

JEE MAIN 2025 · QUESTION PAPER

29 Jan 2025 **Shift 1**

70 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	4 Q42 to Q45
● Mathematics	20 Q46 to Q65	5 Q66 to Q70
In this PDF	70 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.

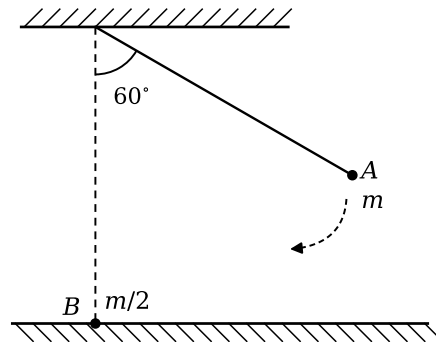
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Answers follow NTA's final answer keys. Typing errors are possible, so check doubtful answers against the official key. Spotted a mistake? prepwisar.in/feedback · Terms: prepwisar.in/terms

Q1 Collision

[Step-by-step solution](https://www.prepwiser.in/questions/ny-f7rED0y) › prepwiser.in/questions/ny-f7rED0y

As shown below, bob A of a pendulum having massless string of length 'R' is released from 60° to the vertical. It hits another bob B of half the mass that is at rest on a frictionless table in the center. Assuming elastic collision, the magnitude of the velocity of bob A after the collision will be (take g as acceleration due to gravity.)



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

Q2 Circular Motion

[Step-by-step solution](https://www.prepwiser.in/questions/gDm1NHoHeG) › prepwiser.in/questions/gDm1NHoHeG

A body of mass 'm' connected to a massless and unstretchable string goes in vertical circle of radius 'R' under gravity g. The other end of the string is fixed at the center of circle. If velocity at top of circular path is $n\sqrt{gR}$, where, $n \geq 1$, then ratio of kinetic energy of the body at bottom to that at top of the circle is:

- (A) $\frac{n^2 + 4}{n^2}$ (B) $\frac{n + 4}{n}$ (C) $\frac{n^2}{n^2 + 4}$ (D) $\frac{n}{n + 4}$

Q3 Alternating Current

[Step-by-step solution](https://www.prepwiser.in/questions/Iv_6ArYmxu) › prepwiser.in/questions/Iv_6ArYmxu

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

Assertion (A) : Choke coil is simply a coil having a large inductance but a small resistance. Choke coils are used with fluorescent mercury-tube fittings. If household electric power is directly connected to a mercury tube, the tube will be damaged.

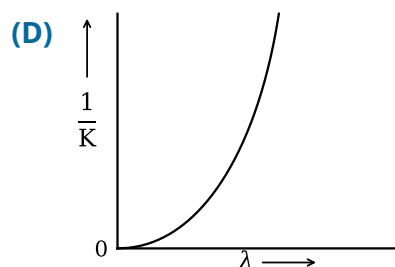
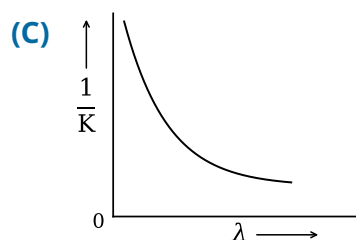
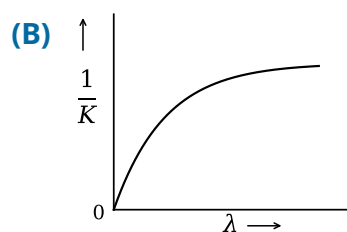
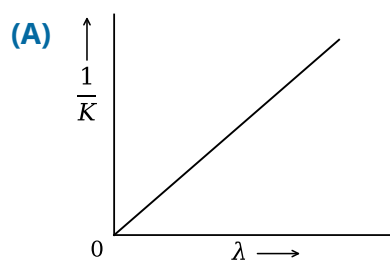
Reason (R): By using the choke coil, the voltage across the tube is reduced by a factor $(R/\sqrt{R^2 + \omega^2 L^2})$, where ω is frequency of the supply across resistor R and inductor L. If the choke coil were not used, the voltage across the resistor would be the same as the applied voltage.

In the light of the above statements, choose the **most appropriate 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) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (D) (A) is false but (R) is true

Q4 Dual Nature of Radiation & Matter[Step-by-step solution](https://www.prepwiser.in/questions/AfMIY0Sz2) › prepwiser.in/questions/AfMIY0Sz2

If λ and K are de Broglie wavelength and kinetic energy, respectively, of a particle with constant mass. The correct graphical representation for the particle will be:

**Q5** Dual Nature of Radiation & Matter[Step-by-step solution](https://www.prepwiser.in/questions/cCbAS27qxK) › prepwiser.in/questions/cCbAS27qxK

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

Assertion (A): Emission of electrons in photoelectric effect can be suppressed by applying a sufficiently negative electron potential to the photoemissive substance.

