

JEE Main 2025 Paper 1 (B.E./B.Tech) 3 April 2025 Shift 1 Question Paper



Conducted by the National Testing Agency (NTA)

Time Allowed: 3 Hours

Paper 1: B.E./B.Tech.

Maximum Marks: 300

General Instructions

- (i) This paper is **Paper 1 (B.E./B.Tech.)** of **JEE (Main) 2025 - Session 2**, conducted by the National Testing Agency (NTA) in Computer Based Test (CBT) mode on 3 April 2025, Shift 1. The total duration is **3 hours**.
- (ii) The paper has **75 questions** and a maximum of **300 marks**: Mathematics, Physics and Chemistry carry 25 questions (100 marks) each, in that order.
- (iii) Each subject has **two sections**. **Section A** has **20 multiple choice questions** (MCQs) with four options each. Select the most appropriate answer. **Section B** has **5 numerical value questions**.
- (iv) **All questions are compulsory**. For Section B, the answer is an integer value; the answer should be **rounded off to the nearest integer**. Use only the constants given in the question while calculating.
- (v) **Marking scheme** (Sections A and B): **+4** for a correct answer, **–1** for an incorrect answer, and **0** for an unanswred or marked-for-review question.
- (vi) All calculations and rough work are to be done on the rough sheets only. Calculators, log tables, slide rules and electronic gadgets are not allowed.

1. If the domain of the function $f(x) = \log_e \left(\frac{2x-3}{5+4x} \right) + \sin^{-1} \left(\frac{4+3x}{2-x} \right)$ is $[\alpha, \beta]$, then $\alpha^2 + 4\beta$ is equal to
- (A) 4 (B) 3
(C) 7 (D) 5
-
2. Let $a_1, a_2, a_3, \dots$ be a G.P. of increasing positive numbers. If $a_3 a_5 = 729$ and $a_2 + a_4 = \frac{111}{4}$, then $24(a_1 + a_2 + a_3)$ is equal to
- (A) 128 (B) 129
(C) 131 (D) 130
-
3. The sum $1 + 3 + 11 + 25 + 45 + 71 + \dots$ upto 20 terms, is equal to
- (A) 7240 (B) 8124
(C) 7130 (D) 6982
-
4. The number of solutions of the equation $2x + 3 \tan x = \pi, x \in [-2\pi, 2\pi] - \left\{ \pm \frac{\pi}{2}, \pm \frac{3\pi}{2} \right\}$ is:
- (A) 4 (B) 5
(C) 3 (D) 6
-
5. Let $A = \{-3, -2, -1, 0, 1, 2, 3\}$. Let R be a relation on A defined by xRy if and only if $0 \leq x^2 + 2y \leq 4$. Let l be the number of elements in R and m be the minimum number of elements required to be added in R to make it a reflexive relation. Then $l + m$ is equal to
- (A) 18 (B) 20
(C) 17 (D) 19
-
6. The radius of the smallest circle which touches the parabolas $y = x^2 + 2$ and $x = y^2 + 2$ is
- (A) $\frac{7\sqrt{2}}{16}$ (B) $\frac{7\sqrt{2}}{8}$
(C) $\frac{7\sqrt{2}}{2}$ (D) $\frac{7\sqrt{2}}{4}$
-
7. Let $f(x) = \int x^3 \sqrt{3-x^2} dx$. If $5f(\sqrt{2}) = -4$, then $f(1)$ is equal to
- (A) $-\frac{6\sqrt{2}}{5}$ (B) $-\frac{8\sqrt{2}}{5}$
(C) $-\frac{2\sqrt{2}}{5}$ (D) $-\frac{4\sqrt{2}}{5}$
-
8. Let the domain of the function $f(x) = \log_2 \log_4 \log_6 (3 + 4x - x^2)$ be (a, b) . If $\int_0^{b-a} [x^2] dx = p - \sqrt{q} - \sqrt{r}, p, q, r \in \mathbb{N}$, $\gcd(p, q, r) = 1$, where $[\cdot]$ is the greatest integer function, then $p + q + r$ is equal to
- (A) 10 (B) 11
(C) 9 (D) 8
-
9. Let α and β be the roots of $x^2 + \sqrt{3}x - 16 = 0$, and γ and δ be the roots of $x^2 + 3x - 1 = 0$. If $P_n = \alpha^n + \beta^n$ and $Q_n = \gamma^n + \delta^n$, then $\frac{P_{25} + \sqrt{3}P_{24}}{2P_{23}} + \frac{Q_{25} - Q_{23}}{Q_{24}}$ is equal to
- (A) 4 (B) 3
(C) 5 (D) 7
-
10. Let a line passing through the point $(4, 1, 0)$ intersect the line $L_1 : \frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ at the point $A(\alpha, \beta, \gamma)$ and the line $L_2 : x - 6 = y = -z + 4$ at the point $B(a, b, c)$. Then $\begin{vmatrix} 1 & 0 & 1 \\ \alpha & \beta & \gamma \\ a & b & c \end{vmatrix}$ is equal to
- (A) 16 (B) 6
(C) 8 (D) 12
-

11. Let $f(x) = \begin{cases} (1+ax)^{1/x}, & x < 0 \\ 1+b, & x = 0 \\ \frac{(x+4)^{1/2}-2}{(x+c)^{1/3}-2}, & x > 0 \end{cases}$ be continuous at $x = 0$. Then $e^a b c$ is equal to:

- (A) 64 (B) 48
(C) 36 (D) 72

12. A line passing through the point $P(\sqrt{5}, \sqrt{5})$ intersects the ellipse $\frac{x^2}{36} + \frac{y^2}{25} = 1$ at A and B such that $(PA) \cdot (PB)$ is maximum. Then $5(PA^2 + PB^2)$ is equal to :

- (A) 290 (B) 377
(C) 338 (D) 218

13. Line L_1 passes through the point $(1, 2, 3)$ and is parallel to z -axis. Line L_2 passes through the point $(\lambda, 5, 6)$ and is parallel to y -axis. Let for $\lambda = \lambda_1, \lambda_2, \lambda_2 < \lambda_1$, the shortest distance between the two lines be 3. Then the square of the distance of the point $(\lambda_1, \lambda_2, 7)$ from the line L_1 is

