

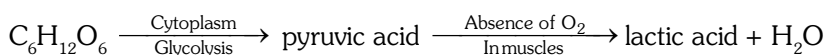
NATIONAL TALENT SEARCH EXAMINATION 2018
SCHOLASTIC APTITUDE TEST (SAT)

1. Under which condition stated below, the six-carbon glucose molecule is broken down into three-carbon molecules pyruvate and lactic acid ?

- (1) aerobic condition in muscle cells (2) anaerobic condition in yeast cells
(3) aerobic condition in mitochondria (4) anaerobic condition in muscle cells

Ans. (4)

Sol. It is a type of anaerobic respiration occurs in muscles during lack of oxygen.



2. Which among the following is the correct sequence regarding the flow of impulse in a neuron

- (1) Dendrite → Axon → Cell body (2) Axon → Cell body → Dendrite
(3) Axon → Dendrite → Cell body (4) Cell body → Axon → Nerve terminal

Ans. (4)

Sol. The correct sequence of impulse travel through neuron is
Cell body → Axon → Nerve terminal

3. In a hypertensive patient the systolic pressure increased to 150 mm of Hg. Which part of the brain would be involved in the regulation of blood pressure ?

- (1) Medulla (2) Cerebrum (3) Cerebellum (4) Hypothalamus

Ans. (1)

Sol. Hypertensive situation is controlled by medulla oblongata.

4. Edward Jenner's contribution for the eradication of small pox is

- (1) his proposition that small pox had possibly spread throughout the world from India and China.
(2) his discovery of transformation procedure.
(3) his finding that rubbing of the skin crust of small pox victims on the arm of a healthy person, would develop resistance against small pox.
(4) his finding that the cow pox infection protects the person from subsequent infection from small pox.

Ans. (4)

Sol. According to Edward Jenner, the cow-pox infection protects the person from small-pox due to development of more amount of Antibody. [secondary response]

5. Four important events given below may have led to the origin of life on the earth.

- (I) Formation of amino acids and nucleotides (II) Availability of water
(III) Organization of cells (IV) Formation of complex molecules

Select the correct sequence of events.

- (1) I, II, III and IV (2) II, I, IV and III (3) I, IV, II and III (4) II, III, I and IV

Ans. (2)

Sol. According to Oparin Haldane theory about the origin of life on earth. The following events occurred in this sequence.

- I → Availability of water
II → formation of amino-acids and nucleotides.
III → formation of complex molecules
IV → Organization of cell.

6. Read the following statements carefully :
- (I) Energy transfer in the biotic world always proceeds from the autotrophs.
 - (II) Energy flow is unidirectional.
 - (III) Energy availability is maximum at the tertiary level.
 - (IV) There is loss of energy from one trophic level to the other.
- Select the relevant statements for the forest ecosystem.

(1) I, II and IV (2) I, II and III (3) I, III and IV (4) II, III and IV

Ans. (1)

Sol. The relevant statement for the forest ecosystem are

I → Energy transfer in the biotic world always proceeds from the autotrophs.

II → Energy flow is unidirectional.

IV → There is loss of energy from one trophic level to the other.

7. In a highly pesticide polluted pond, which of the following aquatic organisms will have the maximum amount of pesticide per gram of body mass ?

(1) Lotus (2) Fishes (3) Spirogyra (4) Zooplanktons

Ans. (2)

Sol. It is an example of 'biomagnification' in which fishes are at highest trophic level, so they will accumulate maximum amount of pesticides.

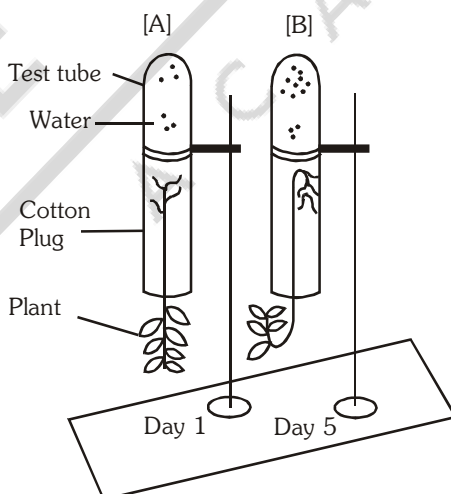
8. A farmer made an observation in a backwater paddy field of coastal Kerala that the paddy plants wilt during noon onwards everyday but appear normal next morning. What would be the possible reason for wilting ?

(1) The rate of water absorption is less than the rate of transpiration in the afternoon.
 (2) The rate of water absorption is more than the rate of transpiration in the afternoon.
 (3) The changes in the rate of water absorption and transpiration are not associated with wilting.
 (4) The rate of water absorption is not related to the rate of transpiration.

Ans. (1)

Sol. Wilting of plants is due to more rate of transpiration, as compared to rate of absorption of water.

9. Observe the experimental sets [A] & [B].



Observe the test tube A & B. From the list given below, choose the combination of responses of shoot and root that are observed in B.

- (1) Positive phototropism and positive geotropism.
- (2) Negative phototropism and positive geotropism.
- (3) Positive phototropism and negative geotropism.
- (4) Only negative phototropism.

Ans. (1)

Sol. In this figure (B), at day 5 shoot is moving towards sun-light (positive phototropism) and root is moving towards gravity (positive geotropism).

- 10.** Raw banana has bitter taste, while ripe banana has sweet taste. It happens because of the conversion of
- (1) starch to sugar
 - (2) sucrose to fructose
 - (3) amino acids to sugar
 - (4) amino acids to protein

Ans. (1)

Sol. Raw banana has bitter taste due to the presence of starch, later on after ripening this starch will convert in sugar, which will provide sweet taste.

- 11.** In the following plants sexual reproduction involves several events beginning with the bud and ending in a fruit. These events are arranged in four different combinations. Select the combination that has the correct sequence of events.
- (1) Embryo, zygote, gametes, fertilization
 - (2) Gametes, fertilization, zygote, embryo
 - (3) Fertilization, zygote, gametes, embryo
 - (4) Gametes, zygote, embryo, fertilization

Ans. (2)

Sol. In flowering plants order of sexual reproduction is
Gametes → Fertilization → Zygote → Embryo

- 12.** In pea plants, Round (R) and Yellow (Y) features of seeds are dominant over wrinkled (r) and green (y) features. In a cross between two plants having the same genotypes (RrYy), the following genotypic combinations of offspring are noticed.
- A – RrYY
 - B – Rryy
 - C – rrYy
 - D – rryy

The phenotypic features of A, B, C and D are given below in an order in four combinations. Select the correct combination of characters that corresponds to the genotypes,

- (1) Round & yellow; round and green; wrinkled & yellow; wrinkled & green.
- (2) Round & green; wrinkled & yellow; wrinkled & green; round & yellow.
- (3) Wrinkled & green; round & yellow; wrinkled & yellow; round & green.
- (4) Wrinkled & yellow; round & green; wrinkled & yellow; round & yellow.

Ans. (1)

Sol. According to question

- A → RrYY → Round and Yellow
- B → Rryy → Round and Green
- C → rrYy → Wrinkled and Yellow
- D → rryy → Wrinkled and Green

- 13.** Eukaryotic organisms have different levels of organization. Select the combination where the levels are arranged in the descending order.
- (1) DNA, chromosome, cell, nucleus, tissue
 - (2) Tissue, cell, nucleus, chromosome, DNA
 - (3) Nucleus, cell, DNA, chromosome, tissue
 - (4) Tissue, cell, chromosome, nucleus, DNA

Ans. (2)

Sol. Descending order in eukaryotic organism is
Tissue → Cell → Nucleus → Chromosome → DNA

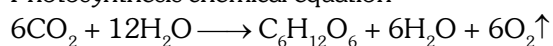
14. The gaseous byproduct of a process in plants is essential for another vital process that releases energy. Given below are four combinations of processes and products. Choose the correct combination.

- (1) Photosynthesis and oxygen
(2) Respiration and carbon dioxide
(3) Transpiration and water vapour
(4) Germination and carbon dioxide

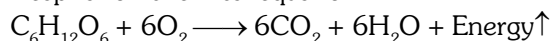
Ans. (1)

Sol. In the given question the two processes that has been discussed are photosynthesis and respiration.

→ Photosynthesis chemical equation



→ Respiration chemical equation



Oxygen released during photosynthesis will be used in respiration.

15. 100 grams of oxygen (O_2) gas and 100 grams of helium (He) gas are in separate containers of equal volume at 100°C . Which one of the following statement is correct ?

- (1) Both gases would have the same pressure.
(2) The average kinetic energy of O_2 molecules is greater than that of He molecules.
(3) The pressure of He gas would be greater than that of the O_2 gas.
(4) The average kinetic energy of He and O_2 molecules is same.

Ans. (3)

Sol. According to ideal gas equation,

$$PV = nRT$$

For 100 gm O_2 ,

$$P_1 \times V = \frac{100}{32} \times R \times T \quad \dots(1)$$

For 100 gm He,

$$P_2 \times V = \frac{100}{4} \times R \times T \quad \dots(2)$$

Dividing eq (1) by (2)

$$\frac{P_1 \times V}{P_2 \times V} = \frac{100 \times R \times T}{32} \times \frac{4}{100} \times \frac{1}{R \times T}$$

$$\frac{P_1}{P_2} = \frac{1}{8}, P_2 = 8P_1$$

$$\therefore P_{\text{He}} > P_{\text{O}_2}$$

16. At 298 K and 1 atm pressure a gas mixture contains equal masses of He, H_2 , O_2 and NH_3 . Which of the following is correct for their average molecular velocities ?

