB} = \frac{1}{2} \pi r^2$$

$$\text{Let A be the area of shaded region } \therefore A = \frac{4}{2} \pi r^2 - \frac{1}{2} \pi r^2 = \frac{3}{2} \pi r^2$$

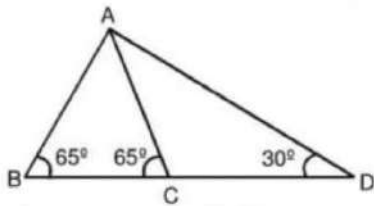
**(BOOKLET CODE: A)**

$$\therefore \text{area of unshaded region} = \frac{9}{2} \pi r^2 - \frac{3}{2} \pi r^2 = \frac{6\pi r^2}{2}$$

$$\therefore \text{required ratio} = \frac{\frac{3}{2} \pi r^2}{\frac{6}{2} \pi r^2} = \frac{1}{2}$$

$$\therefore 1:2$$

72. In the given diagram  $\angle B = \angle C = 65^\circ$  and  $\angle D = 30^\circ$ , then the true statement is



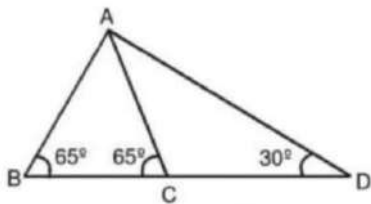
A)  $BC = CA$

B)  $CA > CD$

C)  $BD < AD$

D)  $AB < BD$

**Ans: D**



$$\angle BAC = 50^\circ$$

$$\angle CAD = 35^\circ$$

$$\therefore \angle BAD = 85^\circ$$

$$\angle ACD = 115^\circ \text{ use the property of largest side is opposite to largest angle}$$

73. Value of  $[1234568 \times 198765432 + 98765432 \times 98765432]^{\frac{1}{4}}$

A)  $10^2$

B)  $10^3$

C)  $10^4$

D)  $10^5$

**Ans: C**

Direct calculation is very difficult. But observing the given number

$$198765432 = 100000000 + 98765432$$

$$1234568 = 100000000 - 98765432$$

$$\text{Let } x = 100000000 = 10^8$$

$$y = 98765432, \text{ we have}$$

$$198765432 = x + y$$

$$1234568 = x - y$$

$$[(198765432 \times 1234568 + 98765432 \times 98765432)]^{\frac{1}{4}}$$

$$= [(x + y)(x - y) + y^2]^{\frac{1}{4}}$$

$$= [x^2 - y^2 + y^2]^{\frac{1}{4}}$$

$$= [x^2]^{\frac{1}{4}} = [(10^8)^2]^{\frac{1}{4}}$$

$$= (10^{16})^{\frac{1}{4}} = 10^4$$

74. A person invested some amount at the rate of 12% simple interest and some other amount at the rate of 10% simple interest. He received yearly interest of Rs. 130. But if he had interchanged the amounts invested he would have received Rs. 4 more as interest. How much amount did he invest at 10% simple interest?

A) Rs. 700

B) Rs. 500

C) Rs. 800

D) Rs. 400

**Ans: A**

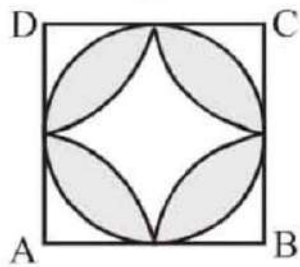
Let x be the amount invested to 12% and y for 10%

$$\therefore \text{ simple interest} = x \times \frac{12}{100} + \frac{8 \times 10}{100} = 130, 12x + 10y = 13000$$

If amount are inter changed  $10x + 12y = 13400$ , Solve,  $y = 700$

75. ABCD is a square. A circle is inscribed in the square. Also taking A, B, C, D (the vertices of square) as a centres of four quadrants, drawn inside the circle, which are touching each other on the mid-points of the sides of square. Area of square is  $4 \text{ cm}^2$ . What is the area of the unshaded region?





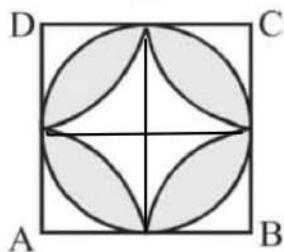
A)  $\left(4 - \frac{3\pi}{2}\right) \text{cm}^2$

B)  $(2\pi - 4) \text{cm}^2$

C)  $(4 - 2\pi) \text{cm}^2$

D)  $(8 - 2\pi) \text{cm}^2$

**Ans: D**



$$A = 4 \left[ 2 \left( 1 - \frac{1}{4} \pi \right) \right] = 8 - 2\pi$$

76. If  $f(x)$  is a polynomial of degree four with leading coefficient 1 such that  $f(1) = 1$ ,  $f(2) = 8$ ,  $f(3) = 27$ , and  $f(4) = 64$ , then the value of  $f(5)$  is

A) 125

B) 144

C) 149

D) 150

**Ans: C**

$$f(1) = 1^3 \quad f(2) = 2^3$$

$$f(3) = 3^3 \quad f(4) = 4^3$$

Since  $f(x)$  is 4<sup>th</sup> degree polynomial

$$\therefore f(x) \neq x^3 \text{ But } f(x) = g(x) + x^3$$

$$f(x) = g(x) + x^3 \text{ so that, } f(1) = g(1) + 1^3, f(2) = g(2) + 2^3 \text{ etc}$$

$$\therefore g(1) = 0, g(2) = 0, g(3) = 0, g(4) = 0$$

$$\therefore g(x) = (x-1)(x-2)(x-3)(x-4)$$

$$\therefore f(x) = (x-1)(x-2)(x-3)(x-4) + x^3$$

$$f(5) = 4.3.2.1 + 5^3 = 24 + 125 = 149$$

77. Two circles touch two parallel lines as shown in figure. The radius of each circle is 1 cm. The distance between the centres of the circles is 6 cm. The area of the shaded region in square unit is



A)  $12 - \pi$

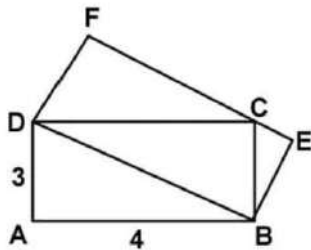
B)  $10\pi$

C)  $12\pi$

D)  $12 + \pi$

**Ans: A**

78. Two rectangles ABCD and DBEF are shown in the figure. The area of rectangle DBEF in square unit is



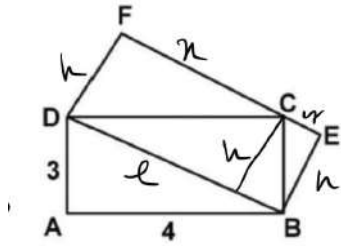
A) 20

B) 12

C) 15

D)  $12\sqrt{2}$

Ans: B



Area of  $DBC = \frac{1}{2} \ell h = 6$ , area of  $DFC = \frac{1}{2} xh$ ;  $BEC = \frac{1}{2} yh$  and  $x + y = \ell$

$$\therefore \text{area } BDEF = \frac{1}{2} \ell h + \frac{1}{2} h(x + y), = \frac{1}{2} \ell h + \frac{1}{2} \ell h; = 6 + 6 = 12$$

79. If  $m$  is a real number such that  $m^2 + 1 = 3m$ , the value of  $\frac{2m^5 - 5m^4 + 2m^3 - 8m^2}{m^2 + 1}$  is

A) 1

B) -1

C) 2

D) -2

Ans: B

$$\frac{2m^5 - 5m^4 + 2m^3 - 8m^2}{m^2 + 1} \text{ is LHS} = \frac{2m^3(m^2 + 1) - 5m^4 - 8m^2}{m^2 + 1}$$

$$= \frac{2m^3 \cdot 3m - 5m^4 - 8m^2}{3m} = \frac{m^4 - 8m^2}{3m}; \left| \begin{array}{l} m^2 + 1 = 3m \\ (m^2 + 1)^2 = 9m^2 \\ m^4 + 2m^2 + 1 = 9m^2 \\ m^4 = 7m^2 - 1 \end{array} \right.$$

$$\text{L.H.S} = \frac{7m^2 - 1 - 8m^2}{3m}; = \frac{-(m^2 + 1)}{3m} = -1$$

80. Match column I, II, & III.

I Equation	II Value of x can be	III Nature of the value of x
1) $x - 3 = 0$	a) -3	p) natural number
2) $x^2 - 9 = 0$	b) 0	q) even number
3) $ x  = 3$	c) 1	r) odd number
4) $x + y = 5$ $2x + y = 6$	d) 3	s) prime number

Which of the following combination is true

A) 1 → c, p

B) 2 → a, q

C) 3 → d, s

D) 4 → c, q

Ans: C

### SECTION B - MATHEMATICS

Question No. Mathematics - (81 - 90 )

Out of these 10 questions candidate can choose to attempt any 5 questions. In the event of a candidate attempting more than 5 questions, the first 5 questions answered by the candidate shall be evaluated.

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING SECTION B QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
●	0	0
0	●	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

(BOOKLET CODE: A)

81. The numbers  $x$ ,  $y$  and  $z$  are given by  $x = \sqrt{12-3\sqrt{7}} - \sqrt{12+3\sqrt{7}}$ ,  $y = \sqrt{7-4\sqrt{3}} - \sqrt{7+4\sqrt{3}}$  and  $z = \sqrt{2+\sqrt{3}} - \sqrt{2-\sqrt{3}}$ . What is the value of  $xyz$ ?

**Ans: 7**

$$x^2 = 12 - 3\sqrt{7} + 12 + 3\sqrt{7} - 2\sqrt{(12-3\sqrt{7})(12+3\sqrt{7})} = 24 - 2\sqrt{144-63}$$

$$= 24 - 2\sqrt{121} = 24 - 22 = 2$$

$$y^2 = 7 - 4\sqrt{3} + 7 + 4\sqrt{3} - 2\sqrt{49-48} = 14 - 2 = 12$$

$$z^2 = 2 + \sqrt{3} - 2 - \sqrt{3} - 2\sqrt{4-3} = 4 - 2 = 2$$

$$\therefore x^2 y^2 z^2 = 2 \times 12 \times 2 = xyz = 4\sqrt{3} \sim 7$$

82. A natural number 'a' is multiplied by 11 and 33 is added to it. Now, the obtained number is divided by 9 and the remainder is zero. Then the largest two digit natural number 'a' is

**Ans: 96**

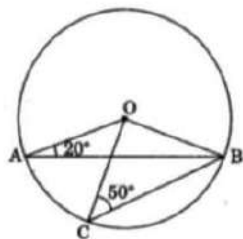
83. A two-digit number is such that it is four times the sum of its digits and twice the product of the digits. Find the number

**Ans: 36**

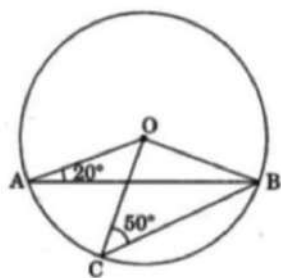
84. If the arithmetic mean of 5, 7, 9,  $x$  is 9 then the value of  $x$  is

**Ans: 15**

85. In the given figure,  $O$  is the centre of a circle in which  $\angle OAB = 20^\circ$  and  $\angle OCB = 50^\circ$ . Then  $\angle AOC =$



**Ans: 60**



$$\angle OBA = 20^\circ, \angle OBC = 50^\circ, \angle ABC = 30^\circ, \therefore \angle AOC = 2 \times 30^\circ = 60^\circ$$

86. Find the 7<sup>th</sup> term of the sequence with n<sup>th</sup> term  $3n + 2$

**Ans: 23**

87.  $8 \sin 30^\circ \times \cos 45^\circ \times \tan 45^\circ \times \sin 45^\circ$

**Ans: 2**

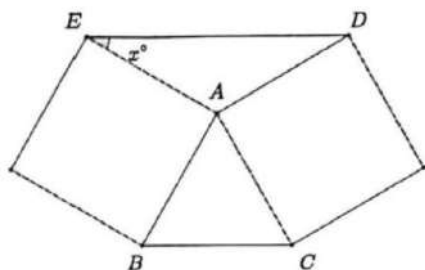
88. Area of a square having side 5 unit.

**Ans: 25**

89. Constant term in the expansion of  $\left(x + \frac{1}{x}\right)^2$  is

**Ans: 2**

90. ABC is an equilateral triangle. Squares are described on the sides AB and AC as shown. The value of x is



**Ans: 30**

$$\angle BAC = 60^\circ, \angle BAE = \angle CAD = 90^\circ, \therefore \angle EAD = 120^\circ, \angle E = \frac{60}{2} = 30^\circ$$



# IIT/AIIMS SCREENING TEST

QUESTION  
BOOKLET  
CODE

**A**

P + C + M - ANSWER KEY

## PHYSICS

1. D
2. B
3. C
4. B
5. D
6. B
7. B
8. B
9. C
10. B
11. D
12. A
13. C
14. D
15. C
16. A
17. C
18. A
19. C
20. A
21. 4
22. Cancelled  
(Error in question)
23. 20
24. 175
25. 30
26. 5
27. 300
28. 25
29. 4
30. 20

## CHEMISTRY

31. B
32. D
33. D
34. C
35. B
36. A
37. C
38. D
39. A
40. A
41. A
42. B
43. B
44. D
45. A
46. B
47. C
48. D
49. C
50. C
51. 16
52. 16
53. 18
54. 144
55. 13
56. 4
57. 4
58. 5
59. 84
60. 3

## MATHEMATICS

61. B
62. D
63. A
64. C
65. D
66. Cancelled (Answer is more than  
One option)
67. A
68. C
69. C
70. D
71. D
72. D
73. C
74. A
75. D
76. C
77. A
78. B
79. B
80. C
81. 7
82. 96
83. 36
84. 15
85. 60
86. 23
87. 2
88. 25
89. 2
90. 30



## IIT/AIIMS SCREENING CUM SCHOLARSHIP TEST

### SAMPLE QUESTION PAPER

#### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 hours** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 240**
5. There are three sections. Physics, Chemistry & Mathematics having 20 questions each. Each section consists of two parts. **In Part 1** (15 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD  
VARYIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE  
60 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

I have read all the instructions and shall  
abide by them

\_\_\_\_\_  
Signature of the Candidate

**Roll Number**

I have verified all the information  
filled by the candidate

\_\_\_\_\_  
Signature of the Invigilator

## PART I

This part contains **15** questions each

Each question has **FOUR** options [A], [B], [C] and [D]. **ONLY ONE** of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

## PART II

This part contains **5** questions each

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

**If Single Digit Answer**  
If answer is 3

**Example 1**

Single Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**  
If answer is 90

**Example 2**

Two Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Three Digit Answer**  
If answer is 180

**Example 3**

Three Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

## PHYSICS -PART I

1. The distance travelled by a freely falling body in one second, two second, three second etc are in the ratio  
A) 1 : 1 : 1                      B) 1 : 2 : 3                      C) 1 : 3 : 5                      D) 1 : 4 : 9
2. A bullet of mass 10g moving with velocity 100m/s strikes a mud wall and comes to rest after penetrating through 5m. The force offered by the mud wall is  
A) 10N                      B) 20N                      C) 25N                      D) 40N
3. Unit of G is  
A)  $\text{Nm}^2\text{kg}^{-2}$                       B)  $\text{Nmkg}^{-2}$                       C)  $\text{Nkg}^2\text{m}^{-2}$                       D)  $\text{Nkg}^{-2}\text{m}^{-2}$
4. If initially the distance between two bodies is r and their masses be  $M_1$  and  $M_2$  then the force of gravitation be F. If this distance is increased to two times then the force would become  
A)  $\frac{F}{2}$                       B)  $\frac{F}{4}$                       C) 2F                      D) 4F
5. Sound wave of wavelength  $\lambda$  travels from a medium in which their speed is V into a medium in which their speed is 4V. The wavelength of the sound in the second medium is  
A)  $\lambda$                       B)  $2\lambda$                       C)  $3\lambda$                       D)  $4\lambda$
6. A particle is taken to a height R above the earth's surface where R is the radius of the earth. The acceleration due to gravity there is  
A)  $19.6 \text{ m/s}^2$                       B)  $2.45 \text{ m/s}^2$                       C)  $9.8 \text{ m/s}^2$                       D)  $4.9 \text{ m/s}^2$
7. A body floats with  $\frac{1}{3}^{\text{rd}}$  of its volume outside water and  $\frac{3}{4}^{\text{th}}$  of its volume outside liquid. Then the density of the liquid is  
A)  $\frac{3}{8} \text{ g/cm}^3$                       B)  $\frac{8}{3} \text{ g/cm}^3$                       C)  $\frac{9}{4} \text{ g/cm}^3$                       D)  $\frac{4}{9} \text{ g/cm}^3$
8. Two bodies of mass 1kg and 4kg possess equal momentum. The ratio of KE is  
A) 4 : 1                      B) 1 : 4                      C) 2 : 1                      D) 1 : 2
9. A 2 cm long object is placed  $\perp$  to the principal axis of a concave mirror the distance of the object from the mirror is 30cm and its image is formed. 60 cm from the mirror on the same side of the mirror as the object the height of the image?  
A) 4cm                      B) 40cm                      C) 4m                      D) none
10. If the light travelling at  $3 \times 10^5 \text{ km/s}$  reaches the earth in 8.3 minutes the distance of sun from the earth is  
A) 150 million km                      B) 15 million km                      C) 300 million km                      D) 200 million km
11. The water flows through three holes made at different heights of a vessel. The pressure is maximum at  
A) the top most hole                      B) the middle hole                      C) the lowermost hole                      D) is same at all hole

12. One coulomb is equal to

A)  $6.35 \times 10^{19}$  electrons

B)  $6.25 \times 10^{18}$  electrons

C)  $6.25 \times 10^{19}$  electrons

D)  $6 \times 25 \times 10^{18}$  electrons

13. In the air the path of lightning goes up to a temperature of about.

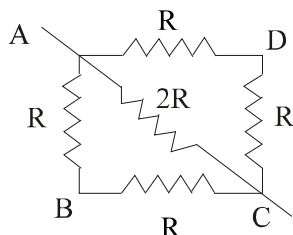
A) 300°C

B) 3, 000°C

C) 300, 000°C

D) 30,000°C

14. Find the effective resistance between point A and C



A)  $3/2R$

B)  $6R$

C)  $3R$

D)  $2/3R$

15. An electron has a circular path of radius 0.01 m in a perpendicular magnetic induction  $10^{-3}$  T find the speed of electron

A)  $1.76 \times 10^6$  m/s

B)  $1.76 \times 10^{-6}$  m/s

C) 1.76 m/s

D) none

### PHYSICS - PART II

16. Calculate the resistance of an electric bulb which allows a 10 A current when connected to a 220 V power source

17. The power of lens having focal length 20 cm is

18. How much force is required to lift a mass of 100 g

19. A bus starts from town A and reaches town B with speed 40 km/h. It returns to town A with speed 60 km/h. The average velocity of the bus is

20. The minimum distance between the source of sound and the obstacle for an echo to take place is (speed of sound is 340 m/s)

### CHEMISTRY - PART I

21. The non-metal having a shiny surface is

A) Sulphur

B) Phosphorous

C) Iodine

D) Carbon

22. Which one of the following metal oxide is amphoteric in nature?

A) CaO

B) MgO

C) FeO

D) ZnO

23. Dry ice is

A) solid  $\text{NH}_3$

B) solid  $\text{SO}_2$

C) solid  $\text{CO}_2$

D) solid  $\text{N}_2$

24. The metal which do not react with water
- A) Ca                      B) Na                      C) Ni                      D) K
25. Striking tip of match box is made up of
- A)  $P_4S_3$                       B)  $P_4$                       C)  $MgPO_4$                       D)  $CaPO_4$
26. Chemical formula of phosphoric acid
- A)  $H_3PO_3$                       B)  $H_3PO_4$                       C)  $H_2PO_4$                       D) None of these
27. When calcium dissolves in water, a milky appearance is obtained. This milky appearance is due to the formation of
- A) CaO                      B)  $Ca(OH)_2$                       C)  $CaCl_2$                       D)  $CaPO_4$
28. The substance which shows sublimation
- A) NaOH                      B) NaCl                      C)  $I_2$                       D)  $Ca(OH)_2$
29. Separation of cream from milk is done by
- A) Sedimentation                      B) Centrifugation                      C) Distillation                      D) Evaporation
30. Which is called baking soda ?
- A) NaOH                      B)  $Na_2CO_3$                       C)  $NaHCO_3$                       D)  $NaNO_3$
31. Rust is chemicaly
- A)  $Fe_3O_4 \cdot 4NH_3$                       B)  $Fe_3O_4 \cdot xH_2O$                       C)  $Fe_2O_3 \cdot xH_2O$                       D)  $FeCl_3 \cdot xH_2O$
32. In neutralization reaction
- A) Heat is absorbed                      B) Heat is evolved
- C) Oxidation take place                      D) None of these
33. When Zn react with con.  $H_2SO_4$ , the gas evolved is
- A)  $O_2$                       B)  $H_2$                       C)  $SO_2$                       D)  $NO_2$
34. Which of the following is a mineral acid
- A)  $H_2CO_2$                       B)  $H_4C_2O_2$                       C)  $H_6C_7O_2$                       D)  $H_2CO_3$

35. Match the substances in column (I) with the type of substances in column (II) and colour of substances in column (III) and select the correct match from choices given

Column I (Substances)	Column -II type of substance	Column-III Colour
(1) air	(i) element	(a) colourless
(2) Chlorine	(ii) compound	(b) brown
(3) rust	(iii) mixture	(c) greenish yellow

- A) (1)-(ii), (a) 2-(i), (b) 3-(ii) (c)                      B) (1)-(iii), (a) 2-(i) (c) 3-(ii) (b)  
 C) (1)-(iii) (c) 2-(i), (a) 3-(ii) (b)                      D) (1)-(i) (c) 2-(iii) (a) 3-(ii) (b)

### CHEMISTRY - PART II

36. The amount of glucose required to prepare 250gm of 4.8% solution of glucose by mass  
 37. Atomicity of S is.....  
 38. 1 mole of a compound containing 1 mole of carbon atoms and 2 moles of oxygen atoms. The molecular weight of the compound is .....  
 39. pH of 1M hydrochloric acid is.....  
 40. In alnico the % of Fe is .....

### MATHEMATICS - PART I

41. The difference between the compound interest and the simple interest for 2 years at 8% per annum on a certain sum of money is 120. Find the sum?  
 A) 18,750/-                      B) 18,700/-                      C) 18,850/-                      D) 18,050/-  
 42. A carton is in the shape of a cuboid of measure  $200\text{ cm} \times 100\text{ cm} \times 50\text{ cm}$ . A box is in the shape of a cube of measure  $5\text{ cm} \times 5\text{ cm} \times 5\text{ cm}$ . Then how many boxes can be stored in the carton?  
 A) 4,000                      B) 8,000                      C) 2,000                      D) 1,000  
 43. The salary of an officer has been increased by 50%. By what percent the new salary must be reduced to restore the original salary?  
 A)  $44\frac{1}{2}\%$                       B)  $33\frac{1}{3}\%$                       C)  $22\frac{1}{3}\%$                       D)  $11\frac{1}{3}\%$   
 44. Find the cost of erecting a fence around a square field whose area is 9 hectares if fencing costs 3.50/- per metre.  
 A) 4200/-                      B) 4300/-                      C) 4400/-                      D) 4500/-

45. The diagonals of a rhombus are 8cm and 6cm, then the length of each side of the rhombus is equal to
- A) 3 cm                      B) 4cm                      C) 5cm                      D) None of these
46. In a cyclic quadrilateral, the difference between two opposite angles is 58, the measure of opposite angles are
- A) 158, 22                      B) 129, 51                      C) 109, 71                      D) 119, 61
47. The mean of 100 observations is 60. If one of the observation 50 is replaced by 120, the resulting mean will be
- A) 50.5                      B) 51                      C) 51.5                      D) 60.7
48. If  $x^2 - 3x - 4$  divides  $p(x)$  completely then the corresponding factors are
- A)  $(x - 4), (x + 1)$                       B)  $(x - 4), (x - 1)$                       C)  $(x + 4), (x - 1)$                       D)  $(x + 4), (x + 1)$
49. If  $-5$  is the remainder when  $3x^2 + mx - 2$  is divided by  $x + 2$ , then  $m$  is
- A) 5                      B)  $\frac{15}{2}$                       C)  $-5$                       D)  $-24$
50. The coefficient of  $x^2$  in  $(px^2 + 4x + r) \times (4x^2 - 3qx - 5)$  is
- A)  $-5p - 12q + 4r$                       B)  $4p + 5q$                       C)  $12q - 5p$                       D)  $16q - 3qr$
51. If in a fraction 1 less from two times of the numerator ( $x$ ) and 1 add in denominator ( $y$ ) then new fraction will be
- A)  $\frac{2x-1}{y+1}$                       B)  $\frac{2(x+1)}{y+1}$                       C)  $2\left(\frac{x-1}{y+1}\right)$                       D)  $2\left(\frac{x}{y}\right)$
52. The sum of the squares of two consecutive positive integers is 545; then the integers are
- A) 19,15                      B) 16,17                      C) 26,17                      D) 6,17
53. If  $(x+1)$  is a factor of  $x^2 - 3ax + 3a - 7$  then the value of ' $a$ ' is
- A) 1                      B)  $-1$                       C) 0                      D)  $-2$
54. Which term of the arithmetic progression 8, 14, 20, 26..... will be 72 more than its 41<sup>st</sup> term
- A) 43<sup>rd</sup>                      B) 53<sup>rd</sup>                      C) 63<sup>rd</sup>                      D) 68<sup>th</sup>

55. If the circumference of a circle increases from  $4\pi$  to  $8\pi$ , then its area is

A) quadrupled

B) tripled

C) doubled

D) halved

**MATHEMATICS - PART II**

56. The value of  $\sqrt[3]{\frac{0.027}{0.008}} \div \sqrt{\frac{0.09}{0.04}} - 1$

57. The difference between a two digit number and the number obtained by interchanging the digit is 27. What is the difference between the two digits of the number?

58. The difference between two numbers is 5 and difference in their squares is 65. The larger number is

59. In  $\triangle ABC$ ,  $\angle A : \angle B : \angle C = 2 : 3 : 5$ , angle at B is

60. How many balls, each of radius 1cm, can be made from a solid sphere of lead of radius 8cm



# IIT / AIIMS - 2023 SCREENING CUM SCHOLARSHIP TEST

## SAMPLE QUESTION ANSWER KEY

FN<sub>20C</sub>/C/[P]

PHYSICS + CHEMISTRY + MATHS + KEY

### PHYSICS

1. D
2. A
3. A
4. B
5. D
6. B
7. B
8. A
9. A
10. A
11. C
12. C
13. D
14. D
15. A
16. 22
17. 5
18. 1
19. 0
20. 17

### CHEMISTRY

21. C
22. D
23. C
24. C
25. A
26. B
27. B
28. C
29. B

30. C
31. C
32. B
33. C
34. D
35. B      air-mixture-colourless chlorine-element-greenish yellow rust-compound-Brown
36. 12
37. 8
38. 44
39. 0
40. 60

### **MATHEMATICS**

41. A
42. B
43. B
44. A
45. D
46. D
47. D
48. A
49. B
50. A
51. A
52. A
53. A
54. A
55. D
56. 0
57. 6
58. 11
59. 54
60. 512

Date: 05<sup>th</sup> April 2018**IMPORTANT INSTRUCTIONS***Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seals of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of 2 ½ hours duration.  
This question booklet contains 90 questions. The Maximum Marks are 360
4. There are three sections in the question paper. Section I - Physics, Section II - Chemistry, Section III - Mathematics having 30 questions each.
5. For each question, four answers are suggested and given against (A), (B), (C) and (D) of which, **only one** will be the **Most Appropriate Answer**. Mark the bubble containing the letter corresponding to the 'Most Appropriate Answer' in the answer sheet, by using either **Blue or Black ball - point pen only**
6. Each correct answer will be awarded **FOUR** marks.
7. **ONE** mark will be deducted for each incorrect answer.
8. More than one answer marked against a question will be deemed as incorrect answer and will be negatively marked.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. Return both the **Question paper and Answer sheet** to the invigilator at the end of the examination

IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD  
VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE  
90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT

Name of the Candidate

I have read all the instructions and shall  
abide by them

\_\_\_\_\_  
Signature of the Candidate

Roll Number

I have verified all the information  
filled by the candidate

\_\_\_\_\_  
Signature of the Invigilator



### **SECTION I - PHYSICS**

1. A box of mass 20 kg is pushed along a rough floor with a velocity 2 m/s and then let go. The box moves 5m on the floor before coming to rest. What must be the frictional force acting on the box?  
  
