



Class 12th (PCM)

Total Questions : 90

Maximum Marks : 360

Time : 3 Hrs.

PAPER PATTERN & MARKING SCHEME

Subject	Physics		Chemistry		Maths	
Ques. type	SCQ	INT	SCQ	INT	SCQ	INT
No. of ques.	20	10	20	10	20	10
Marks per ques.	4	4	4	4	4	4
Negative marks per ques.	1	0	1	0	1	0

SCQ - Single correct answer type questions & INT - Integer answer type questions

INSTRUCTIONS – 1:

- A. The question paper consists of **3 parts (1. Physics 2. Chemistry 3. Maths)**. Please fill the **OMR** answer Sheet accordingly and carefully.
- B. This questions paper contains **60 single correct type questions** and **30 Integer answer type questions**.
- C. Please ensure that the Question Paper you have received contains All the questions in each Section and Pages. If you found some mistake like missing questions or pages then contact immediately to the Invigilator.

INSTRUCTIONS – 2:

- 1. Part – 1, 2 & 3 contains 20 **Single correct type questions** and 10 **Integer type questions**.
- 2. Indicate the correct answer for each question by filling appropriate bubble in your answer sheet.
- 3. Use of Calculator, Log Table, Slide Rule and Mobile is not allowed.

OMR filling instructions for SCQ.

OMR filling instructions for INT.

INSTRUCTIONS

1. "Think before your ink".
2. Marking should be done with Blue/Black Ball Point Pen only.
3. Darken only one circle for each question as shown in Example Below.

WRONG METHODS	CORRECT METHOD

4. If more than one circle is darkened or if the response is marked in any other way as shown "WRONG" above, it shall be treated as wrong way of marking.
5. Make the marks only in the spaces provided.
6. Carefully tear off the duplicate copy of the OMR without tampering the Original.
7. Please do not make any stray marks on the answer sheet.

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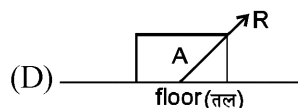
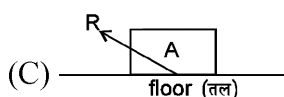
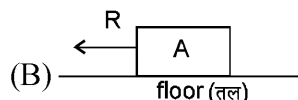
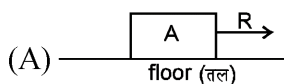
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4. The phenomenon of electromagnetic induction is :
- (A) the process of charging a body
 - (B) The process of generating magnetic field due to a current passing through a coil
 - (C) Producing induced current in a coil due to relative motion between a magnet and the coil
 - (D) The process of rotating a coil of an electric motor
5. The distance and displacement of a moving object are definitely equal when it
- (A) Moves in a circle
 - (B) Slows down
 - (C) Speeds up
 - (D) Moves straight without turning back
6. Friction between two surface in contact increases when
- (A) A layer of grease is applied between them
 - (B) They are pressed harder against each other
 - (C) They move over each other
 - (D) They are pulled apart
7. A box 'A' is lying on the horizontal floor of the compartment of a train running along horizontal rails from left to right. At time 't', it decelerates. Then the reaction R by the floor on the box is given best by :

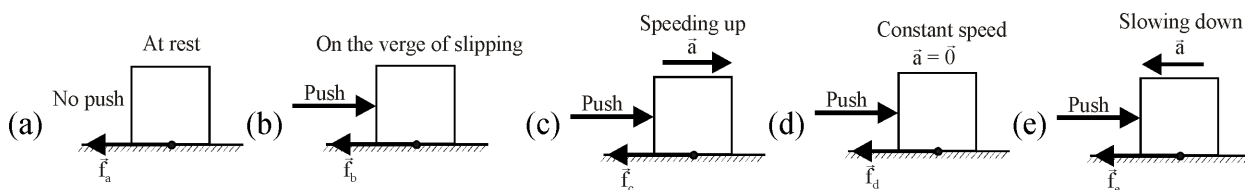


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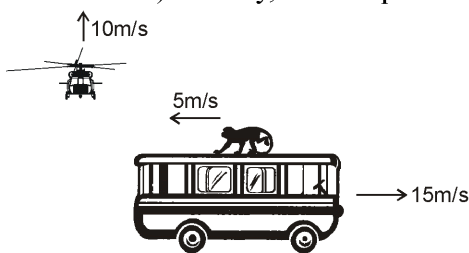
8. Rank in order, from largest to smallest, the sizes of the friction forces \vec{f}_a to \vec{f}_e in these 5 different situations.

