

JEE MAIN 2025 · QUESTION PAPER

7 Apr 2025 **Shift 2**

74 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	20 Q1 to Q20	5 Q21 to Q25
● Chemistry	20 Q26 to Q45	4 Q46 to Q49
● Mathematics	20 Q50 to Q69	5 Q70 to Q74
In this PDF	74 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.

prepwis.in/pyqs/paper/2025-04-07-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? prepwis.in/feedback · Terms: prepwis.in/terms

Q1 Nuclear Physics

[Step-by-step solution](#) › [prepwisar.in/questions/7m71ItalcU](https://www.prepwisar.in/questions/7m71ItalcU)

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

Assertion (A): The density of the copper (${}^{64}_{29}\text{Cu}$) nucleus is greater than that of the carbon (${}^{12}_6\text{C}$) nucleus.

Reason (R): The nucleus of mass number A has a radius proportional to $A^{1/3}$.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (A) (A) is correct but (R) is not correct
- (B) Both (A) and (R) are correct but (R) is **not** the correct explanation of (A)
- (C) (A) is not correct but (R) is correct
- (D) Both (A) and (R) are correct and (R) **is** the correct explanation of (A)

Q2 Dual Nature of Radiation & Matter

[Step-by-step solution](#) › [prepwisar.in/questions/1E7iDbDVj5](https://www.prepwisar.in/questions/1E7iDbDVj5)

A photoemissive substance is illuminated with a radiation of wavelength λ_i so that it releases electrons with de-Broglie wavelength λ_e . The longest wavelength of radiation that can emit photoelectron is λ_o . Expression for de-Broglie wavelength is given by:

(m: mass of the electron, h: Planck's constant and c: speed of light)

- (A) $\lambda_e = \frac{\sqrt{h\lambda_i}}{\sqrt{2mc}}$
- (B) $\lambda_e = \frac{h}{\sqrt{2mc\left(\frac{1}{\lambda_i} - \frac{1}{\lambda_o}\right)}}$
- (C) $\lambda_e = \sqrt{\frac{h}{2mc\left(\frac{1}{\lambda_i} - \frac{1}{\lambda_o}\right)}}$
- (D) $\lambda_e = \sqrt{\frac{h\lambda_o}{2mc}}$

Q3 Electromagnetic Waves

[Step-by-step solution](#) › [prepwisar.in/questions/T57EiWonL4](https://www.prepwisar.in/questions/T57EiWonL4)

The unit of $\sqrt{\frac{2I}{\epsilon_0 c}}$ is:

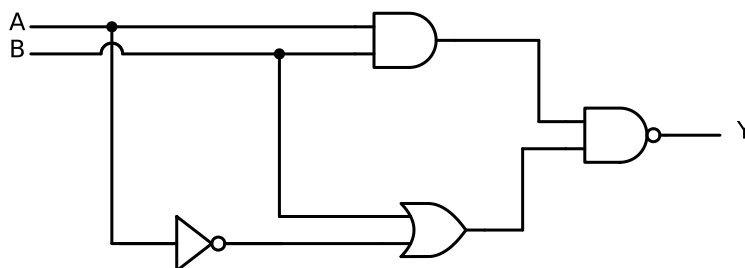
(I = intensity of an electromagnetic wave, c = speed of light)

- (A) Vm
- (B) NC^{-1}
- (C) NC
- (D) Nm

Q4 Semiconductors & Electronic Devices

[Step-by-step solution](#) › [prepwisar.in/questions/cLuG71kYBz](https://www.prepwisar.in/questions/cLuG71kYBz)

Consider the following logic circuit.



The output is $Y = 0$ when:

- (A) A = 1 and B = 0
- (B) A = 0 and B = 0
- (C) A = 1 and B = 1
- (D) A = 0 and B = 1

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A dipole with two electric charges of $2\text{ }\mu\text{C}$ magnitude each, with separation distance $0.5\text{ }\mu\text{m}$, is placed between the plates of a capacitor such that its axis is parallel to an electric field established between the plates when a potential difference of 5 V is applied. Separation between the plates is 0.5 mm . If the dipole is rotated by 30° from the axis, it tends to realign in the direction due to a torque. The value of torque is:

- (A) $2.5 \times 10^{-9}\text{ Nm}$ (B) $2.5 \times 10^{-12}\text{ Nm}$ (C) $5 \times 10^{-3}\text{ Nm}$ (D) $5 \times 10^{-9}\text{ Nm}$

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

Assertion (A): The outer body of an aircraft is made of metal which protects persons sitting inside from lightning strikes.

Reason (R): The electric field inside the cavity enclosed by a conductor is zero.

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

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

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

Assertion (A): Refractive index of glass is higher than that of air.

