Date : 03rd December 2023

PART I - PHYSICS

SECTION A

1. An athelete 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) $7\pi R$

Ans: 2

Time in one revolution = 40s

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

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

$\therefore$ Particle completes three and half revolutions, so displacement = 2R

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

Ans: 4

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

Ans: 4

Stoping distance $S = \frac{u^2}{2a} = \frac{mu^2}{2F}$

$S \alpha u^2$

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

4. Which one of the following is not the unit of time?

1) Leap year

2) Shake

3) Parallactic second

4) Lunar month

Ans: 3

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

Ans: 2

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

6. A body of mass 3kg is under a force which causes a dispalcement 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

Ans: 4

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

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

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

Workdone W = 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. 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

Ans: 3

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

$$g = \frac{4}{3}\pi GR\rho$$

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

8. 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

Ans: 4

$$F = \frac{\Delta P}{\Delta t}$$

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

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

Ans: 2

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

$\therefore$ Larger resistance consumes less power

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

Ans: 1

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

Ans: 1

12. Work done per unit time is called

1) Power

2) Pressure

3) Momentum

4) Force

Ans: 1

$$\text{Power} = \frac{\text{Work done}}{\text{time}}$$

13. Which of the following is not a scalar

1) Density 2) Volume

3) Velocity 4) Speed

Ans: 3

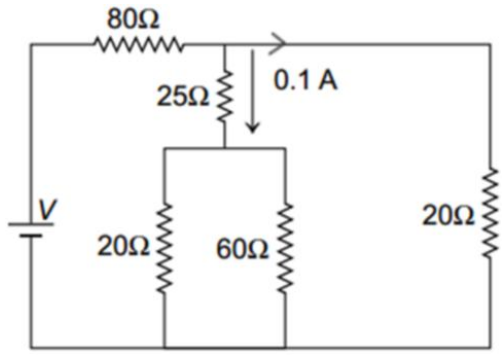
14. A particle at rest is moving with a constant acceleration of $5 m/s^2$. The velocity of the particle at third second is

1) 22.5 m/s 2) 15 m/s 3) 30 m/s 4) 20 m/s

Ans: 2

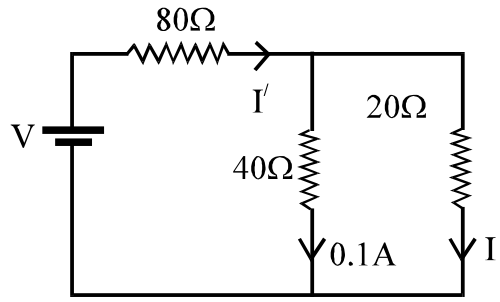
$$V = at = 5 \times 3 = 15 m/s$$

15. A current of 0.1 A flows through a 25Ω resistor represented by the circuit diagram. The current in the $80\ \Omega$ resistor is



1) 0.1 A
2) 0.2 A
3) 0.3 A
4) 0.4 A

Ans: 3



$I \times 20 = 0.1 \times 40$

$I = 0.2$ A

$\therefore$ Current through 80Ω

$I' = 0.1 + 0.2 = 0.3$ A

SECTION B

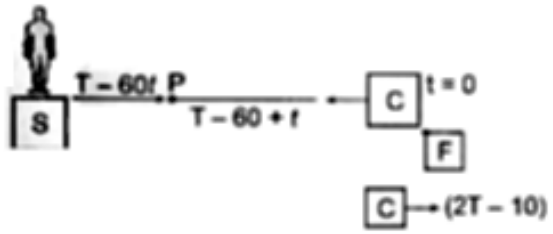
16. An engineer works at a factory out of town. A car is sent for him from the factory everyday and arrives at the railway station at the same time as the train. One day the engineer arrived at the station one hour before his usual time and without waiting for the car, started walking towards factory. 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.

Ans: 55

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

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

This day :

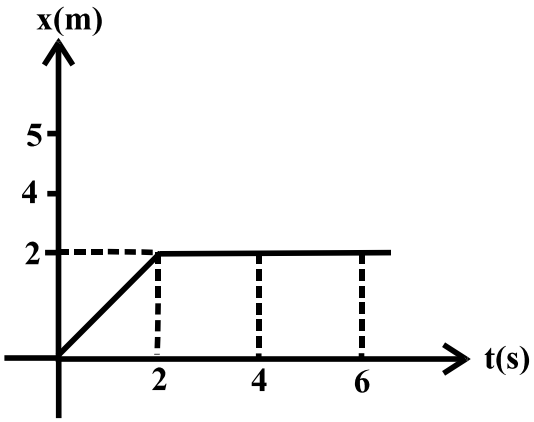


Person reaches 'S' at $T - 60$. Car starts at $t = 0$ from F. Person walks for time t and reaches point P at time $T - 60 + t$. At this time car also reaches 'P'. Car comes back at 'F' at time $(2T - 10)$. That means car takes time $T - 5$ from F to P. That means car reach at 'P' at time $T - 5$.

