

JEE MAIN 2025 · QUESTION PAPER

24 Jan 2025 Shift 2

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	5 Q42 to Q46
● Mathematics	19 Q47 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.

prepwiser.in/pyqs/paper/2025-01-24-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? prepwiser.in/feedback · Terms: prepwiser.in/terms

Q1 Dual Nature of Radiation & Matter[Step-by-step solution](#) > [prepwiser.in/questions/NmRF_rw_LM](#)

The energy E and momentum p of a moving body of mass m are related by some equation. Given that c represents the speed of light, identify the correct equation

- (A) $E^2 = pc^2 + m^2c^4$ (B) $E^2 = pc^2 + m^2c^2$ (C) $E^2 = p^2c^2 + m^2c^4$ (D) $E^2 = p^2c^2 + m^2c^2$

Q2 Dual Nature of Radiation & Matter[Step-by-step solution](#) > [prepwiser.in/questions/7G6r_6qq9J](#)

In photoelectric effect, the stopping potential (V_0) v/s frequency (ν) curve is plotted.

(h is the Planck's constant and ϕ_0 is work function of metal)

- (A) $V_0\nu/s\nu$ is linear.
(B) The slope of $V_0\nu/s\nu$ curve = $\frac{\phi_0}{h}$
(C) h constant is related to the slope of $V_0\nu/s\nu$ line.
(D) The value of electric charge of electron is not required to determine h using the $V_0\nu/s\nu$ curve.
(E) The work function can be estimated without knowing the value of h .

Choose the correct answer from the options given below:

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

Q3 Electromagnetic Waves[Step-by-step solution](#) > [prepwiser.in/questions/wfvYuo5xZs](#)

Arrange the following in the ascending order of wavelength (λ):

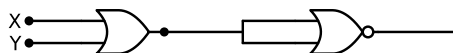
- (A) Microwaves (λ_1)
(B) Ultraviolet rays (λ_2)
(C) Infrared rays (λ_3)
(D) X-rays (λ_4)

Choose the most appropriate answer from the options given below:

- (A) $\lambda_4 < \lambda_3 < \lambda_2 < \lambda_1$ (B) $\lambda_4 < \lambda_2 < \lambda_3 < \lambda_1$ (C) $\lambda_3 < \lambda_4 < \lambda_2 < \lambda_1$ (D) $\lambda_4 < \lambda_3 < \lambda_1 < \lambda_2$

Q4 Semiconductors & Electronic Devices[Step-by-step solution](#) > [prepwiser.in/questions/exXzO1T2t2](#)

The output of the circuit is low (zero) for:



- (A) $X = 0, Y = 0$
(B) $X = 0, Y = 1$
(C) $X = 1, Y = 0$
(D) $X = 1, Y = 1$

Choose the correct answer from the options given below:

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

Q5 Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution](#) > [prepwiser.in/questions/BXC4jhfmwr](#)

A small uncharged conducting sphere is placed in contact with an identical sphere but having $4 \times 10^{-8}\text{C}$ charge and then removed to a distance such that the force of repulsion between them is $9 \times 10^{-3}\text{N}$. The distance between them is (Take $\frac{1}{4\pi\epsilon_0}$ as 9×10^9 in SI units)

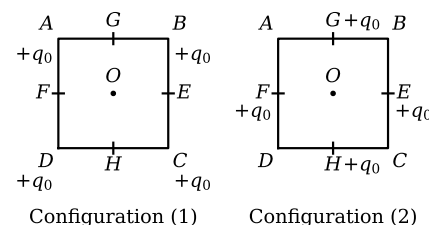
- (A) 1 cm (B) 2 cm (C) 4 cm (D) 3 cm

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Q6 Electrostatics II: Potential & Capacitance

In the first configuration (1) as shown in the figure, four identical charges (q_0) are kept at the corners A, B, C and D of square of side length 'a'. In the second configuration (2), the same charges are shifted to mid points G, E, H and F, of the square. If $K = \frac{1}{4\pi\epsilon_0}$, the difference between the potential energies of configuration (2) and (1) is given by:

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



- (A) $\frac{Kq_0^2}{a}(4 - 2\sqrt{2})$ (B) $\frac{Kq_0^2}{a}(4\sqrt{2} - 2)$ (C) $\frac{Kq_0^2}{a}(3 - \sqrt{2})$ (D) $\frac{Kq_0^2}{a}(3\sqrt{2} - 2)$