Reason (R): Optical density of a medium is directly proportionate to its mass density which results in a proportionate refractive index.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(B) (A) is correct but (R) is not correct
(C) (A) is not correct but (R) is correct
(D) Both (A) and (R) are correct but (R) is **not** the correct explanation of (A)

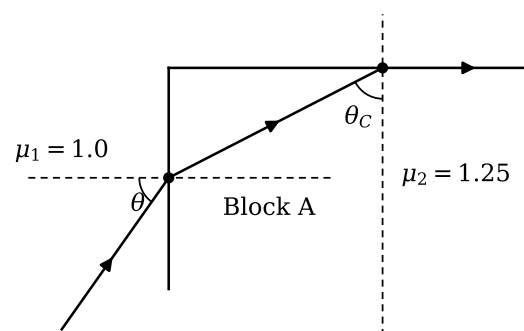
A mirror is used to produce an image with magnification of $\frac{1}{4}$. If the distance between object and its image is 40 cm , then the focal length of the mirror is _____.

- (A) 10 cm (B) 12.7 cm (C) 10.7 cm (D) 15 cm

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Q9 Ray Optics[Step-by-step solution > prepwisar.in/questions/KNtBqnblug](https://www.prepwisar.in/questions/KNtBqnblug)

A transparent block A having refractive index $\mu = 1.25$ is surrounded by another medium of refractive index $\mu = 1.0$ as shown in the figure. A light ray is incident on the flat face of the block with incident angle θ as shown in the figure. What is the maximum value of θ for which light suffers total internal reflection at the top surface of the block?



- (A) $\tan^{-1}(4/3)$ (B) $\sin^{-1}(3/4)$
 (C) $\tan^{-1}(3/4)$ (D) $\cos^{-1}(3/4)$

Q10 Gravitation[Step-by-step solution > prepwisar.in/questions/3LOzUv3mBU](https://www.prepwisar.in/questions/3LOzUv3mBU)

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

Assertion (A): The radius vector from the Sun to a planet sweeps out equal areas in equal intervals of time and thus areal velocity of planet is constant.

Reason (R): For a central force field the angular momentum is a constant.

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

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

Q11 Kinetic Theory of Gases[Step-by-step solution > prepwisar.in/questions/8r35RxPS1j](https://www.prepwisar.in/questions/8r35RxPS1j)

The helium and argon are put in the flask at the same room temperature (300 K). The ratio of average kinetic energies (per molecule) of helium and argon is:

(Give: Molar mass of helium = 4 g/mol, Molar mass of argon = 40 g/mol)

- (A) $1:\sqrt{10}$ (B) 10 : 1 (C) 1 : 10 (D) 1 : 1

Q12 Thermodynamics[Step-by-step solution > prepwisar.in/questions/WM9VDNf1Rb](https://www.prepwisar.in/questions/WM9VDNf1Rb)

Match **List - I** with **List - II**.

List - I	List - II
(A) Isothermal	(I) ΔW (work done) = 0
(B) Adiabatic	(II) ΔQ (supplied heat) = 0
(C) Isobaric	(III) ΔU (change in internal energy) $\neq 0$
(D) Isochoric	(IV) $\Delta U = 0$

Choose the **correct** answer from the options given below:

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

Q13 Rectilinear Motion[Step-by-step solution > prepwisar.in/questions/HITKTD8KkG](https://www.prepwisar.in/questions/HITKTD8KkG)

An object with mass 500 g moves along x-axis with speed $v = 4\sqrt{x}$ m/s. The force acting on the object is:

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

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

Assertion (A): Magnetic monopoles do not exist.

Reason (R): Magnetic field lines are continuous and form closed loops.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(B) (A) is not correct but (R) is correct
(C) (A) is correct but (R) is not correct
(D) Both (A) and (R) are correct but (R) is **not** the correct explanation of (A)

A helicopter flying horizontally with a speed of 360 km/h at an altitude of 2 km, drops an object at an instant. The object hits the ground at a point O, 20 s after it is dropped. Displacement of 'O' from the position of helicopter where the object was released is:

(use acceleration due to gravity $g = 10 \text{ m/s}^2$ and neglect air resistance)

- (A) 7.2 km (B) $2\sqrt{5}$ km (C) $2\sqrt{2}$ km (D) 4 km

A capillary tube of radius 0.1 mm is partly dipped in water (surface tension 70 dyn/cm and glass water contact angle $\approx 0^\circ$) with 30° inclined with the vertical. The length of water risen in the capillary is _____ cm. (Take $g = 9.8 \text{ m/s}^2$)

- (A) $\frac{82}{5}$ (B) $\frac{68}{5}$ (C) $\frac{57}{2}$ (D) $\frac{71}{5}$

The equation of a wave travelling on a string is $y = \sin[20\pi x + 10\pi t]$, where x and t are distance and time in SI units. The minimum distance between two points having the same oscillating speed is:

- (A) 10 cm (B) 2.5 cm (C) 20 cm (D) 5.0 cm

Which one of the following forces cannot be expressed in terms of potential energy?

- (A) Frictional force (B) Coulomb's force (C) Restoring force (D) Gravitational force

The dimension of $\sqrt{\frac{\mu_0}{\epsilon_0}}$ is equal to that of:

(μ_0 = Vacuum permeability and ϵ_0 = Vacuum permittivity)

- (A) Voltage (B) Inductance (C) Resistance (D) Capacitance

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Match **List - I** with **List - II**.