- (1) $\text{He} > \text{H}_2 > \text{NH}_3 > \text{O}_2$
(2) $\text{He} < \text{H}_2 < \text{O}_2 < \text{NH}_3$
(3) $\text{H}_2 < \text{He} < \text{NH}_3 < \text{O}_2$
(4) $\text{O}_2 < \text{NH}_3 < \text{He} < \text{H}_2$

Ans. (4)

Sol. Molecular velocities $\propto \frac{1}{\text{Mass of gases}}$

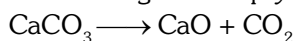
\therefore Order of their molecular velocities will be
 $O_2 < NH_3 < He < H_2$

17. A test tube along with calcium carbonate in it initially weighed 30.08 g. A heating experiment was performed on this test tube till calcium carbonate completely decomposed with evolution of a gas. Loss of weight during this experiment was 4.40 gm. What is the weight of the empty test tube in this experiment ?

- (1) 20.08 g (2) 21.00 g (3) 24.50 g (4) 2.008 g

Ans. (1)

Sol. Let the weight of empty test tube is x gm.



When CO_2 produced is 44 gm, $CaCO_3$ needed is 100 gm.

\therefore When CO_2 produced is 4.4g, $CaCO_3$ needed is $\frac{100}{44} \times 4.4 = 10$ gm

If mass of $CaCO_3$ is 10 gm, then weight of empty test tube
 $= 30.08 - 10.00 = 20.08$ g

18. Match List - I (Mixture to be separated) with the List - II (Method used) and select the correct option using the codes given below.

List - I (mixture to be separated)

- (A) Petroleum products
(B) Camphor and rock salt
(C) Cream from milk
(D) Coloured components in a dye

(1) A - I, B - II, C - III, D - IV

(3) A - IV, B - III, C - I, D - II

List - II (Method used)

- (I) Chromatography
(II) Centrifugation
(III) Sublimation
(IV) Fractional distillation

(2) A - II, B - IV, C - III, D - I

(4) A - IV, B - III, C - II, D - I

Ans. (4)

Sol. A \rightarrow IV, B \rightarrow III, C \rightarrow II, D \rightarrow I

19. In the balanced chemical equation :

(a lead nitrate + b aluminium chloride \rightarrow c aluminium nitrate + d lead chloride)

Which of the following alternatives is correct ?

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

(2) a = 4, b = 3, c = 3, d = 4

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

(4) a = 3, b = 2, c = 2, d = 3

Ans. (4)

Sol. $3Pb(NO_3)_2 + 2AlCl_3 \longrightarrow 2Al(NO_3)_3 + 3PbCl_2$

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

20. The correct order of increasing number of alpha particles passing undeflected through the foils of Au, Ag, Cu and Al of 1000 atoms thickness each in a simulated alpha particle scattering experiment of Rutherford would be :

(1) Au < Ag < Cu < Al

(2) Al < Cu < Ag < Au

(3) Au < Cu < Al < Ag

(4) Ag < Cu < Al < Au

Ans. (1)

Sol. More the atomic number (nuclear charge), more will be the deflection. Thus, in gold number of undeflected particles will be smallest. Hence, $Au < Ag < Cu < Al$ is correct.

21. The correct order of increasing pH values of the aqueous solutions of baking soda, rock salt, washing soda and slaked lime is :

- (1) Baking Soda < Rock salt < Washing Soda < Slaked lime
- (2) Rock Salt < Baking Soda < Washing Soda < Slaked lime
- (3) Slaked lime < Washing Soda < Rock Salt < Baking Soda
- (4) Washing Soda < Baking Soda < Rock Salt < Slaked lime

Ans. (2)

Sol. Rock salt = NaCl,

Baking soda = $NaHCO_3$

Washing soda = Na_2CO_3

Slaked lime = $Ca(OH)_2$

Increasing order of pH values

Rock salt < Baking soda < Washing soda < Slaked lime

22. How many grams of oxygen gas will be needed for complete combustion of 2 moles of 3rd member of alkyne series ?

- (1) 186 g
- (2) 256 g
- (3) 352 g
- (4) 372 g

Sol. $2C_4H_6 + 11O_2 \longrightarrow 8CO_2 + 6H_2O$

For 2 mole of hydrocarbon, 11 moles of O_2 is required

$\therefore 11 \text{ moles} = 11 \times 32 = 352 \text{ g}$

23. Match List - I (Position of the Metal in the Activity Series) with the List - II (Related Reduction Process) and select the correct option using the codes given below.

List - I

(Position of the Metal in the Activity Series)

- (A) The bottom of the series
- (B) The top of the series
- (C) The lower regions of the series
- (D) The middle of the series

List - II

(Related Reduction Process)

- (I) Electrolysis
- (II) Reduction by heat alone
- (III) Found in native state
- (IV) Reduction using carbon or some other reducing agent.

(1) A - II, B - III, C - IV, D - I

(3) A - III, B - I, C - II, D - IV

(2) A - II, B - I, C - IV, D - III

(4) A - III, B - I, C - IV, D - II

Ans. (3)

Sol. The metals which are placed high in the reactivity series are obtained by electrolysis, middle metals by reduction using carbon, lower by heating alone and metals at bottom of the series are found in native state.

24. Which of the following statements can help a chemistry student to predict chemical properties of an element?

- (I) Position of element in the periodic table
 - (II) Atomic number of the element
 - (III) Number of shells in the atom
 - (IV) Number of electrons in the outer most shell
- (1) I, II and III
 - (2) I, II and IV
 - (3) I, III and IV
 - (4) II, III and IV

Ans. (2)

Sol. Position, atomic number and number of electrons in the outermost shell, of an element predicts its chemical properties.

25. Consider the elements A, B, C and D with atomic numbers 6, 7, 14 and 15, respectively. Which of the following statements are correct concerning these elements ?

- (I) D will lose electron more easily than C.
- (II) B will gain electron more easily than C.
- (III) The element with highest electronegativity is D.
- (IV) The element with largest atomic size is C.

(1) I and II

(2) II and III

(3) II and IV

(4) III and IV

Ans. (3)

Sol. Only II and IV statements are correct.

26. A hydrocarbon 'A' (C_3H_8) on treatment with chlorine in presence of sunlight yielded compound 'B' as major product. Reaction of 'B' with aqueous KOH gave 'C' which on treatment with concentrated H_2SO_4 yielded 'D'. Hydrogenation of 'D' gave back 'A'. The sequence of reactions involved in above conversion is :

- (1) Substitution, Substitution, Addition, Dehydration
- (2) Substitution, Substitution, Dehydration, Addition
- (3) Substitution, Dehydration, Addition, Addition
- (4) Addition, Substitution, Dehydration, Substitution

Ans. (2)

Sol. (i) $C_3H_8 + Cl_2 \xrightarrow{h\nu} C_3H_7Cl + HCl$ [Substitution]

(ii) $C_3H_7Cl + Aq\ KOH \xrightarrow{h\nu} C_3H_7OH + KCl$ [Substitution]

(iii) $C_3H_7OH \xrightarrow{dil\ H_2SO_4} C_3H_6 + H_2O$ [Dehydration]

(iv) $C_3H_6 + H_2 \longrightarrow C_3H_8$ [Addition]

27. An organic liquid 'A' with acidified potassium dichromate gave product 'B'. The compound 'B' on heating with methanol in presence of concentrated sulphuric acid formed compound 'C' which on subsequent treatment with sodium hydroxide formed two products 'D' and 'E'. The product 'D' is known to affect the optic nerve causing blindness. Intake of 'D' in very small quantities can cause death. What are compounds 'A', 'B', 'C', 'D' and 'E'?

- (1) A = Ethanol, B = Ethanoic acid, C = Methanol, D = Sodium acetate, E = Methyl ethanoate
- (2) A = Ethanol, B = Ethanoic acid, C = Methyl ethanoate, D = Methanol, E = Sodium acetate
- (3) A = Sodium acetate, B = Ethanoic acid, C = Methyl ethanoate, D = Methanol, E = Ethanol
- (4) A = Ethanol, B = Ethanoic acid, C = Methyl ethanoate, D = Sodium acetate, E = Methanol

Ans. (2)

Sol. $CH_3CH_2OH + 2[O] \xrightarrow[K_2Cr_2O_7]{Acid} CH_3COOH + H_2O$
(A) (B)

$CH_3COOH + CH_3OH \xrightarrow{conc.\ H_2SO_4} CH_3COOCH_3 + H_2O$
(C)

$CH_3COOCH_3 + NaOH \longrightarrow CH_3OH + CH_3COONa$
(D) (E)

28. Two nichrome wires A and B, each of length 5 cm and of radius 1 cm and 3 cm respectively are connected to each other in series. If a current of 5 A flows through the combination of wires, the ratio of potential difference across wire A to that across wire B will be :

- (1) 1 : 3 (2) 3 : 1 (3) 9 : 1 (4) 1 : 9

Ans. (3)

Sol. Ratio of potential difference in series

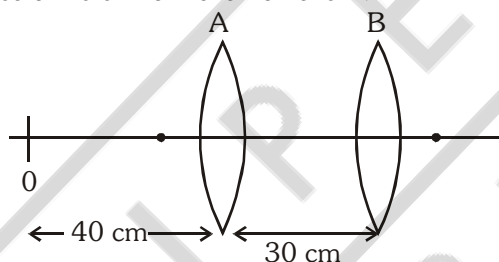
$$\frac{V_1}{V_2} = \frac{IR_1}{IR_2} = \frac{R_1}{R_2}$$

$$\frac{V_1}{V_2} = \frac{\rho \frac{l_1}{A_1}}{\rho \frac{l_2}{A_2}} \quad [\because l_1 = l_2 = 5 \text{ cm}]$$

$$\left[\begin{aligned} A_1 &= \pi(r_1)^2 = \pi(1)^2 \\ A_2 &= \pi(r_2)^2 = \pi(3)^2 \end{aligned} \right]$$

$$\therefore \frac{V_1}{V_2} = \frac{A_2}{A_1} = \frac{\pi(3)^2}{\pi(1)^2} = 9 : 1$$

29. Two convex lenses A and B, each of focal length 30 cm are separated by 30 cm, as shown in the figure. An object O is placed at a distance of 40 cm to the left of lens A.



