

JEE MAIN 2025 · QUESTION PAPER

22 Jan 2025 **Shift 2**

71 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	19 Q1 to Q19	5 Q20 to Q24
● Chemistry	17 Q25 to Q41	5 Q42 to Q46
● Mathematics	20 Q47 to Q66	5 Q67 to Q71
In this PDF	71 questions · answer key at the end	

- 1 Set a 3 hour timer and attempt the paper in one sitting, like the real exam.
- 2 Check yourself against the answer key at the end. Every question names its chapter, so you can see where marks went.
- 3 Got one wrong? Tap “Step-by-step solution” at the top right of it for the full working, where available.

Attempt this paper online

The same questions in the same order, with instant answer checking and step-by-step solutions where available.

prepwise.in/pyqs/paper/2025-01-22-evening · Free, no signup needed to start

Answers follow NTA's final answer keys. Typing errors are possible, so check doubtful answers against the official key. Spotted a mistake?
prepwise.in/feedback · Terms: prepwise.in/terms

Q1 Alternating Current

[Step-by-step solution](#) > [prepwisar.in/questions/eCHGCCn3CI](https://www.prepwisar.in/questions/eCHGCCn3CI)

A series LCR circuit is connected to an alternating source of emf E . The current amplitude at resonant frequency is I_0 . If the value of resistance R becomes twice of its initial value then amplitude of current at resonance will be

- (A) $\frac{I_0}{2}$ (B) $\frac{I_0}{\sqrt{2}}$ (C) $2I_0$ (D) I_0

Q2 Units, Dimensions & Errors

[Step-by-step solution](#) > [prepwisar.in/questions/4yqR7sbRmU](https://www.prepwisar.in/questions/4yqR7sbRmU)

Which one of the following is the correct dimensional formula for the capacitance in F? M , L , T and C stand for unit of mass, length, time and charge,

- (A) $[F] = [CM^{-1}L^{-2}T^2]$ (B) $[F] = [C^2M^{-2}L^2T^2]$
(C) $[F] = [C^2M^{-1}L^{-2}T^2]$ (D) $[F] = [CM^{-2}L^{-2}T^{-2}]$

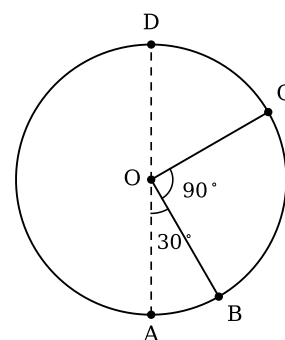
Q3 Circular Motion

[Step-by-step solution](#) > [prepwisar.in/questions/WmYjZ64aA_](https://www.prepwisar.in/questions/WmYjZ64aA_)

A body of mass 100 g is moving in circular path of radius 2 m on vertical plane as shown in figure. The velocity of the body at point A is 10m/s. The ratio of its kinetic energies at point B and C is:

(Take acceleration due to gravity as 10m/s^2)

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



Q4 Dual Nature of Radiation & Matter

[Step-by-step solution](#) > [prepwisar.in/questions/tFsKb0dFNY](https://www.prepwisar.in/questions/tFsKb0dFNY)

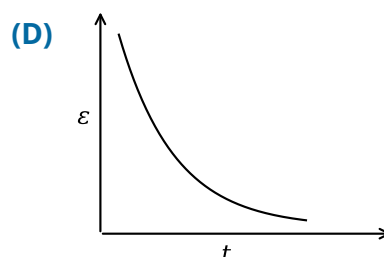
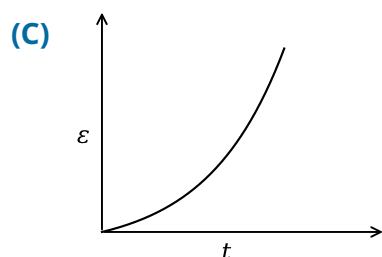
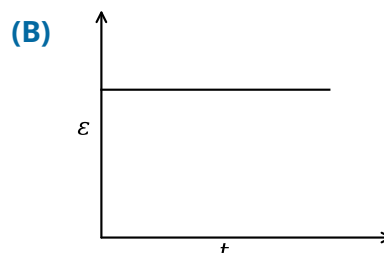
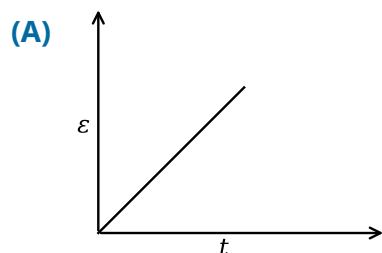
A light source of wavelength λ illuminates a metal surface and electrons are ejected with maximum kinetic energy of 2 eV. If the same surface is illuminated by a light source of wavelength $\frac{\lambda}{2}$, then the maximum kinetic energy of ejected electrons will be (The work function of metal is 1 eV)