List - I	List - II
(A) Mass density	(I) $[ML^2T^{-3}]$
(B) Impulse	(II) $[MLT^{-1}]$
(C) Power	(III) $[ML^2T^0]$
(D) Moment of inertia	(IV) $[ML^{-2}T^0]$

Choose the **correct** answer from the options given below:**(A)** (A)-(IV), (B)-(II), (C)-(III), (D)-(I)**(B)** (A)-(II), (B)-(III), (C)-(IV), (D)-(I)**(C)** (A)-(IV), (B)-(III), (C)-(I), (D)-(II)**(D)** (A)-(IV), (B)-(II), (C)-(I), (D)-(III)**Physics** Section B · Numerical value

Q21 to Q25

Q21 Alternating Current **NUMERICAL**Step-by-step solution > [prepwisar.in/questions/NIgeB4zWko](https://www.prepwisar.in/questions/NIgeB4zWko)

An inductor of reactance 100Ω , a capacitor of reactance 50Ω , and a resistor of resistance 50Ω are connected in series with an AC source of $10V$, $50Hz$. Average power dissipated by the circuit is _____ W.

Q22 Electrostatics II: Potential & Capacitance **NUMERICAL**Step-by-step solution > [prepwisar.in/questions/tTAebnNCWh](https://www.prepwisar.in/questions/tTAebnNCWh)

A parallel plate capacitor has charge $5 \times 10^{-6}C$. A dielectric slab is inserted between the plates and almost fills the space between the plates. If the induced charge on one face of the slab is $4 \times 10^{-6}C$ then the dielectric constant of the slab is _____.

Q23 Electrostatics I: Charges, Field & Gauss's Law **NUMERICAL**Step-by-step solution > [prepwisar.in/questions/RSOKkF51vF](https://www.prepwisar.in/questions/RSOKkF51vF)

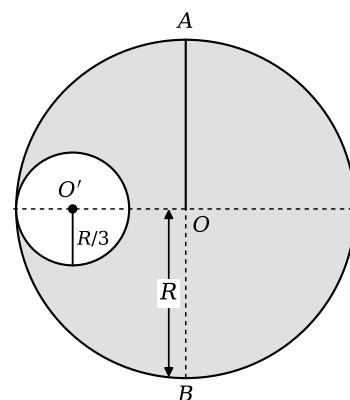
The electric field in a region is given by $\vec{E} = (2\hat{i} + 4\hat{j} + 6\hat{k}) \times 10^3 N/C$. The flux of the field through a rectangular surface parallel to $x - z$ plane is $6.0 Nm^2C^{-1}$. The area of the surface is _____ cm^2 .

Q24 Heat Transfer **NUMERICAL**Step-by-step solution > [prepwisar.in/questions/eZyyhInkKC](https://www.prepwisar.in/questions/eZyyhInkKC)

Two cylindrical rods A and B made of different materials, are joined in a straight line. The ratios of lengths, radii and thermal conductivities of these rods are: $\frac{L_A}{L_B} = \frac{1}{2}$, $\frac{r_A}{r_B} = 2$ and $\frac{K_A}{K_B} = \frac{1}{2}$. The free ends of rods A and B are maintained at $400 K$, $200 K$, respectively. The temperature of rods interface is _____ K , when equilibrium is established.

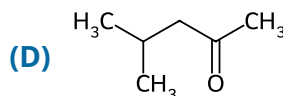
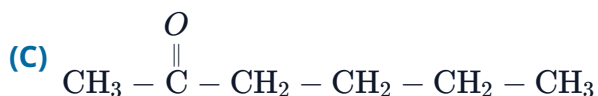
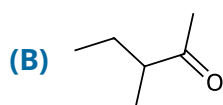
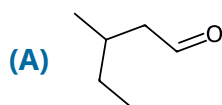
Q25 Rotational Motion **NUMERICAL**Step-by-step solution > [prepwisar.in/questions/6jqDbe5F8J](https://www.prepwisar.in/questions/6jqDbe5F8J)

M and R be the mass and radius of a disc. A small disc of radius $R/3$ is removed from the bigger disc as shown in figure. The moment of inertia of remaining part of bigger disc about an axis AB passing through the centre O and perpendicular to the plane of disc is $\frac{4}{x}MR^2$. The value of x is _____.



Q26 Practical Organic Chemistry[Step-by-step solution](https://www.prepwiser.in/questions/4Mh1e2hXWy)

"P" is an optically active compound with molecular formula $C_6H_{12}O$. When "P" is treated with 2, 4-dinitrophenylhydrazine, it gives a positive test. However, in presence of Tollens reagent, "P" gives a negative test. Predict the structure of "P".

**Q27** Carbohydrates & Biomolecules[Step-by-step solution](https://www.prepwiser.in/questions/Az6_9650ib)

Given below are two statements:

Statement (I): On hydrolysis, oligo peptides give rise to fewer number of α -amino acids while proteins give rise to a large number of β -amino acids.

