

JEE MAIN 2026 · QUESTION PAPER

23 Jan 2026 **Shift 2**

73 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	19 Q25 to Q43	5 Q44 to Q48
● Mathematics	20 Q49 to Q68	5 Q69 to Q73
In this PDF	73 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.

prepwisar.in/pyqs/paper/2026-01-23-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? prepwisar.in/feedback · Terms: prepwisar.in/terms

Q1 Electromagnetic Waves

[Step-by-step solution](#) › [prepwiser.in/questions/MbzwymPK6k](#)

The ratio of speeds of electromagnetic waves in vacuum and a medium, having dielectric constant $k = 3$ and permeability of $\mu = 2\mu_0$, is (μ_0 = permeability of vacuum)

- (A) 6 : 1 (B) 3 : 2 (C) $\sqrt{6}$: 1 (D) 36 : 1

Q2 Moving Charges & Magnetism

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

The current passing through a conducting loop in the form of equilateral triangle of side $4\sqrt{3}\text{cm}$ is 2 A. The magnetic field at its centroid is $\alpha \times 10^{-5}\text{T}$. The value of α is ____.

(Given: $\mu_0 = 4\pi \times 10^{-7}$ SI units)

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

Q3 Wave Optics

[Step-by-step solution](#) › [prepwiser.in/questions/tBpL7HwWFg](#)

When an unpolarized light falls at a particular angle on a glass plate (placed in air), it is observed that the reflected beam is linearly polarized. The angle of refracted beam with respect to the normal is ____.

($\tan^{-1}(1.52) = 57.7^\circ$, refractive indices of air and glass are 1.00 and 1.52, respectively.)

- (A) 36.3° (B) 39.6° (C) 42.6° (D) 32.3°

Q4 Nuclear Physics

[Step-by-step solution](#) › [prepwiser.in/questions/8NOTHG7pXr](#)

Which of the following pair of nuclei are isobars of the element?

- (A) ${}^3_1\text{H}$ and ${}^3_2\text{He}$ (B) ${}^{198}_{80}\text{Hg}$ and ${}^{197}_{79}\text{Au}$ (C) ${}^2_1\text{H}$ and ${}^3_1\text{H}$ (D) ${}^{236}_{92}\text{U}$ and ${}^{238}_{92}\text{U}$

Q5 Units, Dimensions & Errors

[Step-by-step solution](#) › [prepwiser.in/questions/t3ZDUow5L5](#)

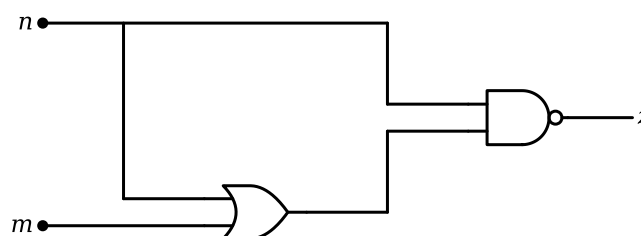
To compare EMF of two cells using potentiometer the balancing lengths obtained are 200 cm and 150 cm. The least count of scale is 1 cm. The percentage error in the ratio of EMFs is ____

- (A) 1.75 (B) 1.55 (C) 1.17 (D) 1.65

Q6 Semiconductors & Electronic Devices

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

For the given logic gate circuit, which of the following is the correct truth table?



- | (A) | <table border="0"> <tr><th>n</th><th>m</th><th>z</th></tr> <tr><td>0</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td></tr> </table> | n | m | z | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | (B) | <table border="0"> <tr><th>n</th><th>m</th><th>z</th></tr> <tr><td>0</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td></tr> </table> | n | m | z | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | (C) | <table border="0"> <tr><th>n</th><th>m</th><th>z</th></tr> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td></tr> </table> | n | m | z | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | (D) | <table border="0"> <tr><th>n</th><th>m</th><th>z</th></tr> <tr><td>0</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td></tr> </table> | n | m | z | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
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Q7 Thermodynamics[Step-by-step solution](#) > [prepwisar.in/questions/9_BGJHNMCH](https://www.prepwisar.in/questions/9_BGJHNMCH)

One mole of an ideal diatomic gas expands from volume V to $2V$ isothermally at a temperature 27°C and does W joule of work. If the gas undergoes same magnitude of expansion adiabatically from 27°C doing the same amount of work W , then its final temperature will be (close to) _____ $^\circ\text{C}$.

($\log_e 2 = 0.693$)

- (A) -56 (B) -117 (C) -30 (D) -189

Q8 Thermodynamics[Step-by-step solution](#) > [prepwisar.in/questions/1GruCUUqsu](https://www.prepwisar.in/questions/1GruCUUqsu)

The internal energy of a monoatomic gas is $3nRT$. One mole of helium is kept in a cylinder having internal cross section area of 17cm^2 and fitted with a light movable frictionless piston. The gas is heated slowly by supplying 126 J heat. If the temperature rises by 4°C , then the piston will move _____ cm.