- (A) 5 eV (B) 3 eV (C) 2 eV (D) 6 eV

Attempt this paper online with instant answer checking > [prepwisar.in/pyqs/paper/2025-01-22-evening](https://www.prepwisar.in/pyqs/paper/2025-01-22-evening)

Q5 Electromagnetic Induction[Step-by-step solution](https://www.prepwisar.in/questions/fLsDDH9KYZ) > prepwisar.in/questions/fLsDDH9KYZ

A rectangular metallic loop is moving out of a uniform magnetic field region to a field free region with a constant speed. When the loop is partially inside the magnetic field, the plot of magnitude of induced emf (ε) with time (t) is given by

**Q6** Electrostatics II: Potential & Capacitance[Step-by-step solution](https://www.prepwisar.in/questions/tjeZbwXnSv) > prepwisar.in/questions/tjeZbwXnSv

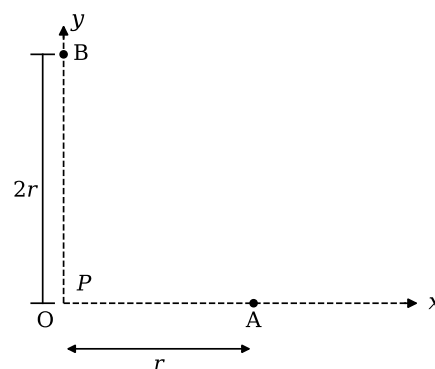
For a short dipole placed at origin O, the dipole moment P is along x -axis, as shown in the figure. If the electric potential and electric field at A are V_0 and E_0 , respectively, then the correct combination of the electric potential and electric field, respectively, at point B on the y -axis is given by

(A) $\frac{V_0}{2}$ and $\frac{E_0}{16}$

(B) zero and $\frac{E_0}{8}$

(C) V_0 and $\frac{E_0}{4}$

(D) zero and $\frac{E_0}{16}$

**Q7** Ray Optics[Step-by-step solution](https://www.prepwisar.in/questions/VEM51HpygY) > prepwisar.in/questions/VEM51HpygY

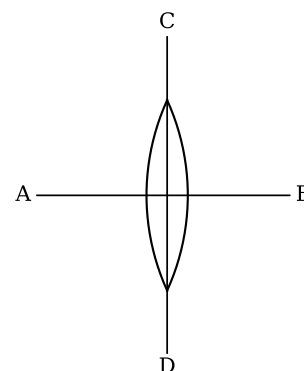
A symmetric thin biconvex lens is cut into four equal parts by two planes AB and CD as shown in figure. If the power of original lens is $4D$ then the power of a part of the divided lens is

(A) $2D$

(B) $8D$

(C) $4D$

(D) D



Q8 Thermodynamics[Step-by-step solution > prepwiser.in/questions/nvgl6Bsi1r](https://www.prepwiser.in/questions/nvgl6Bsi1r)

Given are statements for certain thermodynamic variables,

- (A) Internal energy, volume (V) and mass (M) are extensive variables.
- (B) Pressure (P), temperature (T) and density (ρ) are intensive variables.
- (C) Volume (V), temperature (T) and density (ρ) are intensive variables.
- (D) Mass (M), temperature (T) and internal energy are extensive variables.

Choose the correct answer from the options given below:

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

Q9 Kinetic Theory of Gases[Step-by-step solution > prepwiser.in/questions/KuMKRABKId](https://www.prepwiser.in/questions/KuMKRABKId)

For a diatomic gas, if $\gamma_1 = \left(\frac{C_p}{C_v}\right)$ for rigid molecules and $\gamma_2 = \left(\frac{C_p}{C_v}\right)$ for another diatomic molecules, but also having vibrational modes. Then, which one of the following options is correct? (C_p and C_v are specific heats of the gas at constant pressure and volume)

- (A) $\gamma_2 < \gamma_1$ (B) $\gamma_2 > \gamma_1$ (C) $\gamma_2 = \gamma_1$ (D) $2\gamma_2 = \gamma_1$

Q10 Atomic Physics[Step-by-step solution > prepwiser.in/questions/un9jUG87IF](https://www.prepwiser.in/questions/un9jUG87IF)

An electron projected perpendicular to a uniform magnetic field B moves in a circle. If Bohr's quantization is applicable, then the radius of the electronic orbit in the first excited state is:

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

Q11 Projectile Motion & Relative Motion[Step-by-step solution > prepwiser.in/questions/fgK3cOhd0B](https://www.prepwiser.in/questions/fgK3cOhd0B)

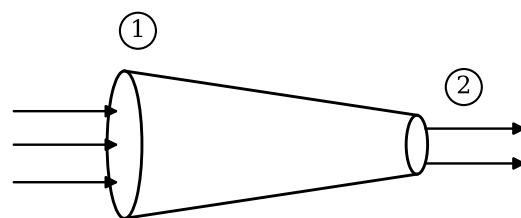
A ball of mass 100 g is projected with velocity 20 m/s at 60° with horizontal. The decrease in kinetic energy of the ball during the motion from point of projection to highest point is

