INSTRUCTIONS TO CANDIDATES:

Read the following instructions carefully before you open the question booklet.

1. There are 100 questions in this test. All are compulsory. The question numbers 1 to 40 belong to Sciences, 41 to 60 pertain to Mathematics and 61 to 100 are on Social Science subjects.

2. Please follow the instructions given on the answer sheet for marking the answers.

3. Write your eight-digit Roll Number as allotted to you in the admission card very clearly on the test-booklet and darken the appropriate circles on the answer sheet as per instructions given.

4. Write down and darken Booklet Number in the appropriate circles on the answer sheet as per instructions given.

5. Since the time allotted for this question paper is very limited and all questions carry equal marks, you should make the best use of it by not spending too much time on any one question.

6. Rough work can be done anywhere in the booklet but not on the answer sheet/loose paper.

7. Every correct answer will be awarded one mark.

8. There will be NO NEGATIVE marking.
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

   Answer (4)

   Sol. During vigorous muscular activity there is lack of oxygen supply and thus anaerobic respiration takes place in muscle cells. During this process lactic acid is formed which gets accumulated in the muscle cells leading to cramps.

2. Which among the following is the correct sequence regarding the flow of impulse in a neuron?
   (1) Dendrite \(\rightarrow\) Axon \(\rightarrow\) Cell body
   (2) Axon \(\rightarrow\) Cell body \(\rightarrow\) Dendrite
   (3) Axon \(\rightarrow\) Dendrite \(\rightarrow\) Cell body
   (4) Cell body \(\rightarrow\) Axon \(\rightarrow\) Nerve terminal

   Answer (4)

   Sol. Transmission of impulse through neurons is in the form of electrical signals and occurs in one direction only, i.e., Dendrite \(\rightarrow\) Cell body \(\rightarrow\) Axon \(\rightarrow\) 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

   Answer (1)

   Sol. All the involuntary actions including blood pressure, salivation and vomiting are controlled by the medulla in the hind brain.

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.

   Answer (4)

   Sol. Edward Jenner found that the cow pox infection protects the person from subsequent infection from small pox.

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

   Answer (2)

   Sol. Origin of life on the earth evolved in the following sequences :- First, water is available, secondly formation of amino acids and nucleotides occurs, thirdly formation of complex molecules occurs, lastly organization of cells occurs.

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

   Answer (1)

   Sol. Flow of energy in an ecosystem is always unidirectional i.e., the energy which passes from the autotrophs to the herbivores does not revert to the autotrophs. There is a 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

   Answer (2)
Answer (2)

Sol. Pesticides gets accumulated at each trophic level. As, fishes occupy the last trophic level in pond. So, fishes will have the maximum amount of pesticide per gram of body mass.

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.

Answer (1)

Sol. When rate of water absorption is less than the rate of transpiration, plant cells loose water and thus plants wilt in the afternoon.


![Diagram of experimental sets A and 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

Answer (1)

Sol. Shoot bends towards light which shows positive phototropism, while root bends towards earth in response to gravity which shows 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

Answer (1)

Sol. During ripening, there is breakdown of starch to simple sugars (such as glucose, fructose, sucrose) which increases sweetness of banana.

11. In the flowering 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

Answer (2)

Sol. The male and female gametes fuse to form zygote. This process is called fertilization. Zygote then divides to form 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 & 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.

Answer (1)

Sol. In heterozygous condition, dominant trait (i.e., round and yellow) will be expressed. So, phenotypes will be
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

Answer (2)

Sol. Chromosomes, present in nucleus, are made up of DNA and proteins. Nucleus is the control room of the cell. A group of cells that are similar in structure and/or work together to achieve a particular function forms a tissue.

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

Answer (1)

Sol. Oxygen is a byproduct of photosynthesis which occurs in plants. Oxygen is essential for another vital process in organisms which releases energy, i.e., respiration.

