

## **SCREENING TEST ANSWER KEY**

## SECTION A - PHYSICS

1. When a ball is thrown in the condition of negligible air resistance then its total energy.
- 1) Remains constant
  - 2) Decreases
  - 3) Increases
  - 4) Becomes zero at the highest point of its journey

**Ans: 1**

**Gravity is conservative force. ∴ Total energy is conserved**

2. Two objects of masses 10 kg and 50 kg are moving along the same line and direction with momenta 4 kgm/s and 2 kgm/s respectively. Ratio of their kinetic energies is
- 1) 2 : 5
  - 2) 20 : 1
  - 3) 3 : 5
  - 4) 1 : 10

**Ans: 2**

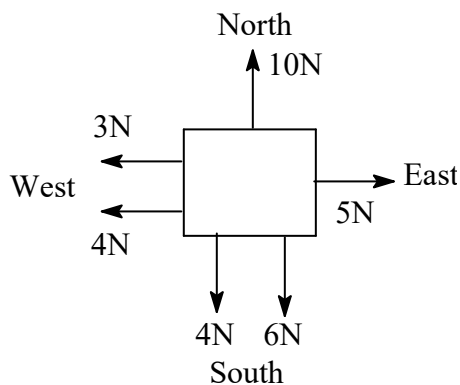
$$\frac{K_1}{K_2} = \frac{P_1^2}{2m_1} \frac{2m_2}{P_2^2} = \frac{m_2}{m_1} \left( \frac{p_1}{p_2} \right)^2 = \frac{50}{10} \times \left( \frac{4}{2} \right)^2 = 20$$

3. The electrical resistivity of the material of conductor is  $\rho$ . If the applied voltage becomes twice the initial value, then the resistivity of the material of the conductor is
- 1)  $2\rho$
  - 2)  $\frac{\rho}{2}$
  - 3)  $\frac{\rho}{3}$
  - 4)  $\rho$

**Ans: 4**

**Resistivity depends only the nature of the material**

4. In which direction does the net force act?



- 1) north
- 2) east
- 3) west
- 4) south

**Ans: 3**

5. The normal force experienced by a surface of area  $2\text{cm}^2$  is 10 N. The pressure acting on the surface is
- 1)  $5\text{ Nm}^{-2}$
  - 2)  $5 \times 10^3\text{ Nm}^{-2}$
  - 3)  $5 \times 10^2\text{ Nm}^{-2}$
  - 4)  $5 \times 10^4\text{ N/m}^2$

**Ans: 4**

$$\text{Pressure } P = \frac{F}{A} = \frac{10}{2 \times 10^{-4}} = 5 \times 10^4 \text{ N/m}^2$$

6. A particle of mass 2kg is moving with a constant velocity of 5 m/s. The net force acting on the particle is
- 1) 2.5 N                      2) Zero                      3) 10 N                      4) 5N

**Ans: 2**                      **Velocity is constant  $\therefore$  net force is zero**

7. What is the maximum value of resistance which can be made by connecting 3 resistors each of  $5\Omega$  ?
- 1)  $15\Omega$                       2)  $25\Omega$                       3)  $30\Omega$                       4)  $75\Omega$

**Ans: 1**                      **Resistance is maximum in series combination  $\therefore R_{\max} = 3 \times 5 = 15\Omega$**

8. From a height h, a body has a free fall to the surface of the earth. After it has fallen a height h/2, the body possesses:
- 1) Both potential energy and kinetic energy, where potential energy is greater than kinetic energy  
2) Equal amounts of potential energy and kinetic energy  
3) Only kinetic energy  
4) Both potential energy and kinetic energy, where kinetic energy is greater than potential energy

**Ans: 2**    **Decrease in P.E =  $mgh - \frac{mgh}{2} = \frac{mgh}{2}$**

**From conservation of energy, K.E. = decrease in P.E.  $\therefore K.E. = \frac{mgh}{2}$**

9. When a body becomes negatively charged, its mass
- 1) Decreases  
2) Increases  
3) Remains the same  
4) First increases then decreases

**Ans: 2**                      **Negative charging is the addition of electrons.  $\therefore$  mass will increase**

10. In an ac generator, mechanical energy is converted into
- 1) electrical energy  
2) magnetic energy  
3) light energy  
4) sound energy

**Ans: 1**

11. If velocity of the object is negative and acceleration is positive, then the speed of the object
- 1) will increase  
2) may increase or decrease  
3) will decrease  
4) will first increase and then decrease

**Ans: 3**

12. Speed of sound wave through air
- 1) is directly proportional to absolute temperature  
2) is directly proportional to square root of pressure, at constant temperature  
3) is directly proportional to square root of absolute temperature  
4) is independent of temperature