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

$\Rightarrow$ $t = 55$ min.

17. In the figure given, the position-time graph of a particle of mass 5kg shown. The magnitude of impulse at t = 2s in kg m/s is

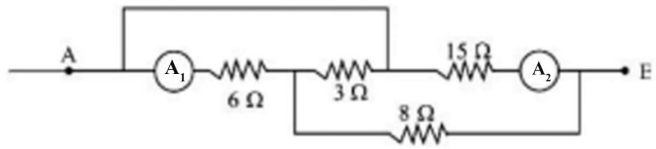


Ans: 5

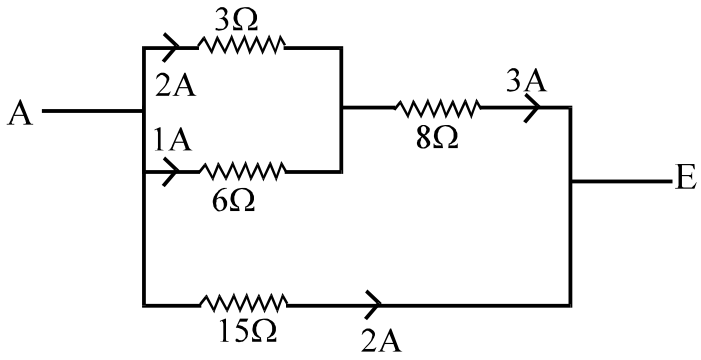
Impulse = change in momentum

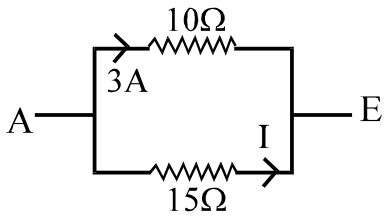
$= mv - 0 = 5 \times \frac{2}{2} = 5$ kgm / s

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



Ans: 2





$10 \times 3 = 15\ I$

$I = 2A$

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)

Ans: 5

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

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

$S = 5m$

20. A rubber balloon of negligible mass is filled with 500 g of water. Its apparent weight in water will be (in gram)

Ans: 0

21. If two plane mirrors are kept at 60° to each other, then the number of images that can be seen is

Ans: 5

$\frac{360}{\theta} = \frac{360}{60} = 6$

$N = 6 - 1 = 5$

22. If a body looses half of its velocity on penetrating 3cm in a wooden block, then how much will it penetrate more before coming to rest? (Answer should be in cm)

Ans: 1

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

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

For entire motion

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

$\therefore$ further distance=4-3=1 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

Ans: 15

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

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 3×10^3 kg/m^3. The gravitational force now will be $\frac{45F}{n}$. The value of n is

Ans: 45

Gravitational force is independent of the medium $\therefore$ force = F

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

Ans: 15

$$m = \frac{f}{f + u}$$

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

$$10 + u = -5$$

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

PART II - CHEMISTRY

SECTION A

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

1) Arsenic (As) 2) Silicon (Si)

3) Boron (B) 4) Copper (Cu)

Ans: 4

As, Si and B are metalloids

27. Tooth enamel is made up of

1) Calcium phosphate

2) Calcium sulphate

3) Calcium carbonate

4) Calcium silicate

Ans: 1

Tooth enamel is made up of calcium phosphate

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

1) 1 2) 4 3) 5 4) 10

Ans: 4

Basic solution turn red litmus blue

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

Ans: 1

Strong base and weak acid; Sodium acetate solution is basic

30. Which of the following oxide is insoluble in water?

1) Na_2O 2) CuO 3) K_2O 4) CaO

Ans: 2

CuO is insoluble in water

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

Ans: 2

$$Fe_{(s)} + 2HCl_{(aq)} \longrightarrow FeCl_{2(aq)} + H_{2(g)}$$

32. In the reaction $CuO_{(s)} + H_{2(g)} \longrightarrow Cu_{(s)} + H_2O_{(\ell)}$. The substance reduced is

1) CuO 2) H_2O 3) Cu 3) H_2

Ans: 1

CuO is reduced to Cu

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

1) Iron 2) Copper 3) Magnesium 4) Platinum

Ans: 4

Platinum is a noble metal, it is not easily corroded

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

Ans: 3

Baking soda produce CO_2 which when passed through lime water turns its milky due to formation of $CaCO_3$