15. 100 grams of oxygen (O₂) 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 O₂ molecules is greater than that of He molecules
   (3) The pressure of He gas would be greater than that of the O₂ gas
   (4) The average kinetic energy of He and O₂ molecules is same

Answer (3)

Sol. According to ideal gas equation,

\[ PV = nRT \]

Volume and temperature are constant (given)
\[ P \propto n \]

Number of moles of O₂ \( (n_1) = \frac{100}{32} = 3.125 \) moles

Number of moles of He \( (n_2) = \frac{100}{4} = 25 \) moles

As \( n_2 > n_1 \)

So, the pressure of He gas would be greater than that of O₂ gas

16. At 298 K and 1 atm pressure, a gas mixture contains equal masses of He, H₂, O₂ and NH₃. Which of the following is correct for their average molecular velocities?
   (1) He > H₂ > NH₃ > O₂
   (2) He < H₂ < O₂ < NH₃
   (3) H₂ < He < NH₃ < O₂
   (4) O₂ < NH₃ < He < H₂

Answer (4)

Sol.

<table>
<thead>
<tr>
<th>Gases</th>
<th>Molecular masses (u)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen (H₂)</td>
<td>2</td>
</tr>
<tr>
<td>Helium (He)</td>
<td>4</td>
</tr>
<tr>
<td>Ammonia (NH₃)</td>
<td>17</td>
</tr>
<tr>
<td>Oxygen (O₂)</td>
<td>32</td>
</tr>
</tbody>
</table>

Average molecular velocity = \( \sqrt{\frac{8RT}{\pi M}} \)

According to the above relation, greater the molecular mass lesser will be the average molecular velocity.

\[ \therefore \] The correct order is : O₂ < NH₃ < He < H₂

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 g. 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

Answer (1)
18. Match List-I (Mixture to be separated) with the List-II (Method used) and select the correct option using the codes given below.

<table>
<thead>
<tr>
<th>List-I (Mixture to be separated)</th>
<th>List-II (Method used)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Petroleum products</td>
<td>I. Chromatography</td>
</tr>
<tr>
<td>B. Camphor and rock salt</td>
<td>II. Centrifugation</td>
</tr>
<tr>
<td>C. Cream from milk</td>
<td>III. Sublimation</td>
</tr>
<tr>
<td>D. Coloured components in a dye</td>
<td>IV. Fractional distillation</td>
</tr>
</tbody>
</table>

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

Answer (4)

19. In the balanced chemical equation:
(a lead nitrate + b aluminium chloride → 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

Answer (4)

Sol. 

- NaCl (rock salt) does not undergo hydrolysis hence pH remains 7  
- Baking soda and washing soda undergo hydrolysis as given below.

\[
\begin{align*}
\text{NaHCO}_3 + \text{H}_2\text{O} & \rightarrow \text{Na}^+ + \text{H}_2\text{CO}_3 + \text{OH}^- \\
\text{Na}_2\text{CO}_3 + 2\text{H}_2\text{O} & \rightarrow 2\text{Na}^+ + \text{H}_2\text{CO}_3 + 2\text{OH}^-
\end{align*}
\]

Both produce free \(\text{OH}^-\) ions but \(\text{Na}_2\text{CO}_3\) produces more \(\text{OH}^-\) ions than \(\text{NaHCO}_3\) resulting into higher pH of Aq. solution of \(\text{Na}_2\text{CO}_3\).
Slaked lime (\(\text{Ca(OH)}_2\)) is an Arrhenius base and gives free \(\text{OH}^-\) ions in solution, making solution most basic among all four solutions. So correct sequence of pH of solution is 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

Answer (3)

Sol. \(2\text{C}_4\text{H}_6 + 11\text{O}_2 \rightarrow 8\text{CO}_2 + 6\text{H}_2\text{O}\)

For complete combustion of 2 moles of butyne, 11 moles of oxygen is required

No. of moles of \(\text{O}_2\)

\[
\text{Mass of required } \text{O}_2 \text{ (in grams)} = \frac{\text{Molecular weight (in grams)}}{11} \times 32
\]

\[11 = \frac{W}{32}\]

W = 352 g

\[352 \text{ g of } \text{O}_2 \text{ is required for complete combustion of 2 moles of butyne}\]

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.

<table>
<thead>
<tr>
<th>List I (Position of the Metal in the Activity Series)</th>
<th>List II (Related Reduction Process)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. The bottom of the series</td>
<td>I. Electrolysis</td>
</tr>
<tr>
<td>B. The top of the series</td>
<td>II Reduction by heat alone</td>
</tr>
<tr>
<td>C. The lower regions of the series</td>
<td>III. Found in native state</td>
</tr>
<tr>
<td>D. The middle of the series</td>
<td>IV. Reduction using carbon or some other reducing agent</td>
</tr>
</tbody>
</table>

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

Answer (3)

Sol.  