What is the distance of the final image formed by this lens system ?

- (1) 120 cm to right of lens A (2) 90 cm to right of lens A
 (3) 22.5 cm to right of lens B (4) 45 cm to right of lens B

Ans. (3)

Sol. Object is at 40 cm from lens A.

\therefore for lens A

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} = \frac{1}{30} - \frac{1}{40} = \frac{1}{120}$$

$$v = 120 \text{ cm}$$

\therefore Image of lens A is at 90 cm at the right from lens B.

Now for lens B,

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{30} + \frac{1}{90}$$

$$v = 22.5 \text{ cm}$$

It will be at 22.5 cm at the right of lens B.

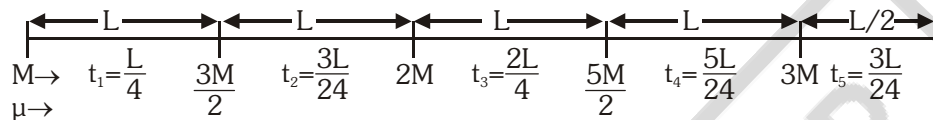
30. A cart of mass M moves at a speed u on a frictionless surface. At regular intervals of length L , blocks of mass $m = \frac{M}{2}$ drops vertically into the cart. How much time is taken to cover a distance of $\frac{9}{2}L$?

- (1) $\frac{9L}{2u}$ (2) $\frac{5L}{2u}$ (3) $\frac{19L}{2u}$ (4) $\frac{17L}{2u}$

Ans. (4)

Sol. We will use conservation of momentum

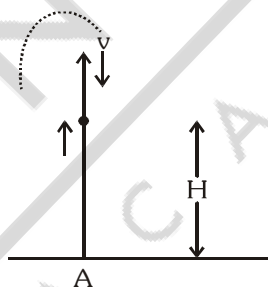
Let a body of mass M travelling with velocity u for length L . After each interval of length L mass $\frac{M}{2}$ is added to the cart with the original body of mass M .



by adding all the time intervals for $\frac{9L}{2}$ distance

$$t = t_1 + t_2 + t_3 + t_4 + t_5 = \frac{17L}{2u}$$

31. A ball is thrown vertically up from the point A (See figure). A person, standing at a height H on the roof of a building, tries to catch it. He misses the catch, the ball overshoots and simultaneously the person starts a stop-watch. The ball reaches its highest point and he manages to catch it upon its return. By this time, a time interval T has elapsed as recorded by the stop watch. If g is the acceleration due to gravity at this place, the speed with which the ball was thrown from point A will be :



- (1) $\sqrt{gH} + gT$ (2) $\frac{(\sqrt{g^2T^2 + 4gH})}{2}$ (3) $\frac{(\sqrt{g^2T^2 + 8gH})}{2}$ (4) $(\sqrt{g^2T^2 + 2gH})$

Ans. (3)

Sol. By using conservation of Energy

Total energy at the foot of the building = Total energy at height H .

$$\therefore \frac{1}{2}mv^2 = mgH + \frac{1}{2}m\left(\frac{gT}{2}\right)^2$$

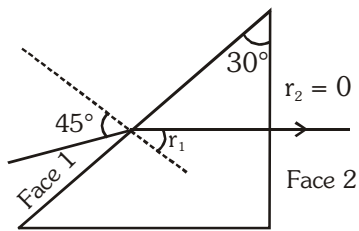
$$\boxed{v = \frac{\sqrt{8gH + g^2T^2}}{2}}$$

32. A ray of light of pure single colour is incident on the face of a prism having angle of the prism 30° at an angle of incidence 45° . The refracted ray does not change its direction as it crosses the other face and emerges out of the prism. The refractive index of the material of the prism is :

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

Ans. (3)

Sol.



For no deviation from Face 2, it should pass normally from Face-2

We know that for a prism of Angle A and r_1 and r_2 as refraction angles.

$$A = r_1 + r_2$$

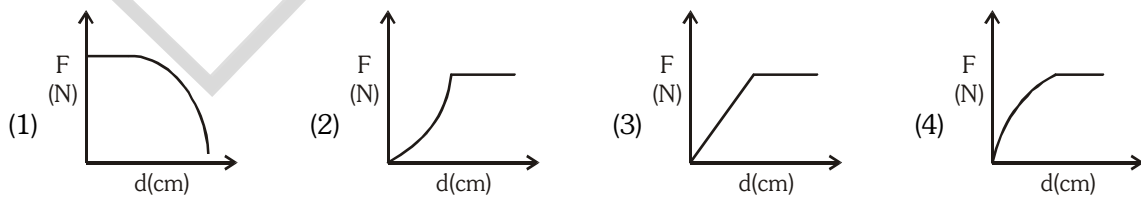
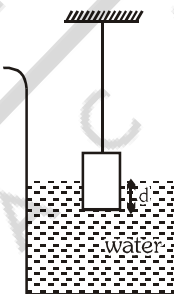
$$30^\circ = r_1 + 0^\circ$$

$$r_1 = 30^\circ$$

$$\therefore \text{By relation } \frac{\sin i_1}{\sin r_1} = \mu_{21} \Rightarrow \frac{\sin 45^\circ}{\sin 30^\circ} = \mu_{21}$$

$$\boxed{\mu_{21} = \sqrt{2}}$$

33. A metallic cubical solid block of side L is slowly lowered continuously in a large vessel, filled with water. Let d be the depth of the lower surface of the block, measured from the surface of the water, at some instant. The graph which represents correctly the variation of the buoyant force F with depth d is :



Ans. (3)

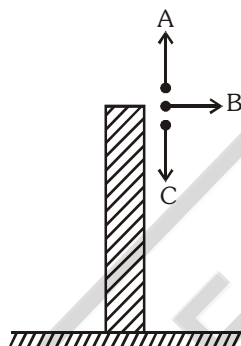
Sol. Buoyant force = $\rho g v$

If the body is immersed uniformly in the vessel filled with water,

The buoyant force will increase uniformly with immersing depth (d).

And then buoyant force will become constant and will not change after the body is fully immersed.

- 34.** Three balls A, B and C of same size but of different masses, are thrown with the same speed from the roof of a building, as shown in figure. Let v_A , v_B and v_C be the respective speeds with which the balls A, B, and C hit the ground. Neglecting air resistance, which one of the following relations is correct ?



(1) $v_A > v_C > v_B$

(2) $v_C > v_A > v_B$

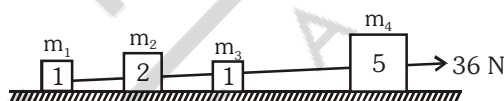
(3) $v_A > v_B > v_C$

(4) $v_A = v_B = v_C$

Ans. (4)

Sol. Since their kinetic energies are equal their final velocities at the time of striking the ground are equal.

- 35.** Four blocks of different masses ($m_1 = 1 \text{ kg}$, $m_2 = 2 \text{ kg}$, $m_3 = 1 \text{ kg}$ and $m_4 = 5 \text{ kg}$) are connected with light, inextensible strings, as shown in figure. This system is pulled along a frictionless surface by a horizontal force of 36N. The force pulling the block of mass m_1 will be:



(1) 2 N

(2) 4 N

(3) 12 N

(4) 36 N

Ans. (2)

Sol.

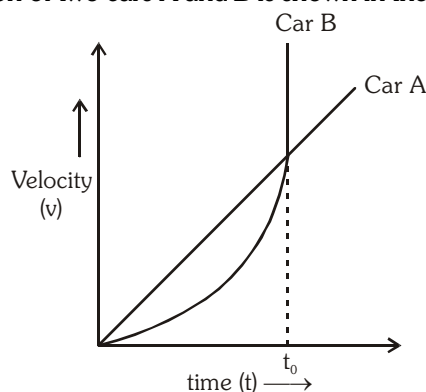
$$a_{\text{system}} = \frac{F_{\text{ext}}}{m_1 + m_2 + m_3 + m_4}$$

$$a = \frac{36}{9}$$

$$a_{\text{system}} = 4 \text{ m/s}^2$$

Force on 1 kg block will be = $ma = 1 \times 4 = 4 \text{ N}$

36. The velocity-time graph of motion of two cars A and B is shown in the figure



Choose the correct statement.

- (1) Accelerations of two cars are equal to each other at time $t = t_0$.
- (2) Accelerations of two cars are equal to each other at an instant greater than t_0 .
- (3) Accelerations of two cars are equal to each other at an instant earlier than t_0 .
- (4) At no instant in the interval $0 \leq t \leq t_0$, the two accelerations are equal.

Ans. (3)

Sol. Acceleration of two cars are equal to each other at an instant earlier than t_0 .

37. Three electric bulbs of rating 40W – 200V; 50W – 200V and 100W – 200V are connected in series to a 600 V supply. What is likely to happen as the supply is switched on ?

- (1) Only 50 W bulb will fuse.
- (2) Both 40 W and 50 W bulbs will fuse.
- (3) All the three bulbs will emit light with their rated powers.
- (4) 100 W bulb will emit light of maximum intensity.