(atmospheric pressure = 10^5Pa)

- (A) 1.55 (B) 14.5 (C) 15.5 (D) 1.45

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

An air bubble of volume 2.9cm^3 rises from the bottom of a swimming pool of 5 m deep. At the bottom of the pool water temperature is 17°C . The volume of the bubble when it reaches the surface, where the water temperature is 27°C , is _____ cm^3 .

($g = 10\text{m/s}^2$, density of water = 10^3kg/m^3 , and 1 atm pressure is 10^5Pa)

- (A) 2.0 (B) 4.2 (C) 3.0 (D) 4.5

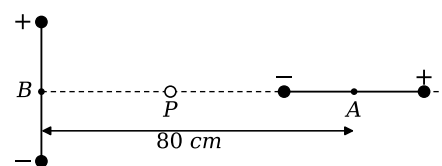
Q10 Electrostatics II: Potential & Capacitance[Step-by-step solution](#) > [prepwisar.in/questions/QDmIvty8dR](https://www.prepwisar.in/questions/QDmIvty8dR)

A parallel plate capacitor with plate separation 5 mm is charged by a battery. On introducing a mica sheet of 2 mm and maintaining the connections of the plates with the terminals of the battery, it is found that it draws 25% more charge from the battery. The dielectric constant of mica is _____

- (A) 1.0 (B) 2.5 (C) 1.5 (D) 2.0

Q11 Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution](#) > [prepwisar.in/questions/shHbIDBKCb](https://www.prepwisar.in/questions/shHbIDBKCb)

Two short dipoles (A, B), A having charges $\pm 2\mu\text{C}$ and length 1 cm and B having charges $\pm 4\mu\text{C}$ and length 1 cm are placed with their centres 80 cm apart as shown in the figure. The electric field at a point P , equi-distant from the centres of both dipoles is _____ N/C .



- (A) $\frac{9}{16}\sqrt{2} \times 10^5$ (B) $\frac{9}{16}\sqrt{2} \times 10^4$ (C) $9\sqrt{2} \times 10^4$ (D) $4.5\sqrt{2} \times 10^4$

Q12 Electrostatics II: Potential & Capacitance[Step-by-step solution](#) > [prepwisar.in/questions/-RvdKd3QTd](https://www.prepwisar.in/questions/-RvdKd3QTd)

Two charges $7\mu\text{C}$ and $-2\mu\text{C}$ are placed at $(-9, 0, 0)\text{cm}$ and $(9, 0, 0)\text{cm}$ respectively in an external field $E = \frac{A}{r^2}\hat{r}$, where $A = 9 \times 10^5\text{N/C}\cdot\text{m}^2$. Considering the potential at infinity is 0, the electrostatic energy of the configuration is _____ J.

- (A) 49.3 (B) 1.4 (C) 24.3 (D) -90.7

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Q13 Newton's Laws of Motion[Step-by-step solution > prepwise.in/questions/hyNbyz9Qf2](https://www.prepwise.in/questions/hyNbyz9Qf2)

A block is sliding down on an inclined plane of slope θ and at an instant $t = 0$ this block is given an upward momentum so that it starts moving up on the inclined surface with velocity u . The distance (S) travelled by the block before its velocity become zero, is ____.

(g = gravitational acceleration)

- (A) $\frac{2u^2}{g \cos \theta}$ (B) $\frac{u^2}{\sqrt{2}g \cos \theta}$ (C) $\frac{u^2}{2g \sin \theta}$ (D) $\frac{u^2}{2g \cos \theta}$

Q14 Rectilinear Motion[Step-by-step solution > prepwise.in/questions/avuXMGnx6S](https://www.prepwise.in/questions/avuXMGnx6S)

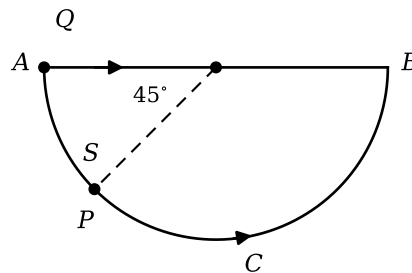
A paratrooper jumps from an aeroplane and opens a parachute after 2 s of free fall and starts deaccelerating with 3m/s^2 . At 10 m height from ground, while descending with the help of parachute, the speed of paratrooper is 5m/s . The initial height of the airplane is ____ m.

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

- (A) 92.5 (B) 62.5 (C) 20 (D) 82.5

Q15 Work, Energy & Power[Step-by-step solution > prepwise.in/questions/PR5urmTt_v](https://www.prepwise.in/questions/PR5urmTt_v)

A bead P sliding on a frictionless semi-circular string (ACB) and it is at point S at $t = 0$ and at this instant the horizontal component of its velocity is v . Another bead Q of the same mass as P is ejected from point A at $t = 0$ along the horizontal string AB , with the speed v , friction between the beads and the respective strings may be neglected in both cases. Let t_P and t_Q be the respective times taken by beads P and Q to reach the point B , then the relation between t_P and t_Q is



- (A) $t_P < t_Q$ (B) $t_P = t_Q$ (C) $t_P > 1.25t_Q$ (D) $t_P > t_Q$

Q16 Centre of Mass & Linear Momentum[Step-by-step solution > prepwise.in/questions/PVmMTn9Bfz](https://www.prepwise.in/questions/PVmMTn9Bfz)

A body of mass 14 kg initially at rest explodes and breaks into three fragments of masses in the ratio 2 : 2 : 3. The two pieces of equal masses fly off perpendicular to each other with a speed of 18m/s each. The velocity of the heavier fragment is ____ m/s.