A) 4N                      B) 2N                      C) 20 N                      D) 8N
2. Two objects, one 4 times as massive as the other, are approaching each other under their mutual gravitational attraction. When the separation between the objects is 100 km, the acceleration of the lighter object is  $1 \text{ m/s}^2$ . When the separation between them is 25 km, the acceleration of the heavier object is  
  
A)  $1 \text{ m/s}^2$                       B)  $2 \text{ m/s}^2$                       C)  $8 \text{ m/s}^2$                       D)  $4 \text{ m/s}^2$
3. A force of 10 N is applied on an object of mass 1 kg of 2s, which was initially at rest. What is the work done on the object by the force?  
  
A) 200 J                      B) 20 J                      C) 16 J                      D) 180 J
4. Stethoscope of doctors for finding quality, strength and frequency of human heart beat is based on the principle of  
  
A) SONAR                      B) Reverberation                      C) Multiple reflection                      D) Echo

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**SPACE FOR ROUGH WORK**

5. A ray of light is incident in medium 1 on a surface that separates medium 1 from medium 2. Let  $v_1$  and  $v_2$  represent the velocity of light in medium 1 and medium 2 respectively. Also let  $n_{12}$  and  $n_{21}$  represent the refractive index of medium 1 with respect to medium 2 and refractive index of medium 2 with respect to medium 1, respectively. If  $i$  and  $r$  denote the angle of incidence and angle of refraction, then

A)  $\frac{\sin i}{\sin r} = n_{21} = \frac{v_1}{v_2}$     B)  $\frac{\sin i}{\sin r} = n_{21} = \frac{v_2}{v_1}$     C)  $\frac{\sin i}{\sin r} = n_{12} = \frac{v_1}{v_2}$     D)  $\frac{\sin i}{\sin r} = n_{12} = \frac{v_2}{v_1}$

6. A convex lens has a focal length of 0.5 m. It has to be combined with a second lens, so that the combination has a power of 1.5 dioptre. Which of the following could be the second lens?

- A) A concave lens of focal length 2m                      B) Another convex lens of focal length 0.5 m  
C) A concave lens of focal length 0.5 m                      D) A convex lens of focal length 2m

7. Consider two conducting plates A and B, between which the potential difference is 5V, plate A being at a higher potential. A proton and an electron are released at plates A and B respectively. The two particles then move towards the opposite plates - the proton to plate B and the electron to plate A. Which one will have a larger velocity when they reach their respective destination plates?

- A) Both will have the same velocity                      B) The electron will have the larger velocity  
C) The proton will have the larger velocity                      D) None will be able to reach the destination point

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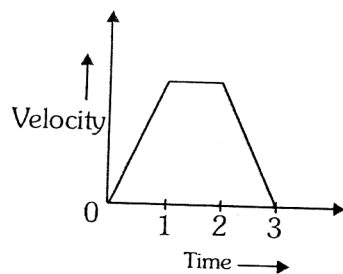
SPACE FOR ROUGH WORK

8. Which one of the following statements best describes the nature of the field lines due to a bar magnet?
- A) Field lines start from the north pole and end on the south pole. Any number of field lines can pass through a point
  - B) Field lines start from the north pole and end on the south pole. Only one field line passes through a point
  - C) Field lines are continuous lines passing inside and outside the magnet. Only one field line passes through a point
  - D) Field lines are continuous lines passing inside and outside the magnet. Any number of field lines can pass through a point
9. A star produces its energy through the process of
- A) Nuclear fusion
  - B) Chemical reaction
  - C) Nuclear fission
  - D) Gravitational attraction between different parts of the star

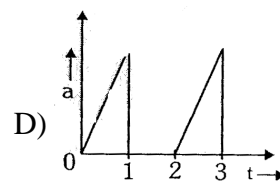
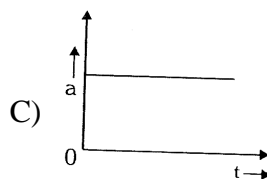
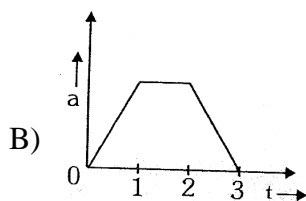
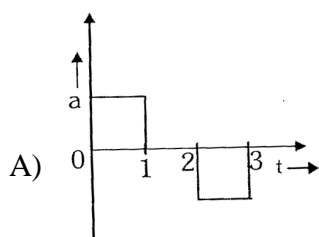
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**SPACE FOR ROUGH WORK**

10. The velocity time graph of an object moving along a straight line is shown below



Which one of the following graphs represents the acceleration ( $a$ ) - time ( $t$ ) graph for the above motion?

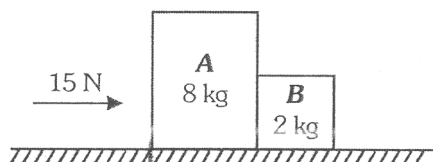



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SPACE FOR ROUGH WORK



11. To read a poster on a wall, a person with defective vision needs to stand at a distance of 0.4m from the poster. A person with normal vision can read the poster from a distance of 2.0 m. Which one of the following lens may be used to correct the defective vision?
- A) A concave lens of 0.5 D
- B) A concave lens of 1.0 D
- C) A concave lens of 2.0 D
- D) A convex lens of 2.0 D
12. Two blocks A and B of masses 8kg and 2 kg respectively, lie on a horizontal frictionless surface as shown in the figure. They are pushed by a horizontally applied force of 15 N. The force exerted by B on A is

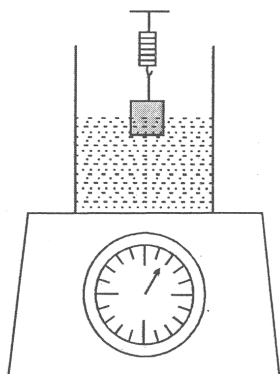


- A) 1.5 N                      B) 3.0 N                      C) 4.5 N                      D) 6.0 N

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SPACE FOR ROUGH WORK

13. A beaker half-filled with water is put on a platform balance which is then set to zero. A 800 g mass is immersed partially in water using a spring balance as shown in the figure. If the spring balance reads 300g, what will be the reading on the platform balance?

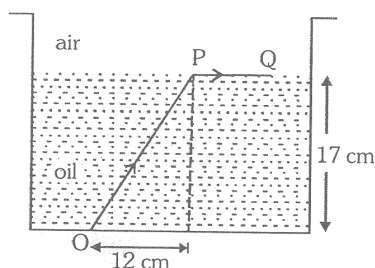


- A) 200 g                      B) 300 g                      C) 500 g                      D) 800 g
14. An object falls a distance  $H$  in 50 s when dropped on the surface of the earth. How long would it take for the same object to fall through the same distance on the surface of a planet whose mass and radius are twice that of the earth? (neglect air resistance)
- A) 35.4 s                      B) 50.0 s                      C) 70.7 s                      D) 100.0 s

---

SPACE FOR ROUGH WORK

15. A source produces sound waves under water. Waves travel through water and then into air. Which of the following statements about the frequency ( $f$ ) and wavelength ( $\lambda$ ) is correct as sound passes from water to air?
- A)  $f$  remains unchanged but  $\lambda$  decreases      B)  $f$  remains unchanged but  $\lambda$  increases  
 C)  $\lambda$  remains unchanged but  $f$  decreases      D)  $\lambda$  remains unchanged but  $f$  increases
16. A vessel is filled with oil as shown in the diagram. A ray of light from point O at the bottom of vessel is incident on the oil-air interface at point P and grazes the surface along PQ. The refractive index of the oil is close to

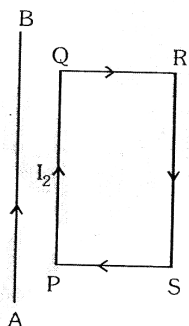


- A) 1.41      B) 1.50      C) 1.63      D) 1.73
17. A charged particle placed in an electric field falls from rest through a distance  $d$  in time  $t$ . If the charge on the particle is doubled, the time of fall through the same distance will be
- A)  $2t$       B)  $t$       C)  $\frac{t}{\sqrt{2}}$       D)  $\frac{t}{2}$

---

**SPACE FOR ROUGH WORK**

18. AB is a long wire carrying a current  $I_1$ , and PQRS is rectangular loop carrying current  $I_2$  (as shown in the figure).



Which among the following statements are correct?

- a) Arm PQ will get attracted to wire AB, and the arm RS will get repelled from wire AB
- b) Arm PQ will get repelled from wire AB and arm RS attracted to wire AB
- c) Forces on the arms PQ and RS will be unequal and opposite
- d) Forces on the arms QR and SP will be zero

A) only (a)

B) (b) and (c)

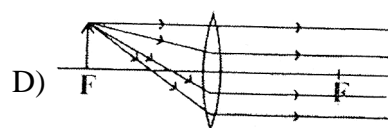
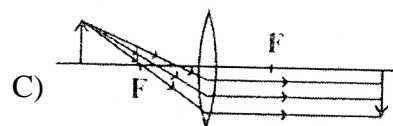
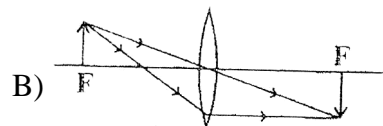
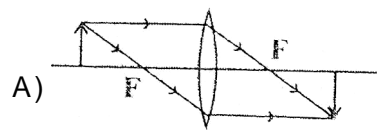
C) (a) and (c)

D) (b) and (d)

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SPACE FOR ROUGH WORK

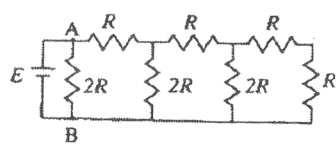
19. Which of the following ray diagram is correct?



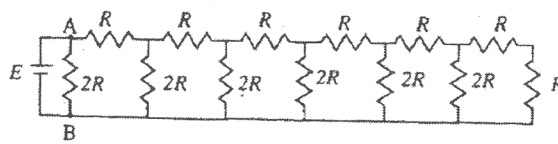

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SPACE FOR ROUGH WORK

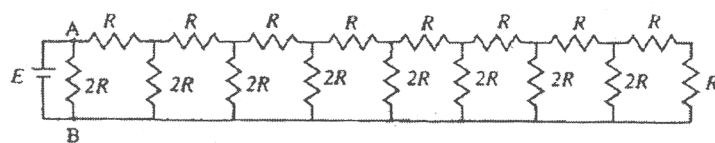
20. Three different circuits (I, II and III) are constructed using identical batteries and resistors of  $R$  and  $2R$  ohm. What can be said about current  $I$  in arm AB of each circuit?



(I)



(II)



(III)

A)  $I_{II} < I_I < I_{III}$

B)  $I_I < I_{II} < I_{III}$

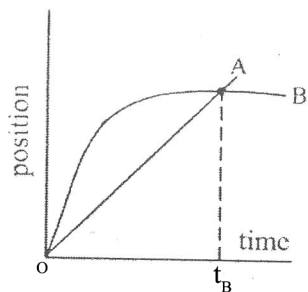
C)  $I_I = I_{II} = I_{III}$

D)  $I_I > I_{II} = I_{III}$

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SPACE FOR ROUGH WORK

21. The graph shows position as a function of time for two trains A and B running on parallel tracks. For times greater than  $t = 0$ , which of the following statement is true?

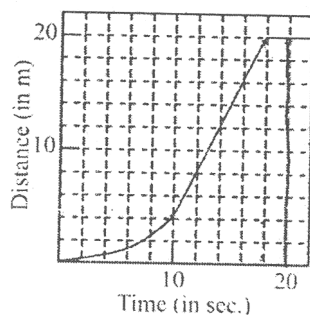


- A) At time  $t_B$ , both trains have the same velocity
- B) Both trains speed up all the time
- C) Both trains may have the same velocity at some time earlier than  $t_B$
- D) Graph indicates that both trains have the same acceleration at a given time

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SPACE FOR ROUGH WORK

22. The figure shown below depicts the distance travelled by a body as a function of time



The average speed and maximum speed between 0 and 20 s are:

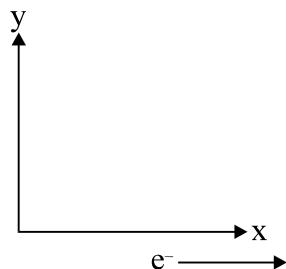
- A) 1 m/s, 2.0 m/s respectively                      B) 1 m/s, 1.6 m/s respectively  
C) 2.0 m/s, 2.6 m/s respectively                      D) 1.3 m/s, 2.0 m/s respectively
23. A hypothetical planet has density  $\rho$ , radius  $R$  and surface gravitational acceleration  $g$ . If the radius of the planet were doubled, but the planetary density stayed the same, the acceleration due to gravity at the planet's surface would be
- A)  $4g$                       B)  $2g$                       C)  $g$                       D)  $g/2$

---

SPACE FOR ROUGH WORK



24. An electron moving with uniform velocity in x direction enters a region of uniform magnetic field along y direction. Which of the following physical quantity (ies) is (are) non-zero and remain constant?



- I) Velocity of the electron
- II) Magnitude of the momentum of the electron
- III) Force on the electron
- IV) The kinetic energy of electron

A) Only I and II                  B) Only III and IV                  C) All four                  D) Only II and IV

25. In a neon gas discharge tube, every second  $4.8 \times 10^{18}$   $\text{Ne}^+$  ions move towards the right through a cross-section of the tube, while 'n' electrons move to the left in the same time. If the current in the tube is 1.12 amperes towards the right, 'n' is equal to (given  $e = 1.6 \times 10^{-19}$  coulomb )

A)  $1.8 \times 10^{18}$                   B)  $2.2 \times 10^{18}$                   C)  $2.4 \times 10^{19}$                   D)  $2.8 \times 10^{19}$

---

**SPACE FOR ROUGH WORK**

26. Four situations are given below

I) An infinitely long wire carrying current

II) A rectangular loop carrying current

III) A solenoid of finite length carrying current

IV) A circular loop carrying current

In which of the above cases will the magnetic field produced be like that of a bar magnet?

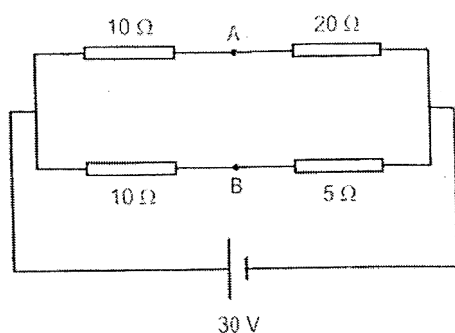
A) I

B) I and III

C) Only III

D) Only IV

27. In the circuit diagram shown below,  $V_A$  and  $V_B$  are the potentials at points A and B respectively. Then,  $V_A - V_B$  is



A) -10 V

B) -20 V

C) 0 V

D) 10 V

---

SPACE FOR ROUGH WORK

28. When a charged particle passes through an electric field, which among the following properties change?
- |             |             |               |                |
|-------------|-------------|---------------|----------------|
| I) Mass     | II) Charge  | III) Velocity | IV) Momentum   |
| A) II & III | B) Only III | C) III and IV | D) I, III & IV |
29. A ball of mass  $m$  is thrown from a height  $h$  with a speed  $v$ . For what initial direction of the ball will its speed on hitting the ground be maximum?
- A) Horizontally
- B) Vertically downwards
- C) At an angle of  $45^\circ$  from the vertical in the downward direction
- D) Speed does not depend on the direction in which the ball is thrown
30. A beaker is filled with two non-mixing liquids. The lower liquid has density twice that of the upper one. A cylinder of height  $h$  floats with one-fourth of its height submerged in the lower liquid and half of its height submerged in the upper liquid. Another beaker is filled with the denser of the two liquids alone. If the same cylinder is kept in the second beaker, the height of the submerged position would be
- |        |                   |                  |                  |
|--------|-------------------|------------------|------------------|
| A) $h$ | B) $\frac{3h}{4}$ | C) $\frac{h}{2}$ | D) $\frac{h}{4}$ |
|--------|-------------------|------------------|------------------|

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SPACE FOR ROUGH WORK

## **SECTION 2 - CHEMISTRY**

31. Four substances were thoroughly mixed with water separately to obtain mixtures A, B, C and D. Some of their properties are given below:
- I) Path of a beam of light passing through it was visible in A, B and D but invisible in C
  - II) On leaving undisturbed, the particles of the substance settle down in A but not in B, C and D
  - III) The solute-particles are visible to naked eye in A but invisible in B, C and D.
- Which of the following is correct about A, B, C and D?
- A) A, B and D are colloids, C is a solution
  - B) A is a suspension, B and D are colloids, C is a solution
  - C) A is colloid, B, C and D are solutions
  - D) A is a suspension. B, C and D are colloids
32. Magnesium ribbon is rubbed with sand paper before making it to burn. The reason of rubbing the ribbon is to
- A) remove moisture condensed over the surface of ribbon
  - B) generate heat due to exothermic reaction
  - C) remove the magnesium oxide formed over the surface of magnesium
  - D) mix silicon from sand paper (silicon dioxide with magnesium for lowering ignition temperature of the ribbon)

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**SPACE FOR ROUGH WORK**

33. An element X reacts with dilute  $\text{H}_2\text{SO}_4$  as well as with  $\text{NaOH}$  to produce salt and  $\text{H}_2(\text{g})$ . Hence, it may be concluded that
- I) X is an electropositive elements
  - II) Oxide of X is basic in nature
  - III) Oxide of X is basic in nature
  - IV) X is an electronegative element
- A) I, II, III                      B) IV, I, III                      C) III, IV, I                      D) II, III, IV
34. An element X has electronic configuration 2, 8, 1 and another element Y has electronic configuration 2, 8, 7. They form a compound Z. The property that is not exhibited by Z is
- A) it has high melting point
  - B) it is a good conductor of electricity in its pure solid state
  - C) it breaks into pieces when beaten with hammer
  - D) it is soluble in water
35. The compound containing both ionic and covalent bond is
- A)  $\text{AlBr}_3$                       B)  $\text{CaO}$                       C)  $\text{MgCl}_2$                       D)  $\text{NH}_4\text{Cl}$

---

**SPACE FOR ROUGH WORK**

36. Somebody wanted to calculate the number of moles of oxygen atoms comprising of  $9.033 \times 10^{23}$  number of its atoms. The person further thought to calculate its mass and to find the number of moles of hydrogen atoms required to combine completely with this amount of oxygen to form water. The number of moles of oxygen atoms, their mass (in grams) and the number of moles of hydrogen atoms are
- A) 1.5, 3 and 24 respectively
  - B) 15, 18 and 3 respectively
  - C) 0.15, 27.3 respectively
  - D) 1.5, 24 and 3 respectively
37. Two identical beakers labelled as (X) and (Y) contain  $100 \text{ cm}^3$  of water each at  $20^\circ\text{C}$ . To the water in the beaker (X)  $100 \text{ g}$  of water at  $0^\circ\text{C}$  was added and stirred to mix thoroughly. To the beaker (Y)  $100 \text{ g}$  of ice at  $0^\circ\text{C}$  was added and stirred till it melted into water. The water in the beaker (Y) will be
- A) hotter than water in beaker X
  - B) colder than water in beaker X
  - C) heavier than water in beaker X
  - D) lighter than water in beaker X

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**SPACE FOR ROUGH WORK**

38. At 283 K a saturated solution of solid X can be prepared by dissolving 21.0 g of it in 100 g of water. The maximum amount of X which can be dissolved in 100 g of water at 313 K is 62.0 g. An attempt is made to dissolve 50.0 g of X in 100 g of water at 313 K
- A) All the 50.0 g of X will dissolve at 313 K  
 B) At 313 K 29.0 g of X will remain undissolved  
 C) Solubility of X decrease with increase of temperature  
 D) On cooling the solution of X from 313 K to 283 K more than 21.0 g of X will crystallize out. Which of the above statements are correct?
- A) A and B                      B) A and D                      C) B and C                      D) A, C and D
39. Two elements A and B contain 13 and 8 proton respectively. If the number of neutrons in them happen to be 14 and 8 respectively, the formula unit mass for the compound between A and B unit would be
- A) 43                              B) 75                              C) 102                              D) 112
40. The reaction of burning carbon in oxygen is represented by the equation
- $$\text{C}_{(s)} + \text{O}_{2(g)} \longrightarrow \text{CO}_{2(g)} + \text{Heat} + \text{Light}$$
- When 9.0 g of solid carbon is burnt in 16.0 g of oxygen gas, 22.0 g of carbon dioxide is produced. The mass of carbon dioxide gas formed on burning of 3.0 g of carbon in 32.0 g of oxygen would be (Note : Atomic mass of C = 12.0 u, O = 16.0 u)
- A) 6.60 g                      B) 7.33 g                      C) 8.25 g                      D) 11.00 g

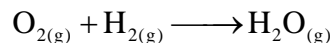
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**SPACE FOR ROUGH WORK**

41. An atom of an element (X) has its K, L and M shells filled with some electrons. It reacts with sodium metal to form a compound NaX. The number of electrons in the M shell of the atom (X) will be

- A) Eight                      B) Seven                      C) Two                      D) One

42. Oxygen gas reacts with hydrogen to produce water. The reaction is represented by the equation



The above reaction is an example of

- a) oxidation of hydrogen
- b) reduction of oxygen
- c) reduction of hydrogen
- d) redox reaction

A) a, b and c

B) b, c and d

C) a, c and d

D) a, b and d

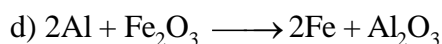
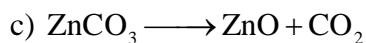
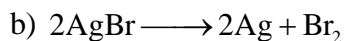
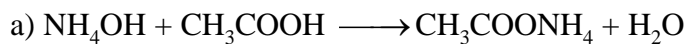
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SPACE FOR ROUGH WORK



43. Match the items of column-I with the items of column-II

**Column-I**



A) d  $\rightarrow$  ii; c  $\rightarrow$  iv; b  $\rightarrow$  i; a  $\rightarrow$  iii

C) b  $\rightarrow$  ii; d  $\rightarrow$  i; a  $\rightarrow$  iii; c  $\rightarrow$  iv

**Column-II**

i) Thermal decomposition

ii) Thermit reaction

iii) Photochemical reaction

iv) Neutralization reaction

B) c  $\rightarrow$  i; a  $\rightarrow$  ii; d  $\rightarrow$  iii; b  $\rightarrow$  iv

D) a  $\rightarrow$  iv; b  $\rightarrow$  iii; c  $\rightarrow$  i; d  $\rightarrow$  ii

44. Metals like sodium, potassium, calcium and magnesium are extracted by electrolysis of their chlorides in molten state. These metals are not extracted by reducing of their oxides with carbon because

a) reduction with carbon is very expensive

b) carbon readily makes alloy with these metals

c) carbon has less affinity for oxygen than these metals

d) carbon is weaker reducing agent than these metals

A) a and b

B) b and c

C) c and d

D) d and a

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SPACE FOR ROUGH WORK

45. A hydrocarbon has a molecular formula as C<sub>6</sub>H<sub>12</sub>. It does not react with hydrogen to give C<sub>6</sub>H<sub>14</sub> nor does it react with chlorine to give C<sub>6</sub>H<sub>12</sub>Cl<sub>2</sub>. The hydrocarbon C<sub>6</sub>H<sub>12</sub> is
- a) A saturated hydrocarbon                      b) An unsaturated hydrocarbon  
c) An open chain hydrocarbon                  d) A cyclo-alkane  
A) a and b                      B) c and d                      C) d and b                      D) a and d
46. An organic compound is a clear liquid having a molecular formula C<sub>4</sub>H<sub>8</sub>O. It has an open chain structure. Without any carbon-carbon double bond. The compound can be
- a) an alcohol                      b) an ester                      c) an aldehyde                      d) a ketone  
A) a and b                      B) c and d                      C) b and d                      D) d and a
47. An element with atomic number 17 is placed in the group 17 of the long form periodic table. Element with atomic number 9 is placed above and with atomic number 35 is placed below it. Element with atomic number 16 is placed left and with atomic number 18 is placed right to it. Which of the following statements are correct?
- a) Valency of the element with atomic number 18 is zero  
b) Elements of the element with atomic number 18 is zero  
c) Valency of elements with atomic number 9, 17 and 35 is one  
d) Element with atomic number 17 is more electronegative than element with atomic numbers 16 and 35  
A) a, b and c                      B) a, c and d                      C) b, c and d                      D) a, b and d

## SPACE FOR ROUGH WORK

48. A drop each of two non-corrosive and non-irritating liquids A and B at a temperature of  $22^{\circ}\text{C}$  are placed on the skin. Liquid A gives a more cooling sensation than liquid B. Which of the following can be said about the liquids A and B?
- A) Liquid A has higher boiling point than that of liquid B
  - B) Liquid A has higher latent heat of vaporisation than that of liquid B
  - C) Liquid A has lower latent heat of vaporisation than that of liquid B
  - D) The boiling points of liquid A and B are equal
49. There is a mixture of three solid compounds A, B and C. Out of these compounds A and C are soluble in water and compound C is sublimable also. In what sequence the following techniques can be used for their effective separation?
- I) Filtration
  - II) Sublimation
  - III) Crystallisation from water extract
  - IV) Dissolution in water
- A) II, I, IV, III      B) IV, I, II, III      C) I, II, III, IV      D) II, IV, I, III
50. Which of the following is a suitable example for illustrating the law of conservation of mass? (Atomic mass of O = 16; H = 1)
- A) 18g of water is formed by the combination of 16g oxygen with 2g of hydrogen
  - B) 18g of water in liquid state is obtained by heating 18g of ice
  - C) 18g of water is completely converted into vapour state on heating
  - D) 18g of water freezes at  $4^{\circ}\text{C}$  to give same mass of ice

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**SPACE FOR ROUGH WORK**

51. A metal carbonate X on treatment with a mineral acid liberates a gas which when passed through aqueous solution of a substance Y gives back X. The substance Y on reaction with the gas obtained at anode during electrolysis of brine gives a compound Z which can decolorise coloured fabrics. The compounds X, Y and Z respectively are
- A)  $\text{CaCO}_3$ ,  $\text{Ca(OH)}_2$ ,  $\text{CaOCl}_2$                       B)  $\text{Ca(OH)}_2$ ,  $\text{CaO}$ ,  $\text{CaOCl}_2$   
 C)  $\text{CaCO}_3$ ,  $\text{CaOCl}_2$ ,  $\text{Ca(OH)}_2$                       D)  $\text{Ca(OH)}_2$ ,  $\text{CaCO}_3$ ,  $\text{CaOCl}_2$
52. A salt can be between produced by reaction
- a) A weak acid and weak base                      b) Metal oxide and water  
 c) Metal and mineral acid                      d) Metal oxide and a mineral acid
- A) a, b and c                      B) b, c and d                      C) c, d and a                      D) d, a and b
53. A silvery white metal X reacts with water at room temperature to produce a water soluble compound Y and a colourless gas Z. The reactions is highly exothermic and the Z catches fire immediately during the reaction. The solution of Y in water on reacting with stoichiometric amount of dilute solution of hydrochloric acid gives a solution of  $\text{pH} = 7.0$  The compounds X, Y and Z respectively are:
- A) Al,  $\text{Al(OH)}_3$  and  $\text{H}_2$                       B) Ag, AgOH and  $\text{H}_2$   
 C) K, KCl and  $\text{H}_2$                       D) Na, NaOH and  $\text{H}_2$

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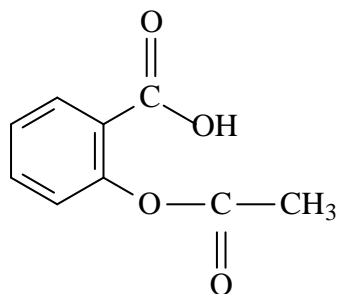
SPACE FOR ROUGH WORK

54. A compound X is obtained by the reaction of alkaline  $\text{KMnO}_3$  with another compound Y followed by acidification. Compound X also reacts with compound Y in presence of few drops of  $\text{H}_2\text{SO}_4$  to form a sweet smelling compound Z. The compound X, Y and Z are respectively.
- A) Ethanol, Ethene, Ethanoic acid                      B) Ethanoic acid, Ethanol, Ethylethanoate  
C) Ethanoic Acid, Ethanal, Ethene                      D) Ethanol, Ethanoic Acid, Sodium Ethanoate
55. An element X (atomic number 12) reacts with another element Y (Atomic number 17) to form a compound Z. Which of the following statements are true regarding this compound?
- I) Molecular formula of Z is  $\text{XY}_2$                       II) It is soluble in water  
III) X and Y are joined by sharing of electrons                      IV) It would conduct electricity in the molten state  
A) II and III                      B) I and III                      C) I, III and IV                      D) II and IV
56. The metal (M) forms an oxide,  $\text{M}_2\text{O}_3$ . The formula of its nitride will be
- A)  $\text{M}_2\text{N}_3$                       B) MN                      C)  $\text{M}_2\text{N}$                       D)  $\text{M}_3\text{N}_2$
57. Which one of the following statement is incorrect about graphite and diamond?
- A) Graphite is smooth and slippery  
B) Diamond is good conductor of heat  
C) Graphite is a good conductor of electricity  
D) Physical and chemical properties of graphite and diamond are different

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SPACE FOR ROUGH WORK

58. The functional groups present in the following compound are:-



- A) Alcohol, ketone and ester
- B) Ester and carboxylic acid
- C) Carboxylic acid and ketone
- D) Ester and alcohol

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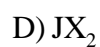
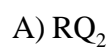
SPACE FOR ROUGH WORK

59. A part of the modern periodic table is presented below in which the alphabets represent the symbols of elements.

Table

Group → Period ↓	1	2	14	15	16	17
2				M	Q	
3	A	J			R	
4	E		L			T
5	G					X

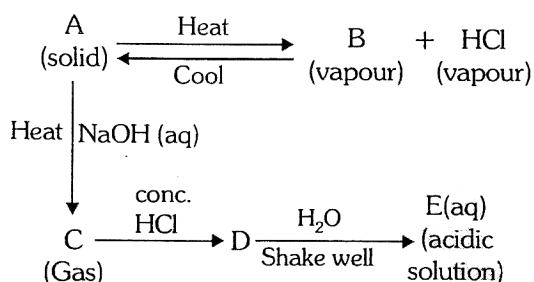
Consult the above part of the periodic table to predict which of the following is a covalent compound




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SPACE FOR ROUGH WORK

60. The schematic diagram is given below



Which of the following is an incorrect statement?