Ans. (2)

Sol. Let R_1 is the resistance offered by bulb of rating 40 W – 200 V
 Let R_2 is the resistance offered by bulb of rating 50 W – 200 V
 Let R_3 is the resistance offered by bulb of rating 100 W – 200 V
 For bulb 1

$$R_1 = \frac{v^2}{P_1}$$

$$= \frac{(200)^2}{40}$$

$$\boxed{R_1 = 1000\Omega}$$

For bulb 2

$$R_2 = \frac{(200)^2}{50}$$

$$\boxed{R_2 = 800\Omega}$$

For bulb 3

$$R_3 = \frac{(200)^2}{100}$$

$$R_3 = 400\Omega$$

$$R_{eq} = R_1 + R_2 + R_3$$

$$R_{eq} = 2200\Omega$$

$$I_{eq} = 0.2727A$$

When bulbs are connected to 600 V supply

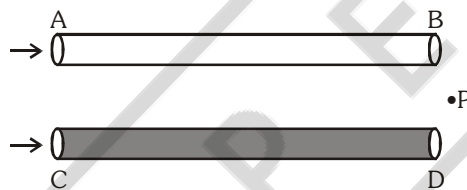
$P(40\text{ W}) = (0.2727)^2 \times 1000 = 74\text{ W}$ so bulb 1 will get fuse

$P(50\text{ W}) = (0.2727)^2 \times 800 = 59.5\text{ W}$ so bulb 2 will get fuse

$P(100\text{ W}) = (0.2727)^2 \times 400 = 29.75\text{ W}$ so bulb 3 will get fuse

So both 40 W and 50 W bulbs will fuse.

- 38.** A sound wave is sent simultaneously through a long hollow pipe AB and a solid pipe CD of same length and having same cross-sectional area. A person standing at point P as shown in the figure will hear the sound



(1) at the same time from pipes, AB and CD

(2) first from pipe CD and then from pipe AB

(3) first from pipe AB and then from pipe CD

(4) from pipe AB only and not from pipe CD

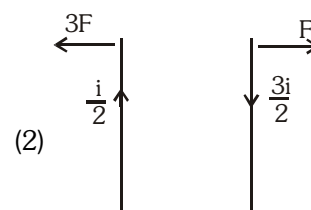
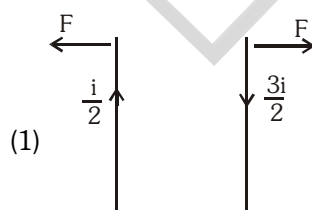
Ans. (2)

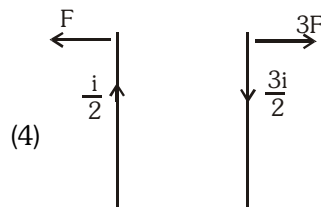
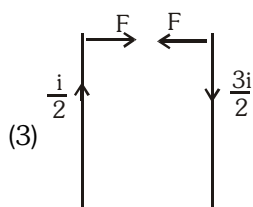
Sol. Speed of sound is faster in solid than air so person will hear first from pipe CD and then from pipe AB.

- 39.** Two long current-carrying parallel wires are placed as shown.



Which of the following figures will represent the magnitude and direction of the forces exerted on the wires ?

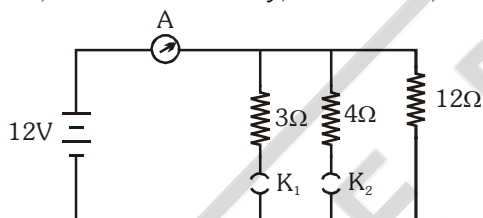




Ans. (1)

Sol. Wires with the current flowing in opposite direction repel each other and magnitude of both forces are equal and opposite in direction as per Newton's 3rd law.

40. An electrical circuit, shown below, consists of a battery, an ammeter, three resistors and two keys.



Consider two cases:

(i) The key K_1 is closed and the key K_2 is open.

(ii) The key K_2 is closed and the key K_1 is open.

The ratio of respective currents in these two cases will be:

(1) 3 : 4

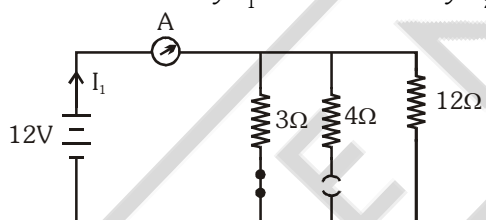
(2) 4 : 3

(3) 4 : 5

(4) 5 : 4

Ans. (4)

Sol. Case 1 : When key k_1 is closed and key K_2 is open



$$\frac{1}{R_{eq}} = \frac{1}{3} + \frac{1}{12}$$

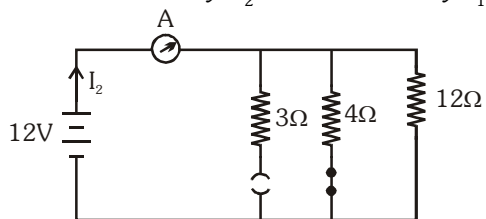
$$\frac{1}{R_{eq}} = \frac{4+1}{12}$$

$$R_{eq} = \frac{12}{5} \Omega$$

$$I_1 = \frac{12}{\frac{12}{5}}$$

$$I_1 = 5A$$

Case 2: When key K_2 is closed and key k_1 is open



$$\frac{1}{R_{eq}} = \frac{1}{4} + \frac{1}{12}$$

$$\frac{1}{R_{eq}} = \frac{3+1}{12}$$

$$R_{eq} = \frac{12}{4}$$

$$R_{eq} = 3\Omega$$

$$V = I_2 R$$

$$I_2 = \frac{12}{3}$$

$$I_2 = 4A$$

$$I_1 : I_2 = 5 : 4$$

41. Given that $\frac{1}{7} = 0.\overline{142857}$, which is a repeating decimal having six different digits. If x is the sum of such first three positive integers n such that $\frac{1}{n} = 0.\overline{abcdef}$, where a, b, c, d, e and f are different digits, then the value of x is
 (1) 20 (2) 21 (3) 41 (4) 42

Ans. (3)

Sol. 1st number

$$x_1 = 7$$

$$\frac{1}{x_1} = 0.\overline{142857}$$

such that,

2nd number

$$x_2 = 13$$

$$\frac{1}{x_2} = 0.\overline{076923}$$

$$x_3 = 21$$

$$\frac{1}{x_3} = \frac{1}{21} = 0.\overline{047619}$$

$$x = x_1 + x_2 + x_3$$

$$= 7 + 13 + 21 = 41$$

- 42.** Which of the following digits is ruled out in the units place of $12^n + 1$ for every positive integer n ?
 (1) 1 (2) 3 (3) 5 (4) 7

Ans. (1)

Sol. $12^n + 1$

2 has cyclicity = 4

so checking

$$n = 1$$

$$12^1 + 1 \equiv 2^1 + 1 \equiv 3$$

$$n = 2$$

$$12^2 + 1 \equiv 2^2 + 1 \equiv 5$$

$$n = 3$$

$$12^3 + 1 \equiv 2^3 + 1 \equiv 9$$

$$n = 4$$

$$12^4 + 1 \equiv 2^4 + 1 \equiv 7$$

so (1) is not coming

- 43.** The rational roots of the cubic equation $x^3 + 14kx^2 + 56kx - 64k^3 = 0$ are in the ratio 1 : 2 : 4.
 The possible values of k are

(1) 0 only

(2) 1 only

(3) 2, 0

(4) -2, -1

Ans. (B)

Sol. $x^3 + 4kx^2 + 56kx - 64k^3 = 0$

Let the root be $P, 2P, 4P$

$$P + 2P + 4P = -14k$$

$$7P = -14k$$

$$P = -2k$$

$$\text{also, } (P)(2P)(4P) = 64k^3$$

$$8P^3 = 64k^3$$

$$8P(-2k)^3 - 64k^3$$

$$-64k^3 = 64k^3$$

$$-k^3 = k^3$$

$$2k^3 = 0$$

$$k = 0$$

$$\therefore P = -2k$$

$$P = 0$$

But since root of the roots are 1 : 2 : 4 and we got $P = 0$, so none of the option satisfy (Bonus)

- 44.** The odd natural numbers have been divided in groups as (1, 3); (5, 7, 9, 11); (13, 15, 17, 19, 21, 23);
 . Then the sum of numbers in the 10th group is

(1) 4000

(2) 4003

(3) 4007

(4) 4008

Ans. (1)

Sol. Numbers in Ist group = 2

Numbers in IInd group = 4

Numbers in 9th group = 18

Numbers in 10th group = 20

Total numbers in Ist to 9th group

$$= 2 + 4 + \dots + 18$$

$$= 2(1 + \dots + 9) = 2 \times \frac{9 \times 10}{2} = 90$$

so sum of numbers in 10th group = $(90 + 20)^2 - 90^2$

$$= 110^2 - 90^2$$

$$= (110 + 90)(110 - 90)$$

$$= 200 \times 20 = 4000$$

45. 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
 (1) -1 (2) -5 (3) 1 (4) 5

Ans. (2)

Sol. $x^2 - 2x + k \overline{) \begin{array}{r} x^4 - 6x^3 + 16x^2 - 25x + 10 \\ x^4 - 2x^3 + kx^2 \\ \hline -4x^3 + (16 - k)x^2 - 25x + 10 \\ -4x^3 + 8x^2 - 4kx \\ \hline (8 - k)x^2 + x(-25 + 4k) + 10 \\ (8 - k)x^2 + x(-16 + 2k) + k(8 - k) \\ \hline x(-25 + 4k + 16 - 2k) + 10 - k(8 - k) \end{array}}$