<table>
<thead>
<tr>
<th>Elements</th>
<th>Atomic number</th>
<th>Electronic configuration</th>
<th>Actual symbol of element</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6</td>
<td>2, 4</td>
<td>C</td>
</tr>
<tr>
<td>B</td>
<td>7</td>
<td>2, 5</td>
<td>N</td>
</tr>
<tr>
<td>C</td>
<td>14</td>
<td>2, 8, 4</td>
<td>Si</td>
</tr>
<tr>
<td>D</td>
<td>15</td>
<td>2, 8, 5</td>
<td>P</td>
</tr>
</tbody>
</table>
I. As D and C both are non-metals so they will not lose electrons and hence statement I is incorrect

II. 'B' is more electronegative than 'C'. It will gain electron more easily. So statement II is correct

III. As we move down the group, electronegativity decreases so D is not having the highest electronegativity because 'D' lies below the 'B' in the same group. Hence statement III is not correct

IV. According to the trends of periodic properties, as we move along the period atomic size decrease whereas on moving down the group atomic size increases. So element 'C' has the largest atomic size. Hence statement IV is 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
(2) Substitution, Substitution, Dehydration, Addition
(3) Substitution, Dehydration, Addition, Addition
(4) Addition, Substitution, Dehydration, Substitution

Answer (2)

Sol. Organic liquid ('A') is ethanol \((CH_3CH_2OH)\)

\[CH_3CH_2OH \xrightarrow{Acidified \ K_2Cr_2O_7} CH_3COOH\]

Ethanol (A) Ethanoic acid (B)

\[CH_3COOH + CH_3OH \xrightarrow{Conc. \ H_2SO_4} CH_3COOCH_3 + H_2O\]

Ethanoic acid (B) Methanol (C) Methyl ethanoate (D)

\[CH_3COONa + CH_3OH \xrightarrow{NaOH} \]

Sodium acetate (E) Methanol (D)

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

Answer (2)

Sol. Organic liquid ('A') is ethanol \((CH_3CH_2OH)\)

\[CH_3CH_2OH \xrightarrow{Acidified \ K_2Cr_2O_7} CH_3COOH\]

Ethanol (A) Ethanoic acid (B)

\[CH_3COOH + CH_3OH \xrightarrow{Conc. \ H_2SO_4} CH_3COOCH_3 + H_2O\]

Ethanoic acid (B) Methanol (C) Methyl ethanoate (D)

\[CH_3COONa + CH_3OH \xrightarrow{NaOH} \]

Sodium acetate (E) Methanol (D)

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

Answer (3)

Sol. For resistance \(R_1\),

\[V_1 = R_1 \times i\]

\[V_1 = \rho \times \frac{5 \times 10^{-2}}{(1 \times 10^{-2})^2} \times i\]

\[V_2 = \rho \times \frac{5 \times 10^{-2}}{(3 \times 10^{-2})^2} \times i\]

\[\Rightarrow \frac{V_1}{V_2} = \frac{9}{1}\]
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.

\[ \text{A} \quad \text{O} \quad \text{B} \]

\[ \leftarrow 40 \text{ cm} \quad \text{30 cm} \rightarrow \]

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

Answer (3)

Sol. For lens A:

\[ \frac{1}{v_1} - \frac{1}{u_1} = \frac{1}{f_1} \]

\[ \frac{1}{v_1} = \frac{1}{30} + \frac{1}{40} \]

\[ v_1 = 120 \text{ cm} \]

For lens B:

Now image formed by lens A is behave as virtual object for lens B and its distance from lens B is 90 cm.

\[ \frac{1}{v_2} - \frac{1}{u_2} = \frac{1}{f_2} \]

\[ \frac{1}{v_2} = \frac{1}{30} + \frac{1}{90} \]

\[ v_2 = 22.5 \text{ cm} \]

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) \( \frac{17L}{2u} \)

Answer (4)

Sol. Apply conservation of momentum for each 'L' distance

For distance L to 2L

\[ \frac{M}{2} v_1 = \frac{2M}{3} \]

\[ v_1 = \frac{2}{3} u \]