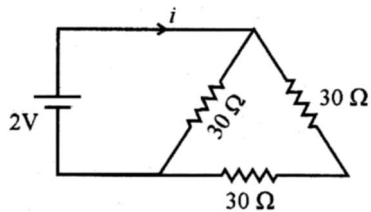
**Ans: 3**                      **Velocity of sound  $V \propto \sqrt{T}$  ; Where T = temperature in Kelvin**

13. A concave mirror of focal length  $f$  produces an image  $n$  times the size of the object. If the image is virtual, the distance of the object from the mirror is
- 1)  $(n-1)f$
- 2)  $(n+1)f$
- 3)  $\frac{(n+1)f}{n}$
- 4)  $\frac{(n-1)f}{n}$

**Ans: 4**

$$m = \frac{f}{f-u}; n = \frac{-f}{-f-u}, -nf - nu = -f; nf + nu = f; nu = f - nf; u = \frac{f(1-n)}{n} = \frac{-f(n-1)}{n}$$

14. Find the value of current 'i' in the circuit shown in the figure.



- 1) 0.1 A                      2) 0.2 A                      3) 1A                      4) 0.5 A

**Ans: 1**

**Effective resistance  $R = 60\ \Omega$  parallel  $30\ \Omega$**

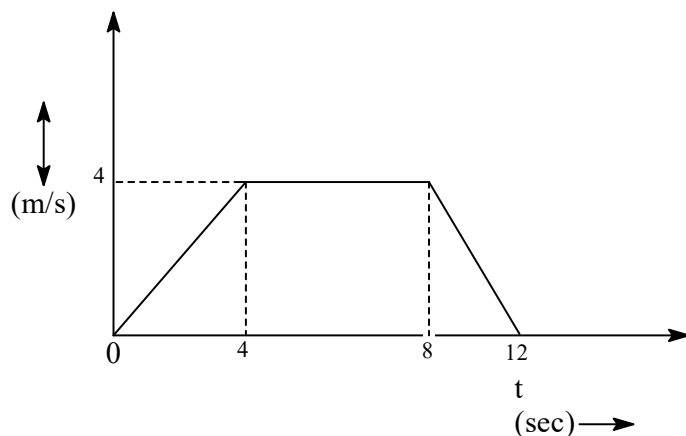
$$R = \frac{60 \times 30}{90} = 20 \Omega; I = \frac{V}{R} = \frac{2}{20} = 0.1 \text{ A}$$

15. CGS unit of force is  
1) newton                      2)  $\text{kgms}^{-2}$                       3) dyne                      4) erg

**Ans: 3**

## **SECTION B - PHYSICS**

16. Speed time graph of a body is given below



The distance travelled by the body in 12 second will be: (Answer should be in meter)

**Ans: 32**

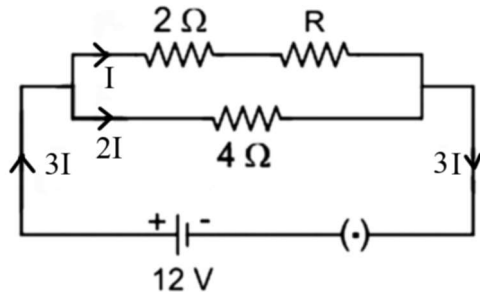
**Area under the graph = distance travelled**  $S = \frac{1}{2}[4+12]4 = 32$

17. Radius of curvature of a concave mirror is 30 cm. Magnitude of focal length of the mirror in a liquid of refractive index 1.5 is: [Answer should be in cm]

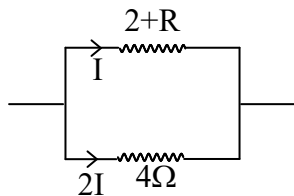
**Ans: 15**

$$f = \frac{R}{2} = \frac{30}{2} = 15 \text{ cm}; \text{ Focal length of mirror is independent of the medium}$$

18. What will the value of R in ohm in the following electric circuit?



**Ans: 6**



$$(2+R) \text{ is parallel to } 4\Omega \therefore (2+R)I = 4 \times 2I; R = 8 - 2 = 6\Omega$$

19. A man of mass 20 kg stands in a lift. The force exerted by the man on the floor of the lift in newton when the lift starts moving downward, with an acceleration of  $3 \text{ m/s}^2$  [ $g = 10 \text{ m/s}^2$ ]

**Ans: 140**  $N = m(g - a) = 20[10 - 3] = 140 \text{ N}$

20. A particle of mass 2kg is moving with a velocity of 8 m/s. The K.E. of the particle in joule is

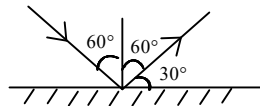
**Ans: 64**  $K = \frac{mv^2}{2} = \frac{2}{2} \times 8^2 = 64 \text{ J}$

21. If a planet consists of a satellite whose mass is half the mass of the earth and radius is one fourth the radius of the earth, then the acceleration due to gravity at its surface is n times that at the earth's surface. The value of n is