- (A) 25 (B) 32
(C) 40 (D) 37

14. Let g be a differentiable function such that $\int_0^x g(t)dt = x - \int_0^x \tan(t)dt, x \geq 0$ and let $y = y(x)$ satisfy the differential equation $\frac{dy}{dx} - y \tan x = 2(x+1) \sec x g(x), x \in [0, \frac{\pi}{2})$. If $y(0) = 0$, then $y(\frac{\pi}{3})$ is equal to

- (A) $\frac{4\pi}{3}$ (B) $\frac{2\pi}{3}$
(C) $\frac{2\pi}{3\sqrt{3}}$ (D) $\frac{4\pi}{3\sqrt{3}}$

15. The sum of all rational terms in the expansion of $(2 + \sqrt{3})^8$ is :

- (A) 16923 (B) 18817
(C) 3763 (D) 33845

16. If $\sum_{r=1}^9 \left(\frac{r+3}{2^r}\right) \cdot {}^9C_r = \alpha \left(\frac{3}{2}\right)^9 - \beta, \alpha, \beta \in \mathbb{N}$, then $(\alpha + \beta)^2$ is equal to

- (A) 27 (B) 81
(C) 18 (D) 9

17. Let $z \in \mathbb{C}$ be such that $\frac{z^2+3i}{z-2+i} = 2+3i$. Then the sum of all possible values of z^2 is :

- (A) $-19+2i$
(B) $-19-2i$
(C) $19-2i$
(D) $19+2i$

18.

$$\text{If } y(x) = \begin{vmatrix} \sin x & \cos x & \sin x + \cos x + 1 \\ 27 & 28 & 27 \\ 1 & 1 & 1 \end{vmatrix},$$

$x \in \mathbb{R}$, then $\frac{d^2y}{dx^2} + y$ is equal to

- (A) 28 (B) 27
(C) -1 (D) 1

19. A line passes through the origin and makes equal angles with the positive coordinate axes. It intersects the lines $L_1 : 2x + y + 6 = 0$ and $L_2 : 4x + 2y - p = 0, p > 0$, at the points A and B , respectively. If $AB = \frac{9}{\sqrt{2}}$ and the foot of the perpendicular from the point A on the line L_2 is M , then $\frac{AM}{BM}$ is equal to

- (A) 5 (B) 3
(C) 2 (D) 4

20. Let A be a matrix of order 3×3 and $|A| = 5$. If $|2 \operatorname{adj}(3A \operatorname{adj}(2A))| = 2^\alpha \cdot 3^\beta \cdot 5^\gamma, \alpha, \beta, \gamma \in \mathbb{N}$, then $\alpha + \beta + \gamma$ is equal to

- (A) 26 (B) 27
(C) 25 (D) 28

21. All five letter words are made using all the letters A, B, C, D, E and arranged as in an English dictionary with serial numbers. Let the word at serial number n be denoted by W_n . Let the probability $P(W_n)$ of choosing the word W_n satisfy $P(W_n) = 2P(W_{n-1})$, $n > 1$.

If $P(CDBEA) = \frac{2^\alpha}{2^\beta - 1}$, $\alpha, \beta \in \mathbb{N}$, then $\alpha + \beta$ is equal to : _____

22.

Let

$\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 3\hat{i} + 2\hat{j} - \hat{k}$, $\vec{c} = \lambda\hat{j} + \mu\hat{k}$ and $\hat{d}$ be a unit vector such that $\vec{a} \times \hat{d} = \vec{b} \times \hat{d}$ and $\vec{c} \cdot \hat{d} = 1$. If $\vec{c}$ is perpendicular to $\vec{a}$, then $|3\lambda\hat{d} + \mu\vec{c}|^2$ is equal to _____

23. Let the product of the focal distances of the point $P(4, 2\sqrt{3})$ on the hyperbola $H : \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be 32. Let the length of the conjugate axis of H be p and the length of its latus rectum be q . Then $p^2 + q^2$ is equal to _____

24. The area of the region bounded by the curve $y = \max\{|x|, |x-2|\}$, the x -axis and the lines $x = -2$ and $x = 4$ is equal to _____

25. If the number of seven-digit numbers, such that the sum of their digits is even, is $m \cdot n \cdot 10^n$; $m, n \in \{1, 2, 3, \dots, 9\}$, then $m + n$ is equal to _____

26. A gas is kept in a container having walls which are thermally non-conducting. Initially the gas has a volume of 800 cm^3 and temperature 27°C . The change in temperature when the gas is adiabatically compressed to 200 cm^3 is:

(Take $\gamma = 1.5$; γ is the ratio of specific heats at constant pressure and at constant volume)

- (A) 300 K (B) 600 K
(C) 327 K (D) 522 K

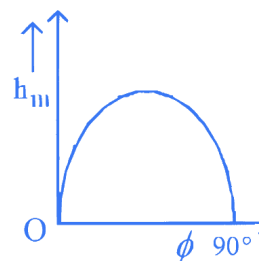
27. A person measures mass of 3 different particles as 435.42 g, 226.3 g and 0.125 g. According to the rules for arithmetic operations with significant figures, the addition of the masses of 3 particles will be.