- (A) $24\sqrt{2}$ (B) 12 (C) $12\sqrt{2}$ (D) $10\sqrt{2}$

Q17 Electromagnetic Induction[Step-by-step solution > prepwise.in/questions/GqQVUHSVBF](https://www.prepwise.in/questions/GqQVUHSVBF)

A circular loop of radius 7 cm is placed in uniform magnetic field of 0.2 T directed perpendicular to plane of loop. The loop is converted into a square loop in 0.5 s. The EMF induced in the loop is ____ mV.

- (A) 13.2 (B) 6.6 (C) 1.32 (D) 8.25

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Q18 Electromagnetic Induction[Step-by-step solution > prepwisar.in/questions/5q6p7cG65d](https://www.prepwisar.in/questions/5q6p7cG65d)

Suppose a long solenoid of 100 cm length, radius 2 cm having 500 turns per unit length, carries a current $I = 10 \sin(\omega t)$ A, where $\omega = 1000 \text{ rad./s}$. A circular conducting loop (B) of radius 1 cm coaxially slid through the solenoid at a speed $v = 1 \text{ cm/s}$. The r.m.s. current through the loop when the coil B is inserted 10 cm inside the solenoid is $\frac{\alpha}{\sqrt{2}} \mu\text{A}$. The value of α is ____.

[Resistance of the loop = 10Ω]

(A) 80**(B)** 280**(C)** 100**(D)** 197**Q19** Fluid Mechanics[Step-by-step solution > prepwisar.in/questions/QiM7IDs2Mf](https://www.prepwisar.in/questions/QiM7IDs2Mf)

A small metallic sphere of diameter 2 mm and density 10.5 g/cm^3 is dropped in glycerine having viscosity 10 Poise and density 1.5 g/cm^3 respectively. The terminal velocity attained by the sphere is ____ cm/s.

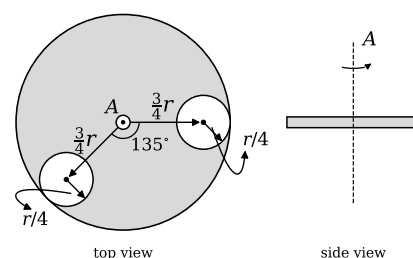
($\pi = \frac{22}{7}$ and $g = 10 \text{ m/s}^2$)

(A) 1.0**(B)** 1.5**(C)** 3.0**(D)** 2.0**Physics Section B · Numerical value**

Q20 to Q24

Q20 Rotational Motion**NUMERICAL**[Step-by-step solution > prepwisar.in/questions/1eFcQceV75](https://www.prepwisar.in/questions/1eFcQceV75)

Suppose there is a uniform circular disc of mass $M \text{ kg}$ and radius $r \text{ m}$ shown in figure. The shaded regions are cut out from the disc. The moment of inertia of the remainder about the axis A of the disc is given by $\frac{x}{256} Mr^2$. The value of x is ____.

**Q21** Nuclear Physics**NUMERICAL**[Step-by-step solution > prepwisar.in/questions/sAPbAfch75](https://www.prepwisar.in/questions/sAPbAfch75)

The average energy released per fission for the nucleus of ${}^{235}_{92}\text{U}$ is 190 MeV. When all the atoms of 47 g pure ${}^{235}_{92}\text{U}$ undergo fission process, the energy released is $\alpha \times 10^{23} \text{ MeV}$. The value of α is ____.

(Avogadro Number = 6×10^{23} per mole)

Q22 Sound Waves**NUMERICAL**[Step-by-step solution > prepwisar.in/questions/kdFWoDgqFn](https://www.prepwisar.in/questions/kdFWoDgqFn)

The velocity of sound in air is doubled when the temperature is raised from 0°C to $\alpha^\circ\text{C}$. The value of α is ____.

Q23 Ray Optics**NUMERICAL**[Step-by-step solution > prepwisar.in/questions/ZRggMN6GCE](https://www.prepwisar.in/questions/ZRggMN6GCE)

The size of the images of an object, formed by a thin lens are equal when the object is placed at two different positions 8 cm and 24 cm from the lens. The focal length of the lens is ____ cm.

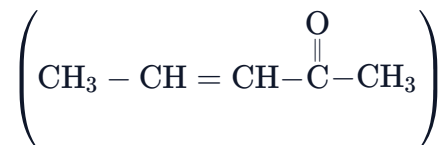
Q24 Fluid Mechanics**NUMERICAL**[Step-by-step solution > prepwisar.in/questions/EwdysQmo-s](https://www.prepwisar.in/questions/EwdysQmo-s)

A ball of radius r and density ρ dropped through a viscous liquid of density σ and viscosity η attains its terminal velocity at time t , given by $t = A \rho^a r^b \eta^c \sigma^d$, where A is a constant and a, b, c and d are integers. The value of $\frac{b+c}{a+d}$ is ____.