**Ans: 8**  $g_e = \frac{GM}{R^2}; g_p = G \frac{M}{2\left(\frac{R}{4}\right)^2} = 8 \frac{GM}{R^2} = 8g_e$

22. A ray of light is incident on a plane mirror with an angle of incidence  $60^\circ$ . The angle made by the reflected ray with the plane of the mirror in degree is

**Ans: 30**



23. A particle has a displacement of 3m under the action of a force of 10N. The angle between the force and the normal to the displacement is  $30^\circ$ . Work done by the force in joule is

**Ans: 15**  $W = FS \cos \theta = 10 \times 3 \times \cos(90 - 30) = 10 \times 3 \times \frac{1}{2} = 15J$

24. A body of mass 100 kg and density  $500 \text{ kg/m}^3$  floats in water. The additional mass in kg should be added to the body so that the body will sink is [density of water =  $10^3 \text{ kg/m}^3$ ]

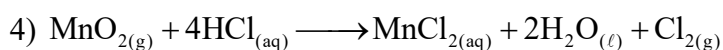
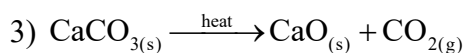
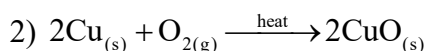
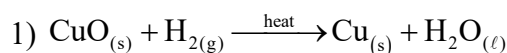
**Ans: 100**  $[100 + m]g = \text{upthrust} = V\rho g$   
 $[100 + m]g = \left(\frac{100}{500}\right) \times 10^3 \times g = 100 + m = 200; m = 100 \text{ kg}$

25. Two point masses at a given distance exert a gravitational interaction force on each other equal to F. If one mass is doubled, the other is halved, and the distance between them is doubled the resulting interaction force is  $\frac{F}{n}$ . The value of n is

**Ans: 4**  $F = \frac{Gm_1m_2}{r^2}; F' = G(2m_1)\left(\frac{m_2}{2}\right)\frac{1}{(2r)^2} = \frac{Gm_1m_2}{4r^2} = F' = \frac{F}{4}$

### SECTION A - CHEMISTRY

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



**Ans: 3** **Thermal decomposition of  $\text{CaCO}_3$  is not a redox reaction**

27. Which of the following is/are not correct method(s) for separating the components of given mixtures?

i) Mixture of iodine and sodium chloride by sublimation

ii) Colours in a dye by chromatography

iii) Mixture of acetic acid and water by using separating funnel

iv) Oxygen, Argon and Nitrogen from liquid air by fractional distillation

1) i only

2) iii only

3) ii and iii

4) ii, iii and iv

**Ans: 2** **Acetic acid and water are miscible liquids**

28. Read the following statements:

Statement-I : Sodium metal reacts violently with water to produce heat and fire.

Statement-II : Potassium metal reacts violently with water to form potassium hydroxide and hydrogen gas

Select the correct answer from the options given below

- 1) Statement-I is true but Statement-II is false
- 2) Statement-I is false but Statement-II is true
- 3) Both Statements are true and Statement-II provides explanation to Statement-I
- 4) Both Statements are true but Statement-II does not provide explanation to Statement-I

**Ans: 4                      Both are true statements. Statement-II is not an explanation to statement-I**

29. Baking powder is a mixture of

- 1) Sodium hydrogen carbonate and oxalic acid
- 2) Sodium carbonate and tartaric acid
- 3) Sodium carbonate and oxalic acid
- 4) Sodium hydrogen carbonate and tartaric acid

**Ans: 4                      Baking powder is a mixture of baking soda and mild edible acid such as tartaric acid**

30. Sulphur is burnt in a spatula. Moist blue and red litmus papers are brought one by one to the gas evolved during burning. The action of gas on the moist litmus papers will be

- 1) No change in colour in both litmus papers      2) Blue litmus paper becomes red
- 3) Red litmus paper becomes blue                      4) Blue litmus paper turns black

**Ans: 2                      SO<sub>2</sub> gas in acidic - blue litmus paper is turned red**

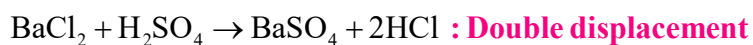
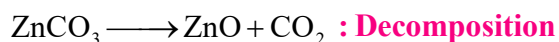
31. Match “chemical reactions” given in List-I with “type of chemical reactions” given in List-II

List-I (Chemical reactions)	List-II (Type of chemical reaction)
A) Formation of $\text{NH}_3$ from $\text{N}_2$ and $\text{H}_2$	I) Decomposition
B) Calcination of Zinc Carbonate	II) Double displacement
C) Reaction of aqueous $\text{BaCl}_2$ with dilute $\text{H}_2\text{SO}_4$	III) Combination
D) Rancidity of oils	IV) Redox
	V) Displacement