Statement (II): Natural proteins are denatured by acids which convert the water soluble form of fibrous proteins to their water insoluble form.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

(A) **Statement I** is incorrect but **Statement II** is correct

(B) Both **Statement I** and **Statement II** are incorrect

(C) Both **Statement I** and **Statement II** are correct

(D) **Statement I** is correct but **Statement II** is incorrect

Q28 Chemical Bonding & Molecular Structure[Step-by-step solution](https://www.prepwiser.in/questions/xAXSpJkTX1)

In SO_2 , NO_2^- and N_3^- , the hybridizations at the central atom are respectively:

(A) sp^2 , sp^2 and sp^2

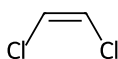
(B) sp , sp^2 and sp

(C) sp^2 , sp and sp

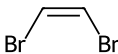
(D) sp^2 , sp^2 and sp

Given below are two statements:

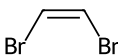
Statement (I):



is more polar than



Statement (II): Boiling point of is lower than but it is more polar than



In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (A) Both Statement I and Statement II are correct
 (B) Statement I is incorrect but Statement II is correct
 (C) Both Statement I and Statement II are incorrect
 (D) Statement I is correct but Statement II is incorrect

$A(g) \rightarrow B(g) + C(g)$ is a first order reaction.

The reaction was started with reactant A only. Which of the following expressions is correct for rate constant k ?

Time	t	∞
P_{system}	P_t	P_{∞}

- (A) $k = \frac{1}{t} \ln \frac{p_{\infty}}{p_t}$ (B) $k = \frac{1}{t} \ln \frac{p_{\infty}}{2(p_{\infty} - p_t)}$ (C) $k = \frac{1}{t} \ln \frac{2(p_{\infty} - p_t)}{p_t}$ (D) $k = \frac{1}{t} \ln \frac{p_{\infty}}{(p_{\infty} - p_t)}$

Match **List - I** with **List - II**.

List - I (Complex)	List - II (Primary valency and Secondary valency)
(A) $[\text{Co(en)}_2\text{Cl}_2]\text{Cl}$	(I) 3, 6
(B) $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$	(II) 3, 4
(C) $\text{Hg} [\text{Co}(\text{SCN})_4]$	(III) 2, 6
(D) $[\text{Mg} (\text{EDTA})]^{2-}$	(IV) 2, 4

Choose the **correct** answer from the options given below:

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

The number of unpaired electrons responsible for the paramagnetic nature of the following complex species are respectively:

$[\text{Fe}(\text{CN})_6]^{3-}$, $[\text{FeF}_6]^{3-}$, $[\text{CoF}_6]^{3-}$, $[\text{Mn}(\text{CN})_6]^{3-}$

- (A) 1, 5, 4, 2 (B) 1, 4, 4, 2 (C) 1, 5, 5, 2 (D) 1, 1, 4, 2

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'X' is the number of acidic oxides among VO_2 , V_2O_3 , CrO_3 , V_2O_5 and Mn_2O_7 . The primary valency of cobalt in

$[\text{Co}(\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2)_3]_2(\text{SO}_4)_3$ is Y. The value of $X + Y$ is _____.

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

Given below are two statements:

1 M aqueous solutions of each of $\text{Cu}(\text{NO}_3)_2$, AgNO_3 , $\text{Hg}_2(\text{NO}_3)_2$, $\text{Mg}(\text{NO}_3)_2$ are electrolysed using inert electrodes. Given: $E^\circ_{\text{Ag}^+/\text{Ag}} = 0.80 \text{ V}$, $E^\circ_{\text{Hg}_2^{2+}/\text{Hg}} = 0.79 \text{ V}$, $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.24 \text{ V}$ and $E^\circ_{\text{Mg}^{2+}/\text{Mg}} = -2.37 \text{ V}$.

Statement (I): With increasing voltage, the sequence of deposition of metals on the cathode will be Ag, Hg and Cu.

Statement (II): Magnesium will not be deposited at the cathode instead oxygen gas will be evolved at the cathode.

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

- (A) Both **Statement I** and **Statement II** are incorrect
 (B) **Statement I** is incorrect but **Statement II** is correct
 (C) **Statement I** is correct but **Statement II** is incorrect
 (D) Both **Statement I** and **Statement II** are correct

The correct statements from the following are:

- (A) Ti^{3+} is a powerful oxidising agent
 (B) Al^{3+} does not get reduced easily
 (C) Both Al^{3+} and Ti^{3+} are very stable in solution
 (D) Ti^{1+} is more stable than Ti^{3+}
 (E) Al^{3+} and Ti^{1+} are highly stable

Choose the **correct** answer from the options given below:

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

Choose the incorrect trend in the atomic radii (r) of the elements.