Q25 Aldehydes & Ketones[Step-by-step solution](https://www.prepwiser.in/questions/6NsyFXp4Wo) › prepwiser.in/questions/6NsyFXp4Wo

Which of the following statements are TRUE about Haloform reaction?

- A. Sodium hypochlorite reacts with KI to give KOI.
B. KOI is a reducing agent.
C. α, β -unsaturated methylketone



will give iodoform reaction.

D. Isopropyl alcohol will not give iodoform test.

E. Methanoic acid will give positive iodoform test.

Choose the correct answer from the options given below:

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

Q26 Practical Organic Chemistry[Step-by-step solution](https://www.prepwiser.in/questions/9p7m3Llt2q) › prepwiser.in/questions/9p7m3Llt2q

Iodoform test can differentiate between

- A. Methanol and Ethanol
B. CH_3COOH and $\text{CH}_3\text{CH}_2\text{COOH}$
C. Cyclohexene and cyclohexanone
D. Diethyl ether and Pentan-3-one
E. Anisole and acetone

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

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

Q27 Coordination Compounds[Step-by-step solution](https://www.prepwiser.in/questions/UGW3HMZ0HM) › prepwiser.in/questions/UGW3HMZ0HM

Identify the CORRECT set of details from the following:

- A. $[\text{Co}(\text{NH}_3)_6]^{3+}$: Inner orbital complex; d^2sp^3 hybridized
B. $[\text{MnCl}_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized
C. $[\text{CoF}_6]^{3-}$: Outer orbital complex; d^2sp^3 hybridized
D. $[\text{FeF}_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized
E. $[\text{Ni}(\text{CN})_4]^{2-}$: Inner orbital complex; sp^3 hybridized

Choose the correct answer from the options given below:

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

Q28 Atomic Structure[Step-by-step solution](https://www.prepwiser.in/questions/YhcWA6Xrhp) › prepwiser.in/questions/YhcWA6Xrhp

The work functions of two metals (M_A and M_B) are in the 1 : 2 ratio. When these metals are exposed to photons of energy 6 eV, the kinetic energy of liberated electrons of $M_A : M_B$ is in the ratio of 2.642 : 1. The work functions (in eV) of M_A and M_B are respectively.

- (A) 3.1, 6.2 (B) 1.5, 3.0 (C) 2.3, 4.6 (D) 1.4, 2.8

Identify the **INCORRECT** statements from the following:

- A. Notation ${}^{24}_{12}\text{Mg}$ represents 24 protons and 12 neutrons.
 B. Wavelength of a radiation of frequency $4.5 \times 10^{15}\text{s}^{-1}$ is $6.7 \times 10^{-8}\text{m}$.
 C. One radiation has wavelength = $\lambda_1(900\text{nm})$ and energy = E_1 . Other radiation has wavelength = $\lambda_2(300\text{nm})$ and energy = E_2 . $E_1 : E_2 = 3 : 1$.
 D. Number of photons of light of wavelength 2000 pm that provides 1 J of energy is 1.006×10^{16} .

Choose the correct answer from the options given below:

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

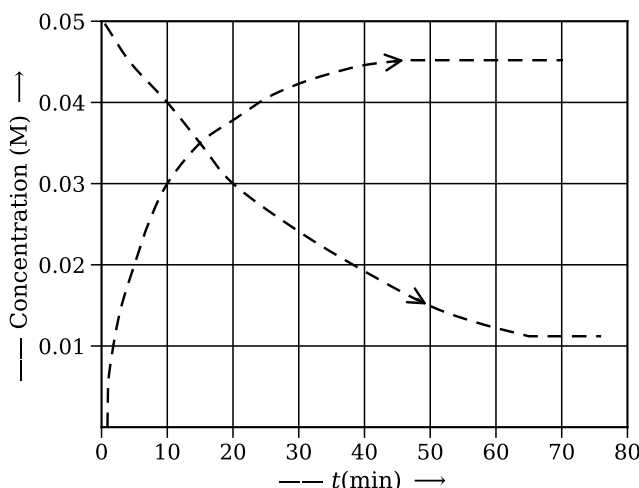
Given below are two statements:

Statement I: $(\text{CH}_3)_3\text{C}^\oplus$ is more stable than $\text{CH}_3^\oplus$ as nine hyperconjugation interactions are possible in $(\text{CH}_3)_3\text{C}^\oplus$.

Statement II: $\text{CH}_3^\oplus$ is less stable than $(\text{CH}_3)_3\text{C}^\oplus$ as only three hyperconjugation interactions are possible in $\text{CH}_3^\oplus$.

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



Given above is the concentration vs time plot for a dissociation reaction: $\text{A} \rightarrow n\text{B}$.

Based on the data of the initial phase of the reaction (initial 10 min), the value of n is ____.

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

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Observe the following reactions at T(K).

I. $A \rightarrow \text{products}$.



Both the reactions are started at 10.00 am. The rates of these reactions at 10.10 am are same. The value of $-\frac{\Delta[\text{Br}^-]}{\Delta t}$ at 10.10 am is $2 \times 10^{-4} \text{molL}^{-1} \text{min}^{-1}$. The concentration of A at 10.10 am is 10^{-2}molL^{-1} . What is the first order rate constant (in min^{-1}) of reaction I?