Select the correct answer using options given below

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

**Ans: 1**



**Rancidity of oils : Redox reaction**

32. Which of the following are 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

**Ans: 1      Reaction of water with  $\text{CaO}$  and dilution of acid are exothermic**

33. Silver articles become black on exposure to air for longer time, because of the formation of coating of

- 1) Silver carbonate ( $\text{Ag}_2\text{CO}_3$ )      2) Silver oxide ( $\text{Ag}_2\text{O}$ )  
 3) Silver sulphide ( $\text{Ag}_2\text{S}$ )      4) Silver cyanide ( $\text{AgCN}$ )

**Ans: 3      Tarnishing of silver is due to formation of  $\text{Ag}_2\text{S}$**



34. Which one of the following four metals would be displaced from the solution of its salts by other three metals?

- 1) Mg (Magnesium)    2) Cu (Copper)    3) Zn (Zinc)    4) Fe (Iron)

**Ans: 2**

**Copper is the least reactive metal. The reactivity order is  $Mg > Zn > Fe > Cu$**

35. If refining of impure copper containing zinc impurity is to be done by electrolysis, the anode and cathode employed would be respectively

- 1) Pure zinc, pure copper                      2) Pure copper, pure zinc  
3) Impure copper, pure copper                4) Impure zinc, pure zinc

**Ans: 3                      In electrolytic refining of metals impure metal is made the anode and pure metal is made the cathode**

36. Scattering of a beam of light is shown by

- 1) Sugar solution  
2) Milk  
3) NaCl solution  
4) Dilute sulphuric acid

**Ans: 2                      Milk is a colloid**

37. 22 carat gold means

- 1) 20 parts of pure gold alloyed with 2 parts of Cu or Ag  
2) 22 parts of pure gold alloyed with 2 parts of Cu or Zn  
3) 21 parts of pure gold alloyed with 1 part of Cu or Ag  
4) 22 parts of pure gold alloyed with 2 parts of Cu or Ag

**Ans: 4**

**22 Carat gold is an alloy of 22 parts pure gold and 2 parts Cu or Ag**

38. Which among the following is chemically the most active non metal?

- 1) Bromine (Br)    2) Nitrogen (N)    3) Oxygen (O)    4) Fluorine (F)

**Ans: 4                      Fluorine is the most reactive non metal**

39. In the balanced chemical equation:

**a** lead nitrate + **b** Aluminium chloride  $\rightarrow$  **c** Aluminium nitrate + **d** Lead chloride .

Which among the following is the correct set of co-efficients a, b, c and d?

1)  $a = 3, b = 2, c = 2, d = 3$

2)  $a = 1, b = 2, c = 2, d = 1$

3)  $a = 2, b = 3, c = 2, d = 3$

4)  $a = 4, b = 3, c = 3, d = 4$

**Ans: 1**

**The balanced equation is**  $3\text{Pb}(\text{NO}_3)_2 + 2\text{AlCl}_3 \rightarrow 2\text{Al}(\text{NO}_3)_3 + 3\text{PbCl}_2$

40. When ferrous sulphate crystals ( $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ) are heated in a boiling tube over the flame of a burner, which among the following does not occur?

1) Oxygen ( $\text{O}_2$ ) gas is produced

2) Sulphurdioxide ( $\text{SO}_2$ ) gas is produced

3) Sulphurtrioxide ( $\text{SO}_3$ ) gas is produced

4) Colour of crystals change

**Ans: 1**

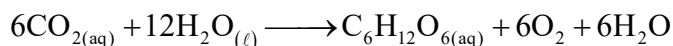
**The reaction taking place is**  $2\text{FeSO}_{4(s)} \xrightarrow{\text{heat}} \text{Fe}_2\text{O}_{3(s)} + \text{SO}_{2(g)} + \text{SO}_{3(g)}$

### SECTION B - CHEMISTRY

41. Consider the reaction  $6\text{CO}_{2(aq)} + y\text{H}_2\text{O}_{(l)} \xrightarrow[\text{chlorophyll}]{\text{Sunlight}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$ . The number of moles of water (y) involved in the balanced equation is .....

**Ans: 12**

**The balanced equation is**



42. In presence of sun light, Silver Bromide decomposes the same way as silver chloride. When exposed to sunlight how many moles of solid silver bromide is required to obtain one mole gaseous bromine ( $\text{Br}_2$ )?