35. Which among the following elements are found in liquid state at room temperature (25°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)

Ans: 3

Mercury and Bromine are two liquid elements at 298 K

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

Ans: 2

Both A and R are correct and R is not the correct explanation of A

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

Ans: 2

Silver is a metal. It is a solid at 30°C

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

1) Mercury (Hg)

2) Copper (Cu)

3) Silver (Ag)

4) Tin (Sn)

Ans: 4

The standard electrode potential of Sn is negative

39. Match List-I with List-II

List-I (Colloid)	List-II (Dispersed phase- Dispersion medium
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) $i \rightarrow c;\ ii \rightarrow a;\ iii \rightarrow b;\ iv \rightarrow d$

Ans: 1

Gem stone - Solid-solid

Shaving cream - Gas - liquid

Cheese - Liquid-solid

Cloud - Liquid-gas

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

1) Silver oxide (Ag_2O)

2) Silver carbonate (Ag_2CO_3)

3) Silver sulphide (Ag_2S)

4) Silver Nitride (Ag_3N)

Ans: 3

Silver articles become black due to formation of a coating of silver sulphide

SECTION B

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

Ans: 7

Sn, Pb, Fe, Ni, Cu, Zn and Al are less malleable compared to Au

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

Ans: 4

CuO, $CaCO_3$, Zn & ZnO dissolve in dil. HCl

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

Ans: 3

NaOH solution, blood and milk of magnesia have pH > 7

44. Water of crystallisation in Gypsum and plaster of paris are m and n respectiely. Give the value of m × n

Ans: 1

Gypsum is $CaSO_4.2H_2O$

Plaster of paris is $CaSO_4.\frac{1}{2}H_2O$

m = 2, n = $\frac{1}{2}$ (m × n) = 1

45. How many different types of oxides are formed when anhydrous ferrous sulphate is heated in a dry boiling tube over a flame?

Ans: 2

$$2FeSO_{4(s)} \xrightarrow{heat} Fe_2O_{3(s)} + SO_{2(g)} + SO_{3(g)}$$

46. Considering the naturally occurring elements, how many are gases at one atmosphere pressure and room temperature (298 K)?

Ans: 11

Considering naturally occurring elemetns-11are gases at room temperature

47. The number of atoms present in one formula unit of calcium bicarbonate is .....

Ans: 11

$Ca(HCO_3)_2$ contain 1-Ca, 2-H, 2-C and 6-O atoms

48. The mass of 3.011×10^{23} molecules of dinitrogen (N_2) is ..... (Nearest integer)

Ans: 14

Molar mass of N_2 = 28 g mol^{-1} = mass of 6.022×10^{23} molecules

49. The sum of smallest whole number co-efficients x, y and z in the balanced equation $xH_{2(g)} + yO_{2(g)} \longrightarrow zH_2O_{(\ell)}$ is .....

Ans: 5

The balanced equation is $2H_{2(g)} + O_{2(g)} \longrightarrow 2H_2O_{(\ell)}$

50. Pure gold is ..... carats

Ans: 24

Pure gold is 24 carat

PART III - MATHEMATICS

SECTION A

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

Ans: 1

Let weight of dog is x; $\therefore\ 8 + \frac{1}{3}x = x \Rightarrow 8 = x - \frac{1}{3}x = \frac{2}{3}x$

$\Rightarrow 24 = 2x \Rightarrow x = 12$ kg

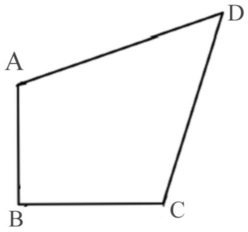
52. 100^{100} is divided by 50^{50} then the quotient is

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

Ans: 3

$$\text{Required quotient} = \frac{100^{100}}{50^{50}} = \frac{2^{100} \times 50^{100}}{50^{50}} = 2^{100} \times 50^{50} = 4^{50} \times 50^{50} = 200^{50}$$