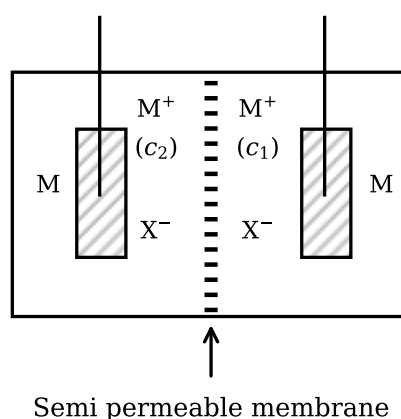
- (A) 4×10^{-3} (B) 2×10^{-3} (C) 10^{-3} (D) 10^{-2}

In Carius method 0.2425 g of an organic compound gave 0.5253 g silver chloride. The percentage of chlorine in the organic compound is

- (A) 87.65% (B) 53.58% (C) 37.57% (D) 34.79%

Both human DNA and RNA are chiral molecules. The chirality in DNA and RNA arises due to the presence of

- (A) L-sugar component (B) D-sugar component
(C) Chiral phosphate unit (D) Base unit



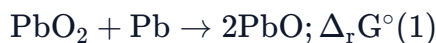
Consider the above electrochemical cell where a metal electrode (M) is undergoing redox reaction by forming M^+ ($\text{M} \rightarrow \text{M}^+ + \text{e}^-$). The cation M^+ is present in two different concentrations c_1 and c_2 as shown above. Which of the following statement is correct for generating a positive cell potential?

- (A) If c_1 is present at anode, then $c_1 > c_2$. (B) If c_1 is present at cathode, then $c_1 > c_2$.
(C) If c_1 is present at cathode, then $c_1 < c_2$. (D) If c_1 is present at anode, then $c_1 = c_2$.

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Q36 p-Block Elements: Part I (Group 13 & 14)[Step-by-step solution](https://www.prepwisar.in/questions/Wn6vmUSzz1) › prepwisar.in/questions/Wn6vmUSzz1

It is noticed that Pb^{2+} is more stable than Pb^{4+} but Sn^{2+} is less stable than Sn^{4+} . Observe the following reactions.



Identify the correct set from the following

(A) $\Delta_r G^\circ(1) > 0; \Delta_r G^\circ(2) < 0$

(B) $\Delta_r G^\circ(1) < 0; \Delta_r G^\circ(2) > 0$

(C) $\Delta_r G^\circ(1) < 0; \Delta_r G^\circ(2) < 0$

(D) $\Delta_r G^\circ(1) > 0; \Delta_r G^\circ(2) > 0$

Q37 Redox Reactions[Step-by-step solution](https://www.prepwisar.in/questions/GUF0au6xs6) › prepwisar.in/questions/GUF0au6xs6

The oxidation state of chromium in the final product formed in the reaction between KI and acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution is:

(A) +2

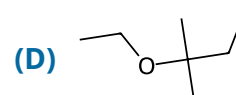
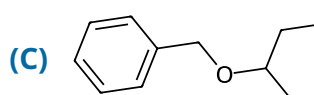
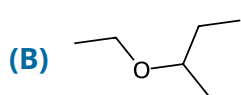
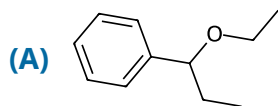
(B) +3

(C) +4

(D) +6

Q38 Alcohols, Phenols & Ethers[Step-by-step solution](https://www.prepwisar.in/questions/Ry3hfnISfY) › prepwisar.in/questions/Ry3hfnISfY

A mixed ether (P), when heated with excess of hot concentrated hydrogen iodide produces two different alkyl iodides which when treated with aq. NaOH give compounds (Q) and (R). Both (Q) and (R) give yellow precipitate with NaOI. Identify the mixed ether (P):

**Q39** Chemical Bonding & Molecular Structure[Step-by-step solution](https://www.prepwisar.in/questions/0xY7W4_QLI) › prepwisar.in/questions/0xY7W4_QLI

Which statements are **NOT TRUE** about XeO_2F_2 ?

A. It has a see-saw shape.

B. Xe has 5 electron pairs in its valence shell in XeO_2F_2 .

C. The $\text{O} - \text{Xe} - \text{O}$ bond angle is close to 180° .

D. The $\text{F} - \text{Xe} - \text{F}$ bond angle is close to 180° .

E. Xe has 16 valence electrons in XeO_2F_2 .

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

(A) B, D and E Only

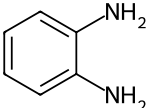
(B) B and D Only

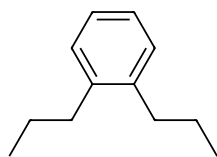
(C) B, C and E Only

(D) A and D Only

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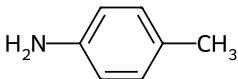
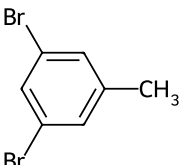
Given below are two statements:

Statement I:  can be synthesized from



using simpler reagents in the order

i) Acidic KMnO_4 , ii) Ammonia, iii) Bromine and alkali

Statement II:  can be converted into  using reagents

in the order i) Bromine- H_2O ii) NaNO_2/HCl ($0 - 5^\circ\text{C}$) (iii) Aq. H_3PO_2 .