Reminder comes out $x + a$

coefficient of x will be 1

$$-25 + 4k + 16 - 2k = 1$$

$$-9 + 2k = 1$$

$$2k = 10 \Rightarrow \boxed{k = 5}$$

$$\text{so, } a = 10 - k(8 - k)$$

$$= 10 - 5(3)$$

$$a = -5$$

46. The values of k , so that the equations $2x^2 + kx - 5 = 0$ and $x^2 - 3x - 4 = 0$ have one root in common, are

- (1) $3, \frac{27}{2}$ (2) $9, \frac{27}{4}$ (3) $-3, -\frac{27}{4}$ (4) $-3, \frac{4}{27}$

Ans. (3)

Sol. $2x^2 + kx - 5 = 0$

$$x^2 - 3x - 4 = 0$$

$$(c_1a_2 - c_2a_1)^2 = (b_1c_2 - b_2c_1)(a_1b_2 - a_2b_1)$$

$$[-5 \times 1 + 4 \times 2]^2 = [K(-4) + 3(-5)][2(-3) - (1)(K)]$$

$$3^2 = [-4K - 15][-6 - K]$$

$$3^2 = (4K + 15)(65K)$$

$$3^2 = (4K + 15)(64K)$$

$$9 = 24K + 4K^2 + 90 + 15K$$

$$0 = 4K^2 + 39K + 81$$

$$K = -3, -\frac{27}{4}$$

Alternate solution

$$x^2 - 3x - 4 = 0$$

$$x^2 - 4x + x - 4 = 0$$

$$(x - 4)(x + 1) = 0$$

$$x = 4, -1$$

By keeping $x = 4$

we get, $2(4)^2 + k \times 4 - 5 = 0$
 $4k = -27$

$$k = -\frac{27}{4}$$

by keeping $x = -1$

we get, $2(-1)^2 + k(-1) - 5 = 0$
 $k = -3$

47. The value of $\cos x^\circ - \sin x^\circ$ ($0 \leq x < 45$) is

(1) 0

(3) negative

(2) positive

(4) sometimes negative and sometimes positive

Ans. (2)

Sol. For $0 < x < 45^\circ$

$\cos x > \sin x$

Ans. Positive

48. A vertical pole of height 10 meters stands at one corner of a rectangular field. The angle of elevation of its top from the farthest corner is 30° , while that from another corner is 60° . The area (in m^2) of rectangular field is

(1) $\frac{200\sqrt{2}}{3}$

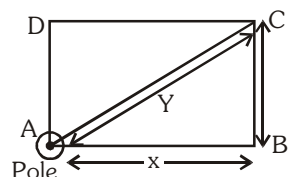
(2) $\frac{400}{\sqrt{3}}$

(3) $\frac{200\sqrt{2}}{\sqrt{3}}$

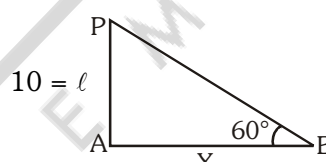
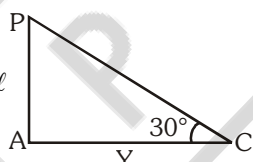
(4) $\frac{400\sqrt{2}}{\sqrt{3}}$

Ans. (1)

Sol.



$$\sqrt{Y^2 - X^2} \quad 10 = \ell$$



$$\tan 30^\circ = \frac{10}{Y} = \frac{1}{\sqrt{3}}$$

$$Y = 10\sqrt{3} \text{ cm} \dots (i)$$

$$\tan 60^\circ = \frac{10}{X} = \sqrt{3}$$

$$X = \frac{10\sqrt{3}}{3} \dots (ii)$$

$$\text{Area} = \frac{10\sqrt{3}}{3} \times \frac{2\sqrt{3} \times 10}{\sqrt{3}} = \frac{200\sqrt{2}}{3} \text{ m}^2$$

$$BC = \sqrt{Y^2 - X^2}$$

$$= \sqrt{300 - \frac{100}{3}}$$

$$= \sqrt{\frac{800}{3}}$$

49. 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 ?

(1) 1 : 2

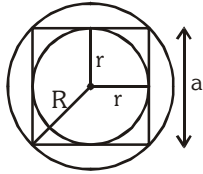
(2) 1 : $\sqrt{2}$

(3) $\sqrt{2}$: 4

(4) 1 : $\sqrt{3}$

Ans. (1)

Sol.



Let side of square = a

$$\therefore r = \frac{a}{2} \dots(i)$$

$$\sqrt{2} a = 2R$$

$$a = \sqrt{2} R \dots(ii)$$

$$2r = \sqrt{2} R$$

$$\sqrt{2} R = R$$

$$\frac{\pi R^2}{\pi R^2} = \left(\frac{r}{R}\right)^2 = \frac{r^2}{2r^2} = \frac{1}{2}$$

50. The surface of water in a swimming pool, when it is full of water, is rectangular with length and breadth 36 m and 10.5 m respectively. The depth of water increases uniformly from 1 m at one end to 1.75 m at the other end. The water in the pool is emptied by a cylindrical pipe of radius 7 cm at the rate of 5 km/h. The time (in hours) to empty water in the pool is (take $\pi = \frac{22}{7}$)

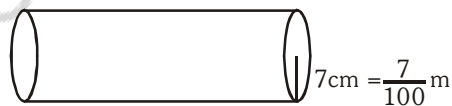
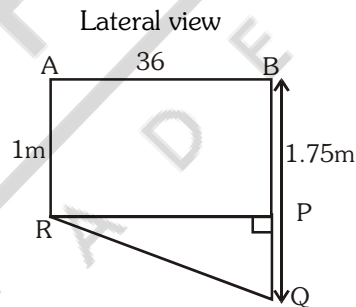
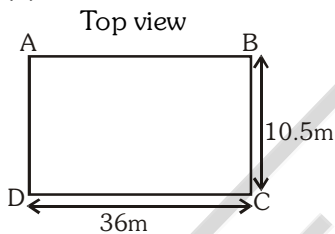
(1) $6\frac{1}{4}$

(2) $6\frac{1}{2}$

(3) $6\frac{3}{4}$

(4) $6\frac{4}{5}$

Ans. (3)
Sol.



$$V_{\text{water}} = \text{ar(trap. ABQR)} \times \text{breadth}$$

$$= \frac{1}{2} \times 2.75 \times 36 \times 10.5 = 519.75 \text{ m}^3$$

$$V_{\text{cylinder}} = \pi r^2 h$$

$$= \frac{22}{7} \times \frac{7}{100} \times \frac{7}{100} \times 5000 = 77 \text{ m}^3$$

$$\text{Time} = \frac{519.75}{77} = 6.75 \text{ hrs.}$$

51. There is a right circular cone of height h and vertical angle 60° . A sphere when placed inside the cone, it touches the curved surface and the base of the cone. The volume of sphere is

(1) $\frac{4}{3}\pi h^3$

(2) $\frac{4}{9}\pi h^3$

(3) $\frac{4}{27}\pi h^3$

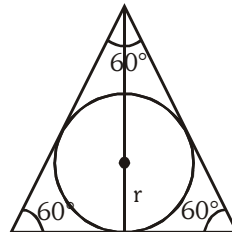
(4) $\frac{4}{81}\pi h^3$

Ans. (4)

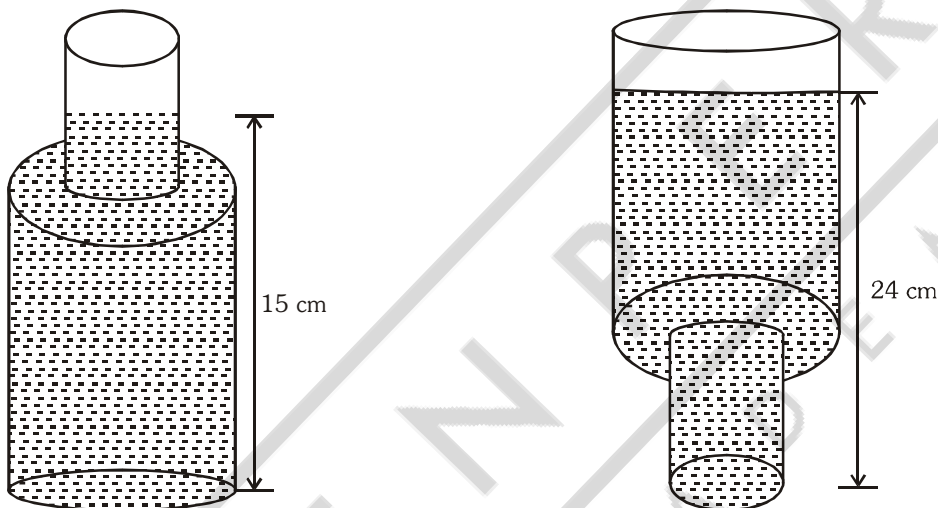
Sol. $r = \frac{h}{3}$

$$\Rightarrow V = \frac{4}{3} \pi \left(\frac{h}{3}\right)^3$$

$$V = \frac{4\pi \cdot h^3}{81}$$



52. A sealed bottle containing some water is made up of two cylinders A and B of radius 1.5 cm and 3 cm respectively, as shown in the figure. When the bottle is placed right up on a table, the height of water in it is 15 cm, but when placed upside down, the height of water is 24 cm. The height of the bottle is



(1) 25 cm

(2) 26 cm

(3) 27 cm

(4) 28 cm

Ans. (3)

Sol. Let heights of cylinder A and B are h_1 and h_2 respectively.

$$\begin{aligned} \text{Volume in first situation} &= \pi \times (3)^2 \times h_2 + \pi \times (1.5)^2 \times (15 - h_2) \\ &= \pi [h_2 \{(3)^2 - (1.5)^2\} + \{15 \times (1.5)^2\}] \end{aligned}$$

$$\begin{aligned} \text{Volume in second situation} &= \pi \times (1.5)^2 \times h_1 + \pi \times (3)^2 \times (24 - h_1) \\ &= \pi [h_1 \{(1.5)^2 - (3)^2\} + \{24 \times (3)^2\}] \end{aligned}$$