- (A) $r_{\text{Rb}} < r_{\text{Cs}}$ (B) $r_{\text{At}} < r_{\text{Cs}}$ (C) $r_{\text{Br}} < r_{\text{K}}$ (D) $r_{\text{Mg}} < r_{\text{Al}}$

Liquid A and B form an ideal solution. The vapour pressures of pure liquids A and B are 350 and 750 mm Hg respectively at the same temperature. If x_A and x_B are the mole fraction of A and B in solution while y_A and y_B are the mole fraction of A and B in vapour phase, then,

- (A) $(x_A - y_A) < (x_B - y_B)$ (B) $\frac{x_A}{x_B} = \frac{y_A}{y_B}$
 (C) $\frac{x_A}{x_B} < \frac{y_A}{y_B}$ (D) $\frac{x_A}{x_B} > \frac{y_A}{y_B}$

Match List - I with List - II.

List - I	List - II
(A) Solution of chloroform and acetone	(I) Minimum boiling azeotrope
(B) Solution of ethanol and water	(II) Dimerizes
(C) Solution of benzene and toluene	(III) Maximum boiling azeotrope
(D) Solution of acetic acid in benzene	(IV) $\Delta V_{\text{mix}} = 0$

Choose the correct answer from the options given below:

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

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

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

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

The extra stability of half-filled subshell is due to:

(A) Symmetrical distribution of electrons

(B) Smaller coulombic repulsion energy

(C) The presence of electrons with the same spin in non-degenerate orbitals

(D) Larger exchange energy

(E) Relatively smaller shielding of electrons by one another

Identify the correct statements:

(A) (B), (D) and (E) only

(B) (A), (B), (D) and (E) only

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

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

The hydration energies of K^+ and Cl^- are $-x$ and $-y$ kJ/mol respectively. If the lattice energy of KCl is $-z$ kJ/mol, then the heat of solution of KCl is:

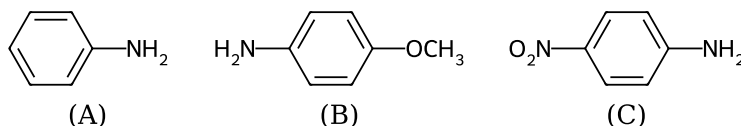
(A) $x + y + z$ (B) $z - (x + y)$ (C) $-z - (x + y)$ (D) $x - y - z$

The correct statement amongst the following is:

(A) The standard state of a pure gas is the pure gas at a pressure of 1 bar and temperature 273 K.

(B) $\Delta_f H_{500}^\circ$ is zero for $O_2(g)$.(C) $\Delta_f H_{298}^\circ$ is zero for $O(g)$.(D) The term 'standard state' implies that the temperature is 0°C .Attempt this paper online with instant answer checking > [prepwiser.in/pyqs/paper/2025-04-07-evening](https://www.prepwiser.in/pyqs/paper/2025-04-07-evening)

The descending order of basicity of the following amines is:



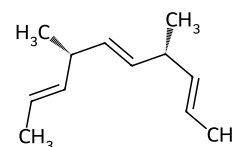
(D) CH_3NH_2

(E) $(\text{CH}_3)_2\text{NH}$

Choose the **correct** answer from the options given below:

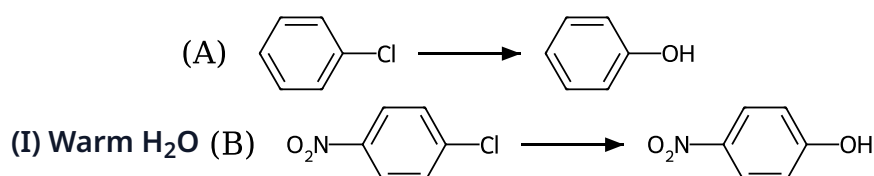
- (A) $\text{E} > \text{A} > \text{D} > \text{C} > \text{B}$ (B) $\text{E} > \text{D} > \text{A} > \text{B} > \text{C}$ (C) $\text{E} > \text{D} > \text{B} > \text{A} > \text{C}$ (D) $\text{B} > \text{E} > \text{D} > \text{A} > \text{C}$

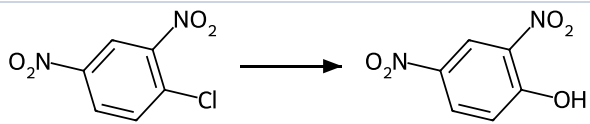
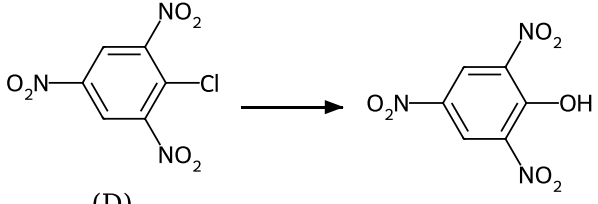
The number of optically active products obtained from the complete ozonolysis of the given compound is:



- (A) 4 (B) 0 (C) 2 (D) 1

Match **List - I** with **List - II**.