Reason (R): A negative electric potential, which stops the emission of electrons from the surface of a photoemissive substance, varies linearly with frequency of incident radiation.

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

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

Q6 Electromagnetic Induction[Step-by-step solution](https://www.prepwiser.in/questions/yAkbiIum8) › prepwiser.in/questions/yAkbiIum8

A coil of area A and N turns is rotating with angular velocity ω in a uniform magnetic field $\vec{B}$ about an axis perpendicular to $\vec{B}$. Magnetic flux ϕ and induced emf ε across it, at an instant when $\vec{B}$ is parallel to the plane of coil, are:

- (A) $\phi = AB$, $\phi = NAB\omega$ (B) $\phi = AB$, $\phi = 0$ (C) $\phi = 0$, $\varepsilon = 0$ (D) $\phi = 0$, $\varepsilon = NAB\omega$

Q7 Electromagnetic Induction[Step-by-step solution](https://www.prepwiser.in/questions/tWguyO-IOc) › prepwiser.in/questions/tWguyO-IOc

Consider I_1 and I_2 are the currents flowing simultaneously in two nearby coils 1 & 2, respectively. If L_1 = self inductance of coil 1, M_{12} = mutual inductance of coil 1 with respect to coil 2, then the value of induced emf in coil 1 will be:

- (A) $e_1 = -L_1 \frac{dI_2}{dt} - M_{12} \frac{dI_1}{dt}$ (B) $e_1 = -L_1 \frac{dI_1}{dt} + M_{12} \frac{dI_2}{dt}$ (C) $e_1 = -L_1 \frac{dI_1}{dt} - M_{12} \frac{dI_1}{dt}$ (D) $e_1 = -L_1 \frac{dI_1}{dt} - M_{12} \frac{dI_2}{dt}$

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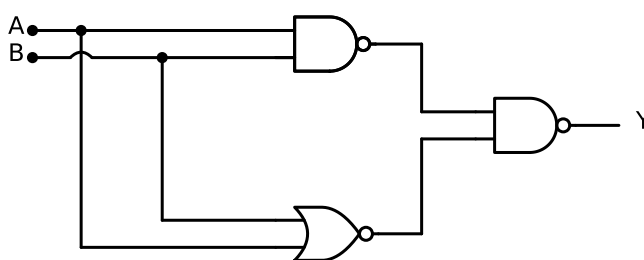
Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Electromagnetic waves carry energy but not momentum.

Reason (R): Mass of a photon 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 true and (R) is the correct explanation of (A)
 (B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (C) (A) is false but (R) is true
 (D) (A) is true but (R) is false



For the circuit shown above, equivalent GATE is:

- (A) NOT gate (B) NAND gate (C) AND gate (D) OR gate

An electric dipole of mass m , charge q , and length l is placed in a uniform electric field $\vec{E} = E_0 \hat{i}$. When the dipole is rotated slightly from its equilibrium position and released, the time period of its oscillations will be:

- (A) $\frac{1}{2\pi} \sqrt{\frac{ml}{2qE_0}}$ (B) $2\pi \sqrt{\frac{ml}{2qE_0}}$ (C) $2\pi \sqrt{\frac{ml}{qE_0}}$ (D) $\frac{1}{2\pi} \sqrt{\frac{2ml}{qE_0}}$

Match List - I with List - II.

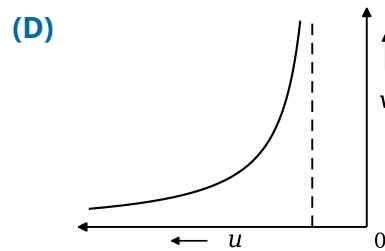
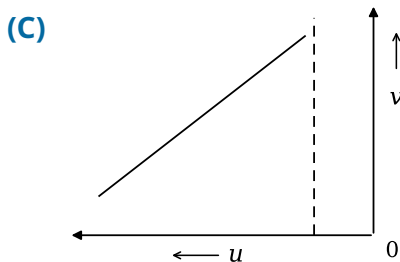
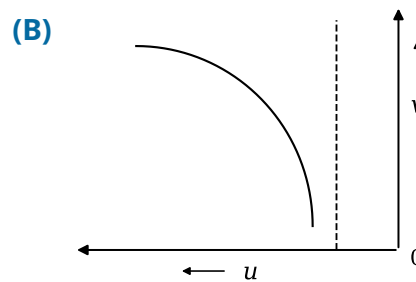
List - I	List - II
(A) Electric field inside (distance $r > 0$ from center) of a uniformly charged spherical shell with surface charge density σ , and radius R .	(I) σ/ϵ_0
(B) Electric field at distance $r > 0$ from a uniformly charged infinite plane sheet with surface charge density σ .	(II) $\sigma/2\epsilon_0$
(C) Electric field outside (distance $r > 0$ from center) of a uniformly charged spherical shell with surface charge density σ , and radius R .	(III) 0
(D) Electric field between 2 oppositely charged infinite plane parallel sheets with uniform surface charge density σ .	(IV) $\frac{\sigma}{\epsilon_0 r^2}$