Volume is same

$$\Rightarrow [h_2 \{(3)^2 - (1.5)^2\} + \{15 \times (1.5)^2\}] = \pi [h_1 \{(1.5)^2 - (3)^2\} + \{24 \times (3)^2\}]$$

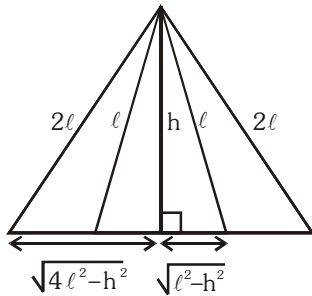
$$\Rightarrow (h_1 + h_2) \{(3)^2 - (1.5)^2\} = 24 \times (3)^2 - 15 \times (1.5)^2$$

$$\Rightarrow \text{Total height} = h_1 + h_2 = \frac{3 \times (1.5)^2 (32 - 5)}{3 \times (1.5)^2} = 27$$

53. Let ℓ be the length of each equal side of an isosceles triangle. If the length of each equal side is doubled, keeping its height unchanged, then the difference of the squares of bases of the new triangle and the given triangle is
 (1) 0 (2) $4\ell^2$ (3) $9\ell^2$ (4) $12\ell^2$

Ans. (4)

Sol.



$$\text{Base length of old triangle} = 2\sqrt{\ell^2 - h^2}$$

$$\text{Base length of new triangle} = 2\sqrt{4\ell^2 - h^2}$$

Difference of their squares

$$= 4(4\ell^2 - h^2 - \ell^2 + h^2) = 12\ell^2$$

54. 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

- (1) $3 + 6\sqrt{3}$ (2) $10 + 3\sqrt{2}$
 (3) $10 + 2\sqrt{3}$ (4) $9 + 3\sqrt{3}$

Ans. (4)

Sol. $MN^2 = O_1O_2^2 - O_1P^2$

$$MN = \sqrt{4^2 - 2^2}$$

$$MN = 2\sqrt{3} = O_2P$$

$$\Delta O_1O_2P \sim \Delta O_1CM$$

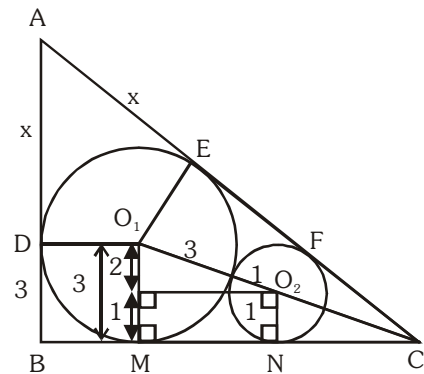
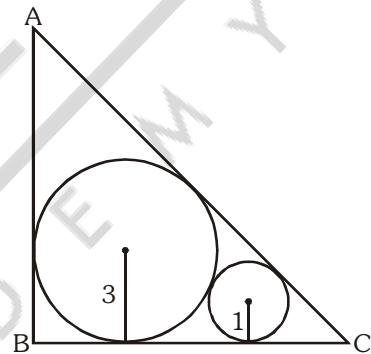
$$\Rightarrow \frac{O_1P}{O_2P} = \frac{O_1M}{CM} \Rightarrow \frac{2}{2\sqrt{3}} = \frac{3}{CM} \Rightarrow CM = 3\sqrt{3} = CE$$

$$\text{Now } AB^2 + BC^2 = AC^2$$

$$\Rightarrow (x + 3)^2 + (3 + 3\sqrt{3})^2 = (x + 3\sqrt{3})^2$$

$$\Rightarrow x^2 + 6x + 9 + 9 + 27 + 18\sqrt{3} = x^2 + 6\sqrt{3}x + 27$$

$$\Rightarrow x = \frac{18(\sqrt{3} + 1)}{6(\sqrt{3} - 1)} = 6 + 3\sqrt{3} \Rightarrow AB = 3 + 6 + 3\sqrt{3} = 9 + 3\sqrt{3}$$



55. In ΔABC , $AB = AC$, P and Q are points on AC and AB respectively such that $BC = BP = PQ = AQ$. Then $\angle AQP$ is equal to (use $\pi = 180^\circ$)

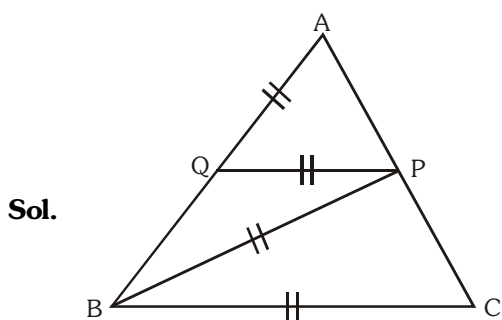
(1) $\frac{2\pi}{7}$

(2) $\frac{3\pi}{7}$

(3) $\frac{4\pi}{7}$

(4) $\frac{5\pi}{7}$

Ans. (4)



Sol.

Let $\angle A = \theta$
 $\Rightarrow \angle APQ = \theta$ ($\because AQ = PQ$)
 $\Rightarrow \angle PQB = 2\theta$ (\because Exterior angle)
 $\Rightarrow \angle PQB = \angle PQB = 2\theta$ ($\because PQ = PB$)
 $\Rightarrow \angle BPC = \angle A + \angle ABP = 3\theta$ (\because Exterior angle)
 $\Rightarrow \angle BCP = \angle BPC = 3\theta$ ($\because BP = BC$)
 Also $\angle ABC = \angle ACB = 3\theta$ ($\because AB = AC$)
 $\Rightarrow \angle A + \angle B + \angle C = \theta + 3\theta + 3\theta = 7\theta = \pi \Rightarrow \theta = \frac{\pi}{7}$
 $\Rightarrow \angle AQP = \pi - \angle BQP = \pi - 2\theta = \pi - \frac{2\pi}{7} = \frac{5\pi}{7}$

56. A line from one vertex A of an equilateral ΔABC meets the opposite side BC in P and the circumcircle of ΔABC in Q . If $BQ = 4$ cm and $CQ = 3$ cm, then PQ is equal to

(1) 7 cm

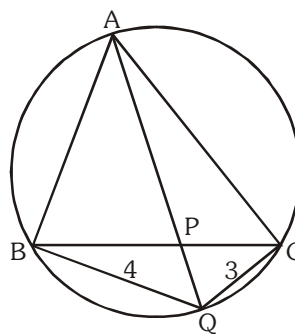
(2) $\frac{4}{3}$ cm

(3) $\frac{12}{7}$ cm

(4) 2 cm

Ans. (3)

Sol. $\angle BQA = \angle BCA = 60^\circ$
 $\angle CQA = \angle CBA = 60^\circ$
 $\therefore QP$ is angle bisector of BC
 $\therefore BP : PC = 4 : 3$ (By angle bisector theorem)
 Now $\Delta BPQ \sim \Delta APC$
 $\frac{PQ}{BQ} = \frac{PC}{AC}$
 $\frac{PQ}{4} = \frac{3}{7} \frac{BC}{BC}$
 $\Rightarrow PQ = \frac{12}{7}$



57. How many points (x, y) with integral co-ordinates are there whose distance from $(1, 2)$ is two units ?
 (1) one (2) two (3) three (4) four

Ans. (4)

Sol. $PQ = 2 \Rightarrow PQ^2 = 4$

$$(x - 1)^2 + (y - 2)^2 = 4$$

possibilities for integral coordinates

$$(x - 1)^2 + (y - 2)^2 = 4 + 0 \text{ or } = 0 + 4$$

check (1) $(x - 1)^2 = 4$

$$x - 1 = 2, -2$$

$$x = 3, -1$$

$$(3, 2) \text{ and } (-1, 2)$$

check (2) $(x - 1)^2 = 0$

$$x = 1$$

$$x = 1$$

$$(1, 4) \text{ and } (1, 0)$$

$$(y - 2)^2 = 0$$

$$y - 2 = 0$$

$$y = 2$$

$$(y - 2)^2 = 4$$

$$y - 2 = 2, -2$$

$$y = 4, y = 0$$

Total 4 integral coordinates are possible.

58. If the vertices of an equilateral triangle have integral co-ordinates, then

- (1) such a triangle is not possible.
 (2) the area of the triangle is irrational.
 (3) the area of the triangle is an integer.
 (4) the area of the triangle is rational but not an integer.

Ans. (1)

Sol. Given : $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ integers.

$$\text{ar}(\Delta ABC) = \frac{1}{2} \{x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\}$$

\Rightarrow which should be rational.

$$\text{But } \Delta = \frac{\sqrt{3}}{4} a^2$$

$$\Delta = \frac{\sqrt{3}}{4} \{(x_1 - x_2)^2 + (y_1 - y_2)^2\}$$

We can say that,

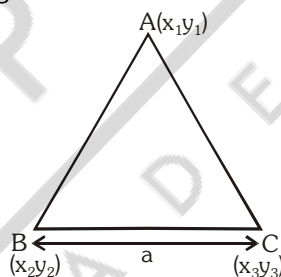
$$\therefore a^2 \rightarrow \text{rational.}$$

$$\therefore \frac{\sqrt{3}}{4} a^2 \rightarrow \text{irrational}$$

$$\Rightarrow \Delta \rightarrow \text{irrational}$$

\Rightarrow Hence, it is a contradiction

\therefore No such Δ is possible.



59. A box contains four cards numbered as 1, 2, 3 and 4 and another box contains four cards numbered as 1, 4, 9 and 16. One card is drawn at random from each box. What is the probability of getting the product of the two numbers so obtained, more than 16 ?