**Ans: 2**

**The balanced equation for the decomposition is**  $2\text{AgBr}(s) \xrightarrow{\text{sunlight}} 2\text{Ag}(s) + \text{Br}_2(g)$

43. How many of the following are olfactory acid base indicators?

i) Litmus

ii) Turmeric

iii) Methyl orange

iv) Clove oil

v) Phenolphthalein

vi) Petals of Hydrangea

vii) Chopped onion

viii) Vanilla essence

ix) Red cabbage leaves

**Ans: 3**

**Onion, vanilla and clove oil are olfactory indicators**

44. How many of the following liberate  $\text{CO}_2$  gas when sodium bicarbonate is added?
- |                                |   |
|--------------------------------|---|
| i) Pure water                  | ii) Dilute hydrochloric acid                |
| iii) Sodium hydroxide solution | iv) Lime water (Calcium hydroxide solution) |
| v) Sodium carbonate solution   | vi) Vinegar                                 |

**Ans: 2**                      **dil. HCl and acetic acid liberate  $\text{CO}_2$  from  $\text{NaHCO}_3$**

45. How many families of salts can be identified in the given list of salts?

- |                               |                                |                     |
|-------------------------------|--------------------------------|---------------------|
| i) $\text{K}_2\text{SO}_4$    | ii) $\text{NaCl}$              | iii) $\text{KNO}_3$ |
| iv) $\text{MgSO}_4$           | v) $\text{NaNO}_3$             | vi) $\text{MgCO}_3$ |
| vii) $\text{Na}_2\text{SO}_4$ | viii) $\text{Na}_2\text{CO}_3$ | ix) $\text{KCl}$    |

**Ans: 7**

**Family of salts of K, Na, Mg**

**Family of sulphate, chloride, nitrate and carbonate salts**

46. 2 moles of gypsum is heated to 373 K to form plaster of paris. Assuming complete conversion of gypsum to plaster of paris, how many moles of water are liberated during the process?

**Ans: 3**

**The reaction taking place is**  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O} \longrightarrow \text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O} + 1\frac{1}{2}\text{H}_2\text{O}$

**2 mol gypsum  $\rightarrow$  3 moles of  $\text{H}_2\text{O}$**

47. 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 solution (The same solution as before) required to neutralise it will be ..... mL

**Ans: 16**

**10 mL NaOH  $\equiv$  8 mL HCl**

**20 mL NaOH = 16 mL HCl**

48. How many of the following conduct heat through them?

- |                |               |                   |                 |
|----------------|---------------|-------------------|-----------------|
| i) Silver (Ag) | ii) Lead (Pb) | iii) Mercury (Hg) | iv) Copper (Cu) |
|----------------|---------------|-------------------|-----------------|

**Ans: 4**                      **Ag, Pb, Hg and Cu are all metals**

49. "When added to dilute hydrochloric acid, no bubbles of  $H_2$  gas are seen to be formed and temperature of the mixture remains the same". This statement is true for how many elements among the following?

- i) Magnesium (Mg)      ii) Iron (Fe)      iii) Copper (Cu)      iv) Zinc (Zn)  
v) Silver (Ag)      vi) Mercury (Hg)      vii) Aluminium (Al)

**Ans: 3**

**Cu, Ag and Hg cannot displace  $H_2$  gas from dilute HCl**

50. You are given the three alloys; Brass, Bronze and Solder mixed together. How many different elements are present in the given mixture of alloys?

**Ans: 4**

**Brass is alloy of Cu & Zn**

**Bronze alloy of Cu & Sn and solder alloy of Sn & Pb**

### SECTION A - MATHEMATICS

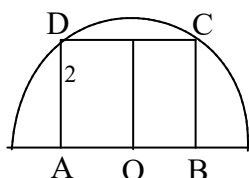
51. If the area of square inscribed in a semicircle is  $4 \text{ cm}^2$ , then the area of the square inscribed in a full circle of the same radius is

- 1)  $9 \text{ cm}^2$       2)  $10 \text{ cm}^2$       3)  $6 \text{ cm}^2$       4)  $8 \text{ cm}^2$

**Ans: 2**

**Area of ABCD = 4  $\Rightarrow$  AD = 2; O is midpoint of AB.  $\therefore$  OA = 1  $\Rightarrow$  OD =  $\sqrt{5} = r$ .**

**If  $r = \sqrt{5}$ , diameter =  $2\sqrt{5}$ .**



**$\therefore$  Diagonal of largest square inscribed in a circle of diameter  $2\sqrt{5}$  is  $2\sqrt{5}$  itself.**

$$\therefore \text{Area} = \frac{1}{2}d^2 = \frac{1}{2} \times 4 \times 5 = 10$$

52. Consider a right triangle with sides  $a$ ,  $b$  and hypotenuse  $c$ . If the altitude drawn to the hypotenuse ' $c$ ' 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)  $k = a + b$

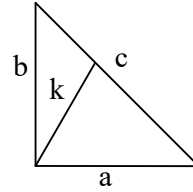
**Ans: 3**

$$\text{Area} = \frac{1}{2}ab = \frac{1}{2}ck$$

$$ck = ab$$

$$c^2 = a^2 + b^2$$

$$\therefore \left(\frac{ab}{k}\right)^2 = a^2 + b^2 \Rightarrow \frac{1}{k^2} = \frac{1}{a^2} + \frac{1}{b^2}$$