- (A) 661.845 g (B) 661.84 g
(C) 662 g (D) 661.8 g

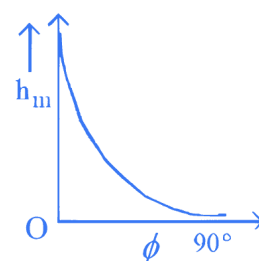
28. A wire of length 25 m and cross-sectional area 5 mm^2 having resistivity of $2 \times 10^{-6} \Omega \text{ m}$ is bent into a complete circle. The resistance between diametrically opposite points will be

- (A) 100Ω (B) 2.5Ω
(C) 12.5Ω (D) 50Ω

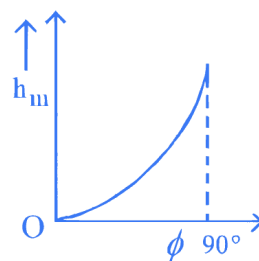
29. The angle of projection of a particle is measured from the vertical axis as ϕ and the maximum height reached by the particle is h_m . Here h_m as function of ϕ can be presented as



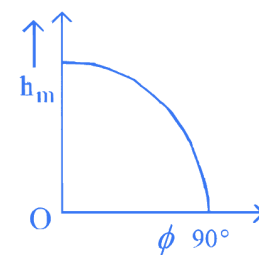
(A)



(B)



(C)



(D)

30. The work function of a metal is 3 eV . The color of the visible light that is required to cause emission of photoelectrons is

- (A) Red (B) Green
(C) Blue (D) Yellow

31.

Match the LIST – I with LIST – II

List - I		List - II	
A.	Gravitational constant	I.	$[LT^{-2}]$
B.	Gravitational potential energy	II.	$[L^2 T^{-2}]$
C.	Gravitational potential	III.	$[ML^2 T^{-2}]$
D.	Acceleration due to gravity	IV.	$[M^{-1} L^3 T^{-2}]$

Choose the correct answer from the options given below:

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

32. Consider a completely full cylindrical water tank of height 1.6 m and of cross-sectional area 0.5 m^2 . It has a small hole in its side at a height 90 cm from the bottom. Assume, the cross-sectional area of the hole to be negligibly small as compared to that of the water tank. If a load 50 kg is applied at the top surface of the water in the tank then the velocity of the water coming out at the instant when the hole is opened is:

$$(g = 10 \text{ m/s}^2)$$

- (A) 2 m/s (B) 5 m/s
(C) 3 m/s (D) 4 m/s

33. Consider following statements for refraction of light through prism, when angle of deviation is minimum.

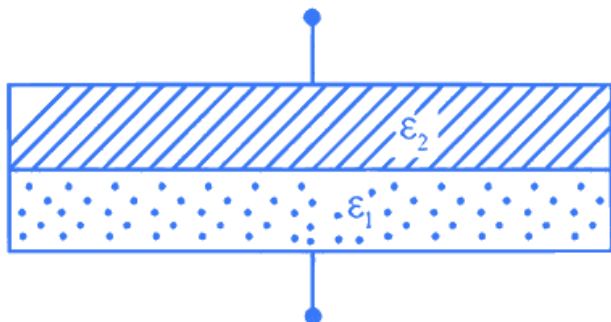
- A. The refracted ray inside prism becomes parallel to the base.
B. Larger angle prisms provide smaller angle of minimum deviation.
C. Angle of incidence and angle of emergence becomes equal.
D. There are always two sets of angle of incidence for which deviation will be same except at minimum deviation setting.
E. Angle of refraction becomes double of prism angle.

Choose the correct answer from the options given below :

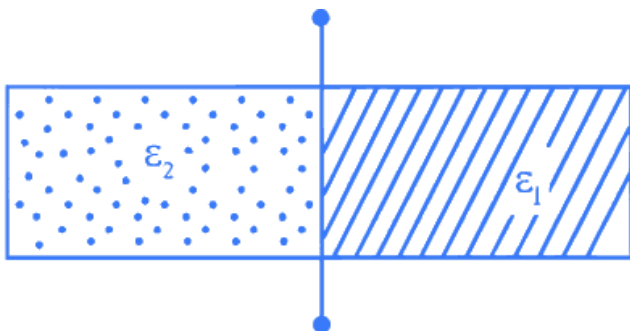
- (A) A, B and E Only (B) B, C and D Only
(C) B, D and E Only (D) A, C and D Only

34. A parallel plate capacitor is filled equally(half) with two dielectrics of dielectric constants ϵ_1 and ϵ_2 , as shown in figures. The distance between the plates is d and area of each plate is A . If capacitance in first configuration and second configuration are C_1 and C_2 respectively, then $\frac{C_1}{C_2}$ is:

First Configuration



Second Configuration



(A) $\frac{\epsilon_0(\epsilon_1 + \epsilon_2)}{2}$

(B) $\frac{\epsilon_1 \epsilon_2^2}{(\epsilon_1 + \epsilon_2)^2}$

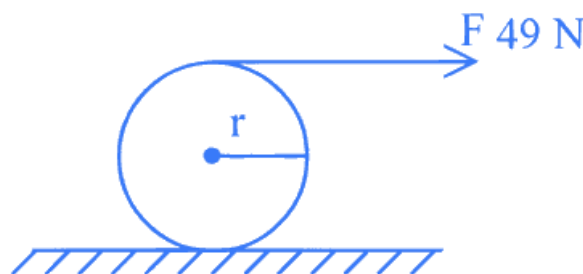
(C) $\frac{4\epsilon_1 \epsilon_2}{(\epsilon_1 + \epsilon_2)^2}$

(D) $\frac{\epsilon_1 \epsilon_2}{\epsilon_1 + \epsilon_2}$

35. During the melting of a slab of ice at 273 K at atmospheric pressure :

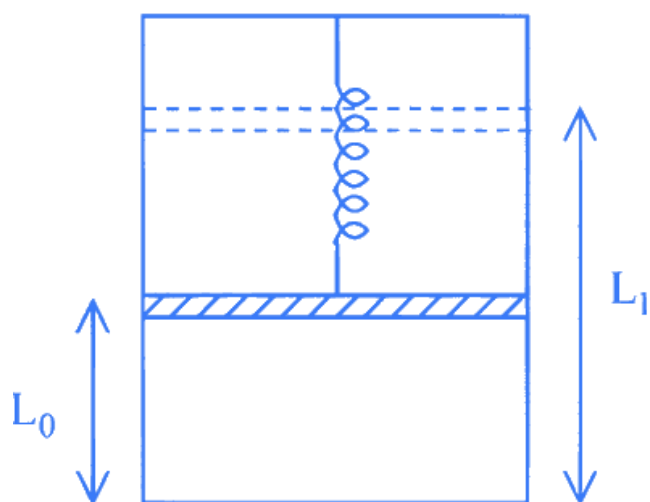
- | | |
|--|--|
| (A) Internal energy of ice-water system remains unchanged. | (B) Positive work is done by the ice-water system on the atmosphere. |
| (C) Positive work is done on the ice-water system by the atmosphere. | (D) Internal energy of the ice-water system decreases. |

36. A force of 49 N acts tangentially at the highest point of a sphere (solid) of mass 20 kg, kept on a rough horizontal plane. If the sphere rolls without slipping, then the acceleration of the center of the sphere is



- | | |
|-----|-----------------------|
| (A) | 2.5 m/s ² |
| (B) | 3.5 m/s ² |
| (C) | 0.25 m/s ² |
| (D) | 0.35 m/s ² |

37.