The box and the floor are made of the same materials in all situations. (If $\mu_s > \mu_k$)



(A) $f_d < f_b = f_c = f_e > f_a$ (B) $f_c < f_b = f_d = f_e > f_a$ (C) $f_b = f_c = f_d = f_e > f_a$ (D) $f_b > f_c = f_d = f_e > f_a$

9. A bus is moving rightward with a velocity of 15 m/sec. and on the bus, a monkey is running oppositely with a velocity of 5 m/sec. (with respect to the bus). Nearby, A helicopter is rising with a velocity of 10 m/sec.

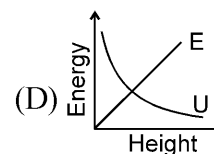
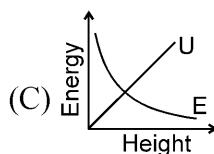
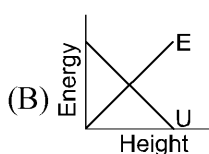
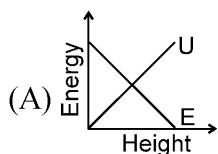


- (A) As seen by the monkey, the helicopter is moving in (↖) direction
- (B) As seen by the monkey, the helicopter is moving in (↗) direction.
- (C) As seen by helicopter's pilot, the bus is moving in (↖) direction.
- (D) As seen by the helicopter's pilot, the bus is moving in (↗) direction.

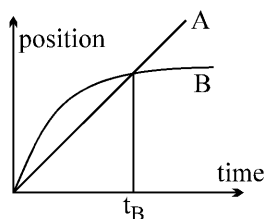
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10. Which of the following graphs is correct for kinetic energy (E) and potential energy (U) (with height (h) measured from the ground) for a particle thrown vertically upward from a horizontal ground ($h \ll R_E$ and $U = 0$ at $h = 0$)



11. The graph shows position as a function of time for two trains running on parallel tracks. Which one of the following statement is true?

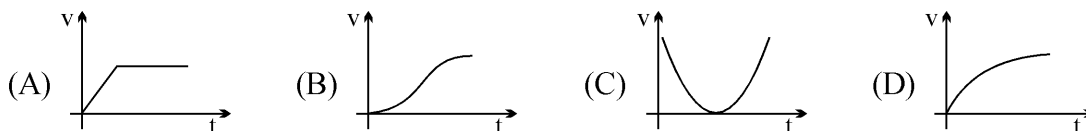
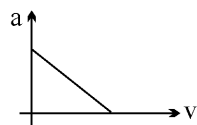


- (A) At time t_B , both trains have the same velocity.
(B) Both trains have the same velocity at some time after t_B .
(C) Both trains have the same velocity at some time before t_B .
(D) Somewhere on the graph, both trains have the same acceleration.

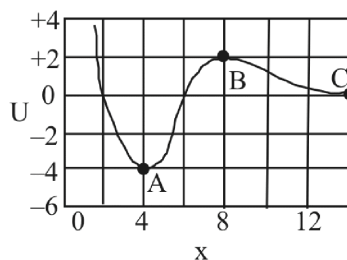
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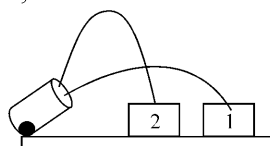
12. Acceleration versus velocity graph of a particle moving in a straight line starting from rest is as shown in figure. The corresponding velocity-time graph would be



13. For the potential energy (U) vs position (x) function shown in fig. there will be an unstable equilibrium at position



- (A) A (B) B (C) C (D) None
14. Two similar cannon simultaneously fires two identical cannon balls at target 1 and 2 as shown in the figure. If the cannon balls have identical initial speeds, which of the following statements is true?



- (A) Target 2 is hit before target 1 (B) Target 1 is hit before target 2
 (C) Both are hit at the same time (D) information is insufficient

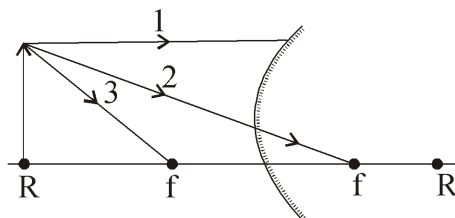
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15. Two metallic wires A and B are connected in series. Wire A has length l and radius r , while wire B has length $2l$ and radius $2r$. If both the wires are of same material then find the ratio of the total resistance of series combination to the resistance of the wire A.

- (A) $\frac{3}{4}$ (B) $\frac{3}{2}$ (C) $\frac{6}{2}$ (D) $\frac{6}{5}$

16. Which pairs of rays from object in the drawing are used to construct the image location produced by the convex spherical mirror of focal length f and radius R ?