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

A student has been given a compound "x" of molecular formula- $\text{C}_6\text{H}_7\text{N}$. 'x' is sparingly soluble in water. However, on addition of dilute mineral acid, 'x' becomes soluble in water. 'x' when treated with CHCl_3 and $\text{KOH}(\text{alc})$, 'y' is produced. 'y' has a specific unpleasant smell. On treatment with benzenesulphonyl chloride, 'x' gives a compound 'z' which is soluble in alkali. The number of different "H" atoms present in 'z' is:-

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

Given below are two statements:

Statement I: The second ionisation enthalpy of Na is larger than the corresponding ionisation enthalpy of Mg.

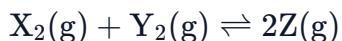
Statement II: The ionic radius of O^{2-} is larger than that of F^- .

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

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

Elements X and Y belong to Group 15. The difference between the electronegativity values of 'X' and phosphorus is higher than that of the difference between phosphorus and 'Y'. 'X' & 'Y' are respectively

- (A) As & Bi (B) Bi & N (C) N & As (D) As & Sb

Q44 Chemical Equilibrium **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/zL_kvIBtWz) › prepwisar.in/questions/zL_kvIBtWz

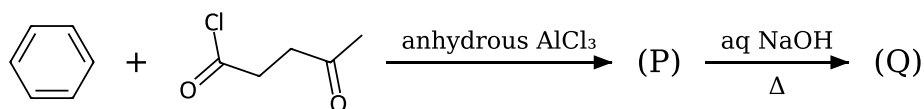
$\text{X}_2(\text{g})$ and $\text{Y}_2(\text{g})$ are added to a 1 L flask and it is found that the system attains the above equilibrium at T(K) with the number of moles of $\text{X}_2(\text{g})$, $\text{Y}_2(\text{g})$ and $\text{Z}(\text{g})$ being 3, 3 and 9 mol respectively (equilibrium moles). Under this condition of equilibrium, 10 mol of $\text{Z}(\text{g})$ is added to the flask and the temperature is maintained at T(K). Then the number of moles of $\text{Z}(\text{g})$ in the flask when the new equilibrium is established is _____. (Nearest integer)

Q45 Coordination Compounds **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/GCCg51C6bc) › prepwisar.in/questions/GCCg51C6bc

Total number of unpaired electrons present in the central metal atoms/ions of $[\text{Ni}(\text{CO})_4]$, $[\text{NiCl}_4]^{2-}$, $[\text{PtCl}_2(\text{NH}_3)_2]$, $[\text{Ni}(\text{CN})_4]^{2-}$ and $[\text{Pt}(\text{CN})_4]^{2-}$ is _____.

Q46 Aldehydes & Ketones **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/4UbaUesGxh) › prepwisar.in/questions/4UbaUesGxh

Consider the following reaction of benzene.



In compound (Q), the percentage of oxygen is _____. (Nearest integer)

Q47 Redox Reactions **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/IxIegXGAFg) › prepwisar.in/questions/IxIegXGAFg

200 cc of $x \times 10^{-3}\text{M}$ potassium dichromate is required to oxidise 750 cc of 0.6 M Mohr's salt solution in acidic medium.

Here $x =$ _____.

Q48 Solutions & Colligative Properties **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/WMIfo07SWx) › prepwisar.in/questions/WMIfo07SWx

Two liquids A and B form an ideal solution. At 320 K, the vapour pressure of the solution, containing 3 mol of A and 1 mol of B is 500 mm Hg. At the same temperature, if 1 mol of A is further added to this solution, vapour pressure of the solution increases by 20 mm Hg. Vapour pressure (in mm Hg) of B in pure state is _____. (Nearest integer)

Mathematics Section A · Multiple choice

Q49 Trigonometric Ratios & Identities[Step-by-step solution](https://www.prepwisar.in/questions/f-4p5YRL-n) › prepwisar.in/questions/f-4p5YRL-n

The least value of $(\cos^2 \theta - 6 \sin \theta \cos \theta + 3 \sin^2 \theta + 2)$ is

(A) $4 - \sqrt{10}$

(B) -1

(C) $4 + \sqrt{10}$

(D) 1

Q50 Complex Numbers[Step-by-step solution](https://www.prepwisar.in/questions/UnYYwIzU0e) › prepwisar.in/questions/UnYYwIzU0e

If $z = \frac{\sqrt{3}}{2} + \frac{i}{2}$, $i = \sqrt{-1}$, then $(z^{201} - i)^8$ is equal to

(A) 1

(B) 0

(C) -1

(D) 256

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Q51 Ellipse[Step-by-step solution](https://www.prepwise.in/questions/vlrEU7Naa5)

If the points of intersection of the ellipses $x^2 + 2y^2 - 6x - 12y + 23 = 0$ and $4x^2 + 2y^2 - 20x - 12y + 35 = 0$ lie on a circle of radius r and centre (a, b) , then the value of $ab + 18r^2$ is:

- (A) 53 (B) 52 (C) 55 (D) 51

Q52 Indefinite Integration[Step-by-step solution](https://www.prepwise.in/questions/YqD-HCjUK0)

Let $I(x) = \int \frac{3dx}{(4x+6)(\sqrt{4x^2+8x+3})}$ and $I(0) = \frac{\sqrt{3}}{4} + 20$. If

$I\left(\frac{1}{2}\right) = \frac{a\sqrt{2}}{b} + c$, where $a, b, c \in \mathbb{N}$, $\gcd(a, b) = 1$, then $a + b + c$ is equal to:

- (A) 30 (B) 29 (C) 28 (D) 31

Q53 Determinants[Step-by-step solution](https://www.prepwise.in/questions/gCp-UBwMCK)

The system of linear equations

$$\begin{aligned} x + y + z &= 6 \\ 2x + 5y + az &= 36 \\ x + 2y + 3z &= b \end{aligned}$$

has:

- (A) unique solution for $a = 8$ and $b = 16$ (B) infinitely many solutions for $a = 8$ and $b = 14$
(C) infinitely many solutions for $a = 8$ and $b = 16$ (D) unique solution for $a = 8$ and $b = 14$

Q54 Statistics[Step-by-step solution](https://www.prepwise.in/questions/9zCf7yWb9O)

If the mean and the variance of the data

Class	4 – 8	8 – 12	12 – 16	16 – 20
Frequency	3	λ	4	7

are μ and 19 respectively, then the value of $\lambda + \mu$ is:

- (A) 21 (B) 19 (C) 18 (D) 20

Q55 Vectors[Step-by-step solution](https://www.prepwise.in/questions/FxwOR2746W)

Let $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $\vec{a} \times \vec{b} = 2(\vec{a} \times \vec{c})$. If $|\vec{a}| = 1$, $|\vec{b}| = 4$, $|\vec{c}| = 2$, and the angle between $\vec{b}$ and $\vec{c}$ is 60° , then $|\vec{a} \cdot \vec{c}|$ is equal to

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

Q56 Vectors[Step-by-step solution](https://www.prepwise.in/questions/uLYOcJoAqM)

Let $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} - \hat{k}$, $\vec{c} = \lambda\hat{i} + \hat{j} + \hat{k}$ and $\vec{v} = \vec{a} \times \vec{b}$. If $\vec{v} \cdot \vec{c} = 11$ and the length of the projection of $\vec{b}$ on $\vec{c}$ is p , then $9p^2$ is equal to

- (A) 9 (B) 6 (C) 4 (D) 12

Q57 Area Under Curves[Step-by-step solution](https://www.prepwise.in/questions/w6oFczt9Iy)

The area of the region enclosed between the circles $x^2 + y^2 = 4$ and $x^2 + (y - 2)^2 = 4$ is:

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

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Q58 Relations & Functions (Basic)[Step-by-step solution](https://www.prepwisar.in/questions/0fh3s6WfN4) > prepwisar.in/questions/0fh3s6WfN4

Consider two sets $A = \{x \in \mathbb{Z} : (|x - 3| - 3) \leq 1\}$ and $B = \left\{x \in \mathbb{R} - \{1, 2\} : \frac{(x-2)(x-4)}{x-1} \log_e(|x-2|) = 0\right\}$. Then the number of onto functions $f : A \rightarrow B$ is equal to:

- (A) 32 (B) 81 (C) 79 (D) 62

Q59 Parabola[Step-by-step solution](https://www.prepwisar.in/questions/YVO7dKqw1A) > prepwisar.in/questions/YVO7dKqw1A

An equilateral triangle OAB is inscribed in the parabola $y^2 = 4x$ with the vertex O at the vertex of the parabola. Then the minimum distance of the circle having AB as a diameter from the origin is

- (A) $2(8 - 3\sqrt{3})$ (B) $4(6 + \sqrt{3})$ (C) $4(3 - \sqrt{3})$ (D) $2(3 + \sqrt{3})$

Q60 Straight Lines[Step-by-step solution](https://www.prepwisar.in/questions/zcDqTycgAp) > prepwisar.in/questions/zcDqTycgAp

Let A(1, 2) and C(-3, -6) be two diagonally opposite vertices of a rhombus, whose sides AD and BC are parallel to the line $7x - y = 14$. If B(α, β) and D(γ, δ) are the other two vertices, then $|\alpha + \beta + \gamma + \delta|$ is equal to:

- (A) 3 (B) 6 (C) 1 (D) 9

Q61 Continuity & Differentiability[Step-by-step solution](https://www.prepwisar.in/questions/A3tbBOyy_g) > prepwisar.in/questions/A3tbBOyy_g

$$\text{If } f(x) = \begin{cases} \frac{a|x| + x^2 - 2(\sin|x|)(\cos|x|)}{x} & , x \neq 0 \\ b & , x = 0 \end{cases}$$

is continuous at $x = 0$, then $a + b$ is equal to:

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

Q62 Permutations & Combinations[Step-by-step solution](https://www.prepwisar.in/questions/ngOmnj40ha) > prepwisar.in/questions/ngOmnj40ha