For distance 2L to 3L

\[ \frac{M}{2} u = \frac{2M}{5} \]

\[ v_2 = \frac{u}{2} \]

For distance 3L to 4L

\[ \frac{2M}{2} u = \frac{5M}{2} \]

\[ v_3 = \frac{2u}{5} \]

For distance 4 L to \( \frac{9L}{2} \)

\[ \frac{5M}{2} \frac{2u}{5} = \frac{3M}{2} v_4 \]

\[ v_4 = \frac{u}{3} \]

Object covers first L distance with speed u and last \( \frac{L}{2} \) with \( \frac{u}{3} \).

Time = \( t_1 + t_2 + t_3 + t_4 + t_5 \)

\[ = \frac{L}{u} + \frac{L}{2u} + \frac{L}{u} + \frac{L}{2u} + \frac{L}{3u} \]

\[ = \frac{L}{u} \left( 1 + \frac{3}{2} + \frac{2}{5} + \frac{3}{2} \right) \]

\[ = \frac{L}{u} \left( \frac{6 + 5}{2} \right) \]

\[ = \frac{17L}{2u} \]
31. A ball is thrown vertically up from the point A (see figure). A person, standing at a height H on the roof atop a building, tries to catch it. He misses the catch, the ball overshoots and simultaneously the person starts a stopwatch. 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 stopwatch. If g is the acceleration due to gravity at this place, the speed with which the ball was thrown from point A will be

\[ u = \sqrt{\frac{g^2 T^2 + 2gH}{2}} \]

\[ u = \sqrt{\frac{g^2 T^2 + 8gH}{2}} \]

\[ u = \sqrt{\frac{g^2 T^2 + 2gH}{2}} \]

\[ u = \sqrt{\frac{g^2 T^2 + 4gH}{2}} \]

Answer (3)

Sol. As we know

\[ v = u + at \]

\[ 0 = v_1 - \frac{gT}{2} \]

\[ v_1 = \frac{gT}{2} \]

For AB

\[ v^2 = u^2 + 2gs \]

\[ \left( \frac{gT}{2} \right)^2 = u^2 - 2gH \]

\[ u^2 = \left( \frac{gT}{2} \right)^2 + 2gH \]

\[ u = \sqrt{\frac{(gT)^2 + 8gH}{4}} \]

\[ u = \frac{\sqrt{g^2 T^2 + 8gH}}{2} \]

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

\[ (1) \quad \frac{2}{\sqrt{3}} \quad (2) \quad 2 \quad (3) \quad \sqrt{2} \quad (4) \quad \sqrt{3} \]

Answer (3)

Sol. By using Snell's law

\[ \frac{\sin i}{\sin r} = \frac{n_2}{n_1} \]

\[ \frac{\sin 45^\circ}{\sin 30^\circ} = \frac{n_2}{1} \]

\[ \frac{1}{\sqrt{2}} = \frac{n_2}{2} \]

\[ n_2 = \frac{2}{\sqrt{2}} \]

\[ n_2 = \sqrt{2} \]

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
Answer (3)

Sol. Buoyancy force, \( F_B = \rho_w g \)

where, volume \( V = AL \)

\( F_B = (AL) \rho_w g \)

\( F_B \propto L \)

Where, \( A \rho_w g = \text{constant} \)

But when the block immersed completely then buoyancy force will be constant.

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) \( v_A = v_B = v_C \)

Answer (4)

Sol. \( v_B^2 = v_{BH}^2 + v_{BV}^2 \)

\( v_B^2 = u^2 + 2gH \)

\( v_B = \sqrt{u^2 + 2gH} \)

\( v_A = v_B = v_C \)

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 36 N. The force pulling the block of mass \( m_1 \) will be

(1) 2 N (2) 4 N (3) 12 N (4) 36 N

Answer (2)

Sol. \( m = 9 \text{ kg} \)

\( a = \frac{F}{m} = \frac{36}{9} = 4 \text{ m/s}^2 \)

Force on block \( m_1 = 1 \times 4 = 4 \text{ N} \)

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

Answer (3)
37. Three electric bulbs of rating 40 W-200 V; 50 W-200 V and 100 W-200 V 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

Answer (2)

Sol. Let $I_1$, $I_2$ and $I_3$ are the maximum current rating of bulbs.