53. Value of  $\frac{1}{\sqrt{32}-\sqrt{18}} + \frac{1}{\sqrt{98}-\sqrt{72}}$  is

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

**Ans: 2**

$$\frac{1}{\sqrt{32}-\sqrt{18}} + \frac{1}{\sqrt{98}-\sqrt{72}} = \frac{1}{4\sqrt{2}-3\sqrt{2}} + \frac{1}{7\sqrt{2}-6\sqrt{2}} = \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \sqrt{2}$$

54. Base diameter of a cone is 12cm and height 4cm, then volume of the cone is

1)  $48\pi$     2)  $64\pi$   
3)  $12\pi$     4)  $46\pi$

**Ans: 1**

$$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 6 \times 6 \times 4 = 48\pi$$

55. If  $\frac{x}{2} + \frac{y}{4} = 4$  and  $\frac{x}{3} + \frac{y}{2} = 4$  then  $y$  is

1) 1    2) 2  
3) 3    4) 4

**Ans: 4**

$$\frac{x}{2} + \frac{y}{4} = 4 \Rightarrow 2x + y = 16$$

$$\frac{x}{3} + \frac{y}{2} = 4 \Rightarrow 2x + 3y = 24$$

$$\text{Solving } y = 4, x = 6$$

56. Raju purchased a laptop of cost Rs. 45,000/- and sold it by Rs. 50,000/- after few days. Then the profit percentage of Raju is
- 1) 10%                                  2) 15%
- 3)  $16\frac{2}{3}\%$                               4)  $11\frac{1}{9}\%$

**Ans: 4**

**Cost price = 45000**

**Sold price = 50000**

$$\text{Profit} = 50000 - 45000 = 5000$$

$$\% \text{ profit} = \frac{5000}{45000} \times 100 = \frac{100}{9} = 11\frac{1}{9}\%$$

57. If  $\sin A = \frac{1}{2}$ , then the value of  $\cos^2 A - \sin^2 A$  is

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

**Ans: 3**

$$\sin A = \frac{1}{2} \Rightarrow A = 30^\circ$$

$$\cos A = \cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\cos^2 A - \sin^2 A = \frac{3}{4} - \frac{1}{4} = \frac{1}{2}$$

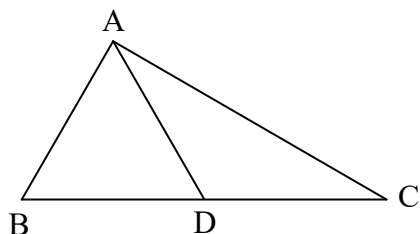
58. If  $P(x) = x^2 - x + 1$  then  $\frac{P(2) - P(-2)}{P(1) - P(-1)} =$

- 1) 0                      2) 2                      3) 4                      4) 5

**Ans: 2**

$$\frac{P(2)-P(-2)}{P(1)-P(-1)} = \frac{(4-2+1)-(4+2+1)}{(1-1+1)-(1+1+1)} = 2$$

59. In the given figure, AD is the bisector of  $\angle BAC$ . If  $AB = 8\text{ cm}$ ,  $AC = 6\text{ cm}$  and  $BC = 21\text{ cm}$ , find DC:



- 1) 4.5 cm                      2) 9 cm                      3) 7.5 cm                      4) 12 cm

**Ans: 2**

**Angle bisector of a triangle divide the opposite side in the ratio of other two sides.**

$$\therefore \frac{BD}{DC} = \frac{AB}{AC} = \frac{8}{6} = \frac{4}{3}$$

$$\therefore 1 + \frac{BD}{DC} = 1 + \frac{4}{3} \Rightarrow \frac{BC}{DC} = \frac{7}{3}$$

$$\therefore \frac{21}{DC} = \frac{7}{3} \Rightarrow DC = 9$$

60. The ratio of the total surface area to the lateral surface area of a cylinder with base radius 80cm and height 20cm is

- 1) 1:2
- 2) 2:1
- 3) 3:1
- 4) 5:1

**Ans: 4**

$$\text{Total surface area} = 2\pi rh + 2\pi r^2 = 2\pi r(h + r)$$

$$\text{Lateral surface area} = 2\pi rh$$

$$\therefore \text{Ratio} = \frac{2\pi r(h + r)}{2\pi rh} = \frac{h + r}{h} = \frac{20 + 80}{20} = \frac{100}{20} = \frac{5}{1}$$

Required ratio = 5 : 1

61. If  $x + y = 6$ ,  $x^2 + y^2 = 26$ ,  $x^3 + y^3 = 126$  then  $x^4 + y^4$  is

- 1) 626
- 2) 426
- 3) 326
- 4) 526

**Ans: 1**

$$(x + y)^2 = x^2 + y^2 + 2xy$$

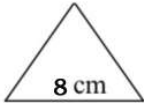

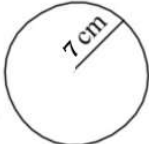
$$6^2 = 26 + 2xy \Rightarrow xy = 5$$

$$(x^2 + y^2)^2 = x^4 + y^4 + 2x^2y^2$$

$$26^2 = x^4 + y^4 + 2(5^2)$$

$$x^4 + y^4 = 676 - 50 = 626$$

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

I (Figures)	II (Required measure)	III
A)  Equilateral triangle	I) Area	1) 154 units
B)  Square	II) Perimeter	2) 44 units
C)  Circle	III) Circumference	3) 36 units
		4) 24 units

Then which among the following is true?