- (A) 20 J (B) 5 J (C) 15 J (D) zero

Q12 Fluid Mechanics[Step-by-step solution > prepwiser.in/questions/fLuDV6uaB7](https://www.prepwiser.in/questions/fLuDV6uaB7)

A tube of length L is shown in the figure. The radius of cross section at the point (1) is 2 cm and at the point (2) is 1 cm, respectively. If the velocity of water entering at point (1) is 2 m/s, then velocity of water leaving the point (2) will be

- (A) 4 m/s (B) 6 m/s (C) 2 m/s (D) 8 m/s

**Q13** Fluid Mechanics[Step-by-step solution > prepwiser.in/questions/oTx5g_aI6V](https://www.prepwiser.in/questions/oTx5g_aI6V)

A small rigid spherical ball of mass M is dropped in a long vertical tube containing glycerine. The velocity of the ball becomes constant after some time. If the density of glycerine is half of the density of the ball, then the viscous force acting on the ball will be (consider g as acceleration due to gravity)

- (A) 2 Mg (B) $\frac{3}{2}Mg$ (C) $\frac{Mg}{2}$ (D) Mg

Q14 Vectors[Step-by-step solution > prepwiser.in/questions/5yTz0moiVk](https://www.prepwiser.in/questions/5yTz0moiVk)

The torque due to the force $(2\hat{i} + \hat{j} + 2\hat{k})$ about the origin, acting on a particle whose position vector is $(\hat{i} + \hat{j} + \hat{k})$, would be

- (A) $\hat{j} + \hat{k}$ (B) $\hat{i} - \hat{k}$ (C) $\hat{i} - \hat{j} + \hat{k}$ (D) $\hat{i} + \hat{k}$

Q15 Gravitation[Step-by-step solution](https://www.prepwiser.in/questions/YKGfTLTYxl) > prepwiser.in/questions/YKGfTLTYxl

Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : A simple pendulum is taken to a planet of mass and radius, 4 times and 2 times, respectively, than the Earth. The time period of the pendulum remains same on earth and the planet.

Reason (R) : The mass of the pendulum remains unchanged at Earth and the other planet.

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

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
- (B) (A) is false but (R) is true
- (C) (A) is true but (R) is false
- (D) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)

Q16 Wave Optics[Step-by-step solution](https://www.prepwiser.in/questions/lr5jBAvLi0) > prepwiser.in/questions/lr5jBAvLi0

A transparent film of refractive index, 2.0 is coated on a glass slab of refractive index, 1.45. What is the minimum thickness of transparent film to be coated for the maximum transmission of Green light of wavelength 550 nm. [Assume that the light is incident nearly perpendicular to the glass surface.]

- (A) 68.7 nm
- (B) 137.5 nm
- (C) 94.8 nm
- (D) 275 nm

Q17 Wave Optics[Step-by-step solution](https://www.prepwiser.in/questions/VdDpNwsOkY) > prepwiser.in/questions/VdDpNwsOkY

Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : In Young's double slit experiment, the fringes produced by red light are closer as compared to those produced by blue light.

Reason (R) : The fringe width is directly proportional to the wavelength of light.

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

- (A) (A) is true but (R) is false
- (B) Both (A) and (R) are true and (R) is the correct explanation of (A)
- (C) (A) is false but (R) is true
- (D) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)

Q18 Vectors[Step-by-step solution](https://www.prepwiser.in/questions/FesJS0P9Sv) > prepwiser.in/questions/FesJS0P9Sv

A force $\vec{F} = 2\hat{i} + b\hat{j} + \hat{k}$ is applied on a particle and it undergoes a displacement $\hat{i} - 2\hat{j} - \hat{k}$ What will be the value of b , if work done on the particle is zero.

- (A) $\frac{1}{3}$
- (B) $\frac{1}{2}$
- (C) 0
- (D) 2

Q19 Units, Dimensions & Errors[Step-by-step solution](https://www.prepwiser.in/questions/XwVXbVGj64) > prepwiser.in/questions/XwVXbVGj64

The maximum percentage error in the measurement of density of a wire is

[Given, mass of wire = (0.60 ± 0.003) g

radius of wire = (0.50 ± 0.01) cm

length of wire = (10.00 ± 0.05) cm]