List - I (Conversion)	List - II (Reagents, Conditions used)
(C) 	(II) (a) NaOH , 368K; (b) H_3O^+
(D) 	(III) (a) NaOH , 443K; (b) H_3O^+
	(IV) (a) NaOH , 623K, 300 atm; (b) H_3O^+

Choose the **correct** answer from the options given below:

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

A mixture of 1 g each of chlorobenzene, aniline, and benzoic acid is dissolved in 50 mL ethyl acetate and placed in a separating funnel. 5 M NaOH (30 mL) was added in the same funnel. The funnel was shaken vigorously and then kept aside. The ethyl acetate layer in the funnel contains:

- (A) chlorobenzene and aniline (B) benzoic acid and aniline
- (C) benzoic acid (D) benzoic acid and chlorobenzene

Q46 Coordination Compounds **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/UYXAo2ZIfj) > prepwisar.in/questions/UYXAo2ZIfj

The number of paramagnetic metal complex species among $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$, $[\text{MnCl}_6]^{3-}$, $[\text{Mn}(\text{CN})_6]^{3-}$, $[\text{CoF}_6]^{3-}$, $[\text{Fe}(\text{CN})_6]^{3-}$ and $[\text{FeF}_6]^{3-}$ with same number of unpaired electrons is _____.

Q47 Ionic Equilibrium **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/Jr8bzytwaf) > prepwisar.in/questions/Jr8bzytwaf

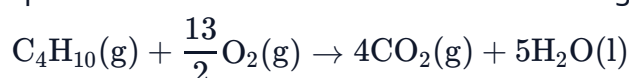
One litre buffer solution was prepared by adding 0.10 mol each of NH_3 and NH_4Cl in deionised water. The change in pH on addition of 0.05 mol of HCl to the above solution is _____ $\times 10^{-2}$.

(Nearest integer)

Given: $\text{p}K_b$ of $\text{NH}_3 = 4.745$ and $\log_{10} 3 = 0.477$

Q48 Mole Concept & Stoichiometry **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/N7_LMzjR_5) > prepwisar.in/questions/N7_LMzjR_5

Butane reacts with oxygen to produce carbon dioxide and water following the equation given below.



If 174.0 kg of butane is mixed with 320.0 kg of O_2 , the volume of water formed in liters is _____. (Nearest integer)

[Given : (a) Molar mass of C, H, O are 12, 1, 16 g mol^{-1} respectively, (b) Density of water = 1 g mL^{-1}]

Q49 Purification & Characterisation of Organic Compounds **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/Pk7rU3QMDz) > prepwisar.in/questions/Pk7rU3QMDz

In Dumas' method 292 mg of an organic compound released 50 mL of nitrogen gas (N_2) at 300 K temperature and 715 mm Hg pressure. The percentage composition of 'N' in the organic compound is _____ % (Nearest integer) (Aqueous tension at 300K = 15 mmHg)

Mathematics Section A · Multiple choice

Q50 Three Dimensional Geometry[Step-by-step solution](https://www.prepwisar.in/questions/k4S_N000-u) > prepwisar.in/questions/k4S_N000-u

If the equation of the line passing through the point $(0, -\frac{1}{2}, 0)$ and perpendicular to the lines $\vec{r} = \lambda(\hat{i} + a\hat{j} + b\hat{k})$ and $\vec{r} = (\hat{i} - \hat{j} - 6\hat{k}) + \mu(-b\hat{i} + a\hat{j} + 5\hat{k})$ is $\frac{x-1}{-2} = \frac{y+4}{d} = \frac{z-c}{-4}$, then $a + b + c + d$ is equal to:

(A) 13

(B) 14

(C) 12

(D) 10

Q51 Three Dimensional Geometry[Step-by-step solution](https://www.prepwisar.in/questions/LnE7sWGa5l) > prepwisar.in/questions/LnE7sWGa5l

Consider the lines $\text{L}_1: x - 1 = y - 2 = z$ and $\text{L}_2: x - 2 = y = z - 1$. Let the feet of the perpendiculars from the point P(5, 1, -3) on the lines L_1 and L_2 be Q and R respectively. If the area of the triangle PQR is A, then $4A^2$ is equal to:

(A) 151

(B) 147

(C) 139

(D) 143

Q52 Applications of Derivatives[Step-by-step solution](https://www.prepwisar.in/questions/N7bF-LrHIK) > prepwisar.in/questions/N7bF-LrHIK

Let $\mathbf{f}: \mathbb{R} \rightarrow \mathbb{R}$ be a polynomial function of degree four having extreme values at $x = 4$ and $x = 5$. If $\lim_{x \rightarrow 0} \frac{f(x)}{x^2} = 5$, then $\mathbf{f}(2)$ is equal to:

(A) 8

(B) 10

(C) 12

(D) 14

Q53 Complex Numbers[Step-by-step solution](#) › [prepwise.in/questions/gKKJw_tYYr](#)

If the locus of $z \in \mathbb{C}$, such that $\operatorname{Re}\left(\frac{z-1}{2z+i}\right) + \operatorname{Re}\left(\frac{\bar{z}-1}{2\bar{z}-i}\right) = 2$, is a circle of radius r and center (a, b) , then $\frac{15ab}{r^2}$ is equal to:

- (A) 16 (B) 24 (C) 12 (D) 18

Q54 Differential Equations[Step-by-step solution](#) › [prepwise.in/questions/OBIL8yvmGL](#)