1)  $A \rightarrow I \rightarrow 3$ ;  $B \rightarrow II \rightarrow 1$ ;  $C \rightarrow III \rightarrow 2$

2)  $A \rightarrow II \rightarrow 4$ ;  $B \rightarrow II \rightarrow 3$ ;  $C \rightarrow I \rightarrow 1$

3)  $A \rightarrow II \rightarrow 4$ ;  $B \rightarrow II \rightarrow 4$ ;  $C \rightarrow III \rightarrow 2$

4)  $A \rightarrow I \rightarrow 1$ ;  $B \rightarrow I \rightarrow 3$ ;  $C \rightarrow II \rightarrow 2$

**Ans: 3** **Area of triangle** =  $\frac{\sqrt{3}}{4} \times 64 = 16\sqrt{3}$

Perimeter of triangle =  $3 \times 8 = 24$

Area of square =  $6^2 = 36$

Perimeter of square =  $4 \times 6 = 24$

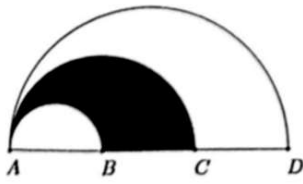
Area of circle =  $\pi r^2 = \frac{22}{7} \times (7)^2 = 154$

Circumference =  $\frac{2 \times 22}{7} \times 7 = 44$

$A \rightarrow II \rightarrow 4$ ;  $B \rightarrow II \rightarrow 4$ ;  $C \rightarrow III \rightarrow 2$  are true



63. Three semicircles with diameters AB, AC and AD are given as in the figure. If  $AB = BC = CD$ , then the ratio of the unshaded area to the shaded area is



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

**Ans: 1**

Let  $AB = 2r \Rightarrow BC = 2r$  and  $CD = 2r \therefore AC = 4r, AD = 6r$

$$\text{Area of shaded region} = \frac{1}{2}\pi\left(\frac{AC}{2}\right)^2 - \frac{1}{2}\pi\left(\frac{AB}{2}\right)^2 = \frac{\pi}{2}[(2r)^2 - (r)^2] = \frac{3\pi r^2}{2}$$

$$\text{Area of unshaded region} = \frac{1}{2}\pi\left(\frac{AD}{2}\right)^2 - \text{area of shaded region}$$

$$= \frac{1}{2}\pi(3r)^2 - \frac{3\pi r^2}{2}$$

$$= \frac{9\pi}{2}r^2 - \frac{3\pi r^2}{2} = \frac{6}{2}\pi r^2$$

$$\text{Required ratio} = \frac{\frac{6\pi r^2}{2}}{\frac{3\pi r^2}{2}} = 2:1$$

64. A pair of natural numbers  $x, y$  satisfy the equation  $\frac{7}{x} + \frac{6}{y} = 1$ , then the largest value of

$x + y$  is

- 1) 65  
2) 57  
3) 56  
4) 75

**Ans: 3**

$$\frac{7}{x} + \frac{6}{y} = 1 \Rightarrow 7y + 6x = xy$$

$$xy - 6x - 7y = 0 \Rightarrow x(y - 6) - 7y + 42 = 42$$

$$(y - 6)(x - 7) = 42$$

$$\text{Now, } 42 = 1 \times 42, 2 \times 21, 3 \times 14, 6 \times 7$$

$$y - 6 = 1; x - 7 = 42 \Rightarrow y = 7 \text{ or } x = 49$$

$$y - 6 = 2; x - 7 = 21 \Rightarrow y = 8 \text{ or } x = 28$$

$$y - 6 = 3; x - 7 = 14 \Rightarrow y = 9 \text{ or } x = 21$$

$$y - 6 = 6; x - 7 = 7 \Rightarrow y = 12 \text{ or } x = 14$$

$$\therefore \text{Largest } x + y = 7 + 49 = 56$$

$$y - 6 = 1, x - 7 = 42 \Rightarrow x + y - 13 = 43 \Rightarrow x + y = 56 \text{ and}$$

$$y - 6 = 42, x - 7 = 1 \Rightarrow x + y - 13 = 42 \Rightarrow x + y = 56$$

65. 10800 is expressed as  $2^a \times 3^b \times 5^c$  and 6480 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