- A) A and E are chemically same                      B) A and D are chemically same  
C) D and E are chemically same                      D) C and E are chemically same

### **SECTION 3 - MATHEMATICS**

61. On dividing a natural number by 13, the remainder is 3 and on dividing the same number by 21, the remainder is 11. If the number lies between 500 and 600, then the remainder on dividing the number by 19 is
- A) 4                      B) 6                      C) 9                      D) 13

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SPACE FOR ROUGH WORK



62. If  $S_1, S_2, S_3, \dots, S_r$  are the sums of first  $n$  terms of  $r$  arithmetic progressions whose first terms are 1, 2, 3, ..... and whose common differences are 1, 3, 5, ..... respectively, then the value of  $S_1 + S_2 + S_3 + \dots + S_r$  is

A)  $\frac{(nr-1)(nr+1)}{2}$       B)  $\frac{(nr+1)nr}{2}$       C)  $\frac{(nr-1)nr}{2}$       D)  $\frac{n(nr+1)}{2}$

63. If  $\operatorname{cosec} x - \sin x = a$  and  $\sec x - \cos x = b$ , then

A)  $(a^2b)^{\frac{2}{3}} + (ab^2)^{\frac{2}{3}} = 1$       B)  $(ab^2)^{\frac{2}{3}} + (a^2b^2)^{\frac{2}{3}} = 1$   
 C)  $a^2 + b^2 = 1$       D)  $b^2 - a^2 = 1$

64. If Anish is moving along the boundary of a triangular field of sides 35m, 53m and 66 m and you are moving along the boundary of a circular field whose area is double the area of the triangular field, then the radius of the circular field is: (Take  $\pi = \frac{22}{7}$ )

A)  $14\sqrt{3}$  m      B)  $3\sqrt{14}$  m      C)  $28\sqrt{3}$  m      D)  $7\sqrt{3}$  m

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SPACE FOR ROUGH WORK

65. Two circles with centres P and R touch each other externally at O. A line passing through O cuts the circles at T and S respectively. Then,
- A) PT and RS are of equal length                      B) PT and RS are perpendicular to each other  
C) PT and RS are intersecting                      D) PT and RS are parallel
66. If in a triangle ABC, D is the mid point of side BC,  $\angle ADB = 45^\circ$  and  $\angle ACD = 30^\circ$ , then  $\angle BAD$  and  $\angle ABC$  are respectively equal to
- A)  $15^\circ, 105^\circ$                       B)  $30^\circ, 105^\circ$                       C)  $30^\circ, 100^\circ$                       D)  $60^\circ, 100^\circ$
67. The centre of the circle passing through the points  $(6, -6)$ ,  $(3, -7)$  and  $(3, 3)$  is
- A)  $(3, 2)$                       B)  $(-3, -2)$                       C)  $(3, -2)$                       D)  $(-3, 2)$
68. The mean of three positive numbers is 10 more than the smallest of the numbers and 15 less than the largest of the three. If the median of the three numbers is 5, then the mean of squares of the numbers is
- A)  $108\frac{2}{3}$                       B)  $116\frac{2}{3}$                       C)  $208\frac{1}{3}$                       D)  $216\frac{2}{3}$
69. ABC is a triangle in which  $AB = 4$  cm,  $BC = 5$  cm, and  $AC = 6$  cm. A circle is drawn to touch side BC at P, side AB extended at Q and side AC extended at R. Then, AQ equals
- A) 7.0 cm                      B) 7.5 cm                      C) 6.5 cm                      D) 15.0 cm

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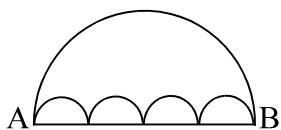
SPACE FOR ROUGH WORK

70. Three dice are thrown simultaneously. The probability of getting a total of at least 5 of the numbers appearing on their tops is
- A)  $\frac{5}{54}$                       B)  $\frac{7}{54}$                       C)  $\frac{49}{54}$                       D)  $\frac{53}{54}$
71. ABCD is a square with side a. With centres A, B, C and D four circles are drawn such that each circle touches externally two of the remaining three circles. Let  $\delta$  be the area of the region in the interior of the square and exterior of the circles. Then the maximum value of  $\delta$  is
- A)  $a^2(1-\pi)$                       B)  $a^2\left(\frac{4-\pi}{4}\right)$                       C)  $a^2(\pi-1)$                       D)  $\frac{\pi a^2}{4}$
72. The value of  $\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 89^\circ$  is
- A) 0                      B) 1                      C) 2                      D) 4
73. Which of the following statements holds always?
- A) Every rectangle is a square                      B) Every parallelogram is a trapezium  
C) Every rhombus is a square                      D) Every parallelogram is a rectangle
74. Which of the following polygons are uniquely determined when all the sides are give?
- A) Quadrilateral                      B) Triangle                      C) Pentagon                      D) Hexagon

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SPACE FOR ROUGH WORK

75. All the arcs in the following diagram are semi-circles. This diagram shows two paths connecting A to B. Path I is the single large semi-circle and Path II consists of the chain of small semi-circles.



- A) Path I is longer than Path II  
B) Path I of the same length of Path II  
C) Path I is shorter than Path II  
D) Path I is of the same length as path II. Only if the number of semi circles is not more than 4
76. One integer is chosen out of 1, 2, 3 ....., 100. What is the probability that it is neither divisible by 4 nor by 6  
A) 0.59                      B) 0.67                      C) 0.41                      D) 0.33
77. A solid metal sphere of surface area  $S_1$  is melted and recast into a number of smaller spheres.  $S_2$  is the sum of the surface areas of all the smaller spheres. Then  
A)  $S_1 > S_2$                       B)  $S_2 > S_1$   
C)  $S_1 = S_2$                       D)  $S_1 = S_2$  only if all the smaller spheres of equal radii

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SPACE FOR ROUGH WORK

78. Which of the following is an irrational number?

A)  $\sqrt{41616}$

B) 23.232323

C)  $\frac{(1+\sqrt{3})^3 - (1-\sqrt{3})^3}{\sqrt{3}}$

D) 23.10100100010000 .....

79. Median of a data number which has number of observations below and above it. The median set is a an equal below and of the data

1, 9, 4, 3, 7, 6, 8, 8, 12, 15 is

A) 7.5

B) 7

C) 8

D) Any number between 7 and 8

80. Suppose you walk from home to the bus stand at 4 km/h and immediately return at x km/h. If the average speed is 6 km/h then x is

A) 8 km/h

B) 10 km/h

C) 12 km/h

D) Cannot be determined unless the distance from home to bus stand is known

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SPACE FOR ROUGH WORK

81. If  $\theta$  is an acute angle such that  $\tan \theta = \frac{2}{3}$ , then evaluate  $\left( \frac{1 + \tan \theta}{\sin \theta + \cos \theta} \right) \left( \frac{1 - \cot \theta}{\sec \theta + \operatorname{cosec} \theta} \right)$

A)  $-\frac{1}{5}$

B)  $\frac{-4}{\sqrt{13}}$

C)  $\frac{1}{5}$

D)  $\frac{4}{\sqrt{13}}$

82. The value of the expression  $\frac{1}{\sqrt{11-2\sqrt{30}}} - \frac{3}{\sqrt{7-2\sqrt{10}}} - \frac{4}{\sqrt{8+4\sqrt{3}}}$  after simplification is

A)  $\sqrt{30}$

B)  $2\sqrt{10}$

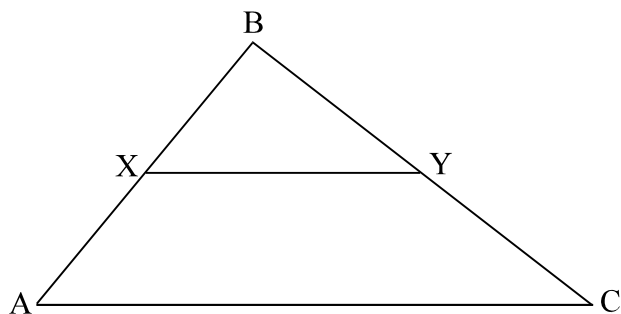
C) 1

D) 0

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SPACE FOR ROUGH WORK

83. In  $\triangle ABC$ ,  $\overline{XY}$  is parallel to  $\overline{AC}$  and divides the triangle into the two parts of equal area. Then the  $\frac{AX}{AB}$  equals

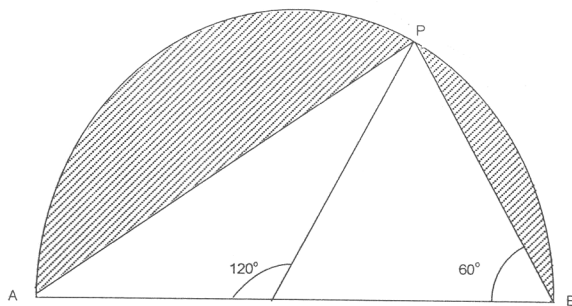


- A)  $\frac{\sqrt{2}+1}{2}$       B)  $\frac{2-\sqrt{2}}{2}$       C)  $\frac{2+\sqrt{2}}{2}$       D)  $\frac{\sqrt{2}-1}{2}$
84. In how many ways can a given square be cut into two congruent trapeziums?
- A) Exactly 4      B) Exactly 8      C) Exactly 12      D) More than 12

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SPACE FOR ROUGH WORK

85. The number of integers  $n$  ( $< 20$ ) for which  $n^2 - 3n + 3$  is a perfect square is  
 A) 0                                  B) 1                                  C) 2                                  D) 3
86. For positive  $x$  and  $y$ , the LCM is 225 and HCF is 15. There  
 A) is exactly one such pair                                  B) are exactly two such pairs  
 C) are exactly three such pairs                                  D) are exactly four such pairs
87. In the figure, a semi-circle with centre  $O$  is drawn on  $AB$ . The ratio of the larger shaded area to the smaller shaded area is



- A)  $\frac{4\pi - 2\sqrt{3}}{2\pi - 2\sqrt{3}}$                                   B)  $\frac{4\pi - 3\sqrt{3}}{3\pi - 3\sqrt{3}}$                                   C)  $\frac{4\pi - 3\sqrt{3}}{2\pi - 3\sqrt{3}}$                                   D)  $\frac{3\pi - 2\sqrt{3}}{2\pi - 2\sqrt{3}}$

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SPACE FOR ROUGH WORK



88. Which of the numbers can be expressed as the sum of squares of two positive integers, as well three positive integers?
- A) 75  
B) 192  
C) 250  
D) 100
89. If the line segments joining the midpoints of the consecutive side of a quadrilateral ABCD form a rectangle then  $\square ABCD$  must be
- A) Rhombus  
B) Square  
C) Kite  
D) All of the above
90. The sides of a triangle are of lengths 20, 21 and 29 units. The sum of the lengths of altitudes will be
- A)  $\frac{1609}{29}$  units  
B) 49 units  
C)  $\frac{1609}{21}$  units  
D) 70 units

## SPACE FOR ROUGH WORK



Name .....

Batch..... Roll No. ....

05-04-2018

IIT/AIIMS 2020 SCREENING &amp; SCHOLARSHIP EXAM

Batch :IIT/AIIMS

LT<sub>18A</sub>/TP/MOD/[A]**Answer key****Section-1 : PHYSICS**

1. D
2. D
3. A
4. C
5. A
6. A
7. B
8. C
9. A
10. A
11. C
12. B
13. C
14. C
15. A
16. D
17. C
18. C
19. A
20. C
21. C
22. A
23. B
24. D
25. B
26. C
27. D
28. C
29. D
30. C

**Section-II : Chemistry**

31. B
32. C
33. A
34. B
35. D
36. D
37. B
38. B
39. C
40. D
41. B
42. D
43. D
44. C
45. D
46. B
47. B
48. C
49. D
50. A
51. A
52. C
53. D
54. B
55. D
56. B
57. D
58. B
59. A
60. D

**Section-III : Mathematics**

61. A
62. B
63. A
64. A
65. D
66. B
67. C
68. D
69. B
70. D
71. B
72. B
73. B
74. B
75. B
76. B
77. B
78. D
79. D
80. C
81. A
82. D
83. B
84. D
85. C
86. B
87. C
88. C
89. A
90. A

## IIT/AIIMS - 2022 SCREENING CUM SCHOLARSHIP

**Date : 27<sup>th</sup> December 2019**

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD  
VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE  
90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

**I have read all the instructions and shall  
abide by them**

\_\_\_\_\_  
**Signature of the Candidate**

**Roll Number**

**I have verified all the information  
filled by the candidate**

\_\_\_\_\_  
**Signature of the Invigilator**

# SECTION I

## PHYSICS

### PART I

This part contains **25** questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

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SPACE FOR ROUGH WORK

1. A body is moving with constant acceleration from A to B in a straight line. C is the mid-point of AB. If  $u$  and  $v$  are the speeds at A and B respectively. The speed at C is

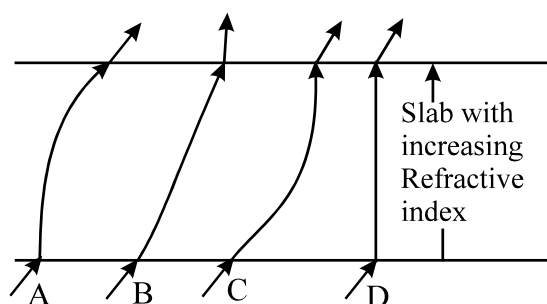
A)  $\frac{u + v}{2}$

B)  $\frac{v - u}{2}$

C)  $\sqrt{\frac{u^2 + v^2}{2}}$

D)  $\sqrt{\frac{v^2 - u^2}{2}}$

2. A ray of light enters a slab of material with increasing refractive index. Four possibilities of the trajectory of the ray are shown below



The correct choice is :

A) A

B) B

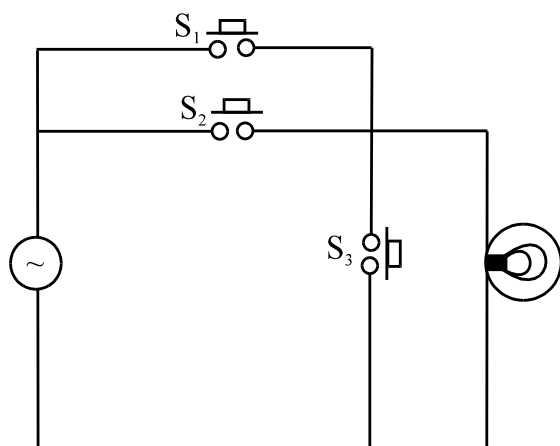
C) C

D) D

---

SPACE FOR ROUGH WORK

3. Consider the circuit below. The bulb will light up if :

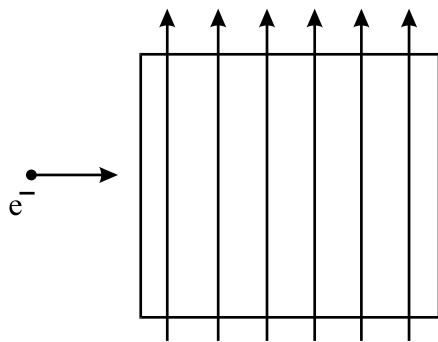


- A)  $S_1$ ,  $S_2$  and  $S_3$  are all closed  
B)  $S_1$  is closed but  $S_2$  and  $S_3$  are open  
C)  $S_2$  and  $S_3$  are closed but  $S_1$  is open  
D)  $S_1$  and  $S_3$  are closed but  $S_2$  is open
4. An electric heater consists of a nichrome coil and runs under 220 V, consuming 1 kW power. Part of its coil burned out and it was reconnected after cutting off the burnt portion. The power it will consume now is :
- A) more than 1 kW  
B) less than 1 kW, but not zero  
C) 1 kW  
D) 0 kW

---

SPACE FOR ROUGH WORK

5. An electron enters a chamber in which a uniform magnetic field is present as shown



An electric field of appropriate magnitude is also applied so that the electron travels undeviated without any change in its speed through the chamber. We are ignoring gravity. Then, the direction of the electric field is

- A) opposite to the direction of the magnetic field
- B) opposite to the direction of the electron's motion
- C) normal to the plane of the paper and coming out of the plane of the paper
- D) normal to the plane of the paper and into the plane of the paper

---

SPACE FOR ROUGH WORK



6. The distance between a town and a factory is 30 km. A man started to walk from the factory to the town at 6.30 am. While a cyclist left the town for the factory at 6.40 am riding at a speed of  $18 \text{ km hr}^{-1}$ , the man met the cyclist after walking 6 km. Find at what time they met?  

A) 7.30 am

B) 8.00 am

C) 8.10 am

D) 8.30 am
7. Tripling the speed of a motor car multiplies the distance needed for stopping it : (brakeing force is same)  

A) By 3 times

B) By 5 times

C) By 6 times

D) By 9 times
8. A small lead shot is embedded in a big lump of ice floating in a jar of water. The level of water in the jar is noted. When all the ice melts down, the level of water in the jar would :  

A) Go down

B) Be raised

C) Remain unchanged

D) None of the above
9. If a body is positively charged, then it has  

A) excess of electrons

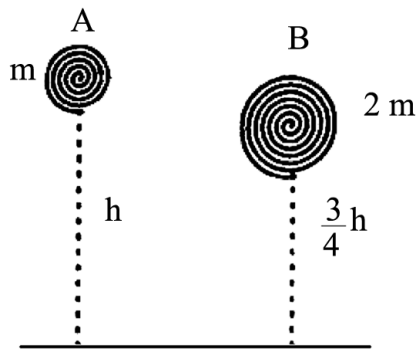
B) excess of neutrons

C) deficiency of electrons

D) deficiency of protons

## SPACE FOR ROUGH WORK

10. Whenever the magnetic flux linked with a coil changes, an induced e.m.f. is produced in the circuit. The e.m.f. lasts
- A) for a short time  
B) for a long time  
C) for ever  
D) so long as the change in flux takes place
11. If work, force and time are represented by A, B and C respectively then the term  $\left(\frac{A}{BC}\right)$  will represent
- A) Displacement  
B) Velocity  
C) Acceleration  
D) Momentum
12. Ratio of potential energies of body A and body B will be



- A)  $\frac{U_A}{U_B} = \frac{2}{3}$       B)  $\frac{U_A}{U_B} = \frac{3}{2}$       C)  $\frac{U_A}{U_B} = \frac{1}{3}$       D)  $\frac{U_A}{U_B} = \frac{3}{4}$

## SPACE FOR ROUGH WORK

13. Identify the following colours in the ascending order of their frequencies

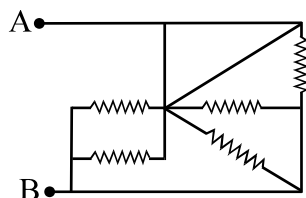
A) Red, blue, yellow, green

B) Blue, green, yellow, red

C) Red, green, yellow, blue

D) Red, yellow, green, blue

14. The circuit shown has 5 resistors of equal resistance  $R$ . Calculate equivalent resistances across point A and B



A)  $\frac{11R}{12}$

B)  $\frac{13R}{12}$

C)  $\frac{R}{5}$

D)  $\frac{15R}{6}$

15. Which one of the following alternating current is supplied in our house hold circuits

A) 110 V and 50 Hz

B) 220 V and 60 Hz

C) 110 V and 60 Hz

D) 220 V and 50 Hz

---

SPACE FOR ROUGH WORK

16. A parachutist with total weight 75 kg drops vertically onto a sandy ground with a speed of  $2 \text{ ms}^{-1}$  and comes to a halt over a distance of 0.25 m. The average force from the ground on her is close to :
- A) 600 N                      B) 1200 N                      C) 1350 N                      D) 1950 N
17. Newton's second law gives a measure of :
- A) Velocity    B) Force  
C) Kinetic energy                                      D) Potential energy
18. If the velocity of an object is doubled, its kinetic energy is :
- A) doubled    B) tripled  
C) increase 4 times                                      D) increase 8 times
19. Sound frequencies greater than 20 kHz is called
- A) Audible    B) Ultrasonic  
C) Infrasonic    D) None of these
20. Which of the following acts as a circuit protection device
- A) Conductor    B) Inductor  
C) Switch    D) Fuse

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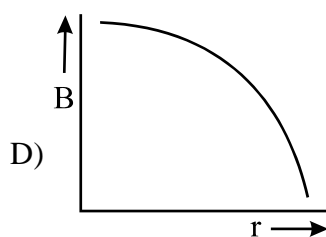
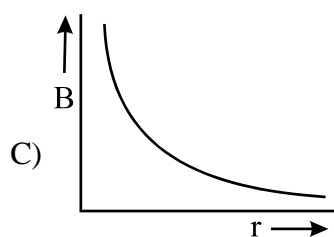
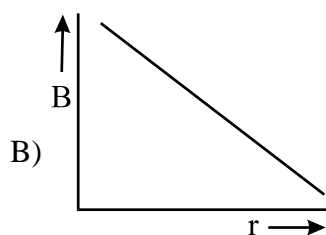
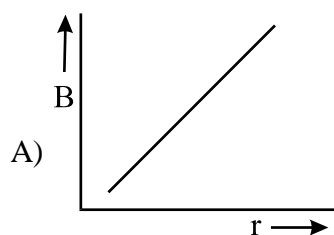
**SPACE FOR ROUGH WORK**

21. A point object is placed at a distance of 10 cm and its real image is formed at a distance of 20 cm from a concave mirror. When the object is moved by 0.1 cm towards the mirror, then the image will be moved by about
- A) 0.4 cm away from the mirror                      B) 0.4 cm towards the mirror
- C) 0.8 cm away from the mirror                      D) 0.8 cm towards the mirror
22. When a piece of aluminium wire of finite length is drawn through a series of dies to reduce its diameter to half its original value, its resistance will become
- A) 4 times    B) 8 times
- C) 2 times    D) 16 times
23. Which of the following statements is false?
- Action and reaction pair
- A) acts on two different objects                      B) do not have equal magnitude
- C) have opposite directions                              D) have resultant zero

---

SPACE FOR ROUGH WORK

24. You are riding on your bicycle with inflated tyres. Your friend asks for a lift and sits on the carrier behind you :
- A) The air pressure in the tyres increases
  - B) The air pressure in the tyres decreases
  - C) The air pressure in the tyres remains the same
  - D) Nothing in the system changes except the reaction of the ground
25. Which of the following graphs, shows the variation of magnetic induction  $B$  with distance  $r$  from a long wire carrying a current



---

SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 26-30

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Three Digit Answer

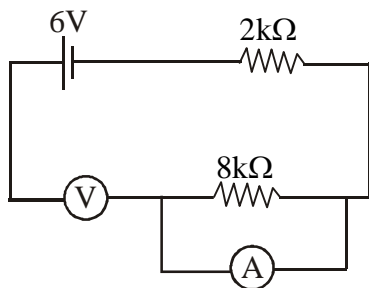
If answer is 180

Example 3

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

SPACE FOR ROUGH WORK

26. Consider two spherical planets of same average density. Planet 2 is 8 times as massive as planet 1. The ratio of the acceleration due to gravity on the second planet to that on the first is
27. The wavelength of a sound wave whose frequency is 220 Hz and speed is 440 m/s in a given medium is ..... metre
28. A 10 N force is applied on a body produces an acceleration of  $1 \text{ m/s}^2$ . The mass of the body is ..... kg
29. In the circuit shown below, a student performing Ohm's law experiment accidentally puts the voltmeter and the ammeter as shown in the circuit below; the reading in the voltmeter will be ..... V (nearest integer)



30. The mass of a body is 10 kg on the moon. Its mass on the earth will be ..... kg

---

SPACE FOR ROUGH WORK



## SECTION II CHEMISTRY

### PART I

This part contains **25** questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK



35. Match the compound in Column (I) with melting point in Column (II) and boiling point in Column (III) and select the correct match from options provided

Column I (compound)	Column II (melting point)	Column III (boiling point)
(a) acetic acid	(i) 90 K	(p) 351 K
(b) ethanol	(ii) 290 K	(q) 111 K
(c) methane	(iii) 156 K	(r) 391 K