- (A) 1 and 3 (B) 1 and 2
(C) 2 and 3 (D) Any pair of rays can be taken among shown

17. Steam at 100°C is added slowly to 1400 gm of water at 16°C until the temperature of water is raised to 80°C .

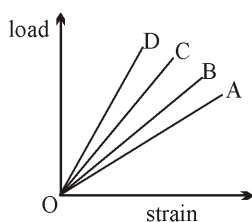
The mass of steam required to do this is ($L_v = 540\text{ cal/gm}$) :

- (A) 160 gm (B) 125 mg (C) 250 gm (D) 320 gm

Space for Rough Work



18. Two atoms of the hydrogen are located at \vec{r}_1 and \vec{r}_2 . Their centre of mass is at :
- (A) $\frac{\vec{r}_1 - \vec{r}_2}{2}$ (B) $\frac{\vec{r}_1 + \vec{r}_2}{2}$ (C) $\vec{r}_1 - \vec{r}_2$ (D) $\vec{r}_1 + \vec{r}_2$
19. A particle is moving in a circular path with velocity varying with time as $v = 1.5t^2 + 2t$. If 2 cm the radius of circular path, the angular acceleration at $t = 2$ sec will be -
- (A) 4 rad/sec² (B) 40 rad/sec²
(C) 400 rad/sec² (D) 0.4 rad/sec²
20. The load versus strain graph for four wires of the same material is shown in the figure. The thickest wire is represented by the line



- (A) OB (B) OA (C) OD (D) OC

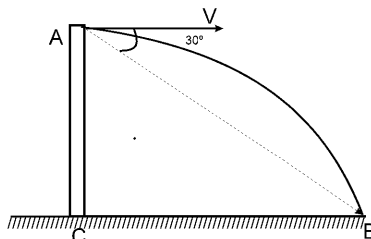
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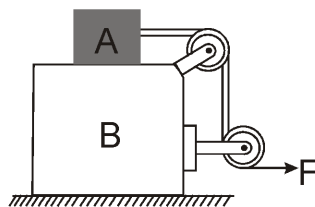
Question No. 21 – 30 are of Integer Answer Type Question.

Answer of these question will come from **00 to 99**.

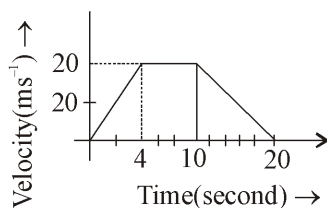
21. A bus starts from rest with an acceleration of 1 m/sec^2 . A man who is 48 m behind the bus starts with a uniform velocity of 10 m/sec, then the minimum time after which the man will catch the bus is -
22. An object is thrown horizontally from a point 'A' from a tower and hits the ground 3s later at B. The line from 'A' to 'B' makes an angle of 30° with the horizontal. The initial velocity of the object is : (take $g = 10 \text{ m/s}^2$)



23. In the arrangement shown in figure, $m_A = m_B = 2\text{kg}$. String is massless and pulley is frictionless. Block B is resting on a smooth horizontal surface and friction coefficient between blocks A and B is $\mu = 0.5$. What maximum horizontal force F can applied so that block A does not slip over that block B ? ($g = 10 \text{ m/s}^2$)



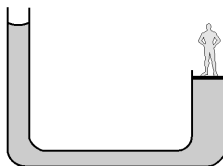
24. The figure represents the velocity-time graph of body moving in a straight line. How much distance does it travel during the last 10 seconds ?



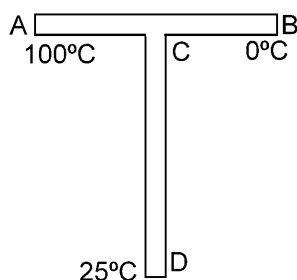
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25. The area of cross-section of the wider tube shown in figure is 900 cm^2 . If the boy standing on the piston weighs 45 kg , find the difference in the levels of water in the two tubes.



26. A rod CD of thermal resistance 5.0 K/W is joined at the middle of an identical rod AB as shown in figure. The ends A, B and D are maintained at 100°C , 0°C and 25°C respectively. Find the heat current in CD.

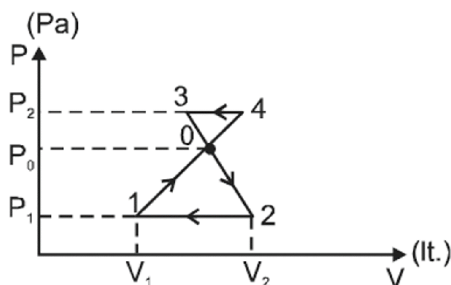


27. A cricketer can throw a ball to a maximum horizontal distance of 100 m . How much high should above the ground can the cricketer throw the same ball.