Let $y = y(x)$ be the solution of the differential equation $(x^2 + 1)y' - 2xy = (x^4 + 2x^2 + 1) \cos x$, $y(0) = 1$. Then $\int_{-3}^3 y(x) dx$ is:

- (A) 36 (B) 24 (C) 18 (D) 30

Q55 Ellipse[Step-by-step solution](#) › [prepwise.in/questions/zfE1zzjIRO](#)

Let the length of a latus rectum of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ be 10. If its eccentricity is the minimum value of the function $f(t) = t^2 + t + \frac{11}{12}$, $t \in \mathbb{R}$, then $a^2 + b^2$ is equal to:

- (A) 115 (B) 120 (C) 125 (D) 126

Q56 Permutations & Combinations[Step-by-step solution](#) › [prepwise.in/questions/obiLVGH2Vr](#)

Let p be the number of all triangles that can be formed by joining the vertices of a regular polygon P of n sides and q be the number of all quadrilaterals that can be formed by joining the vertices of P . If $p + q = 126$, then the eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{n} = 1$ is:

- (A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{2}$ (C) $\frac{\sqrt{7}}{4}$ (D) $\frac{3}{4}$

Q57 Functions (Advanced)[Step-by-step solution](#) › [prepwise.in/questions/5q109jOf-K](#)

If the range of the function $f(x) = \frac{5-x}{x^2-3x+2}$, $x \neq 1, 2$, is $(-\infty, \alpha] \cup [\beta, \infty)$, then $\alpha^2 + \beta^2$ is equal to:

- (A) 188 (B) 192 (C) 190 (D) 194

Q58 Ellipse[Step-by-step solution](#) › [prepwise.in/questions/7prBTNQUO-](#)

Let e_1 and e_2 be the eccentricities of the ellipse $\frac{x^2}{b^2} + \frac{y^2}{25} = 1$ and the hyperbola $\frac{x^2}{16} - \frac{y^2}{b^2} = 1$, respectively. If $b < 5$ and $e_1 e_2 = 1$, then the eccentricity of the ellipse having its axes along the coordinate axes and passing through all four foci (two of the ellipse and two of the hyperbola) is:

- (A) $\frac{4}{5}$ (B) $\frac{3}{5}$ (C) $\frac{\sqrt{7}}{4}$ (D) $\frac{\sqrt{3}}{2}$

Q59 Determinants[Step-by-step solution](#) › [prepwise.in/questions/GLXj7AQcgD](#)

Let the system of equations

$$x + 5y - z = 1$$

$$4x + 3y - 3z = 7$$

$$24x + y + \lambda z = \mu$$

$\lambda, \mu \in \mathbb{R}$, have infinitely many solutions. Then the number of the solutions of this system, if x, y, z are integers and satisfy $7 \leq x + y + z \leq 77$, is:

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

Q60 Probability: Advanced[Step-by-step solution](https://www.prepwiser.in/questions/LJXjJqW_I) › prepwiser.in/questions/LJXjJqW_I

A bag contains 19 unbiased coins and one coin with head on both sides. One coin drawn at random is tossed and head turns up. If the probability that the drawn coin was unbiased, is $\frac{m}{n}$, $\gcd(m, n) = 1$, then $n^2 - m^2$ is equal to:

- (A) 64 (B) 80 (C) 60 (D) 72

Q61 Probability: Advanced[Step-by-step solution](https://www.prepwiser.in/questions/dnSKIS81J7) › prepwiser.in/questions/dnSKIS81J7

Let a random variable X take values 0, 1, 2, 3 with $P(X=0)=P(X=1)=p$, $P(X=2)=P(X=3)$ and $E(X^2)=2E(X)$. Then the value of $8p-1$ is:

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

Q62 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](https://www.prepwiser.in/questions/YG7AtFHlId) › prepwiser.in/questions/YG7AtFHlId

The number of real roots of the equation $x|x-2| + 3|x-3| + 1 = 0$ is:

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

Q63 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/oH9cs-vIG1) › prepwiser.in/questions/oH9cs-vIG1

Let a_n be the n^{th} term of an A.P. If $S_n = a_1 + a_2 + a_3 + \dots + a_n = 700$, $a_6 = 7$ and $S_7 = 7$, then a_n is equal to:

- (A) 65 (B) 56 (C) 70 (D) 64

Q64 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/i3xWmvCMjQ) › prepwiser.in/questions/i3xWmvCMjQ

If the sum of the second, fourth and sixth terms of a G.P. of positive terms is 21 and the sum of its eighth, tenth and twelfth terms is 15309, then the sum of its first nine terms is:

- (A) 757 (B) 755 (C) 750 (D) 760

Q65 Sets[Step-by-step solution](https://www.prepwiser.in/questions/7r0zdf_ICk) › prepwiser.in/questions/7r0zdf_ICk

Let $A = \{(\alpha, \beta) \in \mathbb{R} \times \mathbb{R} : |\alpha - 1| \leq 4 \text{ and } |\beta - 5| \leq 6\}$
and $B = \{(\alpha, \beta) \in \mathbb{R} \times \mathbb{R} : 16(\alpha - 2)^2 + 9(\beta - 6)^2 \leq 144\}$.
Then