A piston of mass M is hung from a massless spring whose restoring force law goes as $F = -kx^3$, where k is the spring constant of appropriate dimension. The piston separates the vertical chamber into two parts, where the bottom part is filled with ' n ' moles of an ideal gas. An external work is done on the gas isothermally (at a constant temperature T) with the help of a heating filament (with negligible volume) mounted in lower part of the chamber, so that the piston goes up from a height L_0 to L_1 , the total energy delivered by the filament is: (Assume spring to be in its natural length before heating)

- (A) $nRT \ln\left(\frac{L_1}{L_0}\right) + Mg(L_1 - L_0) + \frac{3k}{4}(L_1^4 - L_0^4)$
 (B) $nRT \ln\left(\frac{L_1}{L_0}\right) + Mg(L_1 - L_0) + \frac{k}{4}(L_1^4 - L_0^4)$
 (C) $nRT \ln\left(\frac{L_1^2}{L_0^2}\right) + \frac{Mg}{2}(L_1 - L_0) + \frac{k}{4}(L_1^4 - L_0^4)$
 (D) $3nRT \ln\left(\frac{L_1}{L_0}\right) + 2Mg(L_1 - L_0) + \frac{k}{3}(L_1^3 - L_0^3)$

38.

Match the LIST - I with LIST - II

List - I		List - II	
A.	${}_0^1\text{n} + {}_{92}^{235}\text{U} \rightarrow {}_{54}^{140}\text{Xe} + {}_{38}^{94}\text{Sr} + 2{}_0^1\text{n}$	I.	Chemical reaction
B.	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$	II.	Fusion with +ve Q value
C.	${}_1^2\text{H} + {}_1^2\text{H} \rightarrow {}_2^3\text{He} + {}_0^1\text{n}$	III.	Fission
D.	${}_1^1\text{H} + {}_1^3\text{H} \rightarrow {}_2^4\text{He} + {}_0^1\text{n}$	IV.	Fusion with -ve Q value

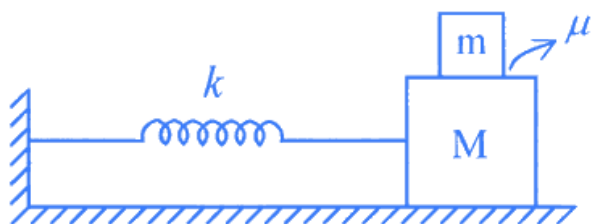
Choose the correct answer from the options given below:

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

39. A particle is released from height S above the surface of the earth. At certain height its kinetic energy is three times its potential energy. The height from the surface of the earth and the speed of the particle at that instant are respectively.

- (A) $\frac{S}{4}, \frac{3gS}{2}$ (B) $\frac{S}{2}, \frac{3gS}{2}$
 (C) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$ (D) $\frac{S}{2}, \sqrt{\frac{3gS}{2}}$

40.



Two blocks of masses m and M , ($M > m$), are placed on a frictionless table as shown in figure. A massless spring with spring constant k is attached with the lower block. If the system is slightly displaced and released, then (μ = coefficient of friction between the two blocks)

A. The time period of small oscillation of the two blocks is $T = 2\pi\sqrt{\frac{(m+M)}{k}}$

B. The acceleration of the blocks is $a = -\frac{kx}{M+m}$ (x = displacement of the blocks from the mean position)

C. The magnitude of the frictional force on the upper block is $\frac{m\mu|x|}{M+m}$

D. The maximum amplitude of the upper block, if it does not slip, is $\frac{\mu(M+m)g}{k}$

E. Maximum frictional force can be $\mu(M+m)g$.
Choose the correct answer from the options given below :

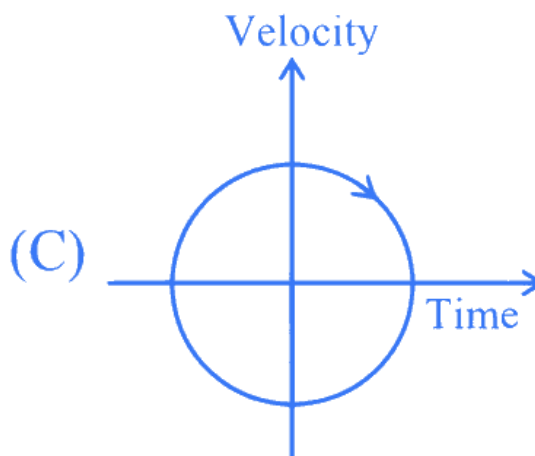
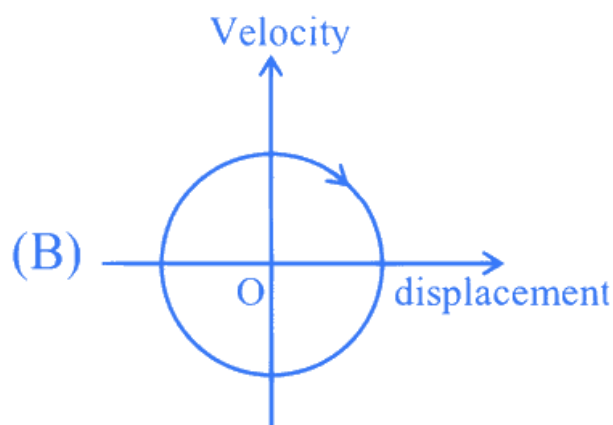
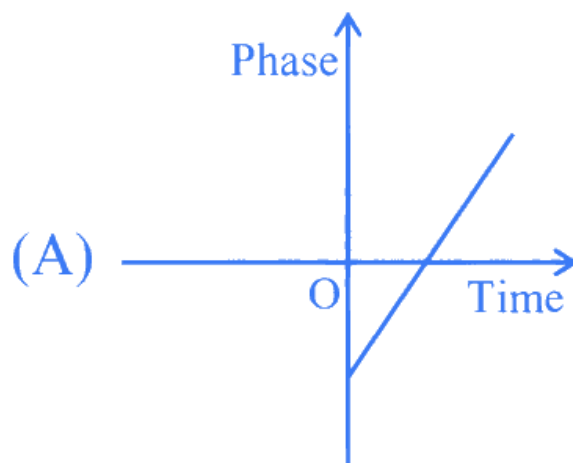
(A) B, C, D Only