(1) $\frac{5}{8}$

(2) $\frac{1}{2}$

(3) $\frac{3}{8}$

(4) $\frac{1}{4}$

Ans. (3)

Sol.

| | |
|---|---|
| 1 | 2 |
| 3 | 4 |

| | |
|---|----|
| 1 | 4 |
| 9 | 16 |

Product more than 16

$$2 \times 9$$

$$2 \times 16$$

$$3 \times 9$$

$$3 \times 16$$

$$4 \times 9$$

$$4 \times 16$$

Possible cases = 6

$$\text{Probability} = \frac{6}{4 \times 4} = \frac{3}{8}$$

60. The mean of a group of eleven consecutive natural numbers is m . What will be the percentage change in the mean when next six consecutive natural numbers are included in the group ?

- (1) $m\%$ (2) $\frac{m}{3}\%$ (3) $\frac{m}{300}\%$ (4) $\frac{300}{m}\%$

Ans. (4)

Sol.
$$\frac{(x) + (x+1) + (x+2) + \dots + (x+10)}{11} = m$$

$$\Rightarrow 11x + \frac{10(11)}{2} = 11m$$

$$\Rightarrow x + 5 = m \quad \dots (1)$$

Now,
$$\frac{(x) + (x+1) + (x+2) + \dots + (x+16)}{17}$$

$$= \frac{17x + \frac{16(17)}{2}}{17} = x + 8$$

$$= (m - 5) + 8$$

$$= m + 3$$

$$\% \text{ change in mean} = \frac{(m+3) - m}{m} \times 100$$

$$= \left(\frac{300}{m}\right)\%$$

61. The Swaraj flag designed by Mahatma Gandhi had the spinning wheel in it. What did it symbolize ?

- (1) Ideal of self-help.
(2) Symbol of defiance to the British rule.
(3) Greatness of India in pre-colonial time.
(4) Ahimsa (non-violence) in contemporary world.

Ans. (1)

Sol. Gandhiji's Swaraj flag had spinning wheel in centre which symbolised the idea of self-help.

62. Which of the following statements regarding the Silk Routes are correct ?

- I. They also meant cultural links.
 - II. They spread over land and by sea.
 - III. They connected Asia with Europe and Africa.
 - IV. Besides textiles, gold and silver got exported from Asia to Europe through these routes.
- (1) I, II and III (2) I, II and IV (3) II, III and IV (4) I, II, III and IV

Ans. (1)

Sol. Gold and silver flowed from Europe to Asia rather than from Asia to Europe so option IV cannot be correct.

63. Which of the following statements regarding the impact of Depression of 1929 are correct ?

- I. India's exports increased but imports decreased.
 - II. India's export of gold increased.
 - III. Urban India suffered more than the rural India.
 - IV. Industrial investment grew in India.
- (1) I, II and III (2) I, III and IV (3) II, III and IV (4) II and IV

Ans. (4)

Sol. India's exports increased but imports decreased is wrong and Rural India suffered more than urban India.

64. Which of the following statements about the French in Vietnam are correct ?

- I. The Vietnamese teachers generally twisted the school curriculum given by the French.
 - II. The students protested the undue dominance by the colons.
 - III. The *Annamese Student* was a French journal for enlisting the students support.
 - IV. The French had to counter the Chinese influence.
- (1) I, II and III (2) I, II and IV (3) I, III and IV (4) II, III and IV

Ans. (2)

Sol. The Annamese Student was Vietnamese journal not a French one.

65. Read the statements about the impact of forest rules on tribal communities in the 19th century. Which of the following statements are incorrect?

- I. Jhum cultivators could carry out their activities in village forests.
 - II. Jhum cultivators took to plough cultivation with ease.
 - III. Tribal people could collect wood and graze cattle in the forests.
 - IV. Tribal people had access to protected forests for collecting wood for fuel and house building.
- (1) I and II (2) I and III (C) II and III (D) III and IV

Ans. (1)

Sol. Option 3 & option 4 are correct.

66. Which of the following statements about the Non-Cooperation Movement are correct?

- I. The Justice Party participated in the elections in Madras.
 - II. The nationalist lawyers did not join back the courts.
 - III. The taluqdars were targeted.
 - IV. The import of foreign cloth declined and the export of Indian textiles increased manifold.
- (1) I and III (2) I and IV (3) I, II and III (4) II, III and IV

Ans. (1)

Sol. Statement II and IV are incorrect.

67. Which of the following regarding the Constitution of 1791 and the status of women in France are correct?

- I. It made them active citizens.
- II. Provisions were made for schools for both boys and girls.
- III. Divorce rules were made stringent.
- IV. Provisions were made for training women for jobs.

(1) I, II and III (2) II and IV (3) III and IV (4) II, III and IV

Ans (4)

Sol. The constitution of 1791 did not make women active citizen in France.

68. Arrange the following historical developments in a chronological sequence

- I. Rowlatt Act
- II. Kheda Satyagraha
- III. Champaran Movement
- IV. Ahmedabad Mill Strike

(1) I, II, III, IV (2) II, I, III, IV (3) III, I, IV, II (4) III, II, IV, I

Ans (4)

Sol. The correct sequence is : Champaran movement, Kheda Satyagraha, Ahmedabad mill strike, Rowlatt Act.

Direction (Qs. 69-74)

Read the statements and select the correct answer from the options given below.

- 1. Statement I is true, Statement II is false
- 2. Statement I is false, 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 of Statement I.

69. Statement I: In the 19th century, London was a colossal city.

Statement II: London had grown as an industrial city.

Ans. (1)

Sol. London was not an industrial city.

70. Statement I: Indians not taking off their turban before colonial officials was considered offending.

Statement II: Turban was a sign of respectability in India.

Ans. (4)

Sol. Statement II is not the correct explanation of statement I.

71. Statement I: Louis Blanc built a cooperative community.

Statement II: He believed the community could produce goods together and divide the profits among the members.

Ans. (2)

Sol. Louis Blanc did not built any cooperative community.

72. Statement I: Hand printing developed in China.

Statement II: The Chinese state printed textbooks in vast numbers.

Ans. (3)

Sol. Hand printing was developed in China and Chinese imperial state was the major producer of textbooks.

73. Statement I: Rainfall is low in the western parts of Deccan Plateau and East of Sahyadris.

Statement II: Western Ghats causes convectional rainfall.

Ans. (1)

Sol. Statement I is true and II is false.

74. Statement I: A large part of the Deccan plateau is occupied by black soil.

Statement II: Black soil in this part was formed by denudation of basaltic rocks overtime.

Ans. (3)

Sol. The Deccan Plateau is dominated by black soil formed by denudation of Basalt rocks.

75. If the local time at Varanasi, located at 83° E longitude is 23:00 hour then what will be the local time at Kibithu located at 97° E longitude (Arunachal Pradesh) and Jodhpur, located at 73° E longitude?

(1) 00:00 hour, 22:00 hour

(2) 22:20 hour, 23:56 hour

(3) 23:56 hour, 22:20 hour

(4) 22:56 hour, 23:20 hour

Ans. (3)

Sol. The difference between longitudes of Kibithu and Varanasi is 14 degrees and Varanasi & Jodhpur is 10 degrees so the time difference will be +56 mins & -40 mins respectively.

76. Which of the following statements are true about latitudes and longitudes.

I. All latitudes are angular distances measured towards the Pole from the Equator.

II. All longitudes do not join at poles.

III. All Parallels and Meridians are imaginary lines.

IV. Latitudes are used to determine the time of a place

(1) I and II

(2) I and III

(3) I, II and III

(4) II, III and IV

Ans. (2)

Sol. All longitudes joined at the poles and used to determine the local time of a place.

77. If the current climatic condition of Srinagar (J&K) with average annual temperature of 13.5° C and annual average precipitation 710 mm get modified and become similar to that of Ranchi (Jharkhand) with annual average temperature 23.7° C and precipitation 1430 mm, which one of the following types of vegetation will become predominant in Srinagar?

(1) Tropical Semi Evergreen

(2) Tropical Moist Deciduous

(3) Tropical Dry Deciduous

(4) Tropical Dry Evergreen

Ans. (2)

Sol. According to given data Tropical Moist Deciduous vegetation will be predominant in Srinagar.

78. On a school field trip, a student spotted tigers, turtles, gharials and snakes in their natural habitats. Name the ecological region (delta) where that student had gone.

(1) Cauvery

(2) Mahanadi

(3) Godavari

(4) Ganga-Brahmaputra

Ans. (4)

Sol. Sundarbans Delta of Ganga- Brahmaputra River is the place where one can find tigers, turtles, snakes & gharials together.

79. A person travelling by road (shortest distance) from Mangaluru to Machilipatnam will be able to observe natural vegetation types in which of the following sequences?

- (1) Montane Forest - Tropical Deciduous Forests – Tropical Evergreen Forests
- (2) Tropical Evergreen Forests – Tropical Thorn Forests – Tropical Deciduous Forests
- (3) Tropical Deciduous Forest – Tropical Evergreen Forests – Mangrove Forests
- (4) Tropical Evergreen Forests – Tropical Deciduous Forests – Mangrove Forests

Ans. (4)

Sol. A person will observe Tropical Evergreen Forest, Tropical Deciduous Forest & Mangrove forests as he travels from Mangaluru to Machilipatnam.

80. Which of the following statement(s) is/are true with respect to monsoons in India?

- A. The Southwestern Monsoon takes longer duration as compared to retreating Monsoon in covering India.
- B. The Southwestern Monsoon has a shorter duration as compared to retreating Monsoon in covering India.
- C. Both the Monsoons take almost the same duration in covering India.
- D. The Southwestern Monsoon is propelled by the depressions while retreating Monsoon results from the movements of Air Masses.