- (A) 7
- (B) 8
- (C) 5
- (D) 4

Q20 Circular Motion **NUMERICAL**

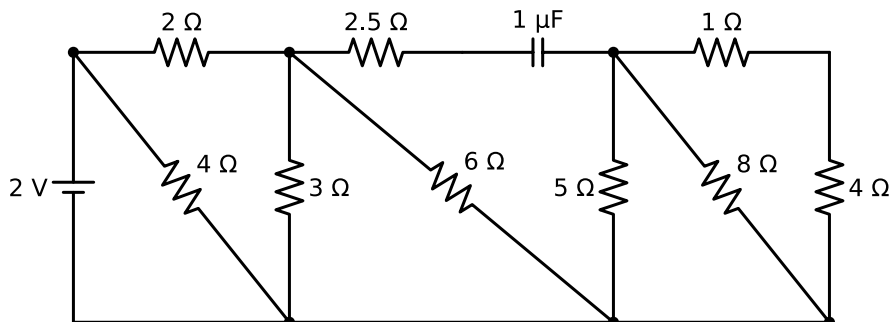
[Step-by-step solution](#) › prepwiser.in/questions/S_jqs-5hFk

A tube of length 1 m is filled completely with an ideal liquid of mass 2 M, and closed at both ends. The tube is rotated uniformly in horizontal plane about one of its ends. If the force exerted by the liquid at the other end is F then angular velocity of the tube is $\sqrt{\frac{F}{\alpha M}}$ in SI unit. The value of α is _____.

Q21 Current Electricity **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/26HjQGZ9bL

The net current flowing in the given circuit is _____ A.



Q22 Electromagnetic Waves **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/oVRDZnTScQ

A parallel plate capacitor of area $A = 16\text{cm}^2$ and separation between the plates 10 cm, is charged by a DC current. Consider a hypothetical plane surface of area $A_0 = 3.2\text{cm}^2$ inside the capacitor and parallel to the plates. At an instant, the current through the circuit is 6A. At the same instant the displacement current through A_0 is _____ mA.

Q23 Moving Charges & Magnetism **NUMERICAL**

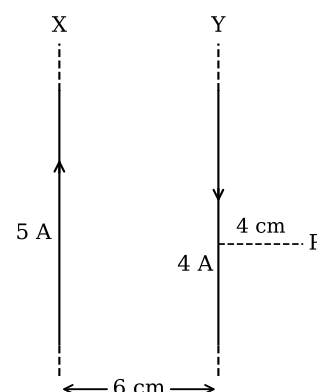
[Step-by-step solution](#) › prepwiser.in/questions/c0qL3Vhq57

A proton is moving undeflected in a region of crossed electric and magnetic fields at a constant speed of $2 \times 10^5 \text{ms}^{-1}$. When the electric field is switched off, the proton moves along a circular path of radius 2 cm. The magnitude of electric field is $x \times 10^4 \text{N/C}$. The value of x is _____. Take the mass of the proton = $1.6 \times 10^{-27} \text{kg}$.

Q24 Moving Charges & Magnetism **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/sPj15Yjuci

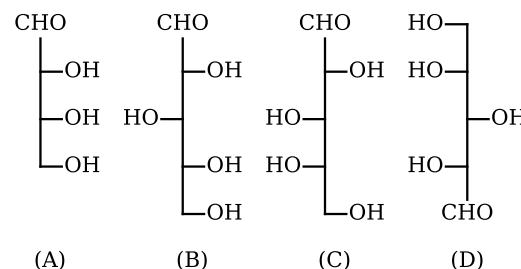
Two long parallel wires X and Y , separated by a distance of 6 cm, carry currents of 5 A and 4A, respectively, in opposite directions as shown in the figure. Magnitude of the resultant magnetic field at point P at a distance of 4 cm from wire Y is $x \times 10^{-5} \text{T}$. The value of x is _____. Take permeability of free space as $\mu_0 = 4\pi \times 10^{-7} \text{SI units}$.



Q25 Carbohydrates & Biomolecules[Step-by-step solution](https://www.prepwisar.in/questions/A4o3j-L8Ci) > prepwisar.in/questions/A4o3j-L8Ci

Identify the number of structure/s from the following which can be correlated to D-glyceraldehyde.

- (A) three (B) two (C) one (D) four

**Q26** Chemical Bonding & Molecular Structure[Step-by-step solution](https://www.prepwisar.in/questions/xTWjpQY_2P) > prepwisar.in/questions/xTWjpQY_2P

Arrange the following compounds in increasing order of their dipole moment:

HBr, H₂S, NF₃ and CHCl₃

- (A) HBr < H₂S < NF₃ < CHCl₃ (B) H₂S < HBr < NF₃ < CHCl₃
 (C) NF₃ < HBr < H₂S < CHCl₃ (D) CHCl₃ < NF₃ < HBr < H₂S

Q27 Coordination Compounds[Step-by-step solution](https://www.prepwisar.in/questions/CnzMHjqGK0) > prepwisar.in/questions/CnzMHjqGK0

The correct order of the following complexes in terms of their crystal field stabilization energies is:

- (A) $[\text{Co}(\text{NH}_3)_4]^{2+} < [\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{en})_3]^{3+}$
 (B) $[\text{Co}(\text{NH}_3)_4]^{2+} < [\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Co}(\text{en})_3]^{3+} < [\text{Co}(\text{NH}_3)_6]^{3+}$
 (C) $[\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{NH}_3)_4]^{2+} < [\text{Co}(\text{en})_3]^{3+}$
 (D) $[\text{Co}(\text{en})_3]^{3+} < [\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Co}(\text{NH}_3)_4]^{2+}$

Q28 Coordination Compounds[Step-by-step solution](https://www.prepwisar.in/questions/5qAFjheVXF) > prepwisar.in/questions/5qAFjheVXF

Identify the homoleptic complex(es) that is/are low spin.