(B) C, D, E Only

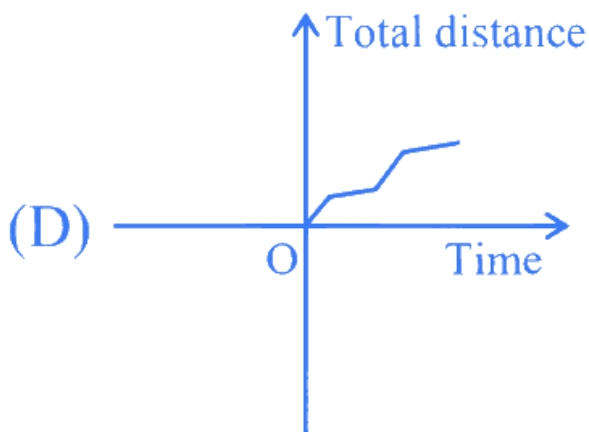
(C) A, B, D Only

(D) A, B, C Only

41. Which of the following curves possibly represent one-dimensional motion of a particle?



41. (continued)



Choose the correct answer from the options given below :

- (A) A, B and C only (B) A, C and D only
(C) A, B and D only (D) A and B only

42. The radii of curvature for a thin convex lens are 10 cm and 15 cm respectively. The focal length of the lens is 12 cm . The refractive index of the lens material is

- (A) 1.4 (B) 1.8
(C) 1.5 (D) 1.2

43. The electrostatic potential on the surface of uniformly charged spherical shell of radius $R = 10$ cm is 120 V . The potential at the centre of shell, at a distance $r = 5$ cm from centre, and at a distance $r = 15$ cm from the centre of the shell respectively, are:

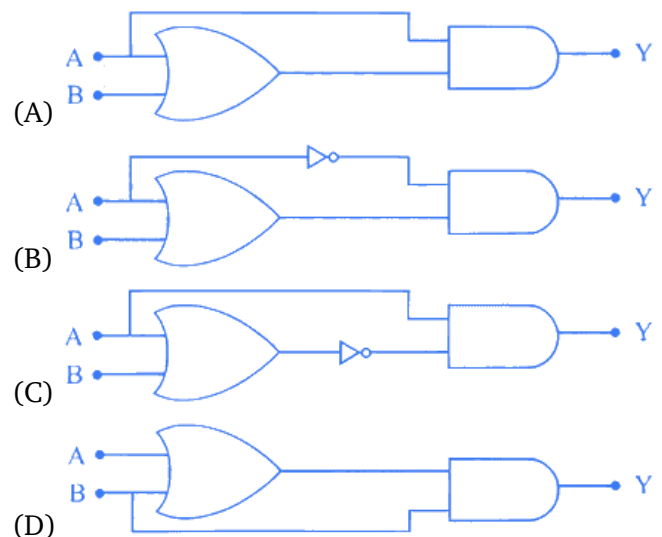
- (A) 0 V, 120 V, 40 V (B) 120 V, 120 V, 80 V
(C) 40 V, 40 V, 80 V (D) 0 V, 0 V, 80 V

44. The radiation pressure exerted by a 450 W light source on a perfectly reflecting surface placed at 2 m away from it, is

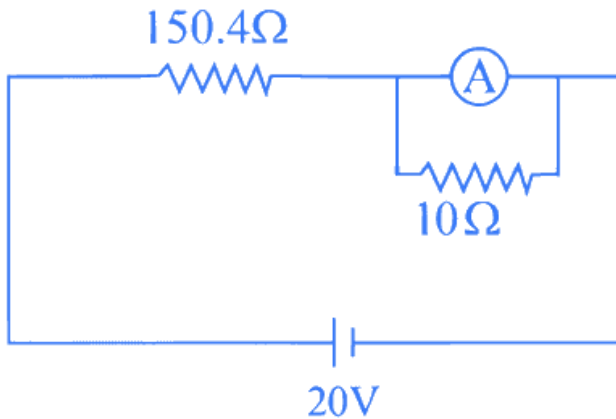
- (A) 3×10^{-8} Pascals (B) 0
(C) 1.5×10^{-8} Pascals (D) 6×10^{-8} Pascals

45. Choose the correct logic circuit for the given truth table having inputs A and B .

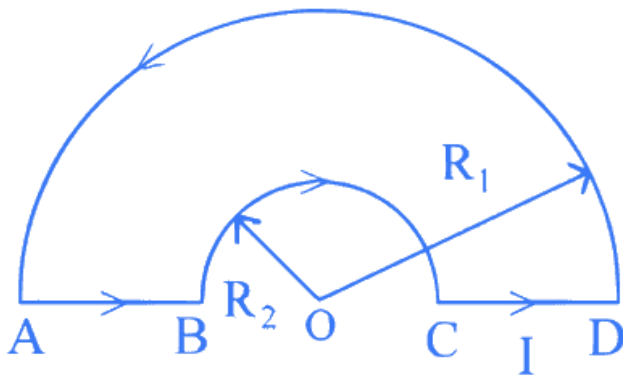
Inputs		Output
A	B	Y
0	0	0
0	1	0
1	0	1
1	1	1



46. In the figure shown below, a resistance of 150.4Ω is connected in series to an ammeter A of resistance 240Ω . A shunt resistance of 10Ω is connected in parallel with the ammeter. The reading of the ammeter is _____ mA .