$I_1 = 0.2$ A
$I_2 = 0.25$ A
$I_3 = 0.5$ A
$R_1 = 1000$ $\Omega$
$R_2 = 800$ $\Omega$
$R_3 = 400$ $\Omega$

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

Answer (2)

Sol. Velocity of sound in solid > Velocity of sound in air

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?

Answer (1)

Sol. Current in opposite direction, wire will repel each other and experiences force of same magnitude.

$\Rightarrow |F_{12}| = |F_{21}|$
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

Answer (4)
Sol. (i) When $K_1$ is closed and $K_2$ is open,

\[ R_{eq} = \frac{12 \times 3}{12 + 3} = \frac{36}{15} = 2.4 \Omega \]

\[ I_1 = \frac{V}{R_{eq}} = \frac{12 \times 15}{36} = 5 \text{ A} \]

(ii) When $K_2$ is closed and $K_1$ is open,

\[ R_{eq} = \frac{12 \times 4}{12 + 4} = \frac{48}{16} = 3 \Omega \]

\[ I_2 = \frac{V}{R_{eq}} = \frac{12}{3} = 4 \text{ A} \]

\[ \therefore I_1 : I_2 = 5 : 4 \]

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

Answer (3)
Sol. $\frac{1}{7} = 0.\overline{142857}$

$\frac{1}{13} = 0.076923$

$\frac{1}{21} = 0.047619$

\[ x = 7 + 13 + 21 \]

\[ \therefore x = 41 \]

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

Answer (1)
Sol. $12^n + 1$

Unit's digit of $12^n + 1$ can be 3, 5, 7, 9

\[ \therefore 1 \text{ cannot be the unit digit of } 12^n + 1 \]

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

Answer (*)
Sol. But ratio of roots is not valid when $k = 0$

\[ \therefore \text{No correct option as technically it is wrong. However, mathematically option (1) satisfies.} \]

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

Answer (1)
Sol. (1, 3), (5, 7, 9, 11), (13, 15, 17, 19, 21, 23) ....
Number of terms in Group 1 = 2
Number of terms in Group 2 = 4
Number of terms in Group 10 = 20
Total number of terms before Group 10
\[= 2 + 4 + 6 + \ldots + 18\]
\[= \frac{9\times(2+18)}{2}\]
\[= 90\]
First term of 10th Group i.e., 91st odd number
\[= 1 + (90)2\]
\[= 181\]
\[\therefore 181\text{ is the first term of Group 10}\]
\[\Rightarrow \text{Sum of terms in group 10}\]
\[= \frac{20}{2}(2\times181+19\times2)\]
\[= 4000\]
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
Answer (2)
Sol.
\[
x^2 - 4x + (8 - k)\\x^2 - 2x + k\]
\[
= \frac{x^4 - 6x^3 + 16x^2 - 25x + 10}{x^4 + 2x^3 + kx^2}\\- 4x^3 + (16 - k)x^2 - 25x + 10\\- 4x^3 + 8x^2 - 4kx\\+ - + + (8 - k)x^2 + (-25 + 4k)x + 10\\(8 - k)x^2 - (16 - 2k)x + 8k - k^2\\- + + + (-25 + 4k + 16 - 2k)x + 10 - 8k + k^2\]
Remainder = \((-9 + 2k)x + 10 - 8k + k^2\)
\[- 9 + 2k = 1\]
\[\Rightarrow k = 5\]
\[a = 10 - 8k + k^2\]
\[= 10 - 40 + 25\]
\[= -5\]
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) \(-3, \frac{4}{27}\)
Answer (3)
Sol. \(x^2 - 3x - 4 = 0 \quad \ldots \text{(i)}\)
\[\Rightarrow 4 \text{ and } -1 \text{ are the roots of equation (i)}\]
\[2x^2 + kx - 5 = 0\]
When \(x = 4,\)
\[2(4)^2 + 4k - 5 = 0\]
\[\Rightarrow k = \frac{-27}{4}\]
When \(x = -1,\)
\[2(-1)^2 - k - 5 = 0\]
\[\Rightarrow k = -3\]
47. The value of \(\cos x^\circ - \sin x^\circ\) \((0 \leq x < 45)\) is
(1) 0
(2) Positive
(3) Negative
(4) Sometimes negative and sometimes positive
Answer (2)
Sol.
\[1 \geq \cos x^\circ > \frac{1}{\sqrt{2}}, \text{ where } 0 \leq x < 45\]
\[0 \leq \sin x^\circ < \frac{1}{\sqrt{2}}, \text{ where } 0 \leq x < 45\]
\[\therefore \cos x^\circ - \sin x^\circ \text{ is always positive}\]
48. A vertical pole of height 10 metres stands at one corner of a rectangular field. The angle of elevation of its top from the farthest corner is 30°, while that from another corner is 60°. The area (in m²) of rectangular field is
(1) \(\frac{200\sqrt{2}}{3}\)
(2) \(\frac{400}{\sqrt{3}}\)
(3) \(\frac{200\sqrt{2}}{\sqrt{3}}\)
(4) \(\frac{400\sqrt{2}}{\sqrt{3}}\)
Answer (1)