- A) (a) - (ii), (r); b - (iii), p; c - (i), q  
B) (a) - (ii), (r); b - (i), q; c - (iii), p  
C) (a) - (ii), (q); b - (i), p; c - (iii), r  
D) (a) - (ii), (p); b - (ii), r; c - (i), q
36. How many moles of aluminium ions are present in 0.051 g aluminium oxide?  
(atomic mass : Al = 27 u, O = 16 u)
- A) 0.051  
B) 0.102  
C) 0.001  
D) 0.0005
37. Atomic mass of Helium is 4 u. How many moles of Helium atoms are there in 52 g Helium?
- A) 52  
B) 13  
C)  $4 \times 6.022 \times 10^{23}$   
D)  $13 \times 6.022 \times 10^{23}$

---

SPACE FOR ROUGH WORK

38. Dry ice is

A) ice below  $0^{\circ}\text{C}$

B) Solid  $\text{CO}_2$

C) Solid  $\text{H}_2\text{O}_2$

D) ice dried between folds of filter paper

39. Match the category of elements in Column (I) with the elements in Column (II) and the type of elements in Column (III) and select the correct match from choices given

Column I (category)	Column II (elements)	Column III (type of the elements)
(a) Dobereiner's triads	(i) Kr, Xe, Rn	(p) inert gases
(b) p-block elements	(ii) Cu, Ag, Au	(q) alkali metals
(c) transition elements	(iii) Li, Na, K	(r) coinage elements

A) (a) - (iii), (q); b - (i), p; c - (ii), r

B) (a) - (ii), (r); b - (iii), q; c - (i), r

C) (a) - (iii), (q); b - (ii), r; c - (i), p

D) (a) - (i), (p); b - (ii), r; c - (iii), q

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SPACE FOR ROUGH WORK

40. Which among the following is not considered to be a state of matter by scientists?
- A) Gas  
B) Plasma  
C) Bose-Einstein Condensate  
D) Colloid
41. In the extraction of iron 'slag is removed from top to leave molten iron at bottom of the furnace' is based on the principle that/of
- A) a sublimable volatile component changes directly from solid to gaseous state on heating  
B) separation of components of a mixture that boil at different temperatures without decomposition  
C) separation of pure solid in the form of crystals from a solution  
D) immiscible liquids separate out in layers depending on their densities
42. Ozone depletion is mainly due to the release of which substance among the following into atmosphere?
- A)  $\text{CO}_2$   
B) CFC  
C)  $\text{CH}_4$   
D) CO
43. The amount of heat energy released during the combustion of unit mass of a fuel is called its calorific value. Which fuel among the following has highest calorific value?
- A) methane  
B) methanol  
C) hydrogen  
D) carbon monoxide

## SPACE FOR ROUGH WORK

44. For standard state of a substance the temperature is taken to be 298 K. Which among the following is this temperature expressed in  $^{\circ}\text{F}$
- A)  $77^{\circ}\text{F}$                       B)  $102.6^{\circ}\text{F}$                       C)  $45^{\circ}\text{F}$                       D)  $57^{\circ}\text{F}$
45. Match the substance in Column (I) with their composition in Column (II) and type of the substances in Column (III). Select the correct match from the provided options

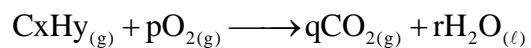
Column I (substance)	Column II (composition)	Column III (type of substances)
(a) baking soda	(i) $\text{NaOH}$	(p) base
(b) soda ash	(ii) $\text{NaHCO}_3$	(q) acid salt
(c) caustic soda	(iii) $\text{Na}_2\text{CO}_3$	(r) normal salt

- A) (a) - (ii), (p); b - (iii), q; c - (i), r                      B) (a) - (ii), (q); b - (i), p; c - (iii), r
- C) (a) - (i), (p); b - (ii), q; c - (iii), r                      D) (a) - (ii), (q); b - (iii), r; c - (i), p
46. Which compound among the following do not belong to the same homologous series as the others?
- A)  $\text{C}_4\text{H}_8$                       B)  $\text{C}_2\text{H}_6$                       C)  $\text{CH}_4$                       D)  $\text{C}_5\text{H}_{12}$

---

**SPACE FOR ROUGH WORK**

47. The correct set of co-efficients for the following balanced equation is



	p	q	r
A	$\left(x + \frac{y}{4}\right)$	$\left(\frac{x}{2}\right)$	y
B	$\left(x + \frac{y}{2}\right)$	2x	$\left(\frac{y}{2}\right)$
C	$\left(\frac{x+y}{2}\right)$	x	y
D	$\left(x + \frac{y}{4}\right)$	x	$\left(\frac{y}{2}\right)$

48. Which among the following sets of atomic numbers corresponds to elements of the same group?

A) 11, 19, 27, 5      B) 12, 20, 4, 38      C) 9, 16, 35, 3      D) 24, 47, 42, 55

---

**SPACE FOR ROUGH WORK**

49. IUPAC name of the compound  $\text{CH}_3 - \overset{\overset{\text{CH}_3}{|}}{\underset{\underset{\text{OH}}{|}}{\text{C}}} - \text{CH}_2 - \text{COOH}$  is
- A) 3-ethyl-2-methylbutanoic acid                      B) 3-hydroxy-3-methylbutanoic acid
- C) 2-hydroxy-2-methylbutane                      D) 3,3-diethyl butane
50. Which among the following are the elements present in stainless steel?
- A) Fe, C and Ni                      B) Fe, Cr and Cu
- C) Fe, Cr and Ni                      D) Fe, Ni and Cu
51. Hydrogen gas is not liberated when
- A) Zinc react with aqueous NaOH                      B) Zinc react with aqueous HCl
- C) Magnesium react with aqueous  $\text{H}_2\text{SO}_4$                       D) Copper react with aqueous  $\text{HNO}_3$

---

SPACE FOR ROUGH WORK



52. Match the metals in Column (I) with the name of the minerals in Column (II) and type of the minerals in Column (III) and select the correct match from choices given

Column I (metal)	Column II (mineral)	Column III (type of the mineral)
(a) Al	(i) Calamine	(p) Sulphate
(b) Ca	(ii) Chinaclay	(q) Carbonate
(c) Zn	(iii) Gypsum	(r) Silicate

- A) (a) - (iii), (r); b - (i), p; c - (ii), q  
 B) (a) - (ii), (q); b - (iii), r; c - (i), p  
 C) (a) - (i), (r); b - (iii), p; c - (ii), q  
 D) (a) - (ii), (r); b - (iii), p; c - (i), q
53. The phenomenon of change of a liquid into vapours at any temperature below its boiling point is called
- A) Sublimation      B) Condensation      C) Evaporation      D) Flocculation
54. The functional group of alcohols is



55. pH of which substance among the following is the least under identical conditions?
- A) Vinegar      B) Lime water      C) Water      D) Milk

---

SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 56-60

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

56. How many atoms are there in a molecule of the element Argon?
57. 15 g of a compound  $C_xH_{12}O_y$  contain 1 g hydrogen. What is the molar mass of organic compound? (atomic mass of H = 1 u)
58. What is the percentage of carbon in acetic acid? (at mass of C = 12 u, H = 1 u, O = 16 u)
59. 2g hydrogen (at. mass = 1 u) and 80 gram bromine (at. mass = 80 u) react to form hydrogen bromide. What is the maximum number of grams of hydrogen bromide that can be formed?
60. A diamond ring weighing 4g contain 1 carat diamond placed on 24 carat gold. What is the percentage of gold in the diamond ring?

---

SPACE FOR ROUGH WORK

# SECTION III

## MATHEMATICS

### PART I

This part contains **25** questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

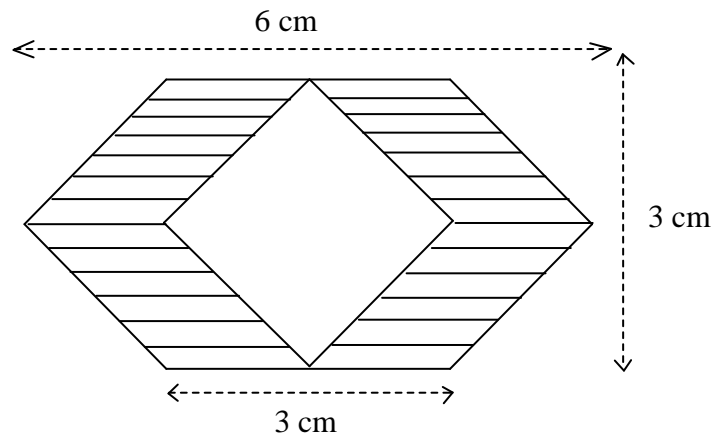
#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK



65. The area of shaded region



A)  $4\sqrt{2} \text{ cm}^2$

B)  $3\sqrt{2} \text{ cm}^2$

C)  $6 \text{ cm}^2$

D)  $9 \text{ cm}^2$

66. What is the greatest positive integer 'm' which makes  $m^3 + 100$  is divisible by  $m + 10$

A) 890

B) 990

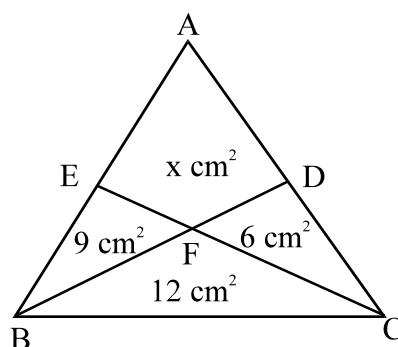
C) 790

D) 690

---

SPACE FOR ROUGH WORK

67.  $\triangle ABC$  is subdivided into four regions with areas are marked as in the figure. Then the value of  $x$  as the area of  $AEFD$  is

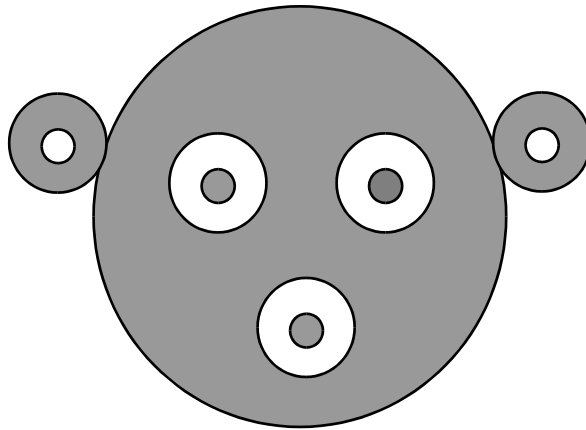


- A)  $\frac{103}{5}$       B)  $\frac{107}{5}$       C)  $\frac{113}{5}$       D)  $\frac{117}{5}$
68. If  $a^2 + a + 1 = 0$  then  $a^2 + \frac{1}{a^2}$  is
- A) a positive integer      B) a negative integer  
C) a positive rational but not integer      D) a negative rational but not integer
69.  $a, b, c, d$  are real numbers such that  $a - 2016 = b + 2017 = c - 2018 = d + 2019$ . Then which among the following is correct
- A)  $d < b < a < c$       B)  $d < a < b < c$       C)  $c < b < a < d$       D)  $b < a < d < c$

---

SPACE FOR ROUGH WORK

70. One Sunday Raju observed that 20 lotus were in a pond. Next day he noticed that lotus were doubled to 40. On third day it became 80 lotus. He continuously noticed and observed that the pond was full of lotus by 20 days. Then on which day he observed only  $\frac{1}{4}$ th of the entire pond had filled by lotus
- A) Wednesday      B) Monday      C) Thursday      D) Friday
71. If diameter of 3 circles are in the ratio 4 : 2 : 1. Perimeter of smallest circle is  $8\pi$  cm. Then the area of shaded region is



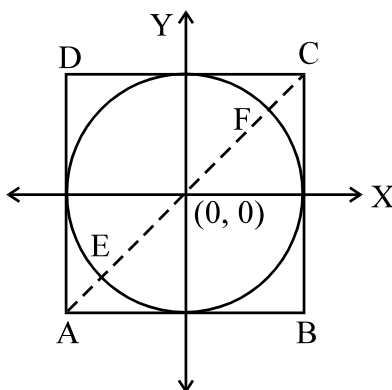
- A)  $196\pi$       B)  $208\pi$       C)  $216\pi$       D)  $220\pi$
72. 20% of 50% is what percent of 25% of 40% is
- A) 80%      B) 60%      C) 90%      D) 100%

---

SPACE FOR ROUGH WORK



73.  $x - 2$  is a factor of  $p(x)$  where  $p(x)$  is given by  $x^3 - x^2 + ax + b$ . When  $p(x)$  is divided by  $x - 3$ , the remainder is 10. Then  $a + b$  is
- A) 1                      B) 0                      C) -1                      D) 2
74. In a right triangle smaller sides are in the ratio  $1 : 2$  and one acute angle is  $\theta$  then  $\sin \theta + \cos \theta$  is
- A)  $\frac{1}{\sqrt{5}}$                       B)  $\frac{2}{\sqrt{5}}$                       C)  $\frac{3}{\sqrt{5}}$                       D)  $\frac{4}{\sqrt{5}}$
75. A circle of radius 1 unit is inscribed in a square ABCD. If center of the circle is  $(0, 0)$  and diagonal AC of square intersect the circle at E, F. Then co-ordinate of F is



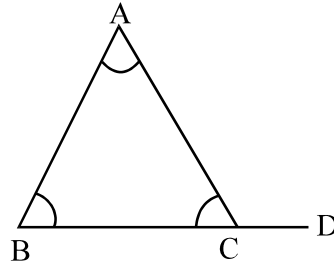
- A)  $\left(\frac{1}{2}, \frac{1}{2}\right)$                       B)  $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$                       C)  $(\sqrt{2}, \sqrt{2})$                       D)  $\left(\frac{2}{3}, \frac{2}{3}\right)$

---

SPACE FOR ROUGH WORK

- ## SPACE FOR ROUGH WORK

82. In the given figure BC is produced to D and  $\angle BAC = 40^\circ$  and  $\angle ABC = 70^\circ$ . Find the value of  $\angle ACD$  :



- A)  $30^\circ$                       B)  $40^\circ$                       C)  $70^\circ$                       D)  $110^\circ$
83. Find the value of  $\frac{-4}{5} \times \frac{3}{7} \times \frac{15}{16} \times \left( \frac{-14}{9} \right)$
- A)  $\frac{1}{2}$                       B)  $\frac{1}{4}$                       C)  $\frac{1}{5}$                       D)  $\frac{1}{6}$
84. Area of the square inscribed in a circle of radius 10 is
- A) 100                      B) 200                      C) 300                      D) 314
85. The length of the ladder making an angle of  $45^\circ$  with the ground and whose foot is 7m away from the wall is
- A) 14 m                      B)  $14\sqrt{2}$ m                      C)  $\frac{7\sqrt{2}}{2}$ m                      D)  $7\sqrt{2}$ m

---

**SPACE FOR ROUGH WORK**

## PART II

This part contains **5** questions

Question No. 86-90

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

86. Given ordered pairs are in a sequence as follows (2, 12) (9, 9) (16, 6) (23, 3) ..... then sum of the entries in the 10<sup>th</sup> ordered pair is
87. Number of digits in  $8^{15} \cdot 5^{40}$  is
88. Find 'm' so that  $(-3)^{m+1} \times (-3)^5 = (-3)^7$
89. The discriminant of the quadratic equation  $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$  is :
90. The next term of the sequence 9, 16, 27, 42, .... is :

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SPACE FOR ROUGH WORK

Name .....

Batch..... Roll No. ....

**Brilliant** STUDY CENTRE  
**PALA**

VERSION

**A**

27 - 12 - 2019

**PHYSICS + CHEMISTRY - MATHEMATICS - KEY**

**PHYSICS**

1. C
2. C
3. B
4. A
5. D
6. B
7. D
8. A
9. C
10. D
11. B
12. A
13. D
14. C
15. D
16. C
17. B
18. C
19. B
20. D
21. A
22. A
23. B
24. A
25. C
26. 2
27. 2
28. 10
29. 6
30. 10

**CHEMISTRY**

31. C
32. B
33. C
34. B
35. A
36. C
37. B
38. B
39. A
40. D
41. D
42. B
43. C
44. A
45. D
46. A
47. D
48. B
49. B
50. C
51. D
52. D
53. C
54. A
55. A
56. 1
57. 180
58. 40
59. 81
60. 95

**MATHEMATICS**

61. A
62. B
63. C
64. C
65. D
66. A
67. D
68. B
69. A
70. A
71. B
72. D
73. B
74. C
75. B
76. D
77. A
78. C
79. B
80. C
81. C
82. D
83. A
84. B
85. D
86. 50
87. 42
88. 1
89. 64
90. 61

## IIT/AIIMS - 2022 SCREENING CUM SCHOLARSHIP TEST

**Date : 29<sup>th</sup> September 2019**

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

**I have read all the instructions and shall abide by them**

\_\_\_\_\_  
**Signature of the Candidate**

**Roll Number**

**I have verified all the information filled by the candidate**

\_\_\_\_\_  
**Signature of the Invigilator**

# SECTION I

## PHYSICS

### PART I

This part contains **25** questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

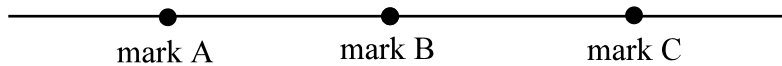
#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK



1. A car moving at 160 km/h when passes the mark A, driver applies brake and reduces its speed uniformly to 40 km/h at mark C. The marks are spaced at equal distances along the road as shown below. At which part of the track the car has instantaneous speed of 100 km/h. Neglect the size of the car



- A) At mark B  
B) Between mark A and mark B  
C) Between mark B and mark C  
D) Insufficient information to decide
2. A car moves with uniform acceleration along a straight line PQR. Its speed at P and R are 5 m/s and 25 m/s respectively. If  $PQ : QR = 1 : 2$ ; the ratio of the times taken by car to travel distance PQ and QR is :
- A) 1 : 2  
B) 2 : 1  
C) 1 : 3  
D) 1 : 1
3. A boy sitting on the topmost berth in the compartment of a train which is just going to stop on a railway station, drops an apple aiming at the open hand of his brother situated vertically below his hands at a distance of about 2 m. The apple will fall
- A) In the hand of his brother  
B) Slightly away from the hands of his brother in the direction of motion of the train  
C) Slightly away from the hands of his brother in the direction opposite to the direction of motion of the train  
D) None of the above

---

SPACE FOR ROUGH WORK

4. A body is under the action of two equal and opposite forces, each of 3 N. The body is displaced by 3 m. The work done is :
- A) +9 J                      B) Zero                      C) -9 J                      D) 18 J
5. The tidal wave in the sea are primarily due to gravitational effect of
- A) earth on the sea      B) sun on the earth      C) earth on the moon      D) moon on the earth
6. A polythene piece, rubbed with wool, is found to have a negative charge of  $4 \times 10^{-7}$  C. The number of electrons transferred is :
- A)  $2.5 \times 10^{12}$  from wool to polythene
- B)  $2.5 \times 10^{12}$  from polythene to wool
- C)  $1.5 \times 10^{12}$  from wool to polythene
- D)  $1.5 \times 10^{12}$  from polythene to wool
7. A magnetic field :
- A) Always exerts force on a charged particle
- B) Exerts force, if the charged particle is moving across the magnetic field lines
- C) Never exerts a force on a charged particle
- D) Exerts a force, if the charged particle is moving along the magnetic field lines

---

SPACE FOR ROUGH WORK

8. The word “KVPY” is written on a board and viewed through different lens such that board is at a distance beyond the focal length of the lens



(i)



(ii)

Ignoring magnification effects, consider the following statements

- I. Image (i) has been viewed from the planar side of a plano-concave lens and image (ii) from the planar side of a plano-convex lens
- II. Image (ii) has been viewed from the concave side of a plano-concave lens and image (ii) from the convex side of a plano-convex lens
- III. Image (i) has been viewed from the concave side of a plano-concave lens and image (ii) from the planar side of a plano-convex lens
- IV. Image (i) has been viewed from the planar side of a plano-concave lens and image (ii) from the convex side of a plano-convex lens

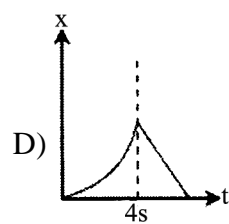
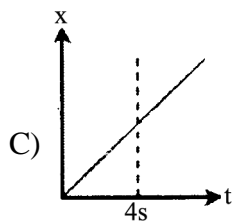
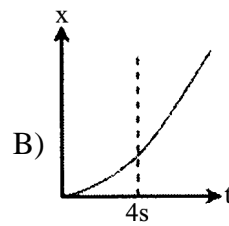
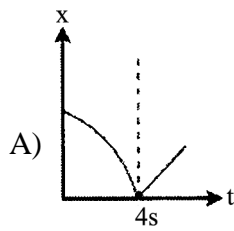
Which of the above statements are correct?

- A) Only III                      B) Only IV                      C) Only III and IV                      D) All four

---

SPACE FOR ROUGH WORK

9. An object at rest at the origin begins to move in the +x direction with a uniform acceleration of  $1 \text{ m/s}^2$  for 4s and then it continues moving with a uniform velocity of 4 m/s in the same direction. The x-t graph for object's motion will be -



10. The unit of frequency of the sound is :

A) Hertz

B) Metre

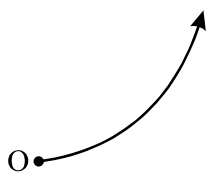
C) Metre/second

D) Second

---

SPACE FOR ROUGH WORK

11. A charged particle initially at rest at O, when released follows a trajectory as shown. Such a trajectory is possible in the presence of



- A) Electric field of constant magnitude and varying direction  
B) Magnetic field of constant magnitude and varying direction  
C) Electric field of constant magnitude and constant direction  
D) Electric and magnetic fields of constant magnitudes and constant directions which are parallel to each other
12. The figure shows a bar magnet and a metallic coil. Consider four situations
- I. Moving the magnet away from the coil      II. Moving the coil towards the magnet  
III. Rotating the coil about the vertical diameter      IV. Rotating the coil about its axis



An emf in the coil will be generated for the following situations

- A) I and II only      B) I, II and IV only      C) I, II and III only      D) I, II, III and IV

---

SPACE FOR ROUGH WORK

13. A clay ball of mass  $m$  and speed  $v$  strikes another metal ball of same mass  $m$ , which is at rest. They stick together after collision. The kinetic energy of the system after collision is :

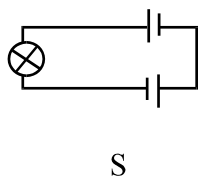
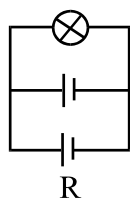
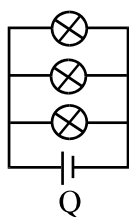
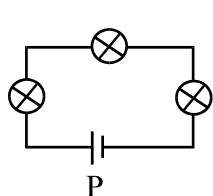
A)  $\frac{mv^2}{2}$

B)  $\frac{mv^2}{4}$

C)  $2mv^2$

D)  $mv^2$

14. Following figures show different combinations of identical bulb(s) connected to identical battery(ies). Which option is correct regarding the total power dissipated in the circuit



A)  $P < Q < R < S$

B)  $P < Q < R = S$

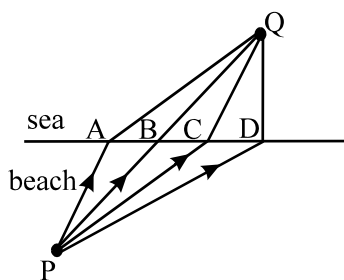
C)  $R < Q < P < S$

D)  $P < R < Q < S$

---

SPACE FOR ROUGH WORK

15. A girl standing at point P on a beach wishes to reach a point Q in the sea as quickly as possible. She can run at  $6 \text{ km h}^{-1}$  on the beach and swim at  $4 \text{ km h}^{-1}$  in the sea. She should take the path

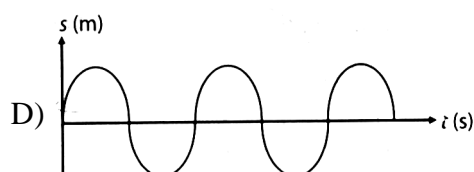
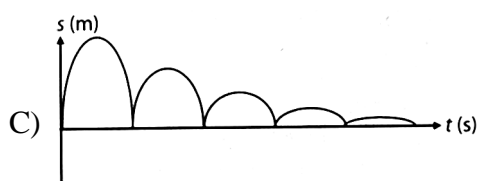
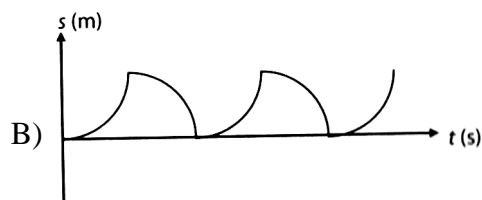
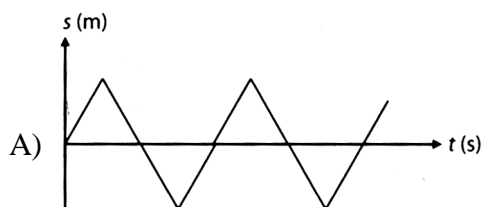


- A) PAQ                      B) PBQ                      C) PCQ                      D) PDQ
16. A  $750 \text{ W}$  motor drives a pump which lifts  $300$  litres of water per minute to a height of  $6$  meters. The efficiency of the motor is nearly (take acceleration due to gravity to be  $10 \text{ m/s}^2$ )
- A)  $30\%$                       B)  $40\%$                       C)  $50\%$                       D)  $20\%$
17. Sound travels  $1.5$  times faster in nickel than in bronze; which is of same density. This is because
- A) nickel has greater elasticity
- B) bronze is more elastic
- C) nickel is less elastic
- D) bronze is less ductile

---

SPACE FOR ROUGH WORK

18. A block of ice is floating in a liquid of specific gravity 1.2 in a beaker. When the ice melts completely, the level of liquid \_\_\_\_\_
- A) rises  
B) goes down  
C) remains same  
D) first rises and then goes down
19. The displacement-time graph of a ball bouncing on the ground and eventually coming to rest looks like

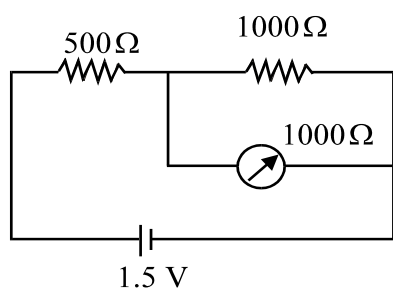


20. If a new unit of length is chosen such that the distance travelled by light in vacuum in one second is unity, then the distance between the sun and the earth in terms of the new unit if light takes 8 min and 20 s to cover this distance \_\_\_\_\_
- A) 500 new unit      B) 50 new unit      C) 5000 new unit      D) 5 new unit

## SPACE FOR ROUGH WORK



21. Two resistances  $500\ \Omega$  and  $1000\ \Omega$  are connected in series with a battery of  $1.5\text{ V}$ . The voltage across the  $1000\ \Omega$  resistance is measured by a voltmeter having a resistance of  $1000\ \Omega$ . The reading in the voltmeter would be \_\_\_\_\_



- A)  $1.5\text{ V}$                       B)  $1\text{ V}$                       C)  $0.75\text{ V}$                       D)  $0.5\text{ V}$
22. If  $6\text{ coulomb}$  of charge flows through a conductor in  $3\text{ seconds}$ , find the strength of electric current  
A)  $18\text{ A}$                       B)  $0.5\text{ A}$                       C)  $2\text{ A}$                       D)  $3\text{ A}$
23. A moving charge will produce :  
A) no field                      B) an electric field                      C) a magnetic field                      D) both B and C
24. An automobile travelling with speed of  $60\text{ km/h}$  can brake to stop with in a distance of  $20\text{ m}$ . If the car is going twice as fast i.e.  $120\text{ km/h}$ , the stopping distance will be :  
A)  $20\text{ m}$                       B)  $40\text{ m}$                       C)  $60\text{ m}$                       D)  $80\text{ m}$
25. How many dynes are equal to  $1\text{ N}$ ?  
A)  $10^6$                       B)  $10^4$                       C)  $10^5$                       D)  $10^3$

---

SPACE FOR ROUGH WORK

## **PART II**

This part contains **5** questions

Question No. 26-30

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### **CORRECT METHOD FOR MARKING PART - II QUESTIONS**

**If Single Digit Answer**

If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Two Digit Answer**

If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

**If Three Digit Answer**

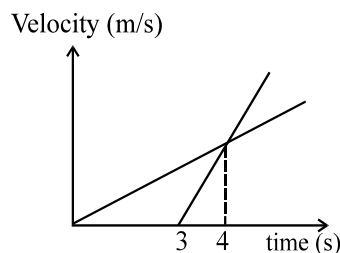
If answer is 180

**Example 3**

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

26. A material particle is chasing the other one and both of them are moving on the same straight line. Their motion after they pass a particular point is recorded and the data obtained is shown by velocity - time graph of the particles. How long after the start will the chase end?