47. A loop ABCDA , carrying current $I = 12\text{ A}$, is placed in a plane, consists of two semi-circular segments of radius $R_1 = 6\pi\text{ m}$ and $R_2 = 4\pi\text{ m}$. The magnitude of the resultant magnetic field at center O is $k \times 10^{-7}\text{ T}$. The value of k is _____.
(Given $\mu_0 = 4\pi \times 10^{-7}\text{ TmA}^{-1}$)

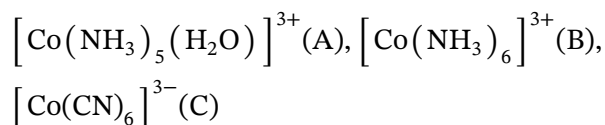


48. Two coherent monochromatic light beams of intensities $4I$ and $9I$ are superimposed. The difference between the maximum and minimum intensities in the resulting interference pattern is xI . The value of x is _____ .

49. Three identical spheres of mass m , are placed at the vertices of an equilateral triangle of length a . When released, they interact only through gravitational force and collide after a time $T = 4$ seconds. If the sides of the triangle are increased to length $2a$ and also the masses of the spheres are made $2m$, then they will collide after _____ seconds.

50. A 4.0 cm long straight wire carrying a current of 8 A is placed perpendicular to a uniform magnetic field of strength 0.15 T . The magnetic force on the wire is _____ mN .

51. The correct order of the complexes



and $\left[\text{CoCl}(\text{NH}_3)_5 \right]^{2+} \text{ (D)}$ in terms of wavelength of light absorbed is

- (A) $D > C > B > A$ (B) $C > B > A > D$
 (C) $D > A > B > C$ (D) $C > B > D > A$

52. Which of the following statements are correct?

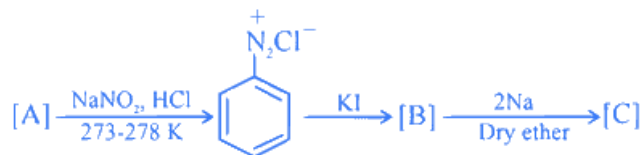
- A. The process of adding an electron to a neutral gaseous atom is always exothermic.
 B. The process of removing an electron from an isolated gaseous atom is always endothermic.
 C. The 1st ionization energy of boron is less than that of beryllium.
 D. The electronegativity of C is 2.5 in CH_4 and CCl_4
 E. Li is the most electropositive among elements of group I.

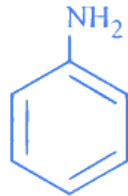
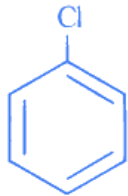
Choose the correct answer from the options given below:

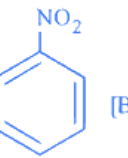
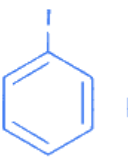
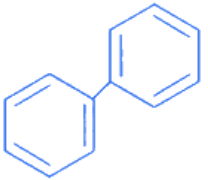
- (A) A, C and D Only (B) B and C Only
 (C) B and D Only (D) B, C and E Only

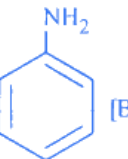
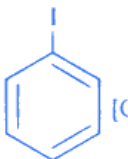
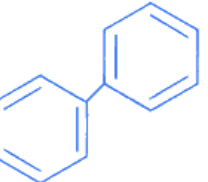
53.

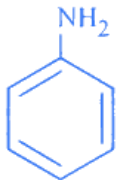
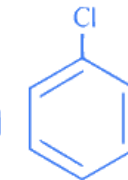
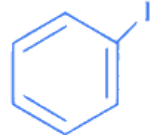
Identify [A], [B] and [C], respectively in the following reaction sequence :



(A)  [B]  [C] 

(B)  [B]  [C] 

(C)  [B]  [C] 

(D)  [B]  [C] 

54.

Match the LIST – I with LIST – II

LIST-I (Molecules/ion)		LIST-II (Hybridisation of central atom)	
A.	PF ₅	I	dsp ²
B	SF ₆	II	sp ³ d
C	Ni(CO) ₄	III	sp ³ d ²
D	[PtCl ₄] ²⁻	IV	sp ³

Choose the correct answer from the options given below:

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

55. Which of the following postulate of Bohr's model of hydrogen atom is not in agreement with quantum mechanical model of an atom?

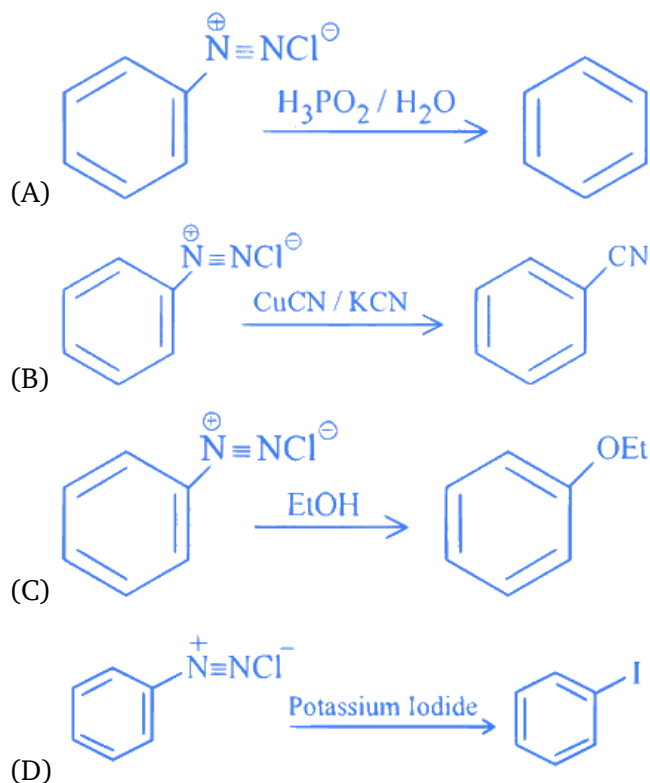
- (A) The electron in a H atom's stationary state moves in a circle around the nucleus. (B) An atom can take only certain distinct energies E₁, E₂, E₃, etc. These allowed states of constant energy are called the stationary states of atom.
(C) An atom in a stationary state does not emit electromagnetic radiation as long as it stays in the same state. (D) When an electron makes a transition from a higher energy stationary state to a lower energy stationary state, then it emits a photon of light.