Choose the correct answer from the options given below:

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

[Step-by-step solution › prepwiser.in/questions/z4tSEPQX4u](https://www.prepwiser.in/questions/z4tSEPQX4u)

(A)



Step-by-step solution › [prepwiser.in/questions/XRb_5cEgEI](https://www.prepwiser.in/questions/XRb_5cEgEI)

(A) change in its pressure (B) change in its temperature
(C) change in its specific heat (D) change in its volume

Step-by-step solution › [prepwisser.in/questions/Ldc2aDNM-K](https://www.prepwisser.in/questions/Ldc2aDNM-K)

(A) $[a/2, 3a]$ (B) $[a/4, 3a/2]$ (C) $[a/2, 2a]$ (D) $[a/4, 2a]$

[Step-by-step solution](#) › prepwiser.in/questions/0g9MdJRkp2

(A) $\frac{1 + \sin \alpha}{1 - \sin \alpha}$ (B) $\frac{1 + \sin 2\alpha}{1 - \sin 2\alpha}$ (C) $\frac{1 - \tan \alpha}{1 + \tan \alpha}$ (D) $\frac{1 - \sin 2\alpha}{1 + \sin 2\alpha}$

Step-by-step solution › [prepwiser.in/questions/MudEMesvr9](https://www.prepwiser.in/questions/MudEMesvr9)

(A) 1.0 (B) 1.25 (C) 1.75 (D) 1.5

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Q17 Simple Harmonic Motion[Step-by-step solution](#) > prepwiser.in/questions/RcqXwm6mqe

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

Assertion (A): Time period of a simple pendulum is longer at the top of a mountain than that at the base of the mountain.

Reason (R): Time period of a simple pendulum decreases with increasing value of acceleration due to gravity and vice-versa.

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

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

Q18 Units, Dimensions & Errors[Step-by-step solution](#) > prepwiser.in/questions/nKGICUKzGt

The pair of physical quantities not having the same dimensions is:

- (A) Angular momentum and Planck's constant (B) Torque and energy
 (C) Surface tension and impulse (D) Pressure and Young's modulus

Q19 Units, Dimensions & Errors[Step-by-step solution](#) > prepwiser.in/questions/tTB_2awkw

The expression given below shows the variation of velocity (v) with time (t),

$$v = At^2 + \frac{Bt}{C+t}$$

The dimension of ABC is:

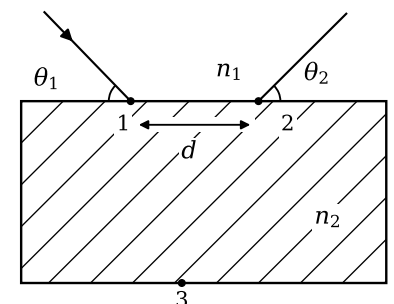
- (A) $[M^0L^1T^{-2}]$ (B) $[M^0L^2T^{-3}]$ (C) $[M^0L^2T^{-2}]$ (D) $[M^0L^1T^{-3}]$

Physics Section B · Numerical value

Q20 to Q24

Q20 Ray Optics **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/Y01mN3e7Vw

Two light beams fall on a transparent material block at point 1 and 2 with angle θ_1 and θ_2 , respectively, as shown in figure. After refraction, the beams intersect at point 3 which is exactly on the interface at other end of the block. Given : the distance between 1 and 2, $d = 4\sqrt{3}\text{cm}$ and $\theta_1 = \theta_2 = \cos^{-1}\left(\frac{n_2}{2n_1}\right)$. where refractive index of the block $n_2 >$ refractive index of the outside medium n_1 , then the thickness of the block is ____ cm.

**Q21** Kinetic Theory of Gases **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/iut4Tyh4GL

A container of fixed volume contains a gas at 27°C . To double the pressure of the gas, the temperature of gas should be raised to ____ $^\circ\text{C}$.

Q22 Projectile Motion & Relative Motion **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/4Hg9x81JJY

The maximum speed of a boat in still water is 27 km/h. Now this boat is moving downstream in a river flowing at 9 km/h. A man in the boat throws a ball vertically upwards with speed of 10 m/s. Range of the ball as observed by an observer at rest on the bank is _____ cm. (Take $g = 10 \text{ m/s}^2$)

The coordinates of a particle with respect to origin in a given reference frame is (1, 1, 1) meters. If a force of $\vec{F} = \hat{i} - \hat{j} + \hat{k}$ acts on the particle, then the magnitude of torque (with respect to origin) in z-direction is _____.