27. Three unequal resistors in parallel are equivalent to a resistance of 1 ohm. If two of them are in the ratio 1 : 2 and if no resistance value is fractional, the largest value of the three resistances in ohm is :
28. A force of 50 N is applied normally on a table of area 2 m<sup>2</sup>. Then the pressure exerted on the table top is: (in Nm<sup>-2</sup>)
29. The net force acting on a body of mass 1 kg moving with a uniform velocity of 5 ms<sup>-1</sup> is : (answer in N)
30. 0.035 kg = \_\_\_\_\_ gm

---

SPACE FOR ROUGH WORK

## SECTION II CHEMISTRY

### PART I

This part contains **25** questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

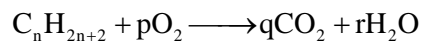
SPACE FOR ROUGH WORK

31. Which among the following is a compound?  
A) Ozone                      B) Fullerene                      C) Freon                      D) Graphene
32. The formula of a metal chloride is  $MCl_4$  the formula of the metal phosphate is  
A)  $MPO_4$                       B)  $M_2(PO_4)_3$                       C)  $M_4(PO_4)_3$                       D)  $M_3(PO_4)_4$
33. The SI unit of amount of substance is  
A) Kilogram                      B) Cubic metre                      C) Mole                      D) Gram
34. In which among the following cases a chemical reaction do not occur?  
A) Water is added to quick lime  
B) Baking soda is added to vinegar  
C) Sugar is added to salt solution  
D) White phosphorus glows in the dark
35. When an aqueous solution of Barium chloride is added to ammonium sulphate solution a white precipitate of Barium sulphate is formed. This reaction is an example of  
A) Simple combination reaction                      B) Double displacement reaction  
C) Redox reaction                      D) Neutralisation reaction

---

SPACE FOR ROUGH WORK

36. The correct set of co-efficients, p, q and r for the following, balanced equation is



	<b>p</b>	<b>q</b>	<b>r</b>
A	$(3n+1)$	$n$	$(n+1)$
B	$\left(\frac{3n+1}{2}\right)$	$\left(\frac{n}{2}\right)$	$(n+1)$
C	$(3n+1)$	$n$	$\left(\frac{n+1}{2}\right)$
D	$\left(\frac{3n+1}{2}\right)$	$n$	$(n+1)$

37. Aqueous solutions of which among the following do not conduct electricity?

- A) Cane sugar                      B) Vinegar                      C) Caustic soda                      D) Common salt

38. The acid present in lemon is

- A) Sulphuric acid                      B) Benzoic acid                      C) Hydrochloric acid                      D) Citric acid

---

**SPACE FOR ROUGH WORK**

39. In aqueous solution which among the following act as a weak acid?
- A)  $\text{H}_2\text{CO}_3$                       B)  $\text{HNO}_3$                       C)  $\text{H}_2\text{SO}_4$                       D)  $\text{HBr}$
40. Which among the following is correct regarding aqueous solution of a base?
- A) The solution contains  $\text{H}^+$  ion as well as  $\text{OH}^-$  ion
- B) The solution contains  $\text{OH}^-$  ions only
- C) The solution contains  $\text{H}^+$  ions only
- D) The nature of the base decide whether there are  $\text{H}^+$  ions or  $\text{OH}^-$  ions in solution
41. A metal exist as its carbonate ore on the crust of earth. The carbonate ore is concentrated by suitable method and is converted to metal oxide. The process by which concentrated carbonate ore is converted to metal oxide is
- A) Roasting                      B) Calcination                      C) Carbon reduction                      D) Electrolysis of molten ore
42. 'After concentrating the ore the metal can be obtained by just heating it in air'. This is applicable to which ore among the following?
- A)  $\text{Al}_2\text{O}_3$                       B)  $\text{Cu}_2\text{S}$                       C)  $\text{Fe}_2\text{O}_3$                       D)  $\text{ZnS}$
43. Silver articles become black after some time, when exposed to air. This is because of formation of
- A) Silver carbonate                      B) Silver oxide                      C) Silver sulphide                      D) Silver nitrate

---

SPACE FOR ROUGH WORK

44. Which among the following combination is incorrect?
- A) Amalgam - alloy where one of the metal is mercury  
B) Brass - alloy of copper and zinc  
C) Bronze - alloy of copper and tin  
D) Solder - alloy of tin and zinc
45. Among the following atomic radius is the least for
- A) Carbon                      B) Oxygen                      C) Nitrogen                      D) Lithium
46. Which element among the following is not classified as a metalloid?
- A) Carbon                      B) Silicon                      C) Germanium                      D) Arsenic
47.  $\text{CaCO}_3$  dissolves in water in presence of
- A)  $\text{O}_2$                       B)  $\text{CO}_2$                       C) CO                      D) NaOH
48. The fuel used in cryogenic rocket-engine CE-20 that was used in Chandrayan-2 mission is
- A) hydrogen peroxide and hydrazine                      B) kerosine mixed with TNT  
C) liquid oxygen and liquid hydrogen                      D) liquid helium and solid  $\text{CO}_2$

---

SPACE FOR ROUGH WORK



49. A crystalline substance (X) is water soluble. Aqueous solution of (X) produced a precipitate with Barium nitrate. On adding a drop of methyl orange the aqueous solution of (X) develops yellow colour. The substance (X) could be
- A)  $(\text{NH}_4)_2\text{SO}_4$       B)  $\text{CaCl}_2$       C)  $\text{K}_3\text{PO}_4$       D)  $\text{NaNO}_3$
50. No coloured gas is evolved or no colour change is observed when
- A) hydrated copper sulphate is heated strongly  
B) aqueous solutions of potassium iodide and lead nitrate are mixed together  
C) lead nitrate is heated strongly  
D) potassium nitrate is heated strongly
51. Which among the following is not formed when  $\text{FeSO}_4$  is heated strongly
- A)  $\text{FeO}$       B)  $\text{Fe}_2\text{O}_3$       C)  $\text{SO}_2$       D)  $\text{SO}_3$
52. Which among the following is not a balanced equation?
- A)  $3\text{Fe} + 4\text{H}_2\text{O} \longrightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$   
B)  $\text{P}_4 + 3\text{NaOH} + 2\text{H}_2\text{O} \longrightarrow 3\text{NaH}_2\text{PO}_2 + \text{PH}_3$   
C)  $4\text{FeS}_2 + 11\text{O}_2 \longrightarrow 2\text{Fe}_2\text{O}_3 + 8\text{SO}_2$   
D)  $4\text{Zn} + 10\text{HNO}_3 \longrightarrow 4\text{Zn}(\text{NO}_3)_2 + 5\text{H}_2\text{O} + \text{N}_2\text{O}$

---

SPACE FOR ROUGH WORK

53. Which among the following is incorrect?

A)  $\text{H}_2\text{S}$  burns in air to form  $\text{H}_2\text{O}$  and  $\text{SO}_2$

B)  $\text{BaCO}_3$  on heating decomposes to  $\text{BaO}$  and  $\text{CO}_2$

C)  $\text{CaO}$  can combine with  $\text{CO}_2$  to form  $\text{CaCO}_3$

D)  $\text{BaSO}_4$  combines with  $\text{H}_2\text{O}$  to form  $\text{Ba(OH)}_2$  and  $\text{H}_2\text{SO}_4$

54. Match the non metals in Column-I with the colour of non metals in Column-II and their physical state at 273 K and 1 atm. Pressure in Column (III) and select the correct match from choices given

Column - I (Non metals)	Column-II (Colour)	Column-III (Physical state at STP)
a) $\text{Cl}_2$	p) violet	I) liquid
b) $\text{Br}_2$	q) greenish yellow	II) Solid
c) $\text{I}_2$	r) red brown	III) Gas

A) a-q,-III

b - r, II

c-p, I

B) a - r, I

b - p, II

c - q, III

C) a - p, III

b - q, II

c - r, I

D) a - q, III

b - r, I

c - p, II

---

SPACE FOR ROUGH WORK

55. Match the salts in Column-I with nature of their aqueous solutions in Column-II and behaviour of the salts towards acid/alkali in Column-III and select the correct match from choices given

Column - I (Salts)	Column-II (Nature of aqueous solution)	Column-III (Behaviour towards acid/alkali)
a) NaCl	p) acidic	I) Pungent smell with aqueous NaOH
b) NH <sub>4</sub> Cl	q) basic	II) No pungent smell with aqueous NaOH or dil.H <sub>2</sub> SO <sub>4</sub>
c) CH <sub>3</sub> COONa	r) neutral	III) Pungent smell with dil.H <sub>2</sub> SO <sub>4</sub>

- |               |            |            |
|---------------|------------|------------|
| A) a - r, II  | b - p, I   | c - q, III |
| B) a - r, I   | b - p, III | c - q, II  |
| C) a - p, I   | b - q, II  | c - r, III |
| D) a - r, III | b - q, II  | c - p, I   |

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SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 56-60

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

56. How many grams of mass decrease is observed when 1 mole gypsum is carefully converted into 1 mole plaster of paris
57. One mole acetic acid weighs 60.2 g. How many grams does  $10^{23}$  molecules of acetic acid weigh (take avogadro constant rounded off to two decimal places for calculation)
58. Give the number of atoms present in a molecule of sulphuric acid
59. What is the atomic number of carbon.
60. What is the percentage of oxygen in NaOH? (Given at. mass of Na = 23 u, O = 16 u, H = 1u)

---

SPACE FOR ROUGH WORK

# SECTION III

## MATHEMATICS

### PART I

This part contains **25** questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

61. If  $x + y + z = 10$ ;  $x^2 + y^2 + z^2 = 20$  and  $x^3 + y^3 + z^3 = 40$  then  $xyz$  is :

A) 80

B) 100

C) 70

D) 90

62. LCM of  $\frac{7}{15}$  and  $\frac{3}{25}$  is :

A)  $\frac{7}{25}$

B)  $\frac{21}{25}$

C)  $\frac{21}{5}$

D)  $\frac{21}{125}$

63. If  $p(x) = x^3 - 3x^2 + 5x - 2$  then which among the following is true :

A)  $p(0) > p(1)$

B)  $p(1) < p(2)$

C)  $p(3) < p(2)$

D)  $p(1) > p(3)$

64. The digit in the unit place of  $3^{73} + 7^{37}$  is :

A) 0

B) 2

C) 4

D) 6

---

SPACE FOR ROUGH WORK

65.  $\frac{\sin^4 \theta - \cos^4 \theta}{\sin \theta - \cos \theta} =$

- A)  $\sin^3 \theta - \cos^3 \theta$       B)  $\sin^2 \theta - \cos^2 \theta$       C)  $\sin^3 \theta + \cos^3 \theta$       D)  $\sin \theta + \cos \theta$

66. If  $\frac{1^2 + 2^2 + \dots + n^2}{1 + 2 + \dots + n} = 17$ , then the sum  $\sum_{k=1}^n (2k-1)$  is :

- A) 576      B) 676      C) 625      D) 900

67. If 'n!' is read as 'n' factorial and defined as product of first 'n' natural numbers 1, 2, 3, ..... n. That is  $n! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot \dots \cdot (n-1) \cdot n$ , then the last digit of the sum  $1! + 2! + 3! + \dots + 11!$ , is :

- A) 1      B) 4      C) 3      D) 6

68. In a mathematics class Raju was requested to add square of first 10 natural numbers and Rani was requested to add cubes of first 10 natural numbers. After the calculation made by Raju and Rani, Ravi was requested to find the sum of the values obtained by Raju and Rani, Rahim was asked to subtract the sum obtained by Rani from the sum obtained by Raju. Finally Roshan was requested to calculate the sum of the values obtained by Ravi and Rahim. Then what was the sum obtained by Roshan?

- A) 550      B) 660      C) 770      D) 880

---

SPACE FOR ROUGH WORK



69. A superfast train takes 3 hours less than a slow train for a journey of 1200 km. If the speed of slow train is 20 km/hr less than the fast train, then the speed of slow train is :
- A) 100                      B) 70                      C) 90                      D) 80
70. Let x and y be two numbers, which leave remainders 4 and 5 respectively after dividing them by '7'. Then what is the remainder when we divide  $2x^2 + 3y^2$  by 7?
- A) 1                      B) 2                      C) 3                      D) 4
71. If  $p(x) = \frac{\frac{1}{x^{2017}} - \frac{1}{x^{2019}}}{\frac{1}{x^{2018}} - \frac{1}{x^{2020}}}$  then :
- A)  $p(3) < 3$                       B)  $p(3) > 3$                       C)  $p(3) = 0$                       D)  $p(3) = 3$
72. If x, y, z are real numbers such that,  $x^2 + 2y - 7 = 0$ ,  $y^2 + 4z + 7 = 0$ ,  $z^2 + 6x + 14 = 0$  then the value of  $x^2 + y^2 + z^2$  is :
- A) 21                      B) 17                      C) 14                      D) 29

---

**SPACE FOR ROUGH WORK**

73. If  $x + y + z = 0$  then the square of the value of  $\frac{(x+y)^2}{xy} + \frac{(y+z)^2}{yz} + \frac{(z+x)^2}{zx}$  is of:
- A) 3                      B) 1                      C) 9                      D) 81
74. If  $P(x, y) = 2x^2 + 3y^2$ ;  $Q(x, y) = 4x - 18y - 39$ , where  $x$  and  $y$  are real numbers, then the minimum value of  $P(x, y) - Q(x, y)$  is:
- A) 8                      B) 10                      C) 15                      D) 19
75. If  $1 + 2 + 3 + \dots + x = 190$  then the value of  $(x+1)(x+2)$  is:
- A) 420                      B) 480                      C) 540                      D) 560
76. If  $x > 0$ ;  $x + \frac{1}{x^2} = \frac{9}{2}$ , and  $x^2 + \frac{1}{x} = \frac{9}{4}$  then value of  $x^3 + \frac{1}{x} =$
- A)  $\frac{9}{8}$                       B)  $\frac{19}{8}$                       C)  $\frac{19}{9}$                       D)  $\frac{17}{8}$

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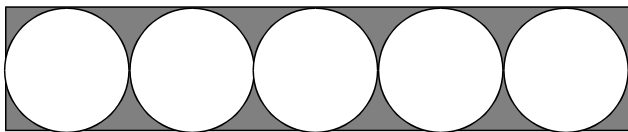
SPACE FOR ROUGH WORK

77. A circle centered at O touches all the sides of  $\triangle ABC$ , whose perimeter is 24cm, externally. If A be the farthest vertex of the triangle from the centre O of the circle and at a distance of 13 cm. Then the area of circle is :
- A)  $25\pi\text{cm}^2$                       B)  $36\pi\text{cm}^2$                       C)  $16\pi\text{cm}^2$                       D)  $49\pi\text{cm}^2$
78. A (0, 0), B(0, 6) and C(8,0) are vertices of a triangle. Then the diameter of circumcircle of  $\triangle ABC$  is :
- A) 8                                      B) 9                                      C) 10                                      D) 12
79. HCF of  $x^3 - 1$  and  $x^2 + x - 2$  is :
- A) 1                                      B)  $x - 1$                                       C)  $x - 2$                                       D)  $x + 1$
80. Difference between mean and median of the following data is :
- 9, 16, 10, 16, 13, 15, 17, 12, 18
- A) 1                                      B) 2                                      C) 0                                      D) -1

---

SPACE FOR ROUGH WORK

81. Five circles are inscribed in a rectangle as in the figure. The width of the rectangle is 8 cm. Then the area of shaded region is :



- A)  $60(4 - \pi)\text{cm}^2$                       B)  $60(6 - \pi)\text{cm}^2$
- C)  $80(6 - \pi)\text{cm}^2$                       D)  $80(4 - \pi)\text{cm}^2$
82. If the polynomial  $2x^3 + ax^2 + 3x - 5$  and  $x^3 + x^2 - 4x + a$  leave the same remainder when divided by  $x - 2$  then the value of  $a$  is :
- A)  $\frac{13}{3}$                       B)  $\frac{-13}{3}$                       C)  $\frac{3}{13}$                       D)  $\frac{-3}{13}$
83. Find the angle between the minute hand of clock and hour hand when the time is 8 : 20 am
- A)  $90^\circ$                       B)  $120^\circ$                       C)  $100^\circ$                       D)  $110^\circ$

---

SPACE FOR ROUGH WORK

84. If the sum of interior angles of a convex polygon is  $1980^\circ$  then its number of sides are :

A) 10

B) 11

C) 12

D) 13

85. The point on the y-axis which is equidistant from A(-5, -2) and B(3, 2) is :

A) (-4, 0)

B) (-2, 0)

C) (0, -3)

D) (1, -4)

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SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 86-90

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
●	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
●	9	9
0	●	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
●	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	●	8
9	9	9
0	0	●

SPACE FOR ROUGH WORK

86. The mean of first  $n$  natural numbers is  $\frac{5n}{9}$ , find  $n$  :
87. Varun and Arun make a plan to submit a school project of '7 -segment display' for numbers with match box sticks. Only 30 sticks are available for the project. Varun plan to make a display of two numbers - smallest and largest prime numbers between 50 and 100 - and remaining sticks are given to Arun. Arun decides to make a single two digit perfect square number by using all sticks given by Varun. For more clarity he wrote all possible two digit perfect square number which can be formed by remaining all sticks. Seeing this Varun add that all possible numbers written by Arun. Then what is the sum got by Varun?
88. Smallest two digit prime number is :
89. If  $N$  is a two digit perfect square number. Find  $N$  so that sum of their two digits becomes maximum :
90. The diameter of circle is 20cm. Find the radius of the circle in mm?

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SPACE FOR ROUGH WORK

**SPACE FOR ROUGH WORK**



**SPACE FOR ROUGH WORK**

29 - 09 - 2019

CODE

**A**

**PHYSICS**

1. C
2. D
3. B
4. B
5. D
6. A
7. B
8. CANCELLED
9. B
10. A
11. A
12. C
13. B
14. D
15. C
16. B
17. A
18. A
19. C
20. A
21. C
22. C
23. D
24. D
25. C
26. 6
27. 6
28. 25
29. 0
30. 35

**CHEMISTRY**

31. C
32. D
33. C
34. C
35. B
36. D
37. A
38. D
39. A
40. A
41. B
42. B
43. C
44. D
45. B
46. A
47. B
48. C
49. C
50. D
51. A
52. B
53. D
54. D
55. A
56. 27
57. 10
58. 7
59. 6
60. 40

**MATHEMATICS**

61. A
62. C
63. B
64. A
65. D
66. C
67. C
68. C
69. D
70. B
71. D
72. C
73. C
74. B
75. A
76. D
77. A
78. C
79. B
80. A
81. D
82. B
83. CANCELLED
84. D
85. CANCELLED
86. 9
87. 36
88. 11
89. 49
90. 100

## IIT/AIIMS - 2021 SCREENING CUM SCHOLARSHIP EXAM

**Date : 30<sup>th</sup> September 2018**

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD  
VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE  
90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

**I have read all the instructions and shall  
abide by them**

\_\_\_\_\_  
**Signature of the Candidate**

**Roll Number**

**I have verified all the information  
filled by the candidate**

\_\_\_\_\_  
**Signature of the Invigilator**

# SECTION I

## PHYSICS

### PART I

This part contains **25** questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

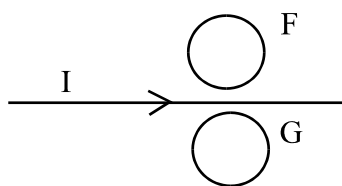
**Negative Marks** : -1 In all other cases

#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

1. Two conducting circular loops F and G are kept in a plane on either side of a straight current carrying wire as shown in the figure below



If the current in the wire decreases in magnitude, the induced current in the loops will be

- A) Clockwise in F and clockwise in G      B) Anti-clockwise in F and clockwise in G  
C) Clockwise in F and anti-clockwise in G      D) Anti-clockwise in F and anti-clockwise in G
2. A body falling from rest describes distance  $S_1$ ,  $S_2$  and  $S_3$  in the first, second and third seconds of its fall. Then the ratio of  $S_1 : S_2 : S_3$  is :
- A) 1 : 3 : 5      B) 1 : 1 : 1      C) 1 : 2 : 3      D) 1 : 4 : 9
3. A comb run through ones dry hair attracts small bits of paper. This is due to :
- A) comb is a good conductor  
B) Paper is a good conductor  
C) The atoms in the paper gets polarised by the charged comb  
D) The comb possesses magnetic properties

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SPACE FOR ROUGH WORK

4. Ice is floating on water in a beaker when ice completely melts then level of water in beaker :
- A) Increases  
B) Decreases  
C) Remains the same  
D) First increases then decreases
5. An apple falls from a tree because of gravitation between the earth and apple. If  $F_1$  is the magnitude of force exerted by the earth on the apple and  $F_2$  is the magnitude of force exerted by apple on earth, then :
- A)  $F_1$  is very much greater than  $F_2$   
B)  $F_2$  is very much greater than  $F_1$   
C)  $F_1$  is only a little greater than  $F_2$   
D)  $F_1$  and  $F_2$  are equal
6. A vehicle is moving on a road. Ink drops are falling, one at a time, on the road from the vehicle. After the vehicle has moved away, what one observes is shown (qualitatively) in the figure given below. From the figure we can conclude about the vehicle to be moving

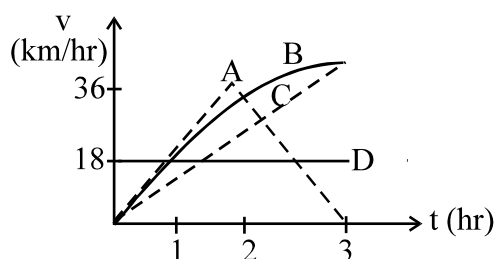


- A) From left to right with increasing speed  
B) From right to left with uniform speed  
C) From right to left with decreasing speed  
D) From left to right with decreasing speed

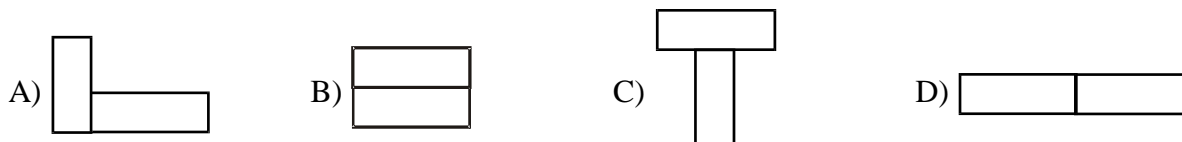
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SPACE FOR ROUGH WORK

7. Velocity time graph of four athletes for three seconds as given below. Who has travelled maximum distance?



- A) A                      B) B                      C) C                      D) D
8. You are given two identical steel pieces and only one of those is magnetized. In all the following arrangements, there is attraction between them. Which of the following arrangements helps us in identifying the magnet?



9. The S.I unit of pressure is

- A)  $\text{Nm}^2$                       B)  $\text{N/m}^2$                       C)  $\text{m}^2/\text{N}$                       D)  $\text{N/m}$

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SPACE FOR ROUGH WORK

10. The frequency of a source of sound is 50 Hz. How many times does it vibrate in 1 minute
- A) 50                      B) 300                      C) 3000                      D) 30000
11. A student was asked to draw a ray diagram for formation of image by a convex lens for the following positions of the object :
- a) Between F and 2F                      b) At F .
- c) At 2 F                      d) Between F and optical centre
- The position for which virtual image can be formed among these is
- A) b                      B) a                      C) c                      D) d
12. Which one of the following expressions has the same units as power?
- A) Force  $\times$  distance      B) Work  $\times$  time      C) Force  $\times$  acceleration      D) Force  $\times$  velocity
13. Suppose you are given three resistances of values 2, 4, 6 ohms. Which of the following value is not possible to get by arranging resistances in various combinations?
- A) Less than 2                      B) Equal to 4.4                      C) Equal to 7.33                      D) Equal to 6.75

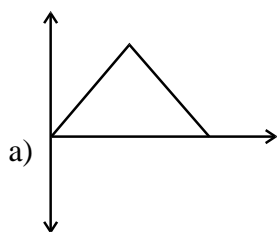
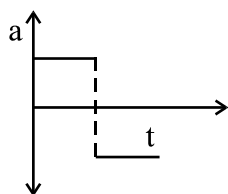
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SPACE FOR ROUGH WORK

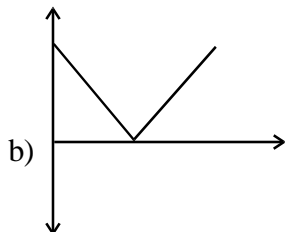


14. The coil of the heater is cut into two equal halves and only one of them is used in the heater. The ratio of the heat produced by the original coil to the halved coil is
- A) 2 : 1                      B) 1 : 2                      C) 4 : 1                      D) 1 : 4
15. Which of the given velocity time graphs matches the given acceleration time graph .

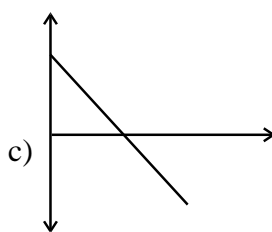
(Time is plotted along the horizontal axis in all cases)



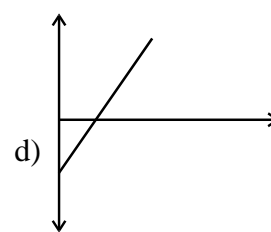
A) a



B) b



C) c

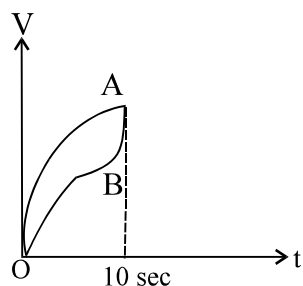


D) d

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SPACE FOR ROUGH WORK

16. A graph given, shows the variation of velocity and time of two bodies A and B. Choose an alternative for their average velocities

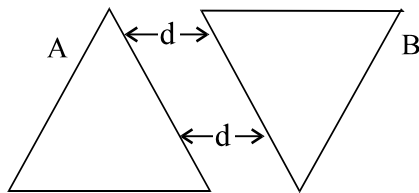
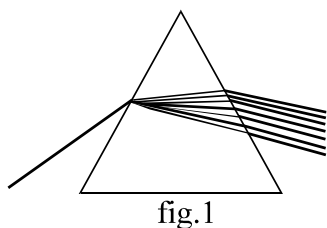


- A) Average velocities of both are same since they have same initial and final velocities
- B) Average velocities of both are same since both cover equal distance in equal interval of time
- C) Average velocity of A is greater than that of B since it covers more distance than B in 10 sec
- D) Nothing can be said since their accelerations are not given
17. A flat mirror creates a virtual image of your face which of the following optical elements in combination with the flat mirror can form a real image?
- A) convex lens      B) concave lens      C) concave mirror      D) convex mirror

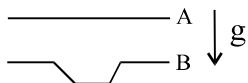
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SPACE FOR ROUGH WORK

18. When a ray of white light enters a prism, it begins to spread out in rainbow colours (figure 1). An inverted prism is brought close to this prism as shown in the figure 2. Both the prisms are made of same material. If a ray of white light is incident on surface A and “d” is made zero then output from surface “B” will be



- A) White light  
B) Rainbow colours which are converging  
C) Rainbow colours which are spreading out  
D) no light comes out from surface B
19. There are two tracks A and B as shown in the figure. The direction of gravity is also shown in the figure



If two similar balls begin to move at same uniform velocity at the same time which of the two balls will reach the end of the track faster?