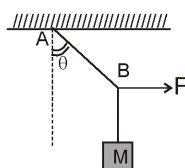
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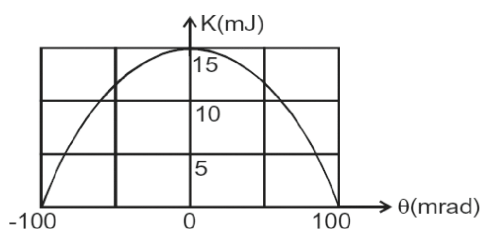
28. Find the work done by an ideal gas during a closed cycle $1 \rightarrow 4 \rightarrow 3 \rightarrow 2 \rightarrow 1$ shown in figure if $P_1 = 10^5$ Pa, $P_0 = 3 \times 10^5$ Pa, $P_2 = 4 \times 10^5$ Pa, $V_2 - V_1 = 10$ litre, and segments 4-3 and 2-1 of the cycle are parallel to the V-axis ?



29. A mass M is suspended by a rope from a rigid support at A as shown in figure. Another rope is tied at the end B , and it is pulled horizontally with a force F . If the tension in the string AB is nF when the rope AB makes an angle 30° with the vertical in equilibrium. Find n ?



30. Figure shows the kinetic energy K of a simple pendulum versus its angle θ from the vertical. The pendulum bob has mass 0.2 kg. If the length of the pendulum is equal to n/g meter, then find n . ($g = 10$ m/s²).



Space for Rough Work



Part – 2 contains 20 Single correct type questions and 10 Integer type questions.

Question No. 31 – 50 are of Single Correct Answer Type Question.

Four options are given in each question out of which only one option is correct.

31. A metal M of equivalent mass E forms an oxide of molecular formula M_xO_y . The atomic mass of the metal is given by the correct equation :

- (A) $\frac{2Ey}{x}$ (B) xyE (C) $\frac{E}{y}$ (D) y/E

32. An excited state of H atom emits a photon of wavelength λ and returns in the ground state, the principal quantum number of excited state is given by :

- (A) $\sqrt{\lambda R(\lambda R - 1)}$ (B) $\sqrt{\frac{\lambda R}{(\lambda R - 1)}}$ (C) $\sqrt{\lambda R(\lambda - 1)}$ (D) $\sqrt{\frac{\lambda R - 1}{\lambda R}}$

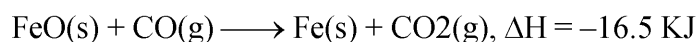
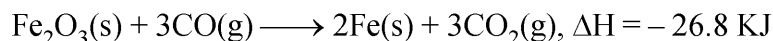
33. If U_{RMS} of a gas is $30R^{1/2} \text{ ms}^{-1}$ at 27°C then the molar mass of gas is :

- (A) 0.02 kg/mol (B) 0.001 kg/mol (C) 0.003 kg/mol (D) 1 kg/mol

34. The ratio among most probable velocity, mean velocity and root mean square velocity is given by

- (A) 1 : 2 : 3 (B) $1 : \sqrt{2} : \sqrt{3}$ (C) $\sqrt{2} : \sqrt{3} : \sqrt{\frac{8}{\pi}}$ (D) $\sqrt{2} : \sqrt{\frac{8}{\pi}} : \sqrt{3}$

35. The following two reactions are known



The value of ΔH for the following reaction is :

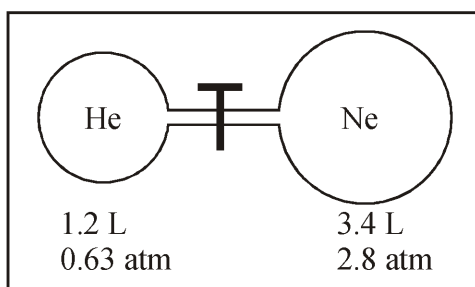


- (A) +10.3 KJ (B) -43.3 KJ (C) -10.3 KJ (D) +6.2 KJ

Space for Rough Work



36. Consider the following apparatus. Calculate the partial pressure of helium after the opening valve. The temperature remains constant at 16°C.



- (A) 0.164 atm (B) 1.64 atm (C) 0.328 atm (D) 1 atm
37. What will be the heat of formation of methane, if the heat of combustion of carbon is '-x' KJ, heat of formation of water is '-y' KJ and heat of combustion of methane is '-z' KJ ?
- (A) $(-x - y + z)$ KJ (B) $(-z - x + 2y)$ KJ
(C) $(-x - 2y - z)$ KJ (D) $(-x - 2y + z)$ KJ
38. The reaction quotient(Q) for the reaction

$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ is given by $Q = \frac{[\text{NH}_3]^2}{[\text{N}_2][\text{H}_2]^3}$. The reaction will proceed from right to left if:

- (A) $Q = 0$ (B) $Q = K_c$ (C) $Q < K_c$ (D) $Q > K_c$

Space for Rough Work

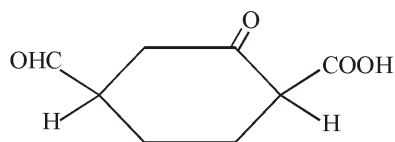



39. For the equilibrium $\text{SO}_2\text{Cl}_2(\text{g}) \rightleftharpoons \text{SO}_2(\text{g}) + \text{Cl}_2(\text{g})$, what is the temperature at which $\frac{K_p(\text{atm})}{K_c(\text{M})} = 3$?
- (A) 0.027 K (B) 0.36 K (C) 36.54 K (D) 273 K
40. What is the ionization constant of an acid if the hydronium ion concentration of a 0.40 M solution is 1.40×10^{-4} M?
- (A) 1.96×10^{-8} (B) 1.22×10^{-9} (C) 4.90×10^{-8} (D) 1.40×10^{-6}
41. Which of the following possesses highest second ionisation energy :
- (A) $1s^2, 2s^2 2p^6, 3s^2$ (B) $1s^2, 2s^2 2p^6, 3s^1$ (C) $1s^2, 2s^2 2p^3$ (D) $1s^2, 2s^2 2p^4$
42. The correct order of increasing C – O bond length of CO , CO_3^{2-} , CO_2 is :
- (A) $\text{CO}_3^{2-} < \text{CO}_2 < \text{CO}$ (B) $\text{CO}_2 < \text{CO}_3^{2-} < \text{CO}$
(C) $\text{CO} < \text{CO}_3^{2-} < \text{CO}_2$ (D) $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$
43. Amongst H_2O , H_2S , H_2Se and H_2Te , the one with the highest boiling point is :
- (A) H_2O because of H– bonding (B) H_2Te because of higher molar mass
(C) H_2S because of H– bonding (D) H_2Se because of lower molar mass

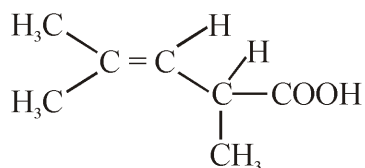
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44. The IUPAC name of following polyfunctional compound is



- (A) 2, 4-dioxo cyclohexanoic acid
(B) 2, 4-dioxo cycloheptanoic acid
(C) 4-formyl-2-oxo cyclohexane-1-carboxylic acid
(D) 2, 4-dioxo cyclohexane - 1 - carboxylic acid
45. A, , A is named as
- (A) bicyclo (2, 2, 1) heptane (B) bicyclo (2, 2, 2) hexane
(C) bicyclo (2, 2, 1) hexane (D) bicyclo (2, 1, 0) hexane
46. The following compound can exhibit :

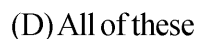
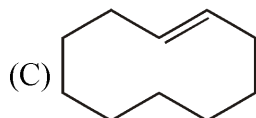
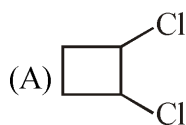


- (A) Geometrical isomerism (B) Geometrical and optical isomerism
(C) Optical isomerism (D) Tautomerism

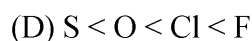
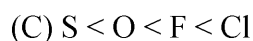
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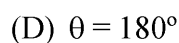
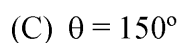
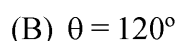
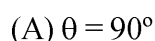
47. Which will form geometrical isomers ?



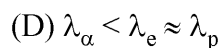
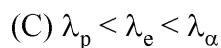
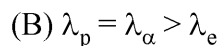
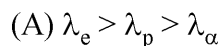
48. The correct order of increasing electron affinity of the following is



49. Which bond angle θ would result in maximum dipole moment for the triatomic molecule yxy ?



50. An electron, a proton and an alpha particle have KE of $16E$, $4E$, and E respectively. What is the qualitative order of their de-broglie wavelengths :



Space for Rough Work



Question No. 51 – 60 are of Integer Answer Type Question.

Answer of these question will come from **00 to 99**.

51. Coffeine has a molecular weight of 194. If it contains 28.9% by mass of nitrogen, number of atoms of nitrogen in one molecule of coffeine is :
52. A sample of ammonium phosphate $(\text{NH}_4)_3\text{PO}_4$, contains 6 moles of hydrogen atoms. The number of moles of oxygen atoms in the sample is :
53. A compoun of vanadium has a magnetic moment (μ) of 1.73BM. if the vanadium ion in the compound is present as V^{x+} , then the value of x is ?
54. In iron atom, how many electrons have $n = 3$ and $l = 2$?
55. the time taken for a certain volume of a certain gas to diffuse through a small hole was 2min. Under similar conditions an equal volume of oxygen took 5.65 min to pass. What is the molecular mass of gas (in amu) ?
56. A planar molecule has AB_x structure with six pair of electrons around A and one lone pair. the value of x is :
15.
57. Number of σ bonds in $\text{C}(\text{CN})_4$ are _____.
58. Given below are two reversible reactions :
- $$\text{A} + \text{B} \rightleftharpoons \text{Z}, K_{c_1}, = 24$$
- $$2\text{B} + \text{C} \rightleftharpoons 2\text{Y}, K_{c_2}, = 24$$
- The equilibrium constant K_C for the reaction
- $$\text{A} + \text{Y} \rightleftharpoons \text{Z} + \frac{\text{C}}{2} \text{ is } \underline{\hspace{2cm}}.$$
59. Minimum number of C-atoms that ketone may contain is :
60. The frequency of one of the lines in paschen series of hydrogen atom is 2.340×10^{11} Hz. The quantum number n_2 which produces this transition is :