- (1) A and D (2) B only (3) C only (4) B and D

Ans. (2)

Sol. Only option B is correct with respect to the Indian Monsoon.

81. Which one of the following regions marked on the sketch is an ideal representation with the following characteristics.

- I. The approximate date for arrival of the Southwestern Monsoon is June 15th.
- II. Well developed in Thermal and Nuclear energy production.
- III. Rich in the production of oil and natural gas.
- IV. Well developed Textile Industry



- (1) A (2) B (3) C (4) D

Ans. (3)

Sol. The region marked with 'C' on the map is an ideal representation that satisfied all characteristics.

82. With increasing urbanization, the main activity which leads to loss of bio-diversity is

- I. rural - urban migration.
- II. rapid increase in built-up area.
- III. increased vehicular pollution.
- IV. development of big industrial complexes.

- (1) I and III (2) I and IV (3) II and IV (4) III and IV

Ans. (3)

Sol. Only option 2 and 4 will leads to loss of bio-diversity.

83. Which one of the following statements is NOT correct about the shaded part on the given outline of India?



- (1) It has high potential for hydel-power generation. (2) It has the lowest degree of urbanization.
(3) Ragi is an important millet grown here. (4) It is famous for religious tourism.

Ans. (3)

Sol. Uttaranchal is not the state with lowest degree of urbanization.

84. Chandimal, Jaysurya and Umesh left their respective villages in Sri Lanka for Chennai in India. Who among the following could be a refugee?

- I. Chandimal, who is an IT professional, could not find a job in Sri Lanka.
II. Jaysurya, who left his village due to ethnic conflicts.
III. Umesh, whose land and house were destroyed due to Tsunami.

- (1) Only Jaysurya (2) Only Chandimal
(3) Jaysurya and Umesh (4) Chandimal and Jaysurya

Ans. (3)

Sol. The Refugees are the people who left their mother country due to ethnic conflicts and natural disasters.

85. Consider the following statements about the United Nations Security Council (UNSC):

- I. UNSC consists of 15 members.
II. US, Russia and Germany are among the permanent members.
III. China is the only Asian nation among the permanent members.
IV. All members of the UNSC have veto power.

Which of the above statements are correct?

- (1) I and II (2) I and III (3) I and IV (4) III and IV

Ans. (2)

Sol. Germany is not the permanent member of UNSC and only five countries has the veto power

86. Which of these statements about the Election Commission of India are true?

- I. It conducts and controls the election process in the country.
II. It gets the voters list updated before the elections.
III. It also conducts the Panchayat elections in the country.
IV. It approves the election manifestoes of political parties.

- (1) I and II (2) II and III (3) II and IV (4) III and IV

Ans. (1)

Sol. Election Commission does not conduct Panchayat elections in India also it does not approve the election manifesto of political parties.

87. Consider the following statements about the Indian Parliament:

- I. It is the ultimate authority to make laws in India.
- II. It consists of the President, the Lok Sabha and the Rajya Sabha.
- III. It consists of only the Lok Sabha and the Rajya Sabha.
- IV. Lok Sabha members are chosen by the people through elections.

Which of the above statements are correct?

- (1) I only (2) I and III (3) II and III (4) I, II and IV

Ans. (4)

Sol. Indian Parliament also consists of President along with Lok Sabha and Rajya Sabha.

88. Which of the following is the inspiring philosophy of the Constitution of India?

- I. Secularism, Equality, Communism, Democratic Republic
- II. Democratic Republic, Sovereignty, Fraternity
- III. Secularism, Equality, Justice
- IV. Equality, Fraternity, Communalism, Secularism

- (1) I and II (2) I and III (3) II and III (4) II and IV

Ans. (3).

Sol. The philosophy of Indian Constitution does not contain Communalism & Communism.

89. Which of the following features of the Indian Judiciary are true?

- I. Integrated judicial system.
- II. The Supreme Court is the highest court of appeal.
- III. Only the Supreme Court can interpret the Constitution.
- IV. Public Interest Litigation (PIL) can be filed only in the Supreme Court and the High Court.

- (1) I, II and III (2) I, III and IV (3) I, II and IV (4) II, III and IV

Ans. (3)

Sol. Both Supreme Court and High court can interpret the constitution.

90. Which of the following statements is NOT true about Indian federalism?

- (1) The Union government is vested with more financial powers than the State governments.
- (2) Power to legislate on residuary subjects is vested in the Union government.
- (3) The name and boundaries of a State can be changed by the Union government without the consent of the concerned State.
- (4) The Union legislature can amend any provision of the Constitution without the consent of the State governments.

Ans. (4)

Sol. The Union government can only amend some provisions of Constitution without the consent of state government.

91. Democracy promotes equality through the following:

- I. Universal adult franchise
- II. Equality before law and equal protection of law.
- III. Reservation for Scheduled Castes, Scheduled Tribes and women.
- IV. Independent and impartial media

- (1) I and II (2) I, II and III (3) I, III and IV (4) II and IV

Ans. (2)

Sol. Independent and impartial media does not relate to Right to Freedom.

92. Read the following statements and select one of the four options given below.

Statement I: Enjoyment of pollution-free water is a fulfilment of right to life.

Statement II: Release from forced labour is a fulfilment of right to life.

- (1) Only I is correct (2) Only II is correct
 (3) Both I and II are correct (4) Both I and II are incorrect

Ans. (1)

Sol. Only first statement is correct as release from forced labour is not related to Right to Life.

93. The daily wage of a person in urban areas is Rs. 300. The poverty line for a person is fixed at Rs. 1000 per month for the urban areas. The following table shows the details of employment of four families living in Mumbai city.

| Family | Total Days of Employment got in a Month by the family | Members of the Family |
|--------|---|-----------------------|
| Hari | 12 | 3 |
| Tenzin | 15 | 4 |
| Bala | 15 | 5 |
| Phulia | 20 | 5 |

Identify the family living below poverty line.

- (1) Hari (2) Tenzin (3) Bala (4) Phulia

Ans. (3)

Sol. According to the given data only Bala's family is below poverty line.

94. In a particular year, the price of wheat in a market is Rs. 15 per kg and a farmer produces 100 kgs of wheat. In the next year the price of wheat has fallen to Rs. 10 per kg and the farmer produces 120 kgs. If the government wishes to stabilize the income of the farmer, then what will be the minimum support price?

- (1) Rs. 12 per kg (2) Rs. 12.5 per kg (3) Rs. 13 per kg (4) Rs. 13.5 per kg

Ans. (2)

Sol. MSP should be 12.5 rs./kg to stabilize the income of the farmers. (as per the given data)

95. A country has four groups of people. The table below describes some social indicators of these groups. Identify the group that is the most vulnerable.

| Groups | Literacy rate (%) | Life Expectancy (years) | Unemployment rate (%) |
|--------|-------------------|-------------------------|-----------------------|
| A | 74 | 82 | 5 |
| B | 93 | 80 | 10 |
| C | 63 | 78 | 15 |
| D | 65 | 78 | 10 |

- (1) A (2) B (3) C (4) D

Ans. (3)

Sol. Group C is the most vulnerable group as per the given data.

96. Which of the following statements are correct?

- I. Bank deposits share the essential features of money.
- II. Any depositor may demand his deposit at any point of time from a bank.
- III. Bank must retain all deposits by itself

- (1) I and II are true, but III is false
- (2) I is true, but II and III are false
- (3) I and II are false, but III is true
- (4) All statement I, II and III are true

Ans. (1)

Sol. Banks has to retain only 15% of all deposits by itself.

97. Bira and his wife Sheena have two daughters aged 12 and 16. Sheena’s mother and father, aged 65 and 72, also live with them. Bira is currently looking for work, but can’t find any. His elder daughter completed class 10 and prefers to look for work. Sheena prefers to stay at home to look after house works. How many unemployed members does Bira’s family have?

- (1) 1
- (2) 2
- (3) 3
- (4) 4

Ans. (2)

Sol. Only Bira and his elder daughter can be called unemployed as per the given situation.

98. Which of the following statements are correct?

- I. Globalization has led to increased flow of capital across countries.
- II. Increase in flows of labour across countries has been larger than the increase has been larger than the increase in flows of capital
- III. MNCs spread their production and work with local producers in various countries across the globe

- (1) I and II
- (2) I and III
- (3) II and III
- (4) I, II and III

Ans. (2)

Sol. The Flow of capital has been larger than flow of labour.

99. In a village Puranpur, 200 families are living. 85 families work on their own piece of land, 60 families work on the field of other farmers, 5 families run their own shops and 50 families work in a nearby factory to earn their livelihood. What percentage of Puranpur village depends on the secondary sector?

- (1) 20
- (2) 25
- (3) 35
- (4) 55

Ans. 2)

Sol. 25% of Puranpur village depends upon secondary sector. $(50/200 \times 100 = 25)$

100. Identify the correct pairs from List-I (Rights) and List-II (Violation of rights) and select the correct option using the codes given below.

| List I (Rights) | | List II (Violation of rights) |
|-----------------|-------------------------|---|
| A | Right to choose | Raman buys a packet of milk on which the company's name, manufacturing date, and expiry date were missing. |
| B | Right to be informed | Sakina wants a particular channel from her cable operator but operator offers some other channel as part of a complete package. |
| C | Right to safety | Joseph bought a television from a shop. He suffered electric shock while using it. |
| D | Right to seek redressal | Murli fell ill and was admitted in the hospital because of stale food served in the restaurant. |

- (1) A-I and C-III
- (2) B-II and C-III
- (3) B-II and D-IV
- (4) C-III and D-IV

Ans. (4)

Sol. Only option C matches with III and D matches with IV