- (A) $[\text{Fe}(\text{CN})_5\text{NO}]^{2-}$
 (B) $[\text{CoF}_6]^{3-}$
 (C) $[\text{Fe}(\text{CN})_6]^{4-}$
 (D) $[\text{Co}(\text{NH}_3)_6]^{3+}$
 (E) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$

Choose the correct answer from the options given below:

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

Q29 Electrochemistry[Step-by-step solution](https://www.prepwisar.in/questions/2Osu2aD46O) > prepwisar.in/questions/2Osu2aD46O

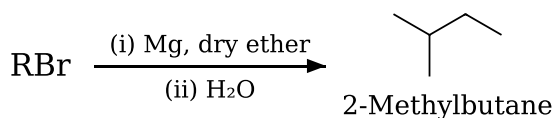
Given below are two statements:

Statement (I) : Corrosion is an electrochemical phenomenon in which pure metal acts as an anode and impure metal as a cathode.

Statement (II) : The rate of corrosion is more in alkaline medium than in acidic medium.

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

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



The maximum number of RBr producing 2-methylbutane by above sequence of reactions is _____.
(Consider the structural isomers only)

- (A) 5 (B) 3 (C) 4 (D) 1

The alkane from below having two secondary hydrogens is:

- (A) 2,2,4,5-Tetramethylheptane (B) 2,2,4,4-Tetramethylhexane
(C) 4-Ethyl-3,4-dimethyloctane (D) 2,2,3,3-Tetramethylpentane

The molar solubility(s) of zirconium phosphate with molecular formula $(\text{Zr}^{4+})_3 (\text{PO}_4^{3-})_4$ is given by relation:

- (A) $\left(\frac{K_{sp}}{5348}\right)^{\frac{1}{6}}$ (B) $\left(\frac{K_{sp}}{8435}\right)^{\frac{1}{7}}$ (C) $\left(\frac{K_{sp}}{6912}\right)^{\frac{1}{7}}$ (D) $\left(\frac{K_{sp}}{9612}\right)^{\frac{1}{3}}$

The maximum covalency of a non-metallic group 15 element 'E' with weakest E – E bond is:

- (A) 5 (B) 3 (C) 4 (D) 6

Given below are two statements:

Statement (I) : An element in the extreme left of the periodic table forms acidic oxides.

Statement (II) : Acid is formed during the reaction between water and oxide of a reactive element present in the extreme right of the periodic table.

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

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

The species which does not undergo disproportionation reaction is:

- (A) ClO_4^- (B) ClO_3^- (C) ClO^- (D) ClO_2^-

Density of 3 M NaCl solution is 1.25g/mL. The molality of the solution is:

- (A) 2.79 m (B) 2 m (C) 1.79 m (D) 3 m

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Given below are two statements:

Statement (I) : A spectral line will be observed for a $2p_x \rightarrow 2p_y$ transition.

Statement (II): $2p_x$ and $2p_y$ are degenerate orbitals.

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

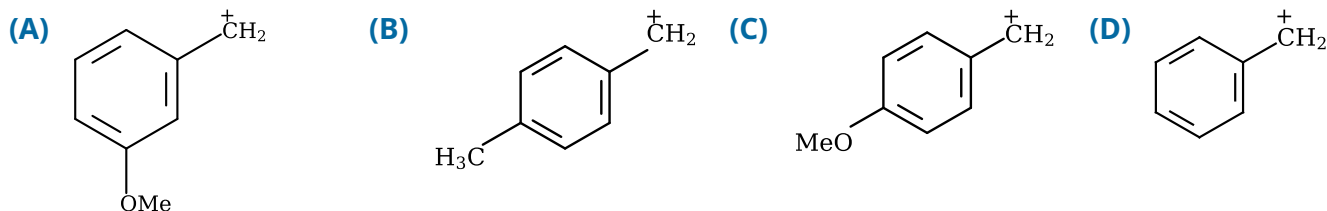
Match List - I with List - II.