- A) Ball on track A  
B) Ball on track B  
C) They will reach on the same time  
D) Cannot decide by the data given
20. Current  $I$  is equal to ( $Q$  - charge,  $t$  - time)
- A)  $Q \times t$   
B)  $Q/t^2$   
C)  $Q \times t^2$   
D)  $Q/t$

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SPACE FOR ROUGH WORK

21. Two bodies with kinetic energies in the ratio 2 : 3 are moving with equal momentum. The ratio of their masses
- A) 1 : 3                      B) 1 : 2                      C) 3 : 2                      D) 2 : 3
22. Figure 1 show a metallic disc with a hole at its centre. Which one of the figures from 2 to 5 schematically shows how the disc will appear after it is uniformly heated?

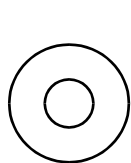


Figure 1

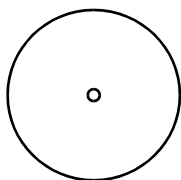


Figure 2

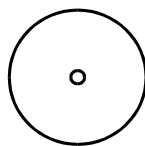


Figure 3

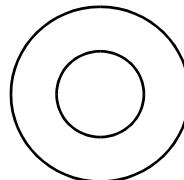


Figure 4

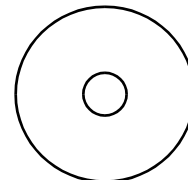


Figure 5

- A) Figure 2                      B) Figure 3                      C) Figure 4                      D) Figure 5
23. Unit of velocity is
- A) m/s                      B)  $m \times s$                       C)  $m/s^2$                       D)  $m \times s^2$
24. An object with an initial velocity  $V_0$  speeds up with an acceleration  $a$ , travelling a distance  $L_1$ , then it slows down with a deceleration  $a$ , and stops after travelling an additional distance  $L_2$ . If  $\frac{L_2}{L_1} = k$ , then what is the maximum velocity of the object during its travel?
- A)  $\frac{k-1}{k+1} v_0$                       B)  $\sqrt{\frac{k}{k-1}} v_0$                       C)  $\frac{k}{k-1} v_0$                       D)  $\sqrt{\frac{k+1}{k}} v_0$
25. A boy and a cart are moving in the same direction, with the boy going twice as fast as the cart. When he gets into the cart, the speed of the cart increases by 20%. Find the ratio of mass of cart to mass of boy
- A) 5                      B) 4                      C) 3                      D) 2

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SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 26-30

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Three Digit Answer

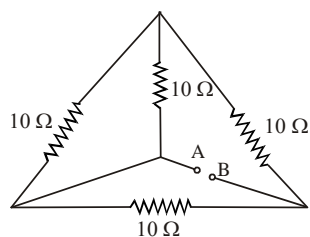
If answer is 180

Example 3

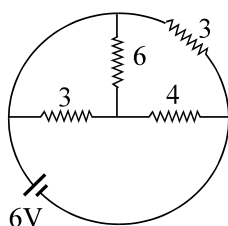
Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

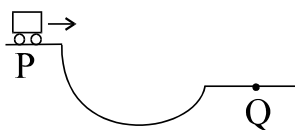
26. Calculate equivalent resistance between points A and B in the following circuit (in ohms)



27. A body of mass 2 kg is moving on a smooth floor in straight line with a uniform velocity of 10 m/s. Resultant force acting on the body is (in N)
28. In the circuit shown, the total current supplied by the battery is (in Ampere)



29. A trolley runs from point P to Q along a track, as shown in the figure. At point Q, its potential energy is 50 kJ less than at point P. At point P, the trolley has kinetic energy 5 kJ. Between P and Q, the work done against friction is 10 kJ. What is the kinetic energy at point Q? (in kJ)



30. A ball is dropped from the top of a tower of height 100 m. Simultaneously, another ball was thrown upward from the bottom of the tower with a speed of 50 m/s ( $g = 10 \text{ m/s}^2$ ). These two balls would cross each other after a time (in second)

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SPACE FOR ROUGH WORK

## SECTION II CHEMISTRY

### PART I

This part contains **25** questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct<sup>7</sup>

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

31. A student is given four sample of solids W, X, Y and Z, all of which have metallic lusture. The results of her investigations are written a tabular form not matched correctly. Select the correct match sequence for W, X, Y and Z.

Property	Solid
a) W is a good electrical conductor. X, Y, Z are poor electrical conductors.	P) $I_2$
b) When the solids are hit with a hammer W, flattens out, X shatters into many pieces, Y is smashed into powder and Z is not affected	Q) $SiO_2$
c) When the solids are heated with a Bunsen burner, Y melts with some sublimation, but X, W, Z do not meet	R) PbS
d) In treatment with 6M $HNO_3$ X dissolves, there is no effect on W or Z	S) Au

A) (W - P), (Y - S), (X - R), (Z - Q)

B) (W - S), (Y - P), (X - R), (Z - Q)

C) (W - S), (Y - P), (X - Q), (Z - R)

D) (W - S), (Y - Q), (X - P), (Z - R)

32. Which one of the following oxides gives pink colour with phenolphthalein indicator in aqueous solution

A)  $N_2O$                       B) NO                      C) BaO                      D)  $CO_2$

33. What are the gases formed, when lead nitrate on heating

A)  $N_2O$  and  $NO_2$               B)  $NO_2$  and  $H_2$               C)  $NO_2$  and NO              D)  $NO_2$  and  $O_2$

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**SPACE FOR ROUGH WORK**



34. Alumino thermite process is used for welding the railway tracks. This process is highly exothermic displacement reaction. Thermite composition is
- A)  $\text{Fe}_2\text{O}_3 : \text{Al} : \text{C}$   
(2:1:3)      B)  $\text{Fe}_2\text{O}_3 : \text{Al}$   
(1:3)      C)  $\text{Fe}_2\text{O}_3 : \text{Al}$   
(2:1)      D)  $\text{Fe}_2\text{O}_3 : \text{Al}$   
(3:1)
35. Pure gold known as 24 carat gold. It is very soft. In order to make jewellery, it mix with silver or copper. In India 22 carat Au is used for making ornaments. What is the percentage of Au present in 18 carat Au?
- A) 91.6%      B) 50.6%      C) 75%      D) 88.8%
36. Among the following is not an oxide ore of metal
- A) Copper pyrites      B) Cuprite      C) Bauxite      D) Magnetite
37. To protect decay, one is advised to brush the teeth regularly. The ingredient of the paste which checks the tooth decay is
- A) Acidic      B) Basic      C) Neutral      D) Corrosive
38. A metal 'X' has high melting point, good conductor of electricity, and is most malleable. Then the metal 'X' is
- A) Cu      B) Au      C) Fe      D) Pt
39. By which property are gases and liquids different from solid?
- A) Volume      B) Mass      C) Conductivity      D) Fluidity

---

**SPACE FOR ROUGH WORK**

40. Structure of nuclei of three atoms A, B and C are given below.
- A has 90 protons and 146 neutrons
- B has 92 protons and 146 neutrons
- C has 90 protons and 148 neutrons
- Based on the above data, which of these atoms are isotopes and which are isobars?
- A) A and C are isotopes B and C are isobars      B) A and B are isotopes A and C are isobars
- C) B and C are isobars A and B are isotopes      D) A and C are isotopes A and B are isobars
41. How much time it would take to distribute one Avogadro's number of wheat grains, if  $10^{10}$  grains are distributed each second
- A)  $1.9 \times 10^2$  years      B)  $1.9 \times 10^{10}$  years      C)  $1.9 \times 10^8$  years      D)  $1.9 \times 10^6$  years
42. The number of atoms present in 0.1 mole of  $P_4$  (atomic mass 31) are
- A)  $2.4 \times 10^{24}$  atoms      B) Same as in 0.05 mol of  $S_8$
- C)  $6 \times 10^{22}$  atoms      D) Same as in 3.1 g of phosphorous
43. A compound contain three elements A, B and C. If the oxidation number of  $A = +2$ ,  $B = +5$  and  $C = -2$ , the possible formula of the compound is
- A)  $A_3(B_4C)_2$       B)  $A_3(BC_4)_2$       C)  $A_4(B_4C_4)_2$       D)  $ABC_2$

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SPACE FOR ROUGH WORK

44. Select the anhydrous of acids from the following
- A)  $\text{NH}_3$                       B)  $\text{BaO}$                       C)  $\text{NO}_2$                       D)  $\text{CaO}$
45. A Brown and bright element 'x' when heated in presence of air turns into black substance 'y'. If hydrogen gas is passed over this heating material again 'x' is obtained 'x' and 'y' are
- A)  $\text{Cu}$  and  $\text{CuO}$               B)  $\text{S}$  and  $\text{SO}_2$               C)  $\text{C}$  and  $\text{CO}_2$               D)  $\text{Na}$  and  $\text{NaH}$
46. Somebody wanted to calculate the number of moles of oxygen atoms comprising of  $9.033 \times 10^{23}$  number of its atoms. The person further thought to calculate its mass and to find the number of moles of hydrogen atoms required to combined completely with this amount of oxygen to form water. The number of moles of oxygen atoms, their mass (in grams) and the number of moles of hydrogen atoms are
- A) 1.5, 3 and 24 respectively                      B) 15, 18 and 3 respectively  
C) 0.15, 27, 3 respectively                      D) 1.5, 24 and 3 respectively
47. Some rocket engines use a mixture of hydrazine,  $\text{N}_2\text{H}_4$  and hydrogen peroxide,  $\text{H}_2\text{O}_2$  as the propellant. The reaction is given by the following equation  $\text{N}_2\text{H}_{4(l)} + 2\text{H}_2\text{O}_{2(l)} \longrightarrow \text{N}_{2(g)} + 4\text{H}_2\text{O}_{(g)}$ . How much of the excess reactant, remains unchanged? When 0.850 mol of  $\text{N}_2\text{H}_4$  is mixed with 17g of  $\text{H}_2\text{O}_2$ ?
- A) 16g of  $\text{N}_2\text{H}_4$               B) 0.25 mol  $\text{H}_2\text{O}_2$               C) 19.2 g of  $\text{N}_2\text{H}_4$               D) 8.5 g of  $\text{H}_2\text{O}_2$

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SPACE FOR ROUGH WORK

48. An element X reacts with dilute.  $\text{H}_2\text{SO}_4$  as well as with NaOH to produce salt and  $\text{H}_2(\text{g})$ . Hence, it may be concluded that-
- I. X is an electropositive element
  - II. oxide of X is basic in nature
  - III. oxide of X is acidic in nature
  - IV. X is an electronegative element
- A) I, II, III are correct    B) IV, I, II are correct    C) III, IV, I are correct    D) II, III, IV are correct
49. A substance A react with another substance B to produce the product C and a gas D. If a mixture of the gas D and ammonia is passed through an aqueous solution of C, baking soda is formed. The substances A and B are
- A) HCl and NaOH    B) HCl and  $\text{Na}_2\text{CO}_3$     C) Na and HCl    D)  $\text{Na}_2\text{CO}_3$  and  $\text{H}_2\text{O}$
50. An element with atomic number 17 is placed in the group 17 of the long form periodic table. Element with atomic number 9 is placed above and with atomic number 35 is placed below it. Element with atomic number 16 is placed left and with atomic number 18 is placed right to it. Which of the following statements are correct?
- a) Valency of the element with atomic number 18 is zero
  - b) Elements with same valency will have atomic number 16, 17 and 18
  - c) Valency of elements with atomic number 9, 17 and 35 is one
  - d) Element with atomic number 17 is more electronegative than element with atomic numbers 16 and 35
- A) a, b and c    B) b, c and d    C) a, c and d    D) a, b and d

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SPACE FOR ROUGH WORK

51. What is the mass of oxygen required to react completely with 15g of  $H_2$  gas to form water?  
A) 140 g                      B) 115 g                      C) 107.5 g                      D) 120 g
52. Which of the following is a liquid metal?  
A) Bromine                      B) Mercury                      C) Iodine                      D) Argon
53. King of chemical is :  
A) HCl                      B)  $HNO_3$                       C)  $H_2SO_4$                       D) NaOH
54. The transition of substance directly from the solid to the gas phase. Without passing through the intermediate liquid phase is called  
A) Sublimation                      B) Freezing                      C) Vapourisation                      D) Boiling
55. A chemical equation is balanced in accordance with the law of:  
A) conservation of mass                      B) multiple proportion  
C) constant proportion                      D) reciprocal proportion

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SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 56-60

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

56. The ion of an element has 3 positive charge, 27 mass-number and 14 neutrons. What is the number of electrons in this ion?
57.  $A + 2B + 3C \longrightarrow AB_2C_3$ . Reaction of 6g of A,  $6 \times 10^{23}$  atom of B, 0.036 mol of C yields 4.8 g of compound  $AB_2C_3$ . If the atomic mass A and C are 60 and 80 respectively. The atomic mass of B is
58. Find the number of gram molecules of oxygen in  $6 \times 10^{24}$  molecules of CO
59. Formula of a metallic oxide is  $M_2O_3$ . Upon reduction with hydrogen the metallic oxide gives pure metal and water. 0.112 gm metal is produced by 6mg of hydrogen after complete reduction. Atomic mass of the metal is
60. Two elements A and B contain 13 and 8 proton respectively. If the number of neutrons in them happen to be 14 and 8 respectively, the formula unit mass for the compound between A and B unit would be

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SPACE FOR ROUGH WORK

## SECTION III

# MATHEMATICS

## PART I

This part contains **25** questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. **ONLY ONE** of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK



61. If  $x, y$  and  $z$  are distinct real numbers such that  $x:(y+z)=y:(z+x)$ , then
- A)  $x, y, z$  are all positive  
B)  $xy+yz+zx+1=0$   
C)  $x+y+z=0$   
D)  $x, y, z$  are all negative
62. If  $x$  and  $y$  are any two real numbers with opposite signs, which of the following is the greatest
- A)  $(|x|-|y|)^2$   
B)  $|x^2 - y^2|$   
C)  $x^2+y^2$   
D)  $(x-y)^2$
63. The sides of a quadrilateral are all positive integers and three of them are 30, 80 and 90 units. How many possible values are there for the fourth side \_\_\_\_\_
- A) 120  
B) 199  
C) 125  
D) 190
64. The number of distinct prime divisors of the number  $512^3-253^3-259^3$  is
- A) 5  
B) 6  
C) 7  
D) 9
65. Let a sequence have 1000 zeroes. In step 1, to every position in the sequence we add 2. In step 2, to every even position in the sequence we add 2. In step 3, to every position which is a multiple of 3 we add 2. This continues up to 1000th step. After 1000th step, what will be the value in the 600th position
- A) 48  
B) 24  
C) 64  
D) 124
66. The least number that is divisible by all the numbers from 1 to 10 both inclusive is \_\_\_\_\_
- A) 1820  
B) 2320  
C) 3520  
D) 2520

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SPACE FOR ROUGH WORK

67. Which one of the following is pure quadratic
- A)  $3x^2+2x$                       B)  $3x^2+2x+4$                       C)  $ax^2+bx+c$ ,  $abc \neq 0$     D)  $x^2+1$
68. If  $x$  and  $y$  are co-ordinates of the vertices of a triangle and more over they are rational numbers, then the triangle can't be a/an
- A) Right angled triangle    B) Isosceles triangle
- C) Isosceles and right angled triangle    D) Equilateral triangle
69. The ratio of the length of a side of an equilateral triangle and its height is
- A)  $1:\sqrt{3}$                       B)  $\sqrt{3}:2$                       C)  $2:\sqrt{3}$                       D)  $2:1$
70. If  $x = \frac{1}{1+\sqrt{3}}$  then the value of  $4x^2+4x+2$  is
- A) 3                                      B) 5                                      C) 6                                      D) 4
71. The average marks scored by Aswin in certain number of test is 84. He scored 100 marks in the next test. His new average score of all those tests is 86, then the total number of tests he appeared, is
- A) 8                                      B) 7                                      C) 5                                      D) 10

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SPACE FOR ROUGH WORK

72. The number of solution of the equation  $\sqrt{x} = x - 2$  is

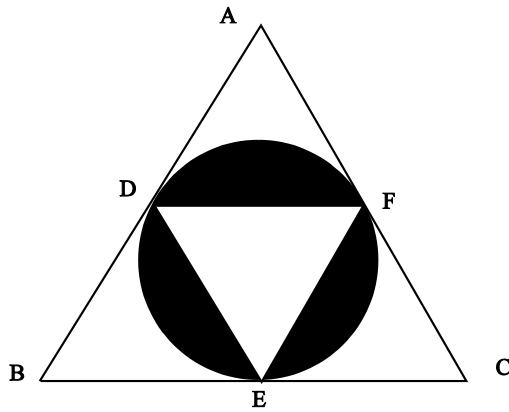
A) 2

B) 1

C) 0

D) 4

73. In the given figure, ABC is an equilateral triangle whose side is  $2\sqrt{3}\text{cm}$ . A circle is drawn which passes through the midpoints D, E and F of its sides. The area of the shaded region is



A)  $\frac{1}{4}(4\pi - 3\sqrt{3})$

B)  $\frac{1}{4}(\pi - 3\sqrt{3})$

C)  $\frac{1}{4}(2\pi - \sqrt{3})$

D)  $\frac{1}{4}(3\pi - \sqrt{3})$

74. If a cylinder of radius 3cm and height 10cm is melted and recast into the shape of small spheres of diameter 1cm, then the number of spheres so formed is

A) 35

B) 270

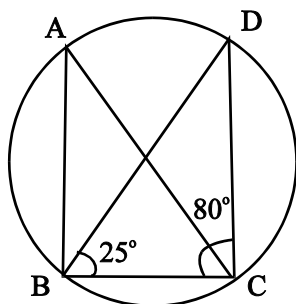
C) 540

D) 1080

---

SPACE FOR ROUGH WORK

75. The angle of elevation of the top of a building from the foot of the tower is  $30^\circ$  and the angle of elevation of the top of the tower from the foot of the building is  $60^\circ$ . If the tower is 30m high, then the height of the building is
- A) 30m                      B) 20m                      C) 15m                      D) 10m
76. If the heights and radii of a cone and a hemisphere are same then the ratio of their volumes is
- A) 1:2                      B) 2:3                      C) 1:3                      D) 1:1
77. In the given figure,  $\angle DBC = 25^\circ$  and  $\angle DCB = 80^\circ$  then  $\angle BAC$  is equal to

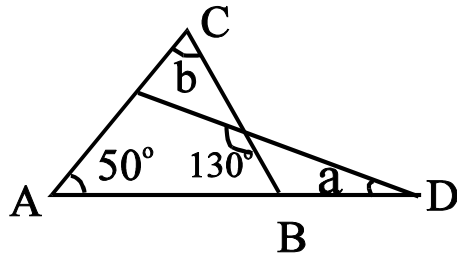


- A)  $90^\circ$                       B)  $85^\circ$                       C)  $75^\circ$                       D)  $25^\circ$
78. The difference between the simple and compound interest on Rs 12500 for 3 years at 4% is
- A) Rs. 60.50                      B) Rs. 60.80                      C) Rs. 60.00                      D) Rs. 60.30

---

**SPACE FOR ROUGH WORK**

79. In the diagram, the value of  $a+b =$



- A)  $70^\circ$                       B)  $90^\circ$                       C)  $100^\circ$                       D)  $80^\circ$

80. The radii of two circles are 9cm and 12cm. The circumference of a circle whose area is equal to sum of the areas of the given two circles is

- A) 15cm                      B)  $15\pi$ cm                      C) 225cm                      D)  $30\pi$ cm

81. In an examination A got 25% mark more than B, B got 10% less than C and C got 25% more than D. If D got 320 marks out of 500, the marks obtained by A was

- A) 400                      B) 405                      C) 450                      D) 360

---

SPACE FOR ROUGH WORK

82. If  $x-a$  is a factor of  $x^3-3x^2a+2a^2x+b$  then value of  $b$  is  
A) 2                      B) 0                      C) 3                      D) 1
83. The point which is equidistant from the points  $(0, 0)$   $(0, 8)$  and  $(4, 6)$  is  
A)  $\left(\frac{1}{2}, -4\right)$               B)  $\left(-\frac{1}{2}, 4\right)$               C)  $\left(\frac{1}{2}, 4\right)$               D)  $\left(-\frac{1}{2}, -4\right)$
84. If  $\frac{a}{b} = \frac{b}{c}$ , the value of  $\frac{1}{b-c} + \frac{1}{b-a}$  is  
A)  $\frac{1}{b}$                       B)  $\frac{1}{a}$                       C)  $\frac{1}{ab}$                       D)  $\frac{1}{c}$
85. The value of  $\sqrt{\frac{(\sqrt{12}-\sqrt{8})(\sqrt{3}+\sqrt{2})}{5+\sqrt{24}}}$  is  
A)  $\sqrt{6}-2$               B)  $2-\sqrt{6}$               C)  $2+\sqrt{6}$               D) Both A and B

---

SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 86-90

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Two Digit Answer

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If Three Digit Answer

If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

86. Five real numbers  $a_1, a_2, a_3, a_4, a_5$  are such that

$$\sqrt{a_1-1} + 2\sqrt{a_2-4} + 3\sqrt{a_3-9} + 4\sqrt{a_4-16} + 5\sqrt{a_5-25} = \frac{a_1 + a_2 + a_3 + a_4 + a_5}{2}. \text{ The value of}$$

$a_1 + a_2 + a_3 + a_4 + a_5$  is

87. How many ordered pairs of  $(x, y)$  integers satisfy  $\frac{x}{15} = \frac{36}{y}$
88. A certain school has 2000 students. Every student reads 5 newspapers and every newspaper is read by 25 students. Then the number of newspaper is
89. There are 4 lines in a plane no two of which are parallel. The maximum number of points in which they can intersect is
90. The median of 10, 14, 11, 9, 8, 12, 6 is

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SPACE FOR ROUGH WORK



Name .....

Batch..... Roll No. ....

**Brilliant** STUDY CENTRE  
**PALA**

VERSION

**A**

**30 - 09 - 2018**

**PHYSICS + CHEMISTRY - MATHEMATICS - KEY**

**PHYSICS**

1. B
2. A
3. C
4. C
5. D
6. D
7. B
8. C
9. B
10. C
11. D
12. D
13. D
14. A
15. A
16. C
17. A
18. A
19. B
20. D
21. C
22. C
23. A
24. B
25. B
26. 6
27. 0
28. 3
29. 45
30. 2

**CHEMISTRY**

31. B
32. C
33. D
34. D
35. C
36. A
37. B
38. B
39. D
40. A
41. D
42. B
43. B
44. C
45. A
46. D
47. C
48. A
49. B
50. C
51. D
52. B
53. C
54. A
55. A
56. 10
57. 50
58. 5
59. 56
60. 102

**MATHEMATICS**

61. C
62. D
63. B
64. B
65. A
66. D
67. D
68. D
69. C
70. D
71. A
72. B
73. A
74. C
75. D
76. A
77. C
78. B
79. D
80. D
81. C
82. B
83. C
84. A
85. A
86. 110
87. 48
88. 400
89. 6
90. 10

## IIT/AIIMS - 2021 SCREENING CUM SCHOLARSHIP EXAM

**Date : 30<sup>th</sup> December 2018**

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD  
VARYIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE  
90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

**I have read all the instructions and shall  
abide by them**

\_\_\_\_\_  
**Signature of the Candidate**

**Roll Number**

**I have verified all the information  
filled by the candidate**

\_\_\_\_\_  
**Signature of the Invigilator**

# SECTION I

## PHYSICS

### PART I

This part contains **25** questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

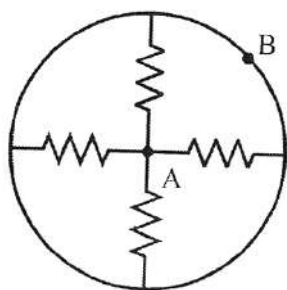
#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

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SPACE FOR ROUGH WORK

1. Which statement is correct among the following for gravitational acceleration ( $g$ ) due to earth?
- A) The value of  $g$  is equal at poles and equatorial circle
- B) The value of  $g$  is more at poles than at equatorial circle
- C) The value of  $g$  is more at equatorial circle than at poles
- D) None of these
2. What is the equivalent resistance of the network between points A and B? (each resistance is of value  $r$ )

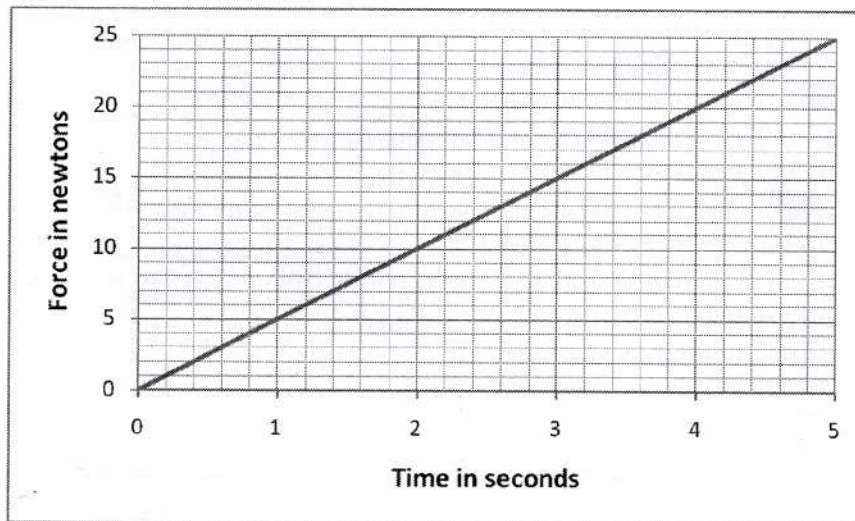


- A)  $\frac{r}{2}$                       B)  $4r$                       C)  $\frac{r}{4}$                       D) Zero

---

SPACE FOR ROUGH WORK

3. The velocity of sound wave in a given medium is  $V$  when its frequency is  $v$ . The velocity, when frequency changes to  $5v$  is
- A)  $5V$                       B)  $V/5$                       C)  $25V$                       D)  $V$
4. A variable force is exerted on a body of constant mass. The body, initially at rest, moves in a straight line. The following graph shows how the force varies with time. All frictional forces are ignored



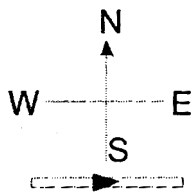
If the velocity of the object is  $7.0 \text{ ms}^{-1}$  after  $2.0 \text{ s}$ , the velocity after  $3.4 \text{ s}$  will be approximately

- A)  $20.2 \text{ ms}^{-1}$                       B)  $17.0 \text{ ms}^{-1}$                       C)  $11.9 \text{ ms}^{-1}$                       D)  $28.9 \text{ ms}^{-1}$

---

SPACE FOR ROUGH WORK

5. A bird is in a wire cage hanging from a spring balance. The reading of the balance is taken when the bird is flying about in the cage, and when the bird is at rest in the cage. The first reading will be
- A) Less than the second  
B) Greater than the second  
C) Much greater than the second  
D) Same as the second
6. A beam of alpha particles moving towards east is deflected towards south by magnetic field. The direction of magnetic field is
- A) Towards south      B) Towards east      C) Downward      D) Upward
7. A constant current  $I$  flows in a horizontal wire in the plane of the paper from West to East as shown in the figure. The direction of magnetic field at a point will be South to North

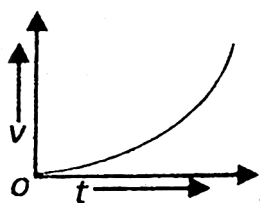


- A) Directly above the wire  
B) Directly below the wire  
C) At a point located in the plane of the paper, on the north side the wire  
D) At a point located in the plane of the paper, on the south side of the wire

---

SPACE FOR ROUGH WORK

8. The velocity-time graph of moving body is shown in the figure



Which of the following statement is true?