In a hydraulic lift, the surface area of the input piston is 6 cm² and that of the output piston is 1500 cm². If 100 N force is applied to the input piston to raise the output piston by 20 cm, then the work done is _____ kJ.

Chemistry Section A · Multiple choice

Q25 to Q41

Match List - I with List - II.

List - I (Carbohydrate)	List - II (Linkage Source)
(A) Amylose	(I) β - C ₁ - C ₄ , plant
(B) Cellulose	(II) α - C ₁ - C ₄ , animal
(C) Glycogen	(III) α - C ₁ - C ₄ , α - C ₁ - C ₆ , plant
(D) Amylopectin	(IV) α - C ₁ - C ₄ , plant

Choose the correct answer from the options given below:

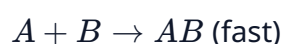
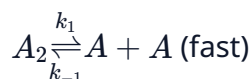
(A) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

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

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

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

The reaction $A_2 + B_2 \rightarrow 2AB$ follows the mechanism:



The overall order of the reaction is:

(A) 3

(B) 2.5

(C) 1.5

(D) 2

Match List - I with List - II.

List - I (Complex)	List - II (Hybridisation & Magnetic characters)
(A) $[MnBr_4]^{2-}$	(I) d ² sp ³ & diamagnetic
(B) $[FeF_6]^{3-}$	(II) sp ³ d ² & paramagnetic
(C) $[Co(C_2O_4)_3]^{3-}$	(III) sp ³ & diamagnetic
(D) $[Ni(CO)_4]$	(IV) sp ³ & paramagnetic

Choose the correct answer from the options given below:

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

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

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

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

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The correct option with order of melting points of the pairs (Mn, Fe), (Tc, Ru) and (Re, Os) is:

- (A) Fe < Mn, Ru < Tc and Re < Os
 (B) Fe < Mn, Ru < Tc and Os < Re
 (C) Mn < Fe, Tc < Ru and Re < Os
 (D) Mn < Fe, Tc < Ru and Os < Re

For a $\text{Mg} \mid \text{Mg}^{2+}(\text{aq}) \parallel \text{Ag}^+(\text{aq}) \mid \text{Ag}$ the correct Nernst Equation is:

- (A) $E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{2F} \ln \frac{[\text{Ag}^+]^2}{[\text{Mg}^{2+}]}$
 (B) $E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{2F} \ln \frac{[\text{Mg}^{2+}]}{[\text{Ag}^+]}$
 (C) $E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{2F} \ln \frac{[\text{Ag}^+]}{[\text{Mg}^{2+}]}$
 (D) $E_{\text{cell}} = E_{\text{cell}}^{\circ} + \frac{RT}{2F} \ln \frac{[\text{Ag}^+]^2}{[\text{Mg}^{2+}]}$

The molar conductivity of a weak electrolyte when plotted against the square root of its concentration, which of the following is expected to be observed?

- (A) Molar conductivity increases sharply with increase in concentration.
 (B) Molar conductivity decreases sharply with increase in concentration.
 (C) A small increase in molar conductivity is observed at infinite dilution.
 (D) A small decrease in molar conductivity is observed at infinite dilution.

The standard reduction potential values of some of the p-block ions are given below. Predict the one with the strongest oxidising capacity.

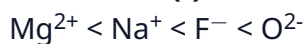
- (A) $E_{\text{Sn}^{4+}/\text{Sn}^{2+}}^{\circ} = +1.15 \text{ V}$
 (B) $E_{\text{Al}^{3+}/\text{Al}}^{\circ} = -1.66 \text{ V}$
 (C) $E_{\text{Pb}^{4+}/\text{Pb}^{2+}}^{\circ} = +1.67 \text{ V}$
 (D) $E_{\text{Tl}^{3+}/\text{Tl}}^{\circ} = +1.26 \text{ V}$

An element 'E' has the ionisation enthalpy value of 374 kJ mol^{-1} . 'E' reacts with elements A, B, C and D with electron gain enthalpy values of -328 , -349 , -325 and -295 kJ mol^{-1} , respectively. The correct order of the products EA, EB, EC and ED in terms of ionic character is:

- (A) EB > EA > EC > ED
 (B) EA > EB > EC > ED
 (C) ED > EC > EA > EB
 (D) ED > EC > EB > EA

Given below are two statements:

Statement (I): The radii of isoelectronic species increases in the order.



Statement (II): The magnitude of electron gain enthalpy of halogen decreases in the order.



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

1.24 g of AX_2 (molar mass 124 g mol^{-1}) is dissolved in 1 kg of water to form a solution with boiling point of 100.015°C , while 25.4 g of AY_2 (molar mass 250 g mol^{-1}) in 2 kg of water constitutes a solution with a boiling point of 100.0260°C .

$$K_b(\text{H}_2\text{O}) = 0.52 \text{ kg mol}^{-1}$$

Which of the following is correct?