**Ans: 4**

$$10800 = 2^4 \times 3^3 \times 5^2$$

$$6480 = 2^4 \times 3^4 \times 5^1$$

$$a + b + c + c + d + e + f = 4 + 3 + 2 + 4 + 4 + 1 = 18$$

$$\text{Now } 2024 = 112 \times 18 + 8$$

$$\therefore \text{remainder} = 8$$

### SECTION B - MATHEMATICS

66. The value of  $20 \tan^2 45 + 18 \cos^2 45$ , is

**Ans: 29**

$$20 \tan^2 45 + 18 \cos^2 45 = 20 \times 1^2 + 18 \times \left(\frac{1}{\sqrt{2}}\right)^2 = 20 + 18 \times \frac{1}{2} = 20 + 9 = 29$$

67. If the arithmetic mean of 15, 17, 19, x is 16 then the value of x, is

Ans: 13

$$\frac{15 + 17 + 19 + x}{4} = 16 \Rightarrow 51 + x = 64; x = 13$$

68.  $\left(3x + \frac{1}{2x}\right)^2 - \left(3x - \frac{1}{2x}\right)^2$  is

**Ans: 6**

$$(a + b)^2 - (a - b)^2 = 4ab$$

$$\left(3x + \frac{1}{2x}\right)^2 - \left(3x - \frac{1}{2x}\right)^2 = 4 \times 3x \times \frac{1}{2x} = 6$$

69. Least common multiple of  $\frac{1}{5}$  and  $\frac{2}{3}$  is

**Ans: 2**

**Multiples of  $\frac{1}{5}$  are  $\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{5}{5}, \frac{6}{5}, \frac{7}{5}, \frac{8}{5}, \frac{9}{5}, \frac{10}{5}, \dots$**

**Multiples of  $\frac{2}{3}$  are  $\frac{2}{3}, \frac{4}{3}, \frac{6}{3}, \frac{8}{3}, \dots$**

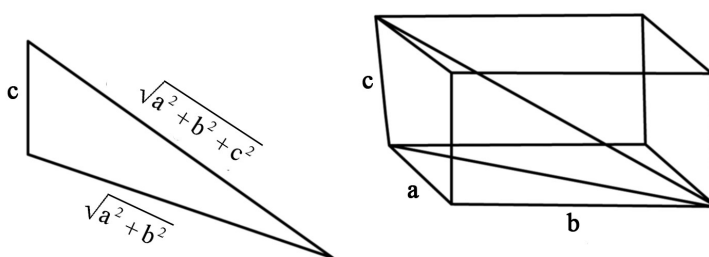
$$\therefore \frac{10}{5} = 2 \text{ and } \frac{6}{3} = 2 \therefore \text{Least common multiple is 2}$$

OR

$$\text{LCM of } \left\{ \frac{a}{b}, \frac{c}{d} \right\} = \frac{\text{LCM}\{a, c\}}{\text{HCF}\{b, d\}} = \frac{\text{LCM}\{1, 2\}}{\text{HCF}\{3, 5\}} = \frac{2}{1} = 2$$

70. A box has 6m length, 3m width and 2m height. Then length of largest straight stick, which can be placed inside the box is

**Ans: 7**  $\sqrt{3^2 + 2^2 + 6^2} = \sqrt{49} = 7$



71. Find the distance between the pair of points P(6,8) and Q(-9, -12)

**Ans: 25**

$$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(6 + 9)^2 + (8 + 12)^2} = \sqrt{15^2 + 20^2} = \sqrt{225 + 400} = 25$$

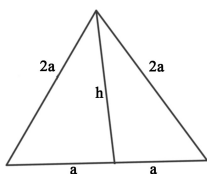
72. Altitude of an equilateral triangle is  $8\sqrt{3}$ , then perimeter of the triangle, is

**Ans: 48**

$$a^2 + h^2 = 4a^2$$

$$h^2 = 3a^2$$

$$h = \sqrt{3}a$$



Altitude is  $\sqrt{3}a$ , then side  $2a$ . Here altitude is  $8\sqrt{3}$  then side  $a$  is 16.  $\therefore$  Perimeter  $16 \times 3 = 48$

73. What is the remainder when  $(x^4 + 1)$  is divided by  $(x-2)$ ?

**Ans: 17**

**P(a) is remainder when P(x) is divided by x - a**

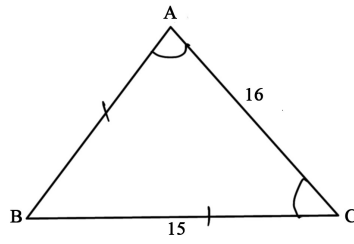
74. If (2, 1) is a solution of the linear equation  $2x + 3y = K$ , then the value of K is

**Ans: 7**

$$2x + 3y = K \text{ with solution } (2, 1) \Rightarrow 4 + 3 = K \Rightarrow K = 7$$

75. In  $\triangle ABC$ ,  $\angle C = \angle A$  and  $BC = 15$  cm and  $AC = 16$  cm, then the length of  $AB$ , is

**Ans: 15**



$$\angle A = \angle C \Rightarrow AB = BC = 15$$