Sol. In \( \triangle OAC \),
\[
\tan 30^\circ = \frac{10}{x}
\]
\[\Rightarrow x = 10\sqrt{3}\]

In \( \triangle OCD \),
\[
\tan 60^\circ = \frac{10}{y}
\]
\[\Rightarrow y = \frac{10}{\sqrt{3}}\]

In \( \triangle ADC \),
\[y^2 + z^2 = x^2\]
\[z^2 = x^2 - y^2\]
\[z^2 = \frac{800}{3}\]
\[z = \frac{20\sqrt{2}}{\sqrt{3}}\]

Required area = \( yz = \frac{10\times 20\sqrt{2}}{\sqrt{3}} = \frac{200\sqrt{2}}{3}\)

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) \( 1:2 \)  
(3) \( \sqrt{2}:4 \)  
(4) \( 1:3 \)

Answer (1)

Sol.

Radius of inner circle = \( \frac{a}{2} \) [where \( a \) is the length of side of square]

Radius of outer circle = \( \frac{a}{\sqrt{2}} \)

\[\therefore \text{Ratio of area of inner circle to outer circle} = \pi \left( \frac{a}{2} \right)^2 : \pi \left( \frac{a}{\sqrt{2}} \right)^2 = 1:2\]

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

Answer (3)

Sol.

Volume of water in tank =
\[36 \times 10.5 \times 1 + 36 \times 10.5 \times \frac{3}{4} \times \frac{1}{2}\]
\[= \frac{10.5 \times 99}{2} \text{ m}^3\]

Volume of water flows through pipe in one hour = \( \pi \times \left( \frac{7}{100} \right)^2 \times 5000 \text{ m}^3\)

Let time to empty water in pool is \( t \) hr
\[\Rightarrow \pi \times \left( \frac{7}{100} \right)^2 \times 5000 \times t = \frac{10.5 \times 99}{2}\]
\[t = 6\frac{3}{4} \text{ hr}\]

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

Answer (3)
Answer (4)
Sol. In $\triangle ADC$
\[
\tan 30^\circ = \frac{R}{h} (AD = h)
\]
\[
R = \frac{h}{\sqrt{3}}
\]
In $\triangle ADC$
\[
AC^2 = h^2 + \left( \frac{h}{\sqrt{3}} \right)^2
\]
\[
= \frac{4h^2}{3}
\]
\[
AC = \frac{2h}{\sqrt{3}}
\]
CE = $R = \frac{h}{\sqrt{3}}$
∴ AE = AC – CE
\[
= \frac{h}{\sqrt{3}}
\]
Now in $\triangle AOE$
\[
\tan 30^\circ = \frac{r}{AE}
\]
\[
r = AE \times \frac{1}{\sqrt{3}} = \frac{h}{3}
\]
∴ Volume of sphere
\[
= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \left( \frac{h}{3} \right)^3
\]
\[
= \frac{4\pi h^3}{81}
\]
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