	List - I (Partial Derivatives)		List - II (Thermodynamic Quantity)
(A)	$\left(\frac{\partial G}{\partial T}\right)_P$	(I)	C_p
(B)	$\left(\frac{\partial H}{\partial T}\right)_P$	(II)	$-S$
(C)	$\left(\frac{\partial G}{\partial P}\right)_T$	(III)	C_v
(D)	$\left(\frac{\partial U}{\partial T}\right)_V$	(IV)	V

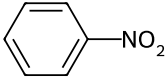
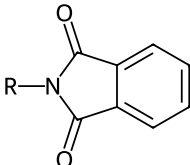
Choose the correct answer from the options given below:

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

The most stable carbocation from the following is:



Match the Compounds (List - I) with the appropriate Catalyst/ Reagents (List - II) for their reduction into corresponding amines.

	List - I (Compounds)		List - II (Catalyst/Reagents)
(A)	$\text{R} - \overset{\text{O}}{\underset{\text{ }}{\text{C}}} - \text{NH}_2$	(I)	NaOH (aqueous)
(B)		(II)	H_2/Ni
(C)	$\text{R} - \text{C} \equiv \text{N}$	(III)	$\text{LiAlH}_4, \text{H}_2\text{O}$
(D)		(IV)	Sn, HCl

Choose the correct answer from the options given below:

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

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

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

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

Given below are two statements:

Statement (I) : Nitrogen, sulphur, halogen and phosphorus present in an organic compound are detected by Lassaigne's Test.

Statement (II) : The elements present in the compound are converted from covalent form into ionic form by fusing the compound with Magnesium in Lassaigne's test.

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

(A) Both Statement I and Statement II are false

(B) Statement I is true but Statement II is false

(C) Statement I is false but Statement II is true

(D) Both Statement I and Statement II are true

Chemistry Section B · Numerical value

Q42 to Q46

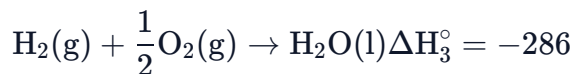
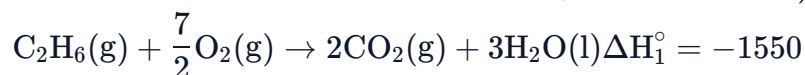
The complex of Ni^{2+} ion and dimethyl glyoxime contains _____ number of Hydrogen (H) atoms.

Niobium (Nb) and ruthenium (Ru) have " x " and " y " number of electrons in their respective 4 d orbitals. The value of $x + y$ is _____.

The compound with molecular formula C_6H_6 , which gives only one monobromo derivative and takes up four moles of hydrogen per mole for complete hydrogenation has _____ π electrons.

20 mL of 2 M NaOH solution is added to 400 mL of 0.5 M NaOH solution. The final concentration of the solution is _____ $\times 10^{-2}$ M. (Nearest integer)

Consider the following cases of standard enthalpy of reaction (ΔH_r° in kJmol^{-1})



The magnitude of $\Delta H_{f\text{C}_2\text{H}_6(\text{g})}^\circ$ is _____ kJmol^{-1} (Nearest integer).

Mathematics Section A · Multiple choice

Q47 to Q66

Q47 Three Dimensional Geometry

Step-by-step solution > prepwiser.in/questions/nK44BPVOTI

Let a line pass through two distinct points $P(-2, -1, 3)$ and Q , and be parallel to the vector $3\hat{i} + 2\hat{j} + 2\hat{k}$. If the distance of the point Q from the point $R(1, 3, 3)$ is 5, then the square of the area of $\triangle PQR$ is equal to:

- (A) 148 (B) 144 (C) 136 (D) 140

Q48 Three Dimensional Geometry

Step-by-step solution > prepwiser.in/questions/CPNa9SrYyX

The perpendicular distance, of the line $\frac{x-1}{2} = \frac{y+2}{-1} = \frac{z+3}{2}$ from the point $P(2, -10, 1)$, is:

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

Q49 Applications of Derivatives

Step-by-step solution > prepwiser.in/questions/2p1iqny4MX

Let $f(x) = \int_0^{x^2} \frac{t^2 - 8t + 15}{e^t} dt$, $x \in \mathbf{R}$. Then the numbers of local maximum and local minimum points of f , respectively, are:

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

Q50 Binomial Theorem

Step-by-step solution > prepwiser.in/questions/ugqmUydTyU

Let α, β, γ and δ be the coefficients of x^7, x^5, x^3 and x respectively in the expansion of

$$\left(x + \sqrt{x^3 - 1}\right)^5 + \left(x - \sqrt{x^3 - 1}\right)^5, x > 1. \text{ If } u \text{ and } v \text{ satisfy the equations}$$

$$\alpha u + \beta v = 18,$$

$$\gamma u + \delta v = 20,$$

then $u + v$ equals:

- (A) 4 (B) 3 (C) 5 (D) 8

Q51 Complex Numbers

Step-by-step solution > prepwiser.in/questions/Ght8b8omOT

Let the curve $z(1+i) + \bar{z}(1-i) = 4$, $z \in C$, divide the region $|z-3| \leq 1$ into two parts of areas α and β . Then $|\alpha - \beta|$ equals:

- (A) $1 + \frac{\pi}{3}$ (B) $1 + \frac{\pi}{6}$ (C) $1 + \frac{\pi}{2}$ (D) $1 + \frac{\pi}{4}$

Q52 Differential Equations[Step-by-step solution](https://www.prepwiser.in/questions/i1KxXdac6R) › prepwiser.in/questions/i1KxXdac6R

If $x = f(y)$ is the solution of the differential equation $(1 + y^2) + (x - 2e^{\tan^{-1}y}) \frac{dy}{dx} = 0, y \in (-\frac{\pi}{2}, \frac{\pi}{2})$ with $f(0) = 1$, then $f\left(\frac{1}{\sqrt{3}}\right)$ is equal to:

- (A) $e^{\pi/4}$ (B) $e^{\pi/12}$ (C) $e^{\pi/6}$ (D) $e^{\pi/3}$

Q53 Ellipse[Step-by-step solution](https://www.prepwiser.in/questions/ZQ2xeSsNAW) › prepwiser.in/questions/ZQ2xeSsNAW

Let $E: \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, a > b$ and $H: \frac{x^2}{A^2} - \frac{y^2}{B^2} = 1$. Let the distance between the foci of E and the foci of H be $2\sqrt{3}$. If $a - A = 2$, and the ratio of the eccentricities of E and H is $\frac{1}{3}$, then the sum of the lengths of their latus rectums is equal to:

- (A) 10 (B) 7 (C) 9 (D) 8

Q54 Relations & Functions (Basic)[Step-by-step solution](https://www.prepwiser.in/questions/3D2WD5zYTy) › prepwiser.in/questions/3D2WD5zYTy

Let $A = \{1, 2, 3, 4\}$ and $B = \{1, 4, 9, 16\}$. Then the number of many-one functions $f: A \rightarrow B$ such that $1 \in f(A)$ is equal to:

- (A) 151 (B) 139 (C) 163 (D) 127

Q55 Limits[Step-by-step solution](https://www.prepwiser.in/questions/6-IpKk6UnF) › prepwiser.in/questions/6-IpKk6UnF

If $\lim_{x \rightarrow \infty} \left(\left(\frac{e}{1-e} \right) \left(\frac{1}{e} - \frac{x}{1+x} \right) \right)^x = \alpha$, then the value of $\frac{\log_e \alpha}{1 + \log_e \alpha}$ equals:

- (A) e^{-2} (B) e^2 (C) e (D) e^{-1}

Q56 Determinants[Step-by-step solution](https://www.prepwiser.in/questions/A4vge7OQwg) › prepwiser.in/questions/A4vge7OQwg

If the system of linear equations:

$$\begin{aligned} x + y + 2z &= 6 \\ 2x + 3y + az &= a + 1 \\ -x - 3y + bz &= 2b \end{aligned}$$

where $a, b \in \mathbf{R}$, has infinitely many solutions, then $7a + 3b$ is equal to:

- (A) 12 (B) 9 (C) 22 (D) 16

Q57 Determinants[Step-by-step solution](https://www.prepwiser.in/questions/eHIQYOq7IZ) › prepwiser.in/questions/eHIQYOq7IZ

For a 3×3 matrix M , let $\text{trace}(M)$ denote the sum of all the diagonal elements of M . Let A be a 3×3 matrix such that $|A| = \frac{1}{2}$ and $\text{trace}(A) = 3$. If $B = \text{adj}(\text{adj}(2A))$, then the value of $|B| + \text{trace}(B)$ equals:

- (A) 56 (B) 132 (C) 174 (D) 280

Q58 Parabola[Step-by-step solution](https://www.prepwiser.in/questions/0spHEdQCgv) › prepwiser.in/questions/0spHEdQCgv

Let $P(4, 4\sqrt{3})$ be a point on the parabola $y^2 = 4ax$ and PQ be a focal chord of the parabola. If M and N are the foot of perpendiculars drawn from P and Q respectively on the directrix of the parabola, then the area of the quadrilateral $PQMN$ is equal to:

- (A) $\frac{34\sqrt{3}}{3}$ (B) $\frac{343\sqrt{3}}{8}$ (C) $17\sqrt{3}$ (D) $\frac{263\sqrt{3}}{8}$

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In a group of 3 girls and 4 boys, there are two boys B_1 and B_2 . The number of ways, in which these girls and boys can stand in a queue such that all the girls stand together, all the boys stand together, but B_1 and B_2 are not adjacent to each other, is:

- (A) 120 (B) 96 (C) 72 (D) 144

If A and B are two events such that $P(A \cap B) = 0.1$, and $P(A | B)$ and $P(B | A)$ are the roots of the equation $12x^2 - 7x + 1 = 0$, then the value of $\frac{P(\bar{A} \cap \bar{B})}{P(A \cap B)}$ is:

- (A) $\frac{4}{3}$ (B) $\frac{7}{4}$ (C) $\frac{9}{4}$ (D) $\frac{5}{3}$

Let α_θ and β_θ be the distinct roots of $2x^2 + (\cos \theta)x - 1 = 0$, $\theta \in (0, 2\pi)$. If m and M are the minimum and the maximum values of $\alpha_\theta^4 + \beta_\theta^4$, then $16(M + m)$ equals:

- (A) 27 (B) 17 (C) 25 (D) 24

Suppose that the number of terms in an A.P. is $2k$, $k \in \mathbb{N}$. If the sum of all odd terms of the A.P. is 40, the sum of all even terms is 55 and the last term of the A.P. exceeds the first term by 27, then k is equal to:

- (A) 8 (B) 6 (C) 4 (D) 5

The sum of all values of $\theta \in [0, 2\pi]$ satisfying $2 \sin^2 \theta = \cos 2\theta$ and $2 \cos^2 \theta = 3 \sin \theta$ is

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

Let $\vec{a}$ and $\vec{b}$ be two unit vectors such that the angle between them is $\frac{\pi}{3}$. If $\lambda \vec{a} + 2\vec{b}$ and $3\vec{a} - \lambda \vec{b}$ are perpendicular to each other, then the number of values of λ in $[-1, 3]$ is:

- (A) 1 (B) 3 (C) 2 (D) 0

The area of the region enclosed by the curves $y = x^2 - 4x + 4$ and $y^2 = 16 - 8x$ is:

- (A) $\frac{8}{3}$ (B) 5 (C) 8 (D) $\frac{4}{3}$

If $\int e^x \left(\frac{x \sin^{-1} x}{\sqrt{1-x^2}} + \frac{\sin^{-1} x}{(1-x^2)^{3/2}} + \frac{x}{1-x^2} \right) dx = g(x) + C$, where C is the constant of integration, then $g\left(\frac{1}{2}\right)$ equals:

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

Q67 Binomial Theorem **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/tt_cMV3LjF](https://www.prepwisar.in/questions/tt_cMV3LjF)

If $\sum_{r=1}^{30} \frac{r^2 \binom{30}{r}^2}{\binom{30}{r-1}} = \alpha \times 2^{29}$, then α is equal to _____.

Q68 Differential Equations **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/i8f14fybJO](https://www.prepwisar.in/questions/i8f14fybJO)

Let $y = f(x)$ be the solution of the differential equation $\frac{dy}{dx} + \frac{xy}{x^2-1} = \frac{x^6+4x}{\sqrt{1-x^2}}$, $-1 < x < 1$ such that $f(0) = 0$. If $6 \int_{-1/2}^{1/2} f(x) dx = 2\pi - \alpha$ then α^2 is equal to _____.

Q69 Relations & Functions (Basic) **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/LwUdOk2jxa](https://www.prepwisar.in/questions/LwUdOk2jxa)

Let $A = \{1, 2, 3\}$. The number of relations on A , containing $(1, 2)$ and $(2, 3)$, which are reflexive and transitive but not symmetric, is _____.

Q70 Straight Lines **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/vUV3aV06RA](https://www.prepwisar.in/questions/vUV3aV06RA)

Let the distance between two parallel lines be 5 units and a point P lie between the lines at a unit distance from one of them. An equilateral triangle PQR is formed such that Q lies on one of the parallel lines, while R lies on the other. Then $(QR)^2$ is equal to _____.

Q71 Properties of Triangles **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/ny4H6Nx-C-E](https://www.prepwisar.in/questions/ny4H6Nx-C-E)

Let $A(6, 8)$, $B(10 \cos \alpha, -10 \sin \alpha)$ and $C(-10 \sin \alpha, 10 \cos \alpha)$, be the vertices of a triangle. If $L(a, 9)$ and $G(h, k)$ be its orthocenter and centroid respectively, then $(5a - 3h + 6k + 100 \sin 2\alpha)$ is equal to _____.

Answer key: JEE Main 2025 · 22 Jan · Shift 2

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Physics

1.	A	2.	C	3.	D	4.	A	5.	B	6.	D	7.	A	8.	B
9.	A	10.	A	11.	C	12.	D	13.	C	14.	B	15.	D	16.	B
17.	C	18.	B	19.	C	20.	1	21.	1	22.	1200	23.	2	24.	1

Chemistry

25.	A	26.	C	27.	A	28.	A	29.	C	30.	C	31.	D	32.	C
33.	C	34.	D	35.	A	36.	A	37.	A	38.	C	39.	C	40.	B
41.	B	42.	14	43.	11	44.	8	45.	57	46.	95				

Mathematics

47.	C	48.	C	49.	C	50.	C	51.	C	52.	C	53.	D	54.	A
55.	C	56.	D	57.	D	58.	B	59.	D	60.	C	61.	C	62.	D
63.	A	64.	D	65.	A	66.	A	67.	465	68.	27	69.	3	70.	28
71.	145														

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