- A) The acceleration is constant and positive  
B) The acceleration is constant and negative  
C) The acceleration is increasing and positive  
D) The acceleration is decreasing and negative
9. A packet of weight  $W$  was allowed to fall freely in a water tank with acceleration ' $a$ ' ( $<g$ ). The magnitude of resistance force offered by water is
- A)  $w \frac{g}{a}$                       B)  $w \frac{a}{g}$                       C)  $w \left(1 - \frac{a}{g}\right)$                       D)  $w \left(1 + \frac{a}{g}\right)$
10. A heater coil is cut in to two equal parts and only one part is now used in the heater instead of the original one. Heat generated by one half of the coil would be how much in comparison to that of the full length coil?
- A) 4 times                      B) 2 times                      C) Half                      D)  $\frac{1}{4}$ th

---

SPACE FOR ROUGH WORK

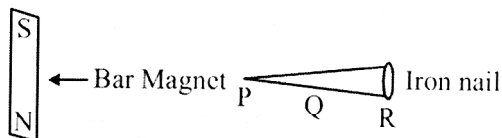




15. Knowing that mass of the moon is  $M/81$ , find distance of a point from moon where gravitational field due to earth and moon cancel each other. Given that distance between earth and moon =  $60R$ , Radius of Earth =  $R$ , Mass of Earth =  $M$

A)  $2R$                       B)  $6R$                       C)  $4R$                       D)  $8R$

16. A bar magnet is used to pick up an Iron nail



At which part P, Q and R is the easiest for the magnet to pick up the iron nail?

A) At P

B) At Q

C) At R

D) It makes no difference at any part

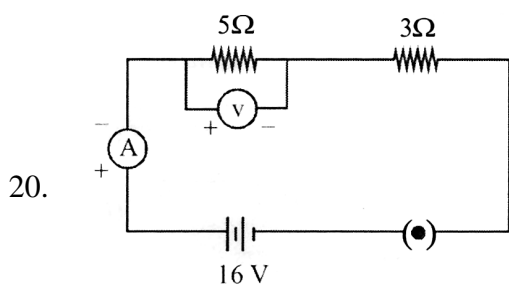
17. An athlete completes one round of a circular track of radius  $R$  in 40 seconds. The displacement at the end of 2 minutes 20 seconds will be

A) Zero                      B)  $2R$                       C)  $\pi R$                       D)  $7\pi R$

---

SPACE FOR ROUGH WORK

18. Magnetic field due to current through a ....., is similar to magnetic field produced by a bar magnet
- A) Circular loop of conducting wire
  - B) Rectangular loop of conducting wire
  - C) Solenoid
  - D) Thick copper wire
19. Choose the wrong statement related to refraction of light
- A) Twinkling of stars
  - B) Oval shape of sun in morning and evening
  - C) Object in water appears bigger in size
  - D) Red light undergoes dispersion, while passing through prism



In the above electrical circuit, the readings shown by the ammeter and voltmeter are :

- A) 2A, 10 V
- B) 3.2 A, 16 V
- C) 2A, 16 V
- D) 3.2 A, 10 V

---

SPACE FOR ROUGH WORK

21. A stone is dropped from the top of a tower 490 m high into a pond of water at the base of the tower. The splash is heard after (Given  $g = 9.8 \text{ m/s}^2$ , speed of sound = 350 m/s)
- A) 11.4 sec                      B) 10 sec                      C) 22.8 sec                      D) 20 sec
22. If an object is moving with constant velocity, then the motion is
- A) Non-uniform speed   B) Uniform acceleration   C) Uniform motion                      D) Non-uniform motion
23. The process of re-emission of absorbed light in all directions with different intensities by the atom or molecule is called
- A) Scattering of light      B) Dispersion of light      C) Reflection of light      D) Refraction of light
24. In which case of a moving body force is not needed?
- A) To increase the speed of the body
- B) To decrease the momentum of the body
- C) To change the direction of motion
- D) To keep the body in uniform velocity
25. The ratio of electric field intensity at distance 5 cm to that at 10 cm from a point charge 5Q in air is
- A) 2 : 1                      B) 1 : 2                      C) 1 : 4                      D) 4 : 1

---

SPACE FOR ROUGH WORK

## **PART II**

This part contains **5** questions

Question No. 26-30

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### **CORRECT METHOD FOR MARKING PART - II QUESTIONS**

**If Single Digit Answer**

**If Two Digit Answer**

**If Three Digit Answer**

If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

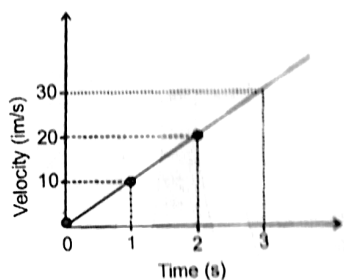
If answer is 180

**Example 3**

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

26. Velocity-time graph of a body moving with uniform acceleration is shown in the diagram. The distance travelled by the body in 3 seconds is (answer in m)



27. If  $x$  calories of heat are supplied to 15 g of water, its temperature rises from  $20^{\circ}\text{C}$  to  $24^{\circ}\text{C}$ . If specific heat for water is  $1 \text{ cal g}^{-1}\text{C}^{-1}$ , then the value of  $x$  is
28. Determine the potential difference between ends of a wire of resistance  $5\Omega$  if  $720 \text{ C}$  charge passes through it per minute (in V)
29. A Diwali rocket is ejecting  $0.05 \text{ Kg}$  of gases per second at a velocity of  $400 \text{ m/s}$ . What is the accelerating force on the rocket? (answer in Newton)
30. A car travels from Chennai to Bengaluru with a speed of  $60 \text{ km/hr}$  and returns back along the same path with a speed of  $40 \text{ km/hr}$ . The average speed of the car is given by : (answer in  $\text{km/hr}$ )

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SPACE FOR ROUGH WORK

## SECTION II CHEMISTRY

### PART I

This part contains **25** questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

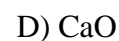
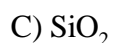
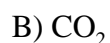
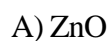
#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

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SPACE FOR ROUGH WORK

31. The oxide among the following that react with both dil. HCl and aqueous NaOH is



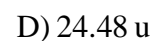
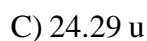
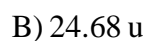
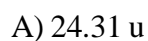
32. Oxygen gas is not liberated on heating



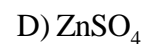
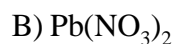
33. Magnesium has three natural isotopes. The isotopic masses and relative abundance are given below

isotopic mass	23.98 u	24.98 u	25.98 u
relative abundance	78.46%	10.08%	11.46%

The average atomic mass of natural magnesium is



34. A colourless crystalline solid 'B' dissolved easily in water. On addition of dilute HCl to the aqueous solution of 'B', no change was observed. When NaOH was added to the aqueous solution of 'B', a white ppt was obtained that dissolved in excess, giving a colourless solution. 'B' is :



---

SPACE FOR ROUGH WORK

35. The formula of ammonia is  $\text{NH}_3$  and that of Magnesium chloride  $\text{MgCl}_2$ . The formula of Magnesium nitride is
- A)  $\text{MgN}_2$                       B)  $\text{Mg}_2\text{N}_3$                       C)  $\text{Mg}_3\text{N}_2$                       D)  $\text{Mg}(\text{NO}_3)_2$
36. A student adds 5.85 gm of  $\text{NaCl}$  to 1 litre of water (the pH of which was measured to be 7.0) in a flask (X) to make a 0.1 M solution. He transfers 500 ml into another flask (Y). He covers the flask (Y) with tissue paper and the original flask (X) with a watch glass and goes to watch a movie. When he returns to the lab the next morning, he checks the pH of both the solutions using a perfectly calibrated pH meter. Which of the following is correct?
- A) X has  $\text{pH} = 7$  and Y has  $\text{pH} > 7$
- B) X has  $\text{pH} < 7$  and Y has  $\text{pH} = 7$
- C) X has  $\text{pH} = 7$  and Y has  $\text{pH} < 7$
- D) Both X and Y have  $\text{pH} = 7$
37. Heavy water is
- A) Water containing heavy metal salts dissolved in it
- B) Water at  $4^\circ\text{C}$ , the temperature of maximum density for water
- C) Deuterium oxide
- D) Water saturated with oxygen gas

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SPACE FOR ROUGH WORK



38. The amount of energy released during the combustion of unit mass of fuel is called  
A) efficiency                      B) calorific value                      C) octane number                      D) packing fraction
39. The substance formed on passing chlorine gas through slaked lime is  
A) Soda lime                      B) Bleaching powder                      C) Chloral                      D) quick lime
40. Which among the following is not a monobasic acid ?  
A) Hydrochloric acid                      B) Nitric acid                      C) Acetic acid                      D) Carbonic acid
41. If the nucleus of hydrogen atom is a sphere of radius 1 cm. The distance at which the electron in the atom is moving round the nucleus is  
A) 10 cm                      B) 100 cm                      C) 100 m                      D) 1000 m
42. Ammonia gas is formed when ammonium chloride react with  
A) Conc.  $\text{H}_2\text{SO}_4$                       B)  $\text{Ca}(\text{OH})_2$                       C)  $\text{NaNO}_2$                       D) dil.  $\text{HCl}$
43. International mole day is  
A) 23<sup>rd</sup> October 6.02 am to 6.02 pm  
B) 22<sup>nd</sup> April 6 am to 6 pm  
C) 5<sup>th</sup> June 12 am to 12 pm  
D) 30<sup>th</sup> January 11 am to 11 pm

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SPACE FOR ROUGH WORK

44. The beach sands of Kerala is a source of minerals like monazite. Monazite is the source of Thorium. Monazite also contain Neodymium and Cerium. The metals Thorium, Neodymium and Cerium belong to which block of modern long form of periodic table ?
- A) s - block                      B) p - block                      C) d - block                      D) f - block
45. Food containers made of iron are coated with tin and not with zinc because
- A) Zinc has higher m.p compared to Sn
- B) Zinc is costly compared to Sn
- C) tin is more reactive compared to Zn
- D) Zinc is more reactive compared to Sn
46. The metal among the following that react with steam but not with cold water or hot water is
- A) Sodium                      B) Calcium                      C) Magnesium                      D) Iron
47. The coloured compound among the following is
- A)  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$                       B)  $(\text{CaSO}_4)_2 \cdot \text{H}_2\text{O}$
- C)  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$                       D)  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

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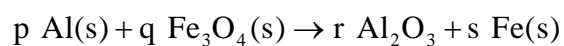
SPACE FOR ROUGH WORK

48. Baking soda is
- A)  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$     B)  $\text{NaOH}$     C)  $\text{NaHCO}_3$     D)  $(\text{NH}_4)_2\text{CO}_3$
49. Stinging hair of nettle leaves inject which compound to human body when touched ?
- A) Methanoic acid    B) Ethanoic acid
- C) Oxalic acid    D) Citric acid
50. Acidity in stomach is got rid of by using antacids. The substance among the following that can be used as antacid is
- A) lemon juice    B) Vinegar
- C) Milk of magnesia    D) aerated soft drinks
51. Rain is called acid rain when the pH of rain water is
- A) less than 5.6    B) more than 6.5    C) more than 7    D) less than zero
52. On passing  $\text{CO}_2$ , lime water is turned milky due to formation of
- A)  $\text{Ca}(\text{OH})_2$     B)  $\text{Ca}(\text{HCO}_3)_2$     C)  $\text{CaCO}_3$     D)  $\text{CaO}$

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SPACE FOR ROUGH WORK

53. The correct set of co-efficients for the balanced equation is



- |            |         |         |         |
|------------|---------|---------|---------|
| A) $p = 3$ | $q = 4$ | $r = 2$ | $s = 4$ |
| B) $p = 8$ | $q = 3$ | $r = 4$ | $s = 9$ |
| C) $p = 8$ | $q = 4$ | $r = 3$ | $s = 9$ |
| D) $p = 6$ | $q = 2$ | $r = 3$ | $s = 6$ |

54. Aqua regia is

- A) a mixture of conc.  $\text{H}_2\text{SO}_4$  &  $\text{HNO}_3$  in 1 : 1 ratio
- B) a mixture of conc.  $\text{HNO}_3$  &  $\text{HCl}$  in the ratio 1 : 3
- C) a mixture of conc.  $\text{HCl}$  &  $\text{H}_2\text{SO}_4$  in the ratio 1 : 2
- D) conc.  $\text{H}_2\text{SO}_4$  containing  $\text{SO}_3$  dissolved in it

55. Anodising is the process of

- A) coating iron with Zinc
- B) coating Copper with tin
- C) forming oxide layer over aluminium
- D) forming carbide layer over steel

---

SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 56-60

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If Two Digit Answer

If Three Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

56. Considering the first 100 elements, how many are gaseous elements at one atmospheric pressure and  $25^{\circ}\text{C}$  temperature ?
57. A gold ornament is Hallmarked 750. The purity of gold used to make the ornament expressed in carats is .....
58. 2 g  $\text{H}_2$  gas and 35.5 g  $\text{Cl}_2$  gas react in presence of sunlight to form  $\text{HCl}$  gas. How many moles of  $\text{HCl}$  gas is formed ?
59. An element with mass number 81 contains 31.7% more neutrons than protons. Give the atomic number of the element
60. Till today how many elements are officially named and accepted by IUPAC officially?

---

SPACE FOR ROUGH WORK

# SECTION III MATHEMATICS

## PART I

This part contains **25** questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. **ONLY ONE** of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

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SPACE FOR ROUGH WORK

61. If  $n$  is a perfect square then the next perfect square greater than  $n$  is
- A)  $n^2 + 1$                       B)  $n^2 + n$                       C)  $n + 2\sqrt{n} + 1$                       D)  $2n + 1$
62. If the polynomial  $2x^3 + ax^2 + 3x - 5$  and  $x^3 + x^2 - 4x + a$  leave the same remainder when divided by  $x - 2$  then the value of  $a$  is
- A)  $\frac{13}{3}$                       B)  $\frac{-13}{3}$                       C)  $\frac{3}{13}$                       D)  $\frac{-3}{13}$
63. In a quadratic equation  $ax^2 + bx + c = 0$ , if both roots are (+) ve then
- A)  $a$  and  $b$  are same sign  $c$  is opposite sign
- B)  $a, b, c$  are (+) ve
- C)  $a, b, c$  are (-ve) ve
- D)  $a$  and  $c$  are same sign  $b$  is opposite sign
64. A factor of  $x^3 - 6x^2 - 6x + 1$  is
- A)  $2x + 1$                       B)  $x - 1$                       C)  $x - 2$                       D)  $x + 1$

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SPACE FOR ROUGH WORK



65. The equations  $2x - 3y + 5 = 0$  and  $6y - 4x = 10$  when solved have
- A) no solution
- B) only one solution
- C) only two solutions
- D) an infinite number of solution
66. Find the common difference of an A.P. where first term is 100 and the sum of whose first 6 terms is 5 times. The sum of the next 6 terms
- A) 10                      B) -5                      C) 6                      D) -10
67. Find the angle between the minute hand of clock and hour hand when the time is 7 : 20
- A)  $90^\circ$                       B)  $105^\circ$                       C)  $100^\circ$                       D)  $110^\circ$
68. The length of the shadow of a pole is  $\sqrt{3}$  times the length of the pole, then angle of elevation of the sun is
- A)  $30^\circ$                       B)  $60^\circ$                       C)  $90^\circ$                       D)  $45^\circ$

---

SPACE FOR ROUGH WORK

69. If  $\sin \theta + \cos \theta = 1$  then  $\sin \theta \cos \theta =$

A)  $\frac{1+\sqrt{2}}{1+\sqrt{3}}$

B)  $\frac{1}{\sqrt{3}-1}$

C) 1

D) 0

70. If the points (0, 4), (4, 0) and (6, 2P) are collinear then the value of P is

A) -1

B) 7

C) 6

D) 4

71. If the sum of interior angles of a convex polygon is  $1620^\circ$  then its number of sides are

A) 10

B) 11

C) 12

D) 13

72. The number of triangles with any three of the lengths 1, 4, 6, 8 are

A) 4

B) 2

C) 1

D) 0

73. In a circle a 16 unit long chord is at a distance 6 units away from the centre, find the distance of a 12 unit long chord from the centre is

A) 5

B) 6

C) 7

D) 8

---

SPACE FOR ROUGH WORK

74. The circumference of the circumcircle of the triangle formed by x-axis, y-axis and the graph of  $3x + 4y = 12$  is
- A)  $3\pi$                       B)  $4\pi$                       C)  $5\pi$                       D)  $6\pi$
75. The mean of first  $n$  natural numbers is  $\frac{5n}{9}$ , find  $n$
- A) 5                      B) 4                      C) 9                      D) 10
76. The arithmetic mean of the set of observations  $1^2, 2^2, 3^2, \dots, n^2$  is
- A)  $\frac{n(n+1)}{6}$                       B)  $\frac{(n+1)(2n+1)}{6}$                       C)  $\frac{(n-1)(2n+1)}{6}$                       D)  $\frac{(n+1)(2n-1)}{6}$
77. The mean of first  $n$  odd natural numbers is  $\frac{n^2}{81}$  find  $n$
- A) 9                      B) 81                      C) 27                      D) 36
78. If a solid sphere of radius 10 cm is moulded into 8 spherical solid balls of equal radius then the surface area of each ball is
- A)  $100\pi$                       B)  $75\pi$                       C)  $60\pi$                       D)  $50\pi$

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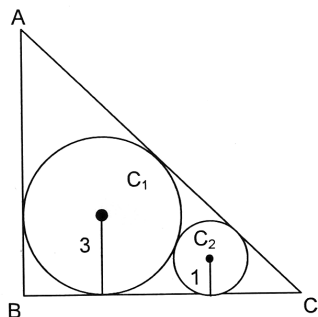
SPACE FOR ROUGH WORK

79. If the centre of the circle is  $(5, 4)$  and touch the y-axis then its radius is
- A) 4                      B) 5                      C) 9                      D) 1
80. The point on the y-axis which is equidistant from A  $(-5, -2)$  and B  $(3, 2)$  is
- A)  $(-4, 0)$               B)  $(-2, 0)$               C)  $(0, -2)$               D)  $(0, -4)$
81. If the polynomial  $x^4 - 6x^3 + 16x^2 - 25x + 10$  is divided by another polynomial  $x^2 - 2x + k$ , the remainder comes out to be  $x + a$ , then the value of a is
- A)  $-1$                       B)  $-5$                       C)  $1$                       D)  $5$
82. A vertical pole of height 10 metres stands at one corner of a rectangular field. The angle of elevation of its top from the farthest corner is  $30^\circ$ , while that from another corner is  $60^\circ$ . The area (in  $\text{m}^2$ ) of rectangular field is
- A)  $\frac{200\sqrt{2}}{3}$               B)  $\frac{400}{\sqrt{3}}$               C)  $\frac{200\sqrt{2}}{\sqrt{3}}$               D)  $\frac{400\sqrt{2}}{\sqrt{3}}$
83. A circle is inscribed in a square and the square is circumscribed by another circle. What is the ratio of the areas of the inner circle to the outer circle?
- A)  $1 : 2$                       B)  $1 : \sqrt{2}$                       C)  $\sqrt{2} : 4$                       D)  $1 : \sqrt{3}$

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SPACE FOR ROUGH WORK

84. In the adjoining figure,  $ABC$  is a triangle in which  $\angle B = 90^\circ$  and its incircle  $C_1$  has radius 3. A circle  $C_2$  of radius 1 touches sides  $AC$ ,  $BC$  and the circle  $C_1$ . Then length  $AB$  is equal to



- A)  $3 + 6\sqrt{3}$       B)  $10 + 3\sqrt{2}$       C)  $10 + 2\sqrt{3}$       D)  $9 + 3\sqrt{3}$
85. If the vertices of an equilateral triangle have integral co-ordinates, then
- A) such a triangle is not possible
- B) the area of the triangle is irrational
- C) the area of the triangle is an integer
- D) the area of the triangle is rational but not an integer

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SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 86-90

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If Two Digit Answer

If Three Digit Answer

If answer is 3

Example 1

Single Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 90

Example 2

Two Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 180

Example 3

Three Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

86. If  $56^2 - 49^2 = 7P$  then  $P =$
87. If the system of the equation  $2x + ky = 7$ ,  $2kx + 3ky = 20$  has no solution then the value of  $k$  is
88. The first term of an AP is 5, the last term is 45 and the sum is 400, then the fourth term of an AP is
89. The shortest distance of the point  $(2, 3)$  from the X axis is
90. A thin wire is bent into the form of a circle of radius 7 cm, if a square is made out of the wire then the side of the square would be

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**SPACE FOR ROUGH WORK**

**SPACE FOR ROUGH WORK**



Name .....

Batch..... Roll No. ....

**Brilliant** STUDY CENTRE  
**PALA**

VERSION

**A**

**30 - 12 - 2018**

**PHYSICS + CHEMISTRY - MATHEMATICS - KEY**

**PHYSICS**

1. B
2. C
3. D
4. A
5. A
6. D
7. B
8. C
9. C
10. B
11. A
12. B
13. C
14. D
15. B
16. C
17. B
18. C
19. D
20. A
21. A
22. C
23. A
24. D
25. D
26. 45
27. 60
28. 60
29. 20
30. 48

**CHEMISTRY**

31. A
32. A
33. A
34. D
35. C
36. C
37. C
38. B
39. B
40. D
41. D
42. B
43. A
44. D
45. D
46. D
47. D
48. C
49. A
50. C
51. A
52. C
53. B
54. B
55. C
56. 11
57. 18
58. 1
59. 35
60. 118

**MATHEMATICS**

61. C
62. B
63. D
64. D
65. D
66. D
67. C
68. A
69. D
70. A
71. B
72. C
73. D
74. C
75. C
76. B
77. B
78. A
79. B
80. C
81. B
82. A
83. A
84. D
85. A
86. 105
87. 3
88. 13
89. 3
90. 11

## IIT/AIIMS - 2021 SCREENING CUM SCHOLARSHIP EXAM

**Date : 31<sup>st</sup> MARCH 2019**

### IMPORTANT INSTRUCTIONS

*Please read the instructions carefully*

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.  
This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover both **Question Paper and the Answer Sheet** to the invigilator at the end of the examination

**IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD  
VERIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE  
90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT**

**Name of the Candidate**

**I have read all the instructions and shall  
abide by them**

\_\_\_\_\_  
**Signature of the Candidate**

**Roll Number**

**I have verified all the information  
filled by the candidate**

\_\_\_\_\_  
**Signature of the Invigilator**

# SECTION I

## PHYSICS

### PART I

This part contains **25** questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

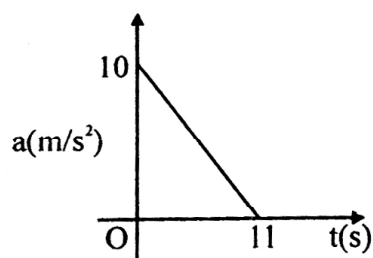
#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

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SPACE FOR ROUGH WORK

1. A boy sitting on the top most berth in the compartment of a train which is just going to stop on the railway station, drops an apple aiming at the open hand of his brother situated vertically below his hands at a distance of about 2m. The apple will fall:
- A) Slightly away from the hand of his brother in the direction of the motion of the train.
- B) In the hand of his brother.
- C) Slightly away from the hands of his brother in the direction opposite to the direction of the motion of the train.
- D) None of these
2. A body starts from rest at time  $t = 0$ , the acceleration time graph is shown in figure. The maximum velocity attained by the body will be:

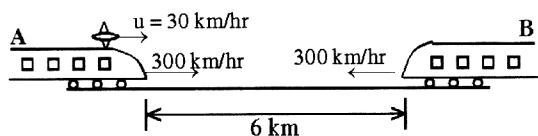


- A) 1110 m/s
- B) 55 m/s
- C) 650 m/s
- D) 550 m/s

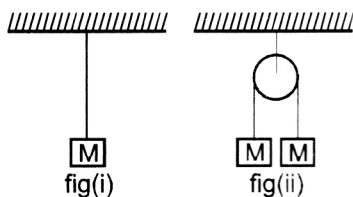
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SPACE FOR ROUGH WORK

3. A bird is sitting on train A moving towards East with a velocity 300 km/hr. Another train B of same speed is moving in West direction on the same track. When the trains are 6 km apart, the bird starts flying with a velocity 30 km/hr with respect to ground towards B. After touching B, it returns back to A and continues repeating this process until the trains collide. In this process, the total distance travelled by the bird is:



- A) 100 m                      B) 200 m                      C) 300 m                      D) 6 km
4. A constant force acts on a body of mass  $m$  at rest for  $t$  seconds and then ceases to act. In next  $t$  seconds the body travels a distance  $x$ , magnitude of force is
- A)  $\frac{mx}{t^2}$     B)  $\frac{mx}{t}$
- C)  $mxt$     D)  $mxt^2$
5. The elongation of wire of length  $L$  is  $I$ , in the case of figure (i). The same wire elongation in case of figure (ii) will be (pulley is light)

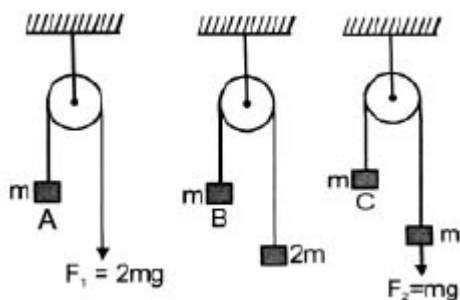


- A)  $2I$     B)  $4I$     C)  $I$     D)  $I/2$

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SPACE FOR ROUGH WORK

6. In the figure, the blocks A, B, C of mass  $m$  each have accelerations  $a_1$ ,  $a_2$  and  $a_3$  respectively. " $F_1$ " and " $F_2$ " are external forces of magnitude  $2mg$  and  $mg$  respectively.