56. In the following system, PCl₅(g) ⇌ PCl₃(g) + Cl₂(g) at equilibrium, upon addition of xenon gas at constant T & p, the concentration of

- (A) PCl₅, PCl₃ & Cl₂ remain constant (B) PCl₃ will increase
(C) Cl₂ will decrease (D) PCl₅ will increase

57.

In the following reactions, which one is NOT correct?



58. Given below are two statements :

Statement I : The N - N single bond is weaker and longer than that of P - P single bond.

Statement II : Compounds of group 15 elements in +3 oxidation states readily undergo disproportionation reactions.

In the light of the above statements, choose the correct answer from the options given below

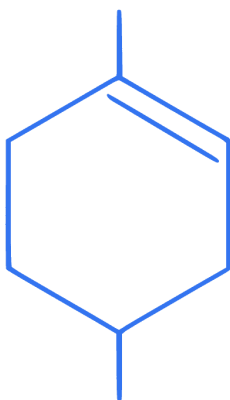
- (A) Statement I is false but Statement II is true (B) Both Statement I and Statement II are true
(C) Both Statement I and Statement II are false (D) Statement I is true but Statement II is false

59.

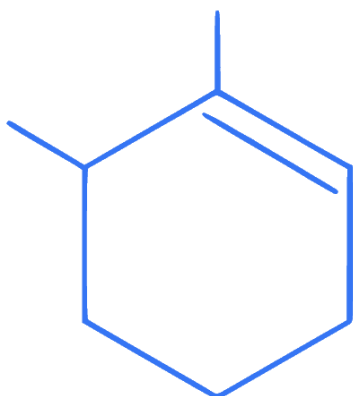
Which compound would give 3-methyl-6-oxoheptanal upon ozonolysis?

59. (continued)

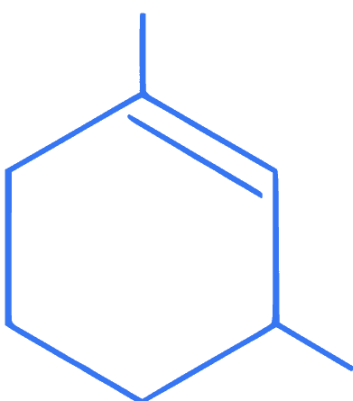
(A)



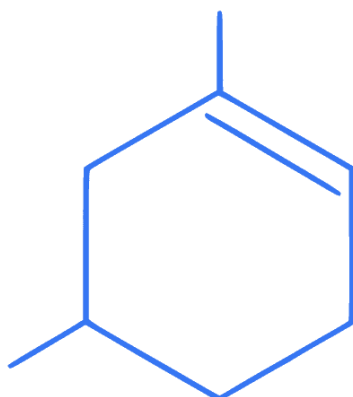
(B)



(C)



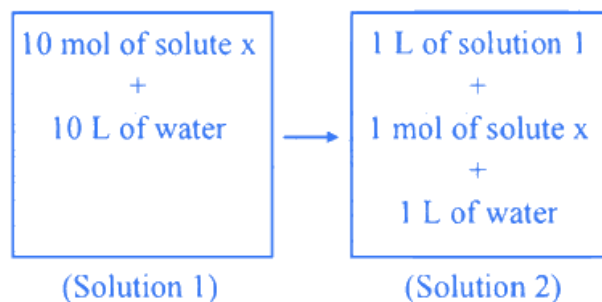
(D)



60. 2 moles each of ethylene glycol and glucose are dissolved in 500 g of water. The boiling point of the resulting solution is: (Given : Ebullioscopic constant of water = $0.52 \text{ K kg mol}^{-1}$)

- (A) 377.3 K (B) 379.2 K
(C) 375.3 K (D) 277.3 K

61. Which of the following properties will change when system containing solution 1 will become solution 2 ?



- (A) Molar heat capacity (B) Concentration
(C) Gibbs free energy (D) Density

62.

Identify the correct statements from the following.

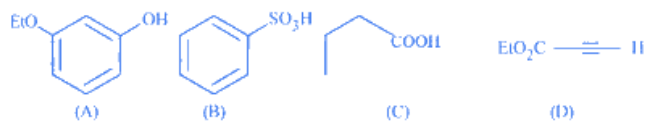
- A. and are metamers
- B. and are functional isomers
- C. and are position isomers
- D. and are homologous

Choose the correct answer from the options given below:

- (A) B & C Only (B) C & D Only
(C) A, B & C Only (D) A & B Only

63.

The least acidic compound, among the following is:



(A) B

(B) D

(C) A

(D) C

64. Among 10^{-9} g (each) of the following elements, which one will have the highest number of atoms?

Element: Pb, Po, Pr and Pt

(A) Pr

(B) Pt

(C) Po

(D) Pb

65. The metal ions that have the calculated spin-only magnetic moment value of 4.9 B.M. are :

A. Cr^{2+}

B. Fe^{2+}

C. Fe^{3+}

D. Co^{2+}

E. Mn^{3+}

Choose the correct answer from the options given below:

(A) A, D and E Only

(B) A, B and E Only

(C) A, C and E Only

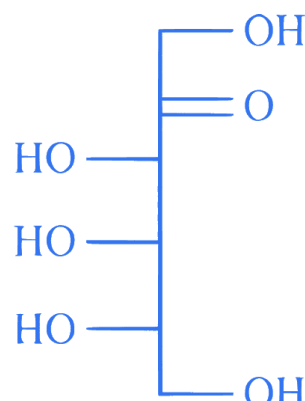
(D) B and E Only

66.