- (A) AX_2 and AY_2 (both) are completely unionised.
(B) AX_2 and AY_2 (both) are fully ionised.
(C) AX_2 is completely unionised while AY_2 is fully ionised.
(D) AX_2 is fully ionised while AY_2 is completely unionised.

Choose the **correct** statements.

- (A) Weight of a substance is the amount of matter present in it.
(B) Mass is the force exerted by gravity on an object.
(C) Volume is the amount of space occupied by a substance.
(D) Temperatures below 0°C are possible in Celsius scale, but in Kelvin scale negative temperature is not possible.
(E) Precision refers to the closeness of various measurements for the same quantity.

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

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

If a_0 is denoted as the Bohr radius of hydrogen atom, then what is the de-Broglie wavelength (λ) of the electron present in the second orbit of hydrogen atom? [n : any integer]

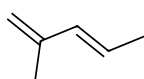
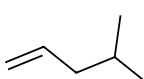
- (A) $\frac{8\pi a_0}{n}$ (B) $\frac{2a_0}{n\pi}$ (C) $\frac{na_0}{4\pi}$ (D) $\frac{4\pi a_0}{n}$

500 J of energy is transferred as heat to 0.5 mol of Argon gas at 298 K and 1.00 atm. The final temperature and the change in internal energy respectively are: Given: $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$

- (A) 368 K and 500 J (B) 348 K and 300 J (C) 378 K and 300 J (D) 378 K and 500 J

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Match List - I with List - II.

List - I (Structure)	List - II (IUPAC Name)
(A) $\text{H}_3\text{C} - \text{CH}_2 - \underset{\text{C}_2\text{H}_5}{\underset{ }{\text{CH}}} - \text{CH}_2 - \underset{\text{CH}_3}{\underset{ }{\text{CH}}} - \text{C}_2\text{H}_5$	(I) 4-Methylpent-1-ene
(B) $(\text{CH}_3)_2\text{C}(\text{C}_3\text{H}_7)_2$	(II) 3-Ethyl-5-methylheptane
(C) 	(III) 4,4-Dimethylheptane
(D) 	(IV) 2-Methyl-1,3-pentadiene

Choose the correct answer from the options given below:

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

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

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

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

Q39 Chemical Equilibrium

Step-by-step solution > prepwiser.in/questions/T9tq1N_NWF

At temperature T, compound $AB_{2(g)}$ dissociates as $AB_{2(g)} \rightleftharpoons AB_{(g)} + \frac{1}{2}B_{2(g)}$ having degree of dissociation x (small compared to unity). The correct expression for x in terms of K_p and p is:

(A) $\sqrt{K_p}$

(B) $\sqrt[3]{\frac{2K_p^2}{p}}$

(C) $\sqrt[3]{\frac{2K_p}{p}}$

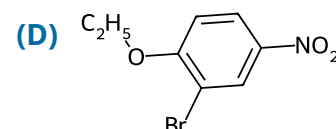
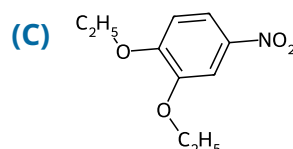
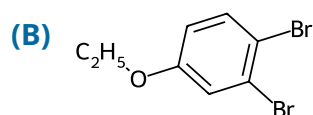
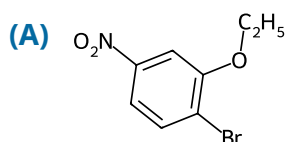
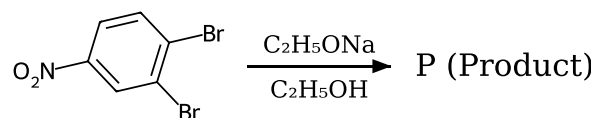
(D) $\sqrt[4]{\frac{2K_p}{p}}$

Q40 Halogen Derivatives: Haloalkanes & Haloarenes

Step-by-step solution > prepwiser.in/questions/EZXUso4do

In the following substitution reaction:

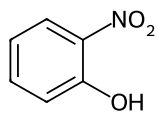
Product 'P' formed is:



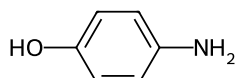
Q41 Purification & Characterisation of Organic Compounds

Step-by-step solution > prepwiser.in/questions/DINA7qDviq

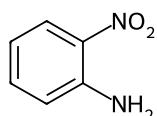
The steam volatile compounds among the following are:



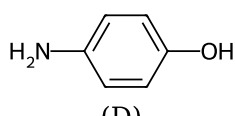
(A)



(C)



(B)



(D)

Choose the correct answer from the options given below:

(A) (B) and (D) Only

(B) (A), (B) and (C) Only

(C) (A) and (B) Only

(D) (A) and (C) Only

Q42 d & f Block Elements **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/A93i1Ta1Sx

The molar mass of the water insoluble product formed from the fusion of chromite ore (FeCr_2O_4) with Na_2CO_3 in presence of O_2 is _____ g mol^{-1} .