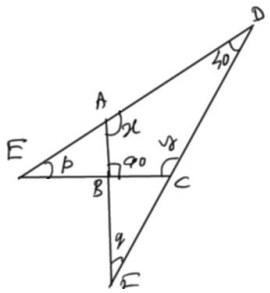
53. In $\square ABCD$, $\angle ABC = 90°$ and $\angle ADC = 40°$. If $\overrightarrow{DA}$ and $\overrightarrow{DC}$ are produced so that they meet $\overrightarrow{CB}$ and $\overrightarrow{AB}$ at E and F respectively. Then $\angle DEC + \angle DFA$ is



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

Ans: 1

In Δ ECD $p + y + 40 = 180$



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

In ΔFAD, $q + x = 140$ .....(2)

In $\square ABCD$, $x + y + 90 + 40 = 360$

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

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

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

Ans: 2

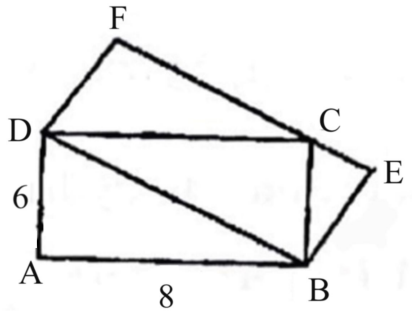
$p(x) = x^2 - x + 1$

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

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

$\therefore \frac{p(2) - p(-2)}{p(1) - p(-1)} = \frac{3-7}{1-3} = \frac{-4}{-2} = 2$

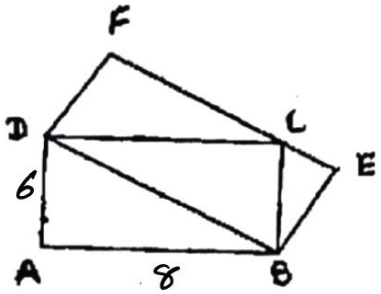
55. Two rectangles ABCD and DBEF are as shown in the figure. AB = 8 cm and AD = 6 cm. Then square root of $25BF^2 - 51$ is



1) 250 2) 3025 3) 65 4) 55

Ans: 4

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



Area of ABCD = 6 × 8 = 48

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

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

$BF^2 = BD^2 + DE^2 = 10^2 + \frac{24^2}{5^2} = \frac{2500+576}{25}$

$25BF^2 = 3076$

$25BF^2 - 51 = 3025$

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

56. **a, b, c** and **d** are real numbers such that **a** – 2025 = **b** + 2022 = **c** – 2023 = **d** + 2025, then which of the following relation is true

1) **a** < **b** < **c** < **d**
2) **a** > **c** > **b** > **d**
3) **a** > **b** > **c** > **d**
4) **a** > **d** > **c** > **b**

Ans: 2

Let a – 2025 = b + 2022 = c – 2023 = d + 2025 = k

$\therefore$ a = k + 2025

b = k – 2022

c = k + 2023

d = k – 2025

Now, k + 2025 > k + 2023 > k - 2022 > k - 2025

$\Rightarrow$ a > c > b > d

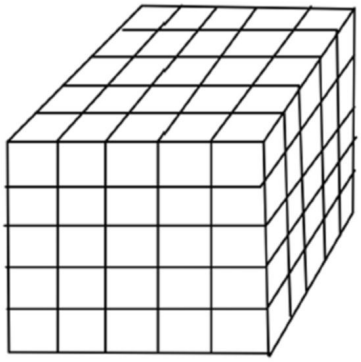
57. A cone of height 6 cm has base radius 4cm, then the volume of the cone is

1) 48π
2) 64π
3) 32π
4) 46π

Ans: 3

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

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

Ans: 3

Remove one layer from each face, then this cube reduced to $3\times3\times3$ cm^3

$\therefore$ There are 27 cubes having no point on any face

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

1) 125×15^{24} 2) 15^9 3) 25×15^{26} 4) 5^{27}

Ans: 1

$$\frac{1}{27}\times(3\times5)^{27} = \frac{1}{3^3}\times3^{27}\times5^{27} = 3^{24}\times5^{27} = 3^{24}\times5^{24}\times5^3 = 125\times15^{24}$$

60. Three identical rectangels 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 cm^2. The perimeter of the outer boundary of figure-2 in cm is