Space for Rough Work



Part – 3 contains 20 Single correct type questions and 10 Integer type questions.

Question No. 61 – 80 are of Single Correct Answer Type Question.

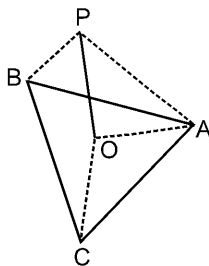
Four options are given in each question out of which only one option is correct.

61. If $n(A) = 10$, $n(B) = 15$ and $n(A \cup B) = x$, then -
(A) $15 < x < 25$ (B) $15 \leq x \leq 25$ (C) $5 \leq x \leq 15$ (D) None of these
62. Consider the following relations :-
 $R = \{(x, y) \mid x, y \text{ are real numbers and } x = wy \text{ for some rational number } w\}$;
 $S = \{(\frac{m}{n}, \frac{p}{q}) \mid m, n, p \text{ and } q \text{ are integers such that } n, q \neq 0 \text{ and } qm = pn.\}$, Then
(A) R is an equivalence relation but S is not an equivalence relation
(B) Neither R nor S is an equivalence relation
(C) S is an equivalence relation but R is not an equivalence relation
(D) R and S both are equivalence relations
63. The mean and variance of a series containing 5 terms are 8 and 24 respectively. The mean and variance of another series containing 3 terms are also 8 and 24 respectively. The variance of their combined series will be
(A) 20 (B) 24 (C) 25 (D) 42
64. Consider :-
Statement-1: $(p \wedge \sim q) \wedge (\sim p \wedge q)$ is a fallacy.
Statement-2: $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is a tautology .
(A) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for statement-1.
(B) Statement-1 is true; Statement-2 is true; Statement-2 is not a correct explanation for Statement-1.
(C) Statement-1 is true; Statement-2 is false.
(D) Statement-1 is false, Statement-2 is true.

Space for Rough Work



65. Each side of an equilateral triangle subtends an angle of 60° at the top of a tower h m high located at the centre of the triangle. If a is the length of each side of the triangle, then-



- (A) $3a^2 = 2h^2$ (B) $2a^2 = 3h^2$ (C) $a^2 = 3h^2$ (D) $3a^2 = h^2$
66. For any three positive real numbers a , b and c , $9(25a^2 + b^2) + 25(c^2 - 3ac) = 15b(3a + c)$. Then
- (A) a , b and c are in A.P. (B) a , b and c are in G.P.
(C) b , c and a are in G.P. (D) b , c and a are in A.P.
67. In a triangle ABC , medians AD and BE are drawn. If $AD = 4$, $\angle DAB = \frac{\pi}{6}$ and $\angle ABE = \frac{\pi}{3}$, then the area of the $\triangle ABC$ is-
- (A) $\frac{64}{3}$ (B) $\frac{8}{3}$ (C) $\frac{16}{3}$ (D) None of these
68. If in a triangle ABC $a \cos^2\left(\frac{C}{2}\right) + c \cos^2\left(\frac{A}{2}\right) = \frac{3b}{2}$, then the sides a , b and c
- (A) satisfy $a + b = c$ (B) are in A.P. (C) are in G.P. (D) are in H.P.
69. Sachin and Rahul attempted to solve a quadratic equation. Sachin made a mistake in writing down the constant term and ended up in roots $(4, 3)$. Rahul made a mistake in writing down coefficient of x to get roots $(3, 2)$. The correct roots of equation are :
- (A) $-4, -3$ (B) $6, 1$ (C) $4, 3$ (D) $-6, -1$