Answer (3)
Sol. Condition (1)
Let the height of cylinder having radius 3 cm and 1.5 cm are $h_1$ and $h_2$ respectively
∴ Volume of water in condition (1)
\[
= \pi (3^2)h_1 + \pi (1.5)^2(15 - h_1)
\]
\[
= \left( \frac{27\pi h_1 + 15\pi}{4} \right) \text{cm}^3
\]
Condition (2)
Volume of water in condition (2)
\[
= \pi (1.5)^2h_2 + (24 - h_2)9\pi
\]
\[
= \left( \frac{36\pi \times 24 - 27\pi h_2}{4} \right) \text{cm}^3
\]
Volume of water in both condition must be same
∴ $\frac{27\pi h_1 + 15\pi}{4} = \frac{36\pi \times 24 - 27\pi h_2}{4}$
\[
27\pi (h_1 + h_2) = 36 \times \pi \times 24 - 15 \times 9\pi
\]
\[
(h_1 + h_2) = \frac{9\pi \times 81}{27\pi}
\]
⇒ $h_1 + h_2 = 27$ cm
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) \( 4l^2 \)  
(3) \( 9l^2 \)  
(4) \( 12l^2 \)

Answer (4)

Sol.

In \( \triangle ABC \),

\[
BC = 2\sqrt{l^2 - h^2}
\]

Given triangle

In \( \triangle PQR \),

\[
QR = 2\sqrt{4l^2 - h^2}
\]

New triangle

Now

\[
QR^2 - BC^2 = 4(4l^2 - h^2) - 4(l^2 - h^2) = 16l^2 - 4l^2 = 12l^2
\]

54. In the adjoining figure, \( \triangle ABC \) 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) \( 9 + 3\sqrt{3} \)

Answer (4)

Sol.

In \( \triangle ABC \),

\[
FG = FM + MG = 3 + 1 = 4
\]

\[
GC = 2 \text{ cm [} \triangle FDC \sim \triangle GEC]\n\]

\[
\triangle DC = 3\sqrt{3} \text{ cm}
\]

In \( \triangle ABC \),

\[
(x + 3\sqrt{3})^2 = (x + 3)^2 + (3 + 3\sqrt{3})^2
\]

\[
\Rightarrow x = 6 + 3\sqrt{3}
\]

\[
AB = x + 3 = 6 + 3\sqrt{3} + 3 = 9 + 3\sqrt{3}
\]

55. In \( \triangle ABC \), \( AB = AC \), \( P \) 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) \( \frac{5\pi}{7} \)

Answer (4)

Sol.
In $\triangle ABC$

$AB = AC$

$y + 180^\circ - 2x = x$

$\Rightarrow 180^\circ = 3x - y \quad \text{(i)}$

In $\triangle AQP$

$2z = y \quad \text{(ii)}$

$\therefore \ APQ$ is a straight line

$z + x + 180^\circ - 2y = 180^\circ$

$\Rightarrow 2x = 3y \quad \text{(iii) \quad \text{(from (ii))}$

From (i) and (iii)

$y = \frac{360^\circ}{7}$

$\angle AQP = 180^\circ - \frac{360^\circ}{7}$

$= \frac{900^\circ}{7} = \frac{5\pi}{7}$

56. A line from one vertex A of an equilateral

$\triangle ABC$ meets the opposite side BC in P and the

circumcircle of $\triangle ABC$ 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

Answer (3)

Sol.

$\triangle ABC$

$BQ \times QC - BP \times PC$

$PQ^2 = BQ \times QC - BP \times PC$

$= 4 \times 3 - 4k \times 3k$

$= 12(1 - k^2)$

$= 12 \left(1 - \frac{37}{49}\right)$

$= \frac{12 \times 12}{49}$

$PQ = \frac{12}{7}$ cm

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

Answer (4)

Sol. Let the points $A(1, 2), B(x, y)$ are at the
distance 2 units.

$\Rightarrow \sqrt{(x-1)^2 + (y-2)^2} = 2$

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

$x$ and $y$ can take only integral values.

$\Rightarrow (x-1)^2 = 0$ and $(y-2)^2 = 4$ gives $(1, 4), (1, 0)$

Further, $(y-2)^2 = 0$ and $(x-1)^2 = 4$ gives

$(3, 2), (-1, 2)$

Hence four such points 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

Answer (1)

Sol. Option (1) is correct.