- (A) $A \subset B$ (B) $B \subset A$
(C) neither $A \subset B$ nor $B \subset A$ (D) $A \cup B = \{(x, y) : -4 \leq x \leq 4, -1 \leq y \leq 11\}$

Q66 Trigonometric Equations[Step-by-step solution](https://www.prepwiser.in/questions/RRwkzgpPrTw) › prepwiser.in/questions/RRwkzgpPrTw

The number of solutions of the equation $\cos 2\theta \cos \frac{\theta}{2} + \cos \frac{5\theta}{2} = 2 \cos^3 \frac{5\theta}{2}$ in $[-\frac{\pi}{2}, \frac{\pi}{2}]$ is:

- (A) 5 (B) 7 (C) 6 (D) 9

Q67 Vectors[Step-by-step solution](https://www.prepwiser.in/questions/u3IOJmh2iG) › prepwiser.in/questions/u3IOJmh2iG

Let $\vec{a}$ and $\vec{b}$ be the vectors of the same magnitude such that

$$\frac{|\vec{a}+\vec{b}|+|\vec{a}-\vec{b}|}{|\vec{a}+\vec{b}|-|\vec{a}-\vec{b}|} = \sqrt{2} + 1. \text{ Then } \frac{|\vec{a}+\vec{b}|^2}{|\vec{a}|^2} \text{ is:}$$

- (A) $2 + \sqrt{2}$ (B) $2 + 4\sqrt{2}$ (C) $4 + 2\sqrt{2}$ (D) $1 + \sqrt{2}$

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If the area of the region $\{(x, y) : 1 + x^2 \leq y \leq \min\{x + 7, 11 - 3x\}\}$ is A , then $3A$ is equal to:

- (A) 50 (B) 46 (C) 49 (D) 47

If the orthocenter of the triangle formed by the lines $y = x + 1$, $y = 4x - 8$ and $y = mx + c$ is at $(3, -1)$, then $m - c$ is:

- (A) 0 (B) 2 (C) -2 (D) 4

Mathematics Section B · Numerical value

Q70 to Q74

The sum of the series

$2 \times 1 \times {}^{20}C_4 - 3 \times 2 \times {}^{20}C_5 + 4 \times 3 \times {}^{20}C_6 - 5 \times 4 \times {}^{20}C_7 + \dots + 18 \times 17 \times {}^{20}C_{20}$, is equal to _____.

Let the lengths of the transverse and conjugate axes of a hyperbola in standard form be $2a$ and $2b$, respectively, and one focus and the corresponding directrix of this hyperbola be $(-5, 0)$ and $5x + 9 = 0$, respectively. If the product of the focal distances of a point $(\alpha, 2\sqrt{5})$ on the hyperbola is p , then $4p$ is equal to _____.

If the function $f(x) = \frac{\tan(\tan x) - \sin(\sin x)}{\tan x - \sin x}$ is continuous at $x = 0$, then $f(0)$ is equal to _____.

For $t > -1$, let α_t and β_t be the roots of the equation

$((t+2)^{1/7} - 1)x^2 + ((t+2)^{1/6} - 1)x + ((t+2)^{1/21} - 1) = 0$. If $\lim_{t \rightarrow -1^+} \alpha_t = a$ and $\lim_{t \rightarrow -1^+} \beta_t = b$, then $72(a+b)^2$ is equal to _____.

If $\int \left(\frac{1}{x} + \frac{1}{x^3}\right) \left(\sqrt[23]{3x^{-24} + x^{-26}}\right) dx = -\frac{\alpha}{3(\alpha+1)} (3x^\beta + x^\gamma)^{\frac{\alpha+1}{\alpha}} + C, x > 0, (\alpha, \beta, \gamma \in \mathbf{Z})$, where C is the constant of integration, then $\alpha + \beta + \gamma$ is equal to _____.

Answer key: JEE Main 2025 · 7 Apr · Shift 2

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Physics

1.	C	2.	C	3.	B	4.	C	5.	D	6.	C	7.	B	8.	C	9.	B	10.	C
11.	D	12.	C	13.	B	14.	A	15.	C	16.	A	17.	D	18.	A	19.	C	20.	D
21.	1	22.	5	23.	15	24.	360	25.	9										

Chemistry

26.	B	27.	B	28.	D	29.	D	30.	B	31.	C	32.	A	33.	D	34.	C	35.	A
36.	D	37.	D	38.	A	39.	B	40.	B	41.	B	42.	C	43.	B	44.	D	45.	A
46.	2	47.	48	48.	138	49.	18												

Mathematics

50.	B	51.	B	52.	B	53.	D	54.	B	55.	D	56.	A	57.	D	58.	B	59.	C
60.	B	61.	A	62.	D	63.	D	64.	A	65.	B	66.	B	67.	A	68.	A	69.	A
70.	34	71.	189	72.	2	73.	98	74.	19										

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