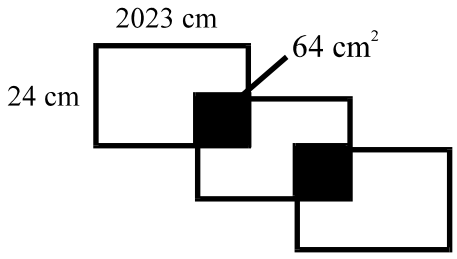


Figure-1

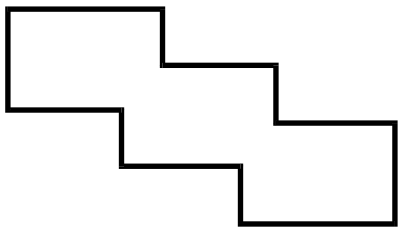


Figure-2

1) 12218 2) 12918

3) 11298 4) 12198

Ans: 1

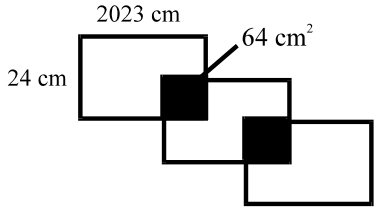


Figure-1

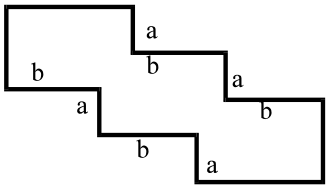


Figure-2

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 × 2 + 4 (2016 + 16) = 4094 + 8124 = 12218

61. If α and β 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) $\lvert\alpha-\beta\rvert$	2) 6
C) $x^2-6x+8=0$	III) $\lvert\alpha\beta\rvert$	3) 8
D) $x^2-8x+16=0$	IV) $\lvert\alpha^2-\beta^2\rvert$	4) 9

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

1) $A \to I \to 2;\ B \to II \to 2;\ C \to I \to 2;\ D \to I \to 3$

2) $A \to III \to 4;\ B \to I \to 1;\ C \to III \to 3;\ D \to II \to 1$

3) $A \to II \to 1;\ B \to I \to 1;\ C \to III \to 3;\ D \to I \to 3$

4) $A \to IV \to 1;\ B \to III \to 4;\ C \to II \to 2;\ D \to II \to 1$

Ans: 4

I	(I) $\alpha+\beta$	(II) $\lvert\alpha-\beta\rvert$	III) $\lvert\alpha\beta\rvert$	IV) $\lvert\alpha^2-\beta^2\rvert$	III
A) $x^2-6x+9=0$	6	0	9	0	1) 0
B) $x^2-9=0$	0	6	9	0	2) 6
C) $x^2-6x+8=0$	6	2	8	12	3)8
D)$x^2-8x+16=0$	8	0	16	0	4)9

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

Ans: 4

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

63. Sin 45° + cos45° + tan 45° + cot 45° is

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

Ans: 2

$$\sin 45°=\frac{1}{\sqrt{2}};\ \cos 45°=1;\ \tan 45°=1,\ \cot 45°=1$$

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

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

1) 7 2) 9 3) 11 4) 13

Ans: 3

If a, b, c are in AP b – a = c – b

$\Rightarrow$ 2b = a + c

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

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

5x + 1 = 5 × 2 + 1 =11

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

Ans: 2

In the end of 2020 - 120000

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

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

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

SECTION B - MATHEMATICS

66. The distance between two points (0, –1) and (x, 3) is 5. Find positive value of x

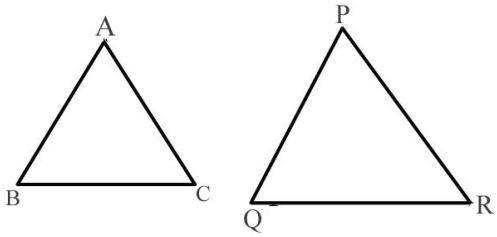
Ans: 3

$\sqrt{(x-0)^2+(3-1)^2} = 5$

$\sqrt{x^2+16} = 5 \Rightarrow x^2+16 = 25;\ x = \pm 3$

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

Ans: 3



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

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

68. Smallest two digit prime number is

Ans: 11

69. If numerical value of volume and surface area of a cube are equal, then length of the side of the cube is

Ans: 6

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

70. Area of a rectangle is $60cm^2$. Then the length of the diagonal, which has an integral value is

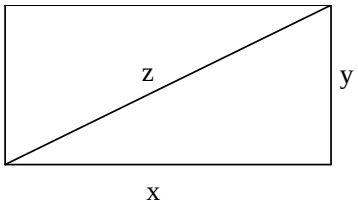
Ans: 13

$xy = 60$

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

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

$\therefore z = 13$



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

Ans: 225

a = 1; b = 2; n = 15

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

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

Ans: 47

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

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

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

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

Ans: 19

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

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

Ans: 72

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

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

Ans: 105

$2^3 + 3^4 + 4^2 = 8 + 81 + 16$