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) $\frac{1}{4}$
Answer (3)
Sol. Number of possible outcomes = 16

Number of favourable outcomes = 
{(2, 9), (2, 16), (3, 9), (3, 16), (4, 9), (4, 16)}

\[
P(E) = \frac{6}{16} = \frac{3}{8}
\]

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) \( \frac{300}{m}\% \)

Answer (4)
Sol. Let the 11 consecutive natural numbers be 
\( n, n + 1, n + 2, \ldots, n + 10 \).

\[ \Rightarrow \text{Mean} = \frac{n + n + 1 + n + 2 + \ldots + n + 10}{11} \]

\[ = \frac{11n + \frac{10 \times 11}{2}}{11} = \frac{n + 5}{2} = m \text{(Given)} \]

Further, mean of 17 consecutive natural numbers = 
\[ \frac{n + n + 1 + \ldots + n + 16}{17} \]

\[ = \frac{17n + 16(17)}{2} = \frac{17n + 272}{17} = n + 8 \]

\[ \% \text{ difference} = \frac{n + 8 - n - 5}{m} \times 100\% \]

\[ = \frac{3}{m} \times 100 \]

\[ = \frac{300}{m}\% \]

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.

Answer (1)

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

Answer (1)

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

Answer (4)

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

Answer (2)
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 (3) II and III (4) III and IV

Answer (1)

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 taluqdar 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

Answer (1)

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

Answer (2)

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

Answer (4)

Direction (Questions 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.

Answer (3)

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.

Answer (4)

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.

Answer (2)

72. Statement I : Hand printing developed in China.
Statement II : The Chinese state printed textbooks in vast numbers.

Answer (4)

73. Statement I : Rainfall is low in the western parts of Deccan Plateau and East of Sahyadris.
Statement II : Western Ghats causes convectional rainfall.

Answer (1)

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.

Answer (3)
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?

(A) 00:00 hour, 22:00 hour
(B) 22:20 hour, 23:56 hour
(C) 23:56 hour, 22:20 hour
(D) 22:56 hour, 23:20 hour

Answer (3)

76. Which one 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

Answer (2)

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

Answer (2)

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

Answer (4)

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 Forests – Tropical Evergreen Forests – Mangrove Forests
(4) Tropical Evergreen Forests – Tropical Deciduous Forests – Mangrove Forests

Answer (4)

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 movement of Air Masses.

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

Answer (2)

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

Answer (2)
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
Answer (3)

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.
Answer (3)

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
Answer (3)

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
Answer (2)

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
Answer (1)

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
Answer (4)
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
Answer (3)

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

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.
Answer (4)

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
Answer (2)

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
Answer (1)

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

<table>
<thead>
<tr>
<th>Family</th>
<th>Total Days of Employment got in a Month by the family</th>
<th>Members of the Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hari</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Tenzin</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Bala</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Phulia</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

Identify the family living below poverty line.
(1) Hari (2) Tenzin (3) Bala (4) Phulia
Answer (3)

94. In a particular year, the price of wheat in a market is ₹ 15 per kg and a farmer produces 100 kgs of wheat. In the next year the price of wheat has fallen to ₹ 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) ₹ 12 per kg (2) ₹ 12.5 per kg (3) ₹ 13 per kg (4) ₹ 13.5 per kg
Answer (2)

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.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Literacy rate (%)</th>
<th>Life Expectancy (years)</th>
<th>Unemployment rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>74</td>
<td>82</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>93</td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>63</td>
<td>78</td>
<td>15</td>
</tr>
<tr>
<td>D</td>
<td>65</td>
<td>78</td>
<td>10</td>
</tr>
</tbody>
</table>

(1) A (2) B (3) C (4) D
Answer (3)
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 statements I, II and III are true.

Answer (1)

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

Answer (2)

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 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

Answer (2)

99. In a village Puranpur, 200 families are living. Eighty five 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

Answer (2)

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.

<table>
<thead>
<tr>
<th>List I</th>
<th>List II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rights</td>
<td>Violation of rights</td>
</tr>
<tr>
<td>A</td>
<td>Right to choose</td>
</tr>
<tr>
<td>B</td>
<td>Right to be informed</td>
</tr>
<tr>
<td>C</td>
<td>Right to safety</td>
</tr>
<tr>
<td>D</td>
<td>Right to seek redressal</td>
</tr>
</tbody>
</table>

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

Answer (4)