Q43 Chemical Bonding & Molecular Structure **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/vyPXF-sRCs

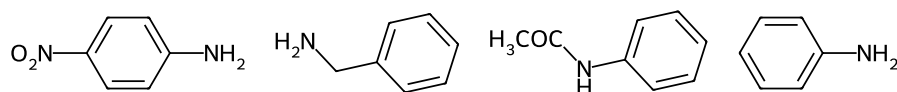
The sum of sigma (σ) and pi (π) bonds in Hex-1,3-dien-5-yne is _____.

Q44 Solutions & Colligative Properties **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/3R8zSpearE

If A_2B is 30% ionised in an aqueous solution, then the value of van't Hoff factor (i) is _____ $\times 10^{-1}$.

Q45 Amines & Diazonium Salts **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/cqS2paILqL

Given below are some nitrogen containing compounds:



Each of them is treated with HCl separately. 1.0 g of the most basic compound will consume _____ mg of HCl.

(Given molar mass in g mol^{-1} C : 12, H : 1, O : 16, Cl : 35.5)

Mathematics Section A · Multiple choice

Q46 to Q65

Q46 Three Dimensional Geometry[Step-by-step solution](#) > prepwiser.in/questions/hX8vUVtENm

Let $L_1 : \frac{x-1}{1} = \frac{y-2}{-1} = \frac{z-1}{2}$ and $L_2 : \frac{x+1}{-1} = \frac{y-2}{2} = \frac{z}{1}$ be two lines.

Let L_3 be a line passing through the point (α, β, γ) and be perpendicular to both L_1 and L_2 . If L_3 intersects L_1 , then $|5\alpha - 11\beta - 8\gamma|$ equals:

- (A) 25 (B) 20 (C) 16 (D) 18

Q47 Binomial Theorem[Step-by-step solution](#) > prepwiser.in/questions/toPoqyVmsR

The least value of n for which the number of integral terms in the Binomial expansion of $(\sqrt[3]{7} + \sqrt[12]{11})^n$ is 183, is:

- (A) 2184 (B) 2172 (C) 2196 (D) 2148

Q48 Circles[Step-by-step solution](#) > prepwiser.in/questions/ubrbijC2E9

Let the line $x+y=1$ meet the circle $x^2 + y^2 = 4$ at the points A and B. If the line perpendicular to AB and passing through the mid-point of the chord AB intersects the circle at C and D, then the area of the quadrilateral ABCD is equal to:

- (A) $\sqrt{14}$ (B) $3\sqrt{7}$ (C) $2\sqrt{14}$ (D) $5\sqrt{7}$

Q49 Complex Numbers[Step-by-step solution](#) > prepwiser.in/questions/b7rAXt9vpE

Let $|z_1 - 8 - 2i| \leq 1$ and $|z_2 - 2 + 6i| \leq 2$, $z_1, z_2 \in \mathbb{C}$. Then the minimum value of $|z_1 - z_2|$ is:

- (A) 3 (B) 10 (C) 7 (D) 13

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Q50 Definite Integration[Step-by-step solution](https://www.prepwisar.in/questions/8q7jZy9Hwo) > prepwisar.in/questions/8q7jZy9Hwo

The integral $80 \int_0^{\frac{\pi}{4}} \left(\frac{\sin \theta + \cos \theta}{9 + 16 \sin 2\theta} \right) d\theta$ is equal to:

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

Q51 Differential Equations[Step-by-step solution](https://www.prepwisar.in/questions/v9pVrte_4U) > prepwisar.in/questions/v9pVrte_4U

Let $y = y(x)$ be the solution of the differential equation:

$\cos x (\log_e (\cos x))^2 dy + (\sin x - 3y \sin x \log_e (\cos x)) dx = 0$, $x \in (0, \frac{\pi}{2})$. If $y(\frac{\pi}{4}) = -\frac{1}{\log_e 2}$, then $y(\frac{\pi}{6})$ is equal to:

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

Q52 Ellipse[Step-by-step solution](https://www.prepwisar.in/questions/rGKW-s8UID) > prepwisar.in/questions/rGKW-s8UID

Let the ellipse $E_1 : \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, $a > b$ and $E_2 : \frac{x^2}{A^2} + \frac{y^2}{B^2} = 1$, $A < B$ have same eccentricity $\frac{1}{\sqrt{3}}$. Let the product of their lengths of latus rectums be $\frac{32}{\sqrt{3}}$ and the distance between the foci of E_1 be 4. If E_1 and E_2 meet at A, B, C and D, then the area of the quadrilateral ABCD equals:

- (A) $\frac{24\sqrt{6}}{5}$ (B) $\frac{18\sqrt{6}}{5}$ (C) $6\sqrt{6}$ (D) $\frac{12\sqrt{6}}{5}$

Q53 Sequences & Series[Step-by-step solution](https://www.prepwisar.in/questions/-ACz78ZEj3) > prepwisar.in/questions/-ACz78ZEj3

The value of $\lim_{n \rightarrow \infty} \left(\sum_{k=1}^n \frac{k^3 + 6k^2 + 11k + 5}{(k+3)!} \right)$ is:

- (A) $5/3$ (B) 2 (C) $4/3$ (D) $7/3$

Q54 Determinants[Step-by-step solution](https://www.prepwisar.in/questions/SNhWtWJKDD) > prepwisar.in/questions/SNhWtWJKDD

Let $A = [a_{ij}] = \begin{bmatrix} \log_5 128 & \log_4 5 \\ \log_5 8 & \log_4 25 \end{bmatrix}$. If A_{ij} is the cofactor of a_{ij} , $C_{ij} = \sum_{k=1}^2 a_{ik} A_{jk}$, $1 \leq i, j \leq 2$, and $C = [C_{ij}]$, then $8|C|$ is equal to:

- (A) 288 (B) 262 (C) 222 (D) 242

Q55 Determinants[Step-by-step solution](https://www.prepwisar.in/questions/BIUegCiaw-) > prepwisar.in/questions/BIUegCiaw-

Let M and m respectively be the maximum and the minimum values of

$$f(x) = \begin{vmatrix} 1 + \sin^2 x & \cos^2 x & 4 \sin 4x \\ \sin^2 x & 1 + \cos^2 x & 4 \sin 4x \\ \sin^2 x & \cos^2 x & 1 + 4 \sin 4x \end{vmatrix}, x \in R$$

Then $M^4 - m^4$ is equal to:

- (A) 1280 (B) 1040 (C) 1215 (D) 1295

Q56 Parabola[Step-by-step solution](https://www.prepwisar.in/questions/N_kCDvxns) > prepwisar.in/questions/N_kCDvxns

Two parabolas have the same focus (4, 3) and their directrices are the x-axis and the y-axis, respectively. If these parabolas intersect at the points A and B, then $(AB)^2$ is equal to:

- (A) 384 (B) 392 (C) 96 (D) 192

Q57 Permutations & Combinations[Step-by-step solution](https://www.prepwisar.in/questions/KB5TY27M1R) > prepwisar.in/questions/KB5TY27M1R

Let P be the set of seven digit numbers with sum of their digits equal to 11. If the numbers in P are formed by using the digits 1, 2 and 3 only, then the number of elements in the set P is:

- (A) 164 (B) 158 (C) 161 (D) 173

Q58 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](https://www.prepwisar.in/questions/v3GOvw48KK) > prepwisar.in/questions/v3GOvw48KK

The number of solutions of the equation

$$\left(\frac{9}{x} - \frac{9}{\sqrt{x}} + 2\right) \left(\frac{2}{x} - \frac{7}{\sqrt{x}} + 3\right) = 0 \text{ is:}$$

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

Q59 Sequences & Series[Step-by-step solution](https://www.prepwisar.in/questions/nfyEPwhT95) > prepwisar.in/questions/nfyEPwhT95

Consider an A. P. of positive integers, whose sum of the first three terms is 54 and the sum of the first twenty terms lies between 1600 and 1800. Then its 11th term is:

- (A) 108 (B) 90 (C) 122 (D) 84

Q60 Relations & Functions (Basic)[Step-by-step solution](https://www.prepwisar.in/questions/aCtrjG3At3) > prepwisar.in/questions/aCtrjG3At3

Define a relation R on the interval $\left[0, \frac{\pi}{2}\right)$ by $x R y$ if and only if $\sec^2 x - \tan^2 y = 1$. Then R is:

- (A) both reflexive and symmetric but not transitive
(B) both reflexive and transitive but not symmetric
(C) reflexive but neither symmetric nor transitive
(D) an equivalence relation

Q61 Statistics[Step-by-step solution](https://www.prepwisar.in/questions/FOYD_RAxGw) > prepwisar.in/questions/FOYD_RAxGw

Let $x_1, x_2, \dots, x_{10}$ be ten observations such that $\sum_{i=1}^{10} (x_i - 2) = 30$, $\sum_{i=1}^{10} (x_i - \beta)^2 = 98$, $\beta > 2$, and their variance is $\frac{4}{5}$. If μ and σ^2 are respectively the mean and the variance of $2(x_1 - 1) + 4\beta, 2(x_2 - 1) + 4\beta, \dots, 2(x_{10} - 1) + 4\beta$, then $\frac{\beta\mu}{\sigma^2}$ is equal to:

- (A) 100 (B) 90 (C) 120 (D) 110

Q62 Three Dimensional Geometry[Step-by-step solution](https://www.prepwisar.in/questions/TXN8yGANeC) > prepwisar.in/questions/TXN8yGANeC

Let $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + 7\hat{j} + 3\hat{k}$. Let $L_1 : \vec{r} = (-\hat{i} + 2\hat{j} + \hat{k}) + \lambda\vec{a}, \lambda \in \mathbf{R}$ and $L_2 : \vec{r} = (\hat{j} + \hat{k}) + \mu\vec{b}, \mu \in \mathbf{R}$ be two lines. If the line L_3 passes through the point of intersection of L_1 and L_2 and is parallel to $\vec{a} + \vec{b}$, then L_3 passes through the point:

- (A) $(-1, -1, 1)$ (B) $(2, 8, 5)$ (C) $(8, 26, 12)$ (D) $(5, 17, 4)$

Q63 Vectors[Step-by-step solution](https://www.prepwisar.in/questions/zyuEPsVSAK) > prepwisar.in/questions/zyuEPsVSAK

Let $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}, \vec{b} = 3\hat{i} - 5\hat{j} + \hat{k}$ and $\vec{c}$ be a vector such that $\vec{a} \times \vec{c} = \vec{a} \times \vec{b} = \vec{c} \times \vec{b}$ and $(\vec{a} + \vec{c}) \cdot (\vec{b} + \vec{c}) = 168$. Then the maximum value of $|\vec{c}|^2$ is:

- (A) 77 (B) 154 (C) 308 (D) 462

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Let the area of the region

$(x, y) : 2y \leq x^2 + 3, y + |x| \leq 3, y \geq |x - 1|$ be A . Then $6A$ is equal to:

(A) 14

(B) 18

(C) 16

(D) 12

Let ΔABC be a triangle formed by the lines $7x - 6y + 3 = 0$, $x + 2y - 31 = 0$ and $9x - 2y - 19 = 0$. Let the point (h, k) be the image of the centroid of ΔABC in the line $3x + 6y - 53 = 0$. Then $h^2 + k^2 + hk$ is equal to:

(A) 47

(B) 37

(C) 40

(D) 36

Mathematics Section B · Numerical value

Q66 to Q70

Let $f : (0, \infty) \rightarrow \mathbf{R}$ be a twice differentiable function. If for some $a \neq 0$, $\int_0^1 f(\lambda x) d\lambda = af(x)$, $f(1) = 1$ and $f(16) = \frac{1}{8}$, then $16 - f'(\frac{1}{16})$ is equal to _____.

Let $S = \{x : \cos^{-1} x = \pi + \sin^{-1} x + \sin^{-1}[2x + 1]\}$. Then $\sum_{x \in S} (2x - 1)^2$ is equal to _____.

Let $[t]$ be the greatest integer less than or equal to t . Then the least value of $p \in \mathbf{N}$ for which

$\lim_{x \rightarrow 0^+} (x([\frac{1}{x}] + [\frac{2}{x}] + \dots + [\frac{p}{x}]) - x^2([\frac{1}{x^2}] + [\frac{2^2}{x^2}] + \dots + [\frac{p^2}{x^2}])) \geq 1$ is equal to _____.

Let $S = \{m \in \mathbf{Z} : A^{m^2} + A^m = 3I - A^{-6}\}$, where $A = \begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$. Then $n(S)$ is equal to _____.

The number of 6-letter words, with or without meaning, that can be formed using the letters of the word MATHS such that any letter that appears in the word must appear at least twice, is _____.

Answer key: JEE Main 2025 · 29 Jan · Shift 1

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Physics

1.	B	2.	A	3.	B	4.	D	5.	B	6.	D	7.	D	8.	C
9.	D	10.	B	11.	C	12.	D	13.	B	14.	C	15.	D	16.	B
17.	C	18.	C	19.	B	20.	6	21.	327	22.	2000	23.	2	24.	5

Chemistry

25.	D	26.	C	27.	C	28.	D	29.	D	30.	B	31.	C	32.	A
33.	B	34.	D	35.	C	36.	A	37.	B	38.	A	39.	B	40.	D
41.	C	42.	160	43.	15	44.	16	45.	341						

Mathematics

46.	A	47.	A	48.	C	49.	C	50.	B	51.	D	52.	A	53.	A
54.	D	55.	A	56.	D	57.	C	58.	D	59.	B	60.	D	61.	A
62.	C	63.	A	64.	A	65.	B	66.	112	67.	5	68.	24	69.	2
70.	1405														

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