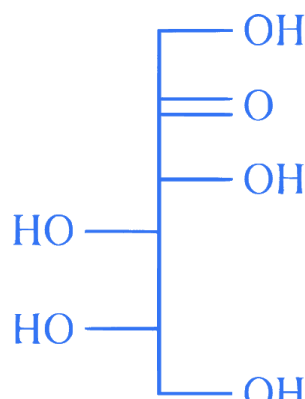
Which of the following is the correct structure of L-Fructose?

66. (continued)

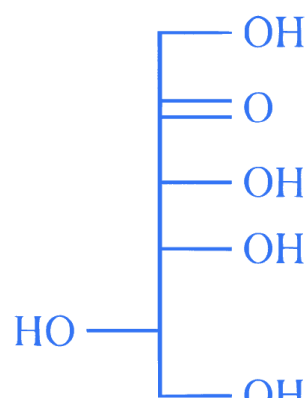
(A)



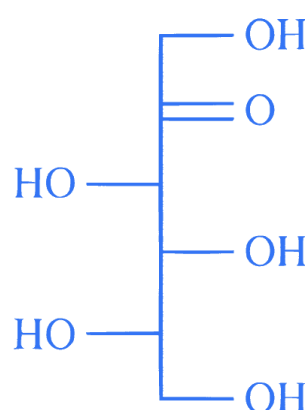
(B)



(C)



(D)



67. Given below are two statements :

Statement I : A catalyst cannot alter the equilibrium constant (K_c) of the reaction, temperature remaining constant.

Statement II : A homogenous catalyst can change the equilibrium composition of a system, temperature remaining constant.

In the light of the above statements, choose the correct answer from the options given below

- | | |
|---|---|
| (A) Statement I is true but Statement II is false | (B) Statement I is false but Statement II is true |
| (C) Both Statement I and Statement II are true | (D) Both Statement I and Statement II are false |

68. Correct order of limiting molar conductivity for cations in water at 298 K is :

- (A) $H^+ > Na^+ > K^+ > Ca^{2+} > Mg^{2+}$
(B) $H^+ > Ca^{2+} > Mg^{2+} > K^+ > Na^+$
(C) $Mg^{2+} > H^+ > Ca^{2+} > K^+ > Na^+$
(D) $H^+ > Na^+ > Ca^{2+} > Mg^{2+} > K^+$

69. In a reaction $A + B \rightarrow C$, initial concentrations of A and B are related as $[A]_0 = 8[B]_0$. The half lives of A and B are 10 min and 40 min, respectively. If they start to disappear at the same time, both following first order kinetics, after how much time will the concentration of both the reactants be same?

- | | |
|------------|------------|
| (A) 20 min | (B) 40 min |
| (C) 80 min | (D) 60 min |

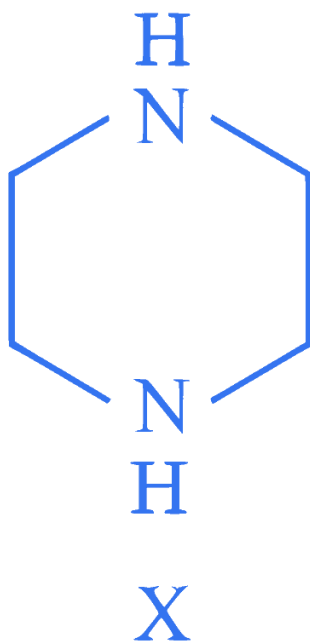
70. Number of molecules from below which cannot give iodoform reaction is :

Ethanol, Isopropyl alcohol, Bromoacetone, 2-Butanol, 2-Butanone, Butanal, 2-Pentanone, 3-Pentanone, Pentanal and 3-Pentanol.

- | | |
|-------|-------|
| (A) 4 | (B) 3 |
| (C) 5 | (D) 2 |

71.

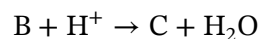
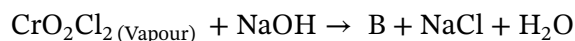
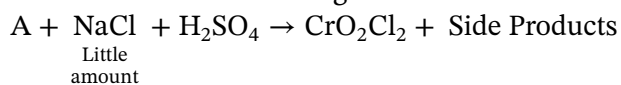
During estimation of nitrogen by Dumas' method of compound X (0.42 g)



_____ mL of N_2 gas will be liberated at STP (nearest integer)

(Given _____ molar _____ mass _____ in $g\ mol^{-1}$: C : 12, H : 1, N : 14)

72. Consider the following reactions

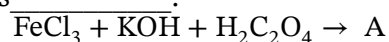


The number of terminal 'O' present in the compound 'C' is _____

73. 0.5 g of an organic compound on combustion gave 1.46 g of CO_2 and 0.9 g of H_2O . The percentage of carbon in the compound is _____. (Nearest integer)

[Given _____ : _____ Molar _____ mass _____ (in $g\ mol^{-1}$) C : 12, H : 1, O : 16]

74. The number of optical isomers exhibited by the iron complex (A) obtained from the following reaction is _____.



75. Given :

$$\Delta H_{\text{sub}}^\ominus [C(\text{graphite})] = 710\ kJ\ mol^{-1}$$

$$\Delta_{C-H}^\ominus = 414\ kJ\ mol^{-1}$$

$$\Delta_{H-H}^\ominus = 436\ kJ\ mol^{-1}$$

$$\Delta_C = CH^\ominus = 611\ kJ\ mol^{-1}$$

The $\Delta H_f^\ominus$ for $CH_2 = CH_2$ is _____ $kJ\ mol^{-1}$ (nearest integer value)

- End of Question Paper -