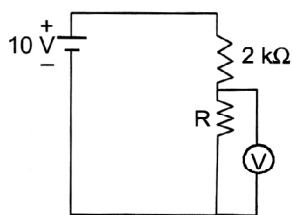


- A)  $a_1 > a_3 > a_2$       B)  $a_1 = a_2 = a_3$       C)  $a_1 > a_2 > a_3$       D)  $a_1 > a_2$ ,  $a_2 = a_3$
7. A cyclist comes to a skidding stop in 10m. During this process, the force on the cycle due to the road is 200 N and is directly opposed to the motion. (a) How much work does the road do on the cycle? (b) How much work does the cycle do on the road?
- A)  $-2000 \text{ J}$ ,  $2000 \text{ J}$       B)  $-2000 \text{ J}$ ,  $1000 \text{ J}$  by each tyre  
 C)  $0 \text{ J}$ ,  $2000 \text{ J}$       D)  $-2000 \text{ J}$ ,  $0 \text{ J}$
8. If the mass of sun were ten times smaller and gravitational constant  $G$  were ten times larger in magnitudes
- A) the acceleration due to gravity on earth will not change  
 B) walking on ground would become more difficult  
 C) raindrops will fall much faster  
 D) airplanes will have to travel much faster

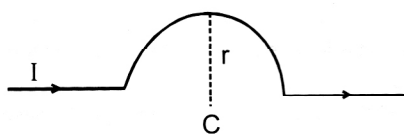
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SPACE FOR ROUGH WORK

9. If a charge  $q$  is placed at the centre of the line joining two equal charges  $Q$  such that the system is in equilibrium then the value of  $q$  is:
- A)  $Q/2$                       B)  $-Q/2$                       C)  $Q/4$                       D)  $-Q/4$
10. In the given circuit voltmeter shows a reading of  $4V$ , then the power developed across  $R$  resistance will be



- A) 15 mW                      B) 14 mW                      C) 12 mW                      D) 10 mW
11. A uniform wire when connected directly across a 220 V line produces heat  $H$  per second. If the wire is divided into  $n$ -parts and all parts are connected in parallel across a 220 V line, the heat produced per second will be
- A)  $H/n$                       B)  $H/n^2$                       C)  $n^2H$                       D)  $nH$
12. A wire carries a current  $I$  amperes shown in figure. The semicircle has a radius  $r$ . The magnetic field at the centre  $C$  will be:

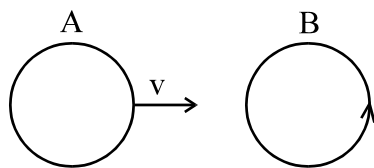


- A) zero                      B)  $\frac{\pi I}{r} \times 10^{-7}$  Newton/ampere-metre
- C)  $\frac{\pi I}{r}$  Newton/ampere-metre                      D)  $\frac{\pi I}{r}$  gauss

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SPACE FOR ROUGH WORK

13. There are two coils A and B as shown in figure. A current starts flowing in B as shown, when A is moved towards B and stops. When A stops moving the current in A is counter clockwise. B is kept stationary when A moves. We can infer that



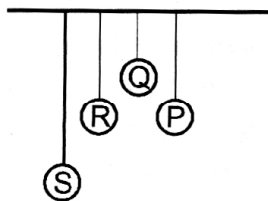
- A) there is a constant current in the clockwise direction in A.
- B) there is a varying current in A
- C) there is no current in A
- D) there is a constant current in the counter clockwise direction in A
14. The focal length of a concave mirror in air is  $f$ . If it is immersed in water  $\left(n = \frac{4}{3}\right)$ , then the focal length will be
- A)  $f$                       B)  $\frac{4}{3}f$                       C)  $\frac{3}{4}f$                       D)  $4f$
15. The speeds of sound in air and sea-water are given to be 340 m/s and 1440 m/s. respectively. A ship sends a strong signal straight down and detects its echo after 1.5 secs. The depth of sea at that point is:
- A) 2.16 km                      B) 0.255 km                      C) 0.51 km                      D) 1.08 km

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SPACE FOR ROUGH WORK



16. Four pendulums P, Q, R & S are suspended from same elastic supports as shown in figure. Out of these P and R are of the same length. Q is smaller than P and S is longest. If the pendulum bob P is displaced to give small vibration.



- A) amplitude of vibration for S is maximum      B) amplitude of vibration for all is same  
C) amplitude of vibration for Q is maximum      D) amplitude of vibration for R is maximum
17. A sound wave of wavelength 90 cm in glass is refracted in to air. If the speed of sound in glass is 5400 m/s, the wavelength of the wave in air (speed of sound in air = 330 m/s)
- A) 55 cm      B) 5.5 cm      C) 55 m      D) 5.5 m
18. A star produces its energy through the process of
- A) Nuclear fusion  
B) Chemical reaction  
C) Nuclear fission  
D) Gravitational attraction between different parts of the star

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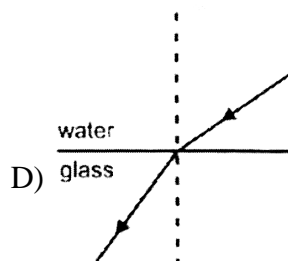
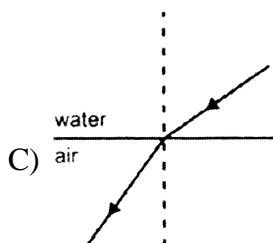
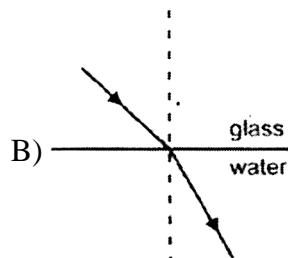
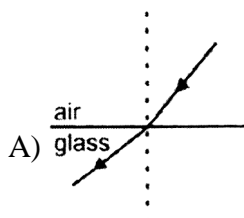
SPACE FOR ROUGH WORK

19. Which of the following can produce a magnetic field?
- A) Electric charges rest
- B) Electric charges in motion
- C) Only by permanent magnets
- D) Electric charges whether at rest or in motion
20. A wire is lying horizontally in the north-south direction and there is a horizontal magnetic field pointing towards the east. Some positive charges in the wire move towards north and an equal number of negative charges move towards south. The direction of force on the wire will be
- A) East
- B) Down, into the page
- C) Up, out of the page
- D) West
21. When a charged particle passes through an electric field, which among the following properties change?
- I. Mass
- II. Charge
- III. Velocity
- IV. Momentum
- A) II and III
- B) Only III
- C) III and IV
- D) I, III and IV
22. The diameter of a wire is reduced to one fifth of its original value by stretching it. If its initial resistance is R, what would be its resistance after reduction of the diameter?
- A)  $\frac{R}{625}$
- B) 625R
- C) 25R
- D)  $\frac{R}{25}$

## SPACE FOR ROUGH WORK

23. If sum of velocities of light in two media is  $3.25 \times 10^8$  m/s and their difference is  $0.75 \times 10^8$  m/s, find the refractive index of the second medium with respect to one:
- A) 1.25                      B) 1.6                      C) 1.5                      D) 1.3

24. Which of the following ray diagrams, show the correct refraction of ray light



25. The energy consumed in 10 hours by 4 devices each of power 500 W:

- A) 20 Joule                      B) 20 Watt                      C) 20 kwh                      D) 5 kwh

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SPACE FOR ROUGH WORK

## **PART II**

This part contains **5** questions

Question No. 26-30

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### **CORRECT METHOD FOR MARKING PART - II QUESTIONS**

**If Single Digit Answer**

**If Two Digit Answer**

**If Three Digit Answer**

If answer is 3

**Example 1**

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 90

**Example 2**

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

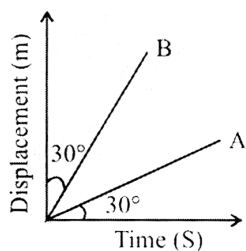
If answer is 180

**Example 3**

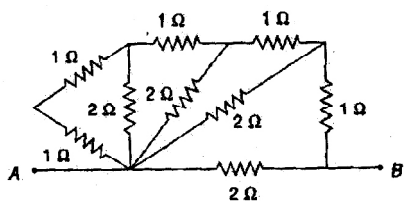
Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

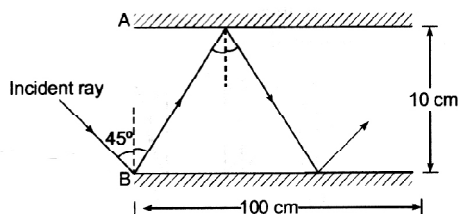
26. A body covers half the distance with a speed of 20 m/s and the other half with 30 m/s. The average speed of the body during the whole journey is (answer in m/s)
27. The displacement-time graph for two particles are shown in the figure. The ratio of velocity of B to velocity of A is



28. What is the resistance between A and B in the following circuit (answer in  $\Omega$ )



29. An object weights 10 N in air. When immersed fully in water, it weights only 8N. The weight of the liquid displaced by the object will be: (answer in N)
30. Two parallel plane mirrors A and B are placed at a separation 10 cm as shown in figure. A ray incident on the corner of mirror B at an angle of incidence  $45^\circ$ . Find the number of times this ray is reflected from mirror A



SPACE FOR ROUGH WORK

## SECTION II CHEMISTRY

### PART I

This part contains **25** questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

#### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

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SPACE FOR ROUGH WORK

31. The metal (M) forms an oxide,  $M_2O_3$ . The formula of its nitride will be
- A) MN                      B)  $M_2N_3$                       C)  $M_2N$                       D)  $M_3N_2$
32. Simple distillation can be used to separate
- A) A mixture of ether (boiling point  $35^\circ\text{C}$ ) and toluene (boiling point  $110^\circ\text{C}$ )
- B) A mixture of benzene (boiling point  $80^\circ\text{C}$ ) and toluene (boiling point  $110^\circ\text{C}$ )
- C) A mixture of ethanol (boiling point  $78^\circ\text{C}$ ) and water (boiling point  $100^\circ\text{C}$ )
- D) None of these
33. An element X (atomic number 12) reacts with another element Y (atomic number 17) to form a compound Z. Which of the following statements are true regarding this compound?
- I. Molecular formula of Z is  $XY_2$
- II. It is soluble in water
- III. X and Y are joined by sharing of electrons
- IV. It would conduct electricity in the molten state
- A) I, II and IV                      B) I and III                      C) II and III                      D) I and IV
34.  $^{35}\text{Cl}$  and  $^{37}\text{Cl}$  are the two isotopes of chlorine, in the ratio 3 : 1 respectively. If the isotope ratio is reversed the average atomic mass of chlorine will be :
- A) 35.0 u                      B) 35.5 u                      C) 36.0 u                      D) 36.5 u

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SPACE FOR ROUGH WORK

35. The solubility of a substance S in water is 28.6% (mass by volume) at 50°C. When 50 mL of its saturated solution at 50°C is cooled to 40°C, 2.4 g of solid S separates out. The solubility of S in water at 40°C (mass by volume) is :

- A) 2.4%                      B) 11.9%                      C) 26.2%                      D) 23.8%

36. Foam of soap always appears white as

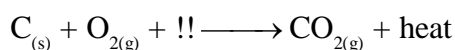
- A) It contains large hydrogen chains  
B) It absorbs red portion of the visible light  
C) It reflects light of all wavelengths  
D) It has one hydrophobic end, which is insoluble in water

37. Aluminium carbonate reacts with dilute nitric acid to form aluminium nitrate, water and carbon dioxide. The reaction can be written as  $\text{Al}_2(\text{CO}_3)_3 + x\text{HNO}_3 \rightarrow y\text{Al}(\text{NO}_3)_3 + z\text{CO}_2 + 3\text{H}_2\text{O}$

The stoichiometric constants x, y and z are

- A) 6, 2, 4                      B) 6, 2, 3                      C) 2, 4, 6                      D) 4, 2, 3

38. The reaction between carbon and oxygen can be represented as



In which of the following type(s), the above reaction can be classified?

- I. Combustion reaction                      II. Displacement reaction  
III. Endothermic reaction                      IV. Combination reaction

- A) I and III                      B) I, III and IV                      C) I and IV                      D) I only

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SPACE FOR ROUGH WORK



39. Gypsum is heated to about 373 K in large steel pots with mechanical stirrers to get plaster of paris. The formula of plaster of paris is :
- A)  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$       B)  $\text{CaSO}_4 \cdot 1\frac{1}{2}\text{H}_2\text{O}$       C)  $\text{CaSO}_4 \cdot \text{H}_2\text{O}$       D)  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$
40. Dilute hydrochloride acid is added to sodium bicarbonate. The gas liberated in
- A)  $\text{CO}_2$       B)  $\text{CO}$       C)  $\text{Cl}_2$       D)  $\text{H}_2$
41. Nonmetallic oxides are usually acidic in nature. Which among the following non metallic oxide is neutral?
- A)  $\text{CO}_2$       B)  $\text{SO}_2$       C)  $\text{H}_2\text{O}$       D)  $\text{P}_2\text{O}_5$
42. The chemical formula of 'Rock salt' is-
- A)  $\text{Na}_2\text{CO}_3$       B)  $\text{NaCl}$       C)  $\text{NaHCO}_3$       D)  $\text{KCl}$
43. On passing  $\text{CO}_2$  in excess in aqueous solution of sodium carbonate the substance obtained is :
- A)  $\text{NaOH}$       B)  $\text{NaHCO}_3$       C)  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$       D)  $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$
44. A substance A reacts with another substance B to produce the product C and a gas D. If a mixture of the gas D and ammonia is passed through an aqueous solution of C, baking soda is formed. The substances A and B are :
- A)  $\text{HCl}$  and  $\text{NaOH}$       B)  $\text{HCl}$  and  $\text{Na}_2\text{CO}_3$       C)  $\text{Na}$  and  $\text{HCl}$       D)  $\text{Na}_2\text{CO}_3$  and  $\text{H}_2\text{O}$
45. The tumeric solution will turn red by an aqueous solution of
- A) Potassium acetate      B) Copper sulphate      C) Sodium sulphate      D) Ferric chloride

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**SPACE FOR ROUGH WORK**

46. Brass contains:
- A) Cu and Sn                      B) Cu and Ni                      C) Cu and Zn                      D) Mg and Al
47. Iron ore is :
- A) Bauxite                      B) Dolomite                      C) Haematite                      D) Calamine
48. The metals which liberate hydrogen gas with dilute hydrochloric acid as well as caustic soda solution are
- A) Na and K                      B) Zn and Al                      C) Fe and Mn                      D) Cu and Ag
49. The metal used to recover copper from an aqueous solution of copper sulphate is
- A) Na                      B) Ag                      C) Hg                      D) Fe
50. Which of the following is true about the two statements?
- Statement I : Reactivity of aluminium decreases when it is dipped in nitric acid
- Statement II : A protective layer of aluminium nitrate is formed when aluminium is dipped in nitric acid
- A) I is correct but II is incorrect
- B) I is incorrect but II is correct
- C) Both statements are correct and II is also the correct explanation of I
- D) Both the statements are correct but II is not correct explanation of I

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SPACE FOR ROUGH WORK

51. Metals like sodium potassium, calcium and magnesium are extracted by electrolysis of their chlorides in molten state. These metals are not extracted by reduction of their oxides with carbon because
- 1) Reduction with carbon is very expensive
  - 2) Carbon readily makes alloys with these metals
  - 3) Carbon has less affinity for oxygen
  - 4) Carbon is a weaker reducing agent than these metals
- A) 1 and 2  
B) 2 and 3  
C) 3 and 4  
D) 4 and 1
52. A metal occurs in nature as its ore X which on heating in air converts to Y. Y reacts with unreacted X to give the metal. The metal is :
- A) Hg  
B) Cu  
C) Zn  
D) Fe
53. Correct order of first ionisation potential of B, C, Al, Si is
- A)  $B < Al < Si < C$   
B)  $B < Si < Al < C$   
C)  $Al < B < Si < C$   
D)  $Al < Si < B < C$

## SPACE FOR ROUGH WORK

54. The given table shows the position of six elements P, Q, R, S, T and U in the periodic table. Using the table identify the incorrect statement.

Group Period	1	2	3-12	13	14	15	16	17	18
2		P					Q		R
3		S				T			U

- A) Element S present in group 2 is a metal and it exhibits a valency of 2.
- B) The element T present in group 15 is a non-metal and it exhibits a valency of 3.
- C) Element S has bigger atomic radius than element T.
- D) Elements R and U are known as halogens
55. An element X has 7 electrons in its L shell. What is true about the element X?
- I. It belongs to period 9 of modern periodic table
- II. Its atom contains 9 protons
- III. It has a valency of 7
- IV. Its atoms can accept an electron to acquire noble gas configuration
- A) I and II                      B) II and III                      C) III and IV                      D) II and IV

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SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 56-60

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If Two Digit Answer

If Three Digit Answer

If answer is 3

Example 1

Single Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 90

Example 2

Two Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 180

Example 3

Three Digit Answer		
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

56. An element with atomic number 17 is placed in the group 17 of the long form periodic table. Element with atomic number 9 is placed above and with atomic number 35 is placed below it. Element with atomic number 16 is placed left and with atomic number 18 is placed right to it. How many of the following statements are correct
- i. Valency of the element with atomic number 18 is zero
  - ii. Elements with same valency will have atomic number 16, 17 and 18
  - iii. Valency of elements with atomic number 9, 17 and 35 is one
  - iv. Element with atomic number 17 is more electronegative than element with atomic numbers 16 and 35
57. The atomic number of an element X is 19. Give the number of electrons in its cation  $X^+$
58. The reaction of burning of carbon in oxygen is represented by the equation :
- $$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)} + \text{Heat} + \text{Light}$$
- When 9.0 g of solid carbon is burnt in 16.0 g of oxygen gas, 22.0 g of carbon dioxide is produced. The mass of carbon dioxide gas formed on burning of 3.0 g of carbon in 32.0 g of oxygen would be (Note : atomic mass of C = 12.0 u, O = 16.0 u)
59. pH of pure water at 298 K is .....
60. A scientist weighs out exactly 1.8 kg of glucose for an experiment. The molecular formula of glucose is  $C_6H_{12}O_6$  and atomic masses of carbon, hydrogen and oxygen are 12u, 1u and 16u respectively. How many moles of glucose did the scientist weigh out?

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SPACE FOR ROUGH WORK

# SECTION III MATHEMATICS

## PART I

This part contains **25** questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS










For each question, marks will be awarded in one of the following categories

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : -1 In all other cases

### CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

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SPACE FOR ROUGH WORK

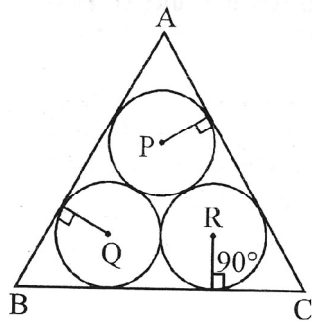
61. Two dice are rolled simultaneously. The probability that face 4 comes up at least once
- A)  $\frac{11}{36}$                       B)  $\frac{1}{3}$                       C)  $\frac{10}{36}$                       D)  $\frac{2}{3}$
62. If x is 80% of y, then what percent of 2x is y?
- A) 40%                      B) 80%                      C)  $66\frac{2}{3}\%$                       D)  $62\frac{1}{2}\%$
63. The pair of linear equations  $2kx + 5y = 7$ ,  $6x - 5y = 11$  has a unique solution if
- A)  $k \neq -3$                       B)  $k \neq 6$                       C)  $k \neq 5$                       D)  $k \neq -5$
64. The median of 5,7,4,6,8,10 is.....
- A) 7                      B) 6                      C) 6.5                      D) 7.5
65. A shopkeeper fixes the marked price of an item 35% above its cost price. The percentage of discount allowed so that he attains a profit of 8% is;
- A) 20%                      B) 27%                      C) 31%                      D) 43%
66. An equilateral triangle and a regular hexagon have equal perimeters. If the area of the triangle is  $12\text{dm}^2$ , then the difference of their areas (in  $\text{dm}^2$ ) is
- A) 2                      B) 4                      C) 6                      D) 8

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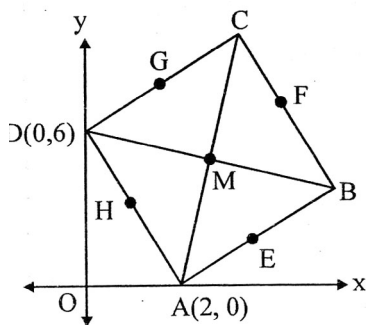
SPACE FOR ROUGH WORK



67. Three circles each of radius  $r$  units are drawn inside an equilateral triangle of side  $a$  units, such that each circle touches the other two and two sides of the triangle as shown in the figure, (P, Q and R are the centres of the three circles). Then relation between  $r$  and  $a$  is



- A)  $a = 2(\sqrt{3} + 1)r$       B)  $a = (\sqrt{3} + 1)r$       C)  $a = (\sqrt{3} + 2)r$       D)  $a = (2\sqrt{3} + 1)r$
68. If the centroid of the triangle formed by the points  $(a,b)$ ,  $(b,c)$  and  $(c,a)$  is at the origin, then  $a^3 + b^3 + c^3 =$
- A)  $abc$       B)  $a+b+c$       C)  $3abc$       D)  $0$
69. In the following diagram ABCD is a square and E, F, G and H are mid-points of the sides. Then which among the following is not true

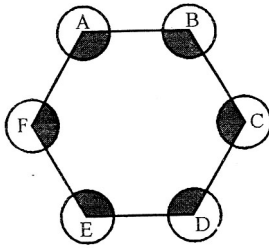


- A) point E(5,1)      B) point G is (3,7)      C) point F is (7,6)      D) point M is (4, 4)

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SPACE FOR ROUGH WORK

70. ABCDEF is any hexagon with different vertices A, B, C, D, E and F as the centres of circles with same radius  $r$  are drawn. The area of the shaded portion is



- A)  $\pi r^2$                       B)  $2\pi r^2$                       C)  $3\pi r^2$                       D)  $4\pi r^2$
71. A cuboidal metal block of dimensions  $20\text{cm} \times 16\text{cm} \times 12\text{cm}$  weighs 6kg. Find the weight of block of the same metal of size  $10\text{cm} \times 8\text{cm} \times 8\text{cm}$
- A) 3kg                      B) 8kg                      C) 7kg                      D) 1kg
72. If the common difference of an AP is -5, then the value of  $a_{20} - a_{15} = \dots\dots\dots$
- A) -5                      B) 5                      C) 25                      D) -25
73. An open box is made from a square lamina of side 12cm, by cutting equal squares at the corners and folding up the remaining flaps. The volume of this box cannot be
- A) 20 c.c                      B) 100 c.c                      C) 108 c.c                      D) 130 c.c
74. Find the distance between -5 and 8 on the number line?
- A) -13                      B) -3                      C) 13                      D) 3

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SPACE FOR ROUGH WORK

75. If  $\sec A + \tan A = p$ , then the value of  $\sin A$  is

- A)  $\frac{1-2p}{1+p^2}$       B)  $\frac{p^2-1}{p^2+1}$       C)  $\frac{1+p^2}{2(1-p^2)}$       D)  $\frac{p^2+1}{p^2-1}$

76. If  $\tan \theta = 4$ , then  $\left( \frac{\tan \theta}{\frac{\sin^3 \theta}{\cos \theta} + \sin \theta \cos \theta} \right)$  is equal to

- A) 0      B)  $2\sqrt{2}$       C)  $\sqrt{2}$       D) 1

77. If  $\tan \theta = m/n$  then what is the value of  $\frac{m \sin \theta - n \cos \theta}{m \sin \theta + n \cos \theta}$  ?

- A)  $\frac{m^2+n^2}{m^2-n^2}$       B)  $\frac{m^2-n^2}{m^2+n^2}$       C)  $\frac{m-n}{m+n}$       D) None of these

78. What is the value of  $\frac{\cos \theta}{\sin(90^\circ - \theta)} + \frac{\sin \theta}{\cos(90^\circ - \theta)}$  ?

- A) -1      B) 2      C) 1      D) 0

79.  $\tan^2 \theta - \sin^2 \theta = K \tan^2 \theta \sin^2 \theta$ , then the value of K is

- A) 1      B) 2      C)  $\frac{1}{2}$       D)  $-\frac{1}{2}$

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SPACE FOR ROUGH WORK

80.  $\sin^2 5^\circ + \sin^2 10^\circ + \dots + \sin^2 85^\circ + \sin^2 90^\circ =$

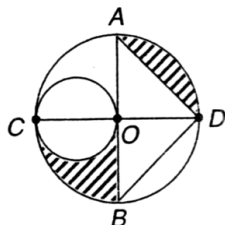
A)  $7\frac{1}{2}$

B)  $8\frac{1}{2}$

C)  $9\frac{1}{2}$

D)  $10\frac{1}{2}$

81. In the figure, AB and CD are two diameters of a circle (with centre at O) perpendicular to each other and OC is the diameter of the smaller circle. If OC = 20cm, find the area of the shaded region.



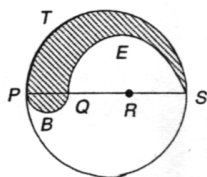
A)  $50(4\pi + 3)$

B)  $50(4\pi - 3)$

C)  $50(3\pi + 4)$

D)  $50(3\pi - 4)$

82. PQRS is a diameter of a circle of radius 3 cm. The lengths PQ, QR and RS are equal. Semi-circles are drawn with PQ and QS as diameters, as shown in the given figure. Find area of the shaded region



A)  $3\pi$

B)  $4\pi$

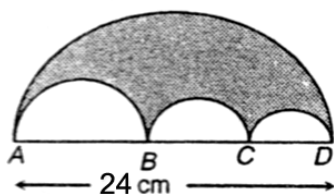
C)  $\frac{7}{2}\pi$

D)  $\frac{9}{2}\pi$

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SPACE FOR ROUGH WORK

83. In the figure provided, are shown four semi-circles are shown with  $AD = 24\text{cm}$  and  $AB:BC:CD = 3:2:1$ . Determine the perimeter of the shaded region is



- A)  $60\pi$
- B)  $24\pi$

- C)  $64\pi$
- D)  $84\pi$

84. If a, b, c be the 4<sup>th</sup>, 7<sup>th</sup> and 10<sup>th</sup> term of an AP respectively then the sum of the roots of the equation  $ax^2 - 2bx + c = 0$

- A)  $-\frac{b}{a}$                       B)  $-\frac{2}{a}$

- C)  $\frac{c+a}{a}$  D) Can not be determined

85. The number of integral solution of the equation  $7\left(y + \frac{1}{y}\right) - 2\left(y^2 + \frac{1}{y^2}\right) = 9$

- A) 0                      B) 1                      C) 2                      D) 3

## SPACE FOR ROUGH WORK

## PART II

This part contains **5** questions

Question No. 86-90

The answer to each question is a **NUMBER** ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

**Full Marks** : +4 If only the bubble corresponding to the correct option is darkened

**Zero Marks** : 0 If none of the bubbles is darkened

**Negative Marks** : No negative mark for incorrect answer

### CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If Two Digit Answer

If Three Digit Answer

If answer is 3

Example 1

Single Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 90

Example 2

Two Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

If answer is 180

Example 3

Three Digit Answer

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
0	0	0

SPACE FOR ROUGH WORK

86. If 40 persons consume 240kg of rice in 15 days, in how many days will 30 persons consume 48 kg of rice
87. If  $\alpha$  and  $\beta$  are the roots of  $x^2 - 7x + 1 = 0$ , then the value of  $\frac{1}{(\alpha-7)^2} + \frac{1}{(\beta-7)^2} =$
88. The sum of first 9 terms of  $\frac{1^2}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \dots$  is
89. Sanjana travels 660 km. partly by train and partly by car. If she covers 300km by train and the rest by car, it takes 13.5 hours. But, if she travels 360 km by train and the rest by car, she takes 30minutes longer. Find the time taken by Sanjana if she travels 660km by car. (in hours)
90. The mode of 3,5,7,3,4,2,2,3,5 is .....

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SPACE FOR ROUGH WORK

**SPACE FOR ROUGH WORK**



Name .....

Batch..... Roll No. ....

31 - 03 2019

**PHYSICS + CHEMISTRY - MATHEMATICS - KEY**

**PHYSICS**

1. A
2. B
3. C
4. A
5. C
6. A
7. D
8. A
9. D
10. C
11. C
12. B
13. D
14. A
15. D
16. D
17. B
18. A
19. B
20. B
21. C
22. D
23. B
24. D
25. C
26. 24
27. 3
28. 1
29. 2
30. 5

**CHEMISTRY**

31. A
32. A
33. A
34. D
35. D
36. C
37. B
38. C
39. D
40. A
41. C
42. B
43. B
44. B
45. A
46. C
47. C
48. B
49. D
50. A
51. C
52. B
53. D
54. D
55. D
56. 3
57. 18
58. 11
59. 7
60. 10

**MATHEMATICS**

61. A
62. D
63. A
64. C
65. A
66. C
67. A
68. C
69. C
70. B
71. D
72. D
73. D
74. C
75. B
76. D
77. B
78. B
79. A
80. C
81. D
82. A
83. B
84. C
85. B
86. 4
87. 47
88. 96
89. 11
90. 3