Space for Rough Work



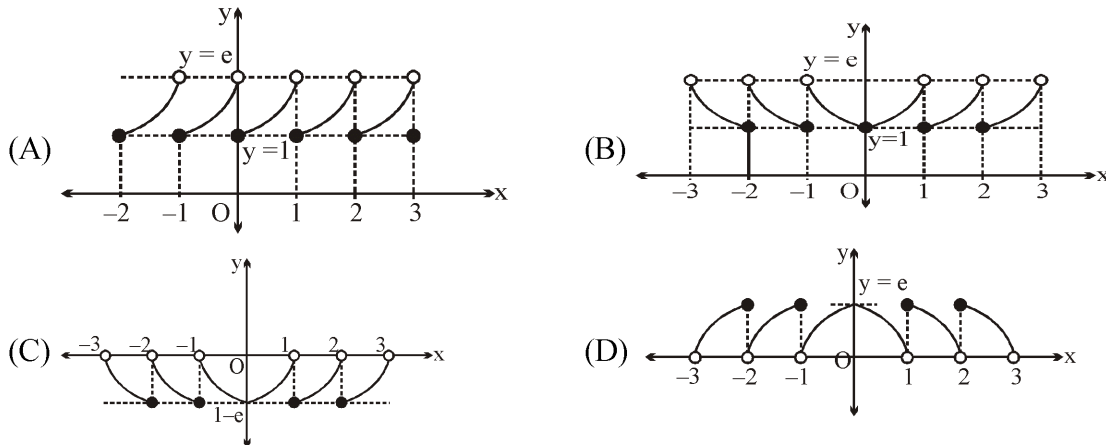
70. Statement - 1 : The number of ways of distributing 10 identical balls in 4 distinct boxes such that no box is empty is 9C_3 .
Statement - 2 : The number of ways of choosing any 3 places from 9 different places is 9C_3 .
- (A) Statement -1 is true, Statement -2 is false.
(B) Statement - 1 is false, Statement - 2 is true.
(C) Statement - 1 is true, Statement - 2 is true; Statement- 2 is a correct explanation for Statement -1.
(D) Statement - 1 is true, Statement - 2 is true; Statement -2 is not a correct explanation for Statement- 1.
71. Let two fair six-faced dice A and B be thrown simultaneously. If E_1 is the event that die A shows up four E_2 is the event that die B shows up two and E_3 is the event that the sum of numbers on both dice is odd, then which of the following statements is NOT true ?
- (A) E_1 and E_3 are independent (B) E_1, E_2 and E_3 are independent
(C) E_1 and E_2 are independent (D) E_2 and E_3 are independent
72. The line $L_1 : y - x = 0$ and $L_2 : 2x + y = 0$ intersect line $L_3 : y + 2 = 0$ at P and Q respectively. The bisector of the acute angle between L_1 and L_2 intersect L_3 at R.
- Statement-1: The ratio PR : RQ equals $2\sqrt{2} : \sqrt{5}$
Statement-2: In any triangle, bisector of an angle divides the triangle into two similar triangles
- (A) Statement - 1 is True, Statement - 2 is True, Statement - 2 is a correct explanation for Statement - 1
(B) Statement - 1 is True, Statement - 2 is True ; Statement - 2 is NOT a correct explanation for Statement - 1
(C) Statement - 1 is True, Statement - 2 is False
(D) Statement - 1 is False, Statement - 2 is True

Space for Rough Work



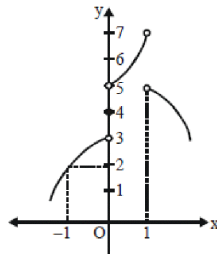
73. Which one of the following best represent the graph of function $f(x) = e^{\{x\}}$.

[Note: $\{\alpha\}$ denotes the fractional part of α .]



74. The graph of $y = f(x)$ is as shown. The which of the following hold(s) good ?

[Note : $[k]$ and $\{k\}$ denote largest integer less than or equal k and fractional part of k respectively] –



(A) $\lim_{x \rightarrow 0^+} f([x - \sin x]) = 4$

(B) $\lim_{x \rightarrow 0^-} f([x - \tan x]) = 2$

(C) $\lim_{x \rightarrow 0^+} f\left(\left\{\frac{x}{\tan x}\right\}\right) = 8$

(D) $\lim_{x \rightarrow \frac{\pi^+}{2}} f(\{\cos x\}) = 5$

Space for Rough Work



75. For every integer n , let a_n and b_n be real numbers. Let function $f: \mathbb{R} \rightarrow \mathbb{R}$ be given by

$$f(x) = \begin{cases} a_n + \sin \pi x, & \text{for } x \in [2n, 2n+1] \\ b_n + \cos \pi x, & \text{for } x \in (2n-1, 2n) \end{cases}, \text{ for all integers } n.$$

If f is continuous, then which of the following hold(s) for all n ?