The number of ways, in which 16 oranges can be distributed to four children such that each child gets at least one orange, is

- (A) 384 (B) 403 (C) 429 (D) 455

Q63 Sequences & Series[Step-by-step solution](https://www.prepwisar.in/questions/1ygCLIPNHp) > prepwisar.in/questions/1ygCLIPNHp

Let $\sum_{k=1}^n a_k = \alpha n^2 + \beta n$. If $a_{10} = 59$ and $a_6 = 7a_1$, then $\alpha + \beta$ is equal to:

- (A) 3 (B) 5 (C) 7 (D) 12

Q64 Hyperbola[Step-by-step solution](https://www.prepwisar.in/questions/MyyM9Q9T76) > prepwisar.in/questions/MyyM9Q9T76

Let PQ be a chord of the hyperbola $\frac{x^2}{4} - \frac{y^2}{b^2} = 1$, perpendicular to the x-axis such that OPQ is an equilateral triangle, O being the centre of the hyperbola. If the eccentricity of the hyperbola is $\sqrt{3}$, then the area of the triangle OPQ is

- (A) $2\sqrt{3}$ (B) $\frac{11}{5}$ (C) $\frac{8\sqrt{3}}{5}$ (D) $\frac{9}{5}$

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Bag A contains 9 white and 8 black balls, while bag B contains 6 white and 4 black balls. One ball is randomly picked up from the bag B and mixed up with the balls in the bag A. Then a ball is randomly drawn from the bag A. If the probability, that the ball drawn is white, is $\frac{p}{q}$, $\gcd(p, q) = 1$, then $p + q$ is equal to

(A) 24

(B) 22

(C) 23

(D) 21

Let $A = \{0, 1, 2, \dots, 9\}$. Let R be a relation on A defined by $(x, y) \in R$ if and only if $|x - y|$ is a multiple of 3.

Given below are two statements:

Statement I: $n(R) = 36$.

Statement II: R is an equivalence relation.

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

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

(B) Both Statement I and Statement II are correct

(C) Both Statement I and Statement II are incorrect

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

Let $\frac{\pi}{2} < \theta < \pi$ and $\cot \theta = -\frac{1}{2\sqrt{2}}$. Then the value of $\sin\left(\frac{15\theta}{2}\right)(\cos 8\theta + \sin 8\theta) + \cos\left(\frac{15\theta}{2}\right)(\cos 8\theta - \sin 8\theta)$ is equal to:

(A) $\frac{\sqrt{2} - 1}{\sqrt{3}}$

(B) $\frac{\sqrt{2}}{\sqrt{3}}$

(C) $\frac{1 - \sqrt{2}}{\sqrt{3}}$

(D) $-\frac{\sqrt{2}}{\sqrt{3}}$

The sum of all the real solutions of the equation $\log_{(x+3)}(6x^2 + 28x + 30) = 5 - 2\log_{(6x+10)}(x^2 + 6x + 9)$ is equal to:

(A) 1

(B) 4

(C) 0

(D) 2

Mathematics Section B · Numerical value

Q69 to Q73

Let $A = \begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & 1 \\ 3 & -1 & 0 \end{bmatrix}$ and B be a matrix such that $B(I - A) = I + A$. Then the sum of the diagonal elements of $B^T B$ is equal to ____

The number of elements in the set $S = \{x : x \in [0, 100] \text{ and } \int_0^x t^2 \sin(x - t) dt = x^2\}$ is ____

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If the solution curve $y = f(x)$ of the differential equation

$$(x^2 - 4)y' - 2xy + 2x(4 - x^2)^2 = 0, x > 2,$$

passes through the point $(3, 15)$, then the local maximum value of f is ____

Let S denote the set of 4-digit numbers $abcd$ such that $a > b > c > d$ and P denote the set of 5-digit numbers having product of its digits equal to 20. Then $n(S) + n(P)$ is equal to ____

If the image of the point $P(a, 2, a)$ in the line $\frac{x}{2} = \frac{y+a}{1} = \frac{z}{1}$ is Q and the image of Q in the line $\frac{x-2b}{2} = \frac{y-a}{1} = \frac{z+2b}{-5}$ is P, then $a + b$ is equal to ____.

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Physics

1.	C	2.	A	3.	D	4.	A	5.	C	6.	A	7.	A	8.	C	9.	D	10.	D
11.	B	12.	A	13.	C	14.	A	15.	A	16.	C	17.	C	18.	D	19.	D	20.	109
21.	228	22.	819	23.	16	24.	1												

Chemistry

25.	D	26.	C	27.	D	28.	C	29.	B	30.	B	31.	D	32.	A	33.	B	34.	B
35.	B	36.	B	37.	B	38.	B	39.	C	40.	A	41.	D	42.	C	43.	C	44.	15
45.	2	46.	10	47.	375	48.	200												

Mathematics

49.	A	50.	D	51.	C	52.	D	53.	B	54.	B	55.	C	56.	D	57.	A	58.	D
59.	C	60.	B	61.	B	62.	D	63.	B	64.	C	65.	C	66.	D	67.	C	68.	C
69.	3	70.	16	71.	16	72.	260	73.	3										

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