(A) $a_{n-1} - b_{n-1} = 0$ (B) $a_n - b_n = 3$ (C) $a_n - b_{n+1} = 1$ (D) $a_{n-1} - b_n = -1$

76. Let $a, b \in \mathbb{R}$ and $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = a \cos(|x^3 - x|) + b|x|\sin(|x^3 + x|)$. Then f is

(A) differentiable at $x = 0$ if $a = 0$ and $b = 1$

(B) differentiable at $x = 2$ if $a = 0$ and $b = 0$

(C) NOT differentiable at $x=0$ at $a=1$ and $b=0$

(D) NOT differentiable at $x=1$ if $a=1$ and $b=1$

77. The locus of the middle point of the intercept of the tangents drawn from an external point to the ellipse $x^2 + 2y^2 = 2$, between the coordinate axes, is

(A) $\frac{1}{x^2} + \frac{1}{2y^2} = 1$ (B) $\frac{1}{4x^2} + \frac{1}{2y^2} = 1$ (C) $\frac{1}{2x^2} + \frac{1}{4y^2} = 1$ (D) $\frac{1}{2x^2} + \frac{1}{y^2} = 1$

78. The minimum area of triangle formed by the tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and coordinate axes is

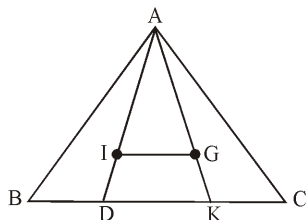
(A) ab sq. units (B) $\frac{a^2 + b^2}{2}$ sq. units

(C) $\frac{(a+b)^2}{2}$ sq. units (D) $\frac{a^2 + ab + b^2}{3}$ sq. units

Space for Rough Work



79. Given positive integers $r > 1$, $n > 2$, and the coefficients of the $(3r)^{\text{th}}$ and $(r + 2)^{\text{th}}$ terms in the binomial expansion of $(1 + x)^{2n}$ are equal, which, if any, of the following statements is true ?
- (A) $n = 2r$ (B) $n = 3r$ (C) $n = 2r + 1$ (D) none of these
80. In triangle ABC (in fig), I and G are incenter and centroid, extended AI and AG intersect BC at D and K. if $AB=12$, $AC=16$ and $BC=14$, find length of IG.



- (A) $\frac{1}{2} \text{ cm}$ (B) $\frac{2}{3} \text{ cm}$ (C) $\frac{1}{3} \text{ cm}$ (D) $\frac{3}{2} \text{ cm}$

Space for Rough Work



Question No. 81 – 90 are of Integer Answer Type Question.

Answer of these question will come from **00 to 99**.

81. Let $a_1, a_2, a_3, \dots, a_{49}$ be in A.P. such that $\sum_{k=0}^{12} a_{4k+1} = 416$ and $a_9 + a_{43} = 66$. If $a_1^2 + a_2^2 + \dots + a_{17}^2 = 140m$, then m is equal to
82. The distance between the highest point on the graph of $y = -(x-1)(x-3)$ and the lowest point on the graph of $y = x(x-4)$ is
83. The number of complex numbers z such that $|z-1| = |z+1| = |z-i|$ equals :
84. Let T_n be the number of all possible triangles formed by joining vertices of an n -sided regular polygon. If $T_{n+1} - T_n = 10$, then the value of n is :-
85. A die thrown. Let A be the event that the number obtained is greater than 3. Let B be the event that the number obtained is less than 5. Then $P(A \cup B)$ is
86. If the line $2x + y = k$ passes through the point which divides the line segment joining the points $(1, 1)$ and $(2, 4)$ in the ratio $3 : 2$, then k equal:
87. $f(x)$ and $g(x)$ are linear function such that for all x , $f(g(x))$ and $g(f(x))$ are Identity functions. If $f(0) = 4$ and $g(5) = 17$, compute $f(136)$.
88. Let $L = \prod_{n=3}^{\infty} \left(1 - \frac{4}{n^2}\right)$; $M = \prod_{n=2}^{\infty} \left(\frac{n^3-1}{n^3+1}\right)$ and $N = \prod_{n=1}^{\infty} \frac{(1+n^{-1})^2}{1+2n^{-1}}$, then find the value of $L^{-1} + M^{-1} + N^{-1}$.
89. A function f is defined as, $f(x) = \begin{cases} \frac{1}{|x|} & \text{if } |x| \geq \frac{1}{2} \\ a + bx^2 & \text{if } |x| < \frac{1}{2} \end{cases}$. If $f(x)$ is derivable at $x = \frac{1}{2}$, then find $(a-b)$.
90. A line through the origin meets the circle $x^2 + y^2 = a^2$ at P & the hyperbola $x^2 - y^2 = a^2$ at Q . If the locus of the point of intersection of the tangent at P to the circle and the tangent at Q to the hyperbola is the curve $a^4(x^2 - a^2) + \lambda x^2 y^4 = 0$, then find the value of λ .

Space for Rough Work