Q7 Ray Optics

[Step-by-step solution](#) > [prepwisar.in/questions/4-H840vLjX](https://www.prepwisar.in/questions/4-H840vLjX)

A photograph of a landscape is captured by a drone camera at a height of 18 km. The size of the camera film is $2\text{cm} \times 2\text{cm}$ and the area of the landscape photographed is 400km^2 . The focal length of the lens in the drone camera is:

- (A) 2.8 cm (B) 0.9 cm (C) 2.5 cm (D) 1.8 cm

Q8 Heat Transfer

[Step-by-step solution](#) > [prepwisar.in/questions/HpB0ZzYdbU](https://www.prepwisar.in/questions/HpB0ZzYdbU)

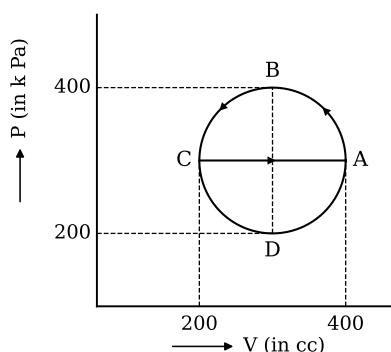
The temperature of a body in air falls from 40°C to 24°C in 4 minutes. The temperature of the air is 16°C . The temperature of the body in the next 4 minutes will be:

- (A) $\frac{28}{3}^\circ\text{C}$ (B) $\frac{56}{3}^\circ\text{C}$ (C) $\frac{42}{3}^\circ\text{C}$ (D) $\frac{14}{3}^\circ\text{C}$

Q9 Thermodynamics

[Step-by-step solution](#) > [prepwisar.in/questions/9U2gpS29ub](https://www.prepwisar.in/questions/9U2gpS29ub)

The magnitude of heat exchanged by a system for the given cyclic process ABCA (as shown in figure) is (in SI unit):



- (A) zero (B) 40π (C) 5π (D) 10π

Q10 Thermodynamics

[Step-by-step solution](#) > [prepwisar.in/questions/3vYIIfDO2y](https://www.prepwisar.in/questions/3vYIIfDO2y)

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

Assertion (A) : In an insulated container, a gas is adiabatically shrunk to half of its initial volume. The temperature of the gas decreases.

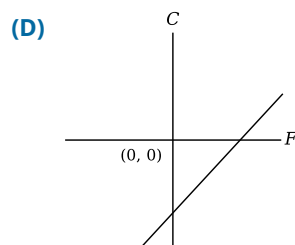
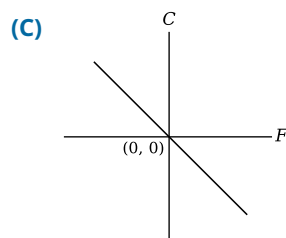
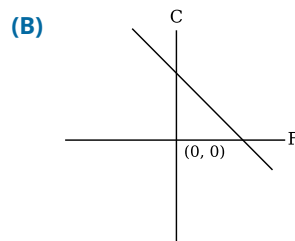
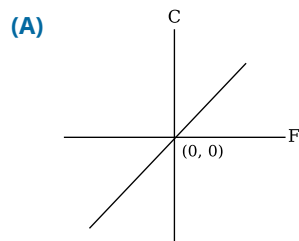
Reason (R) : Free expansion of an ideal gas is an irreversible and an adiabatic process.

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

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (B) 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

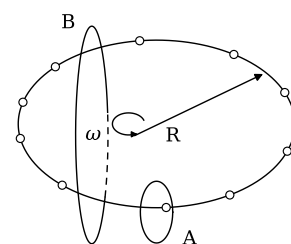
Attempt this paper online with instant answer checking > [prepwisar.in/pyqs/paper/2025-01-24-evening](https://www.prepwisar.in/pyqs/paper/2025-01-24-evening)

Which of the following figure represents the relation between Celsius and Fahrenheit temperatures?



N equally spaced charges each of value q , are placed on a circle of radius R . The circle rotates about its axis with an angular velocity ω as shown in the figure. A bigger Amperian loop B encloses the whole circle where as a smaller Amperian loop A encloses a small segment. The difference between enclosed currents, $I_A - I_B$, for the given Amperian loops is

- (A) $\frac{N^2}{2\pi} q\omega$ (B) $\frac{N}{2\pi} q\omega$ (C) $\frac{2\pi}{N} q\omega$ (D) $\frac{N}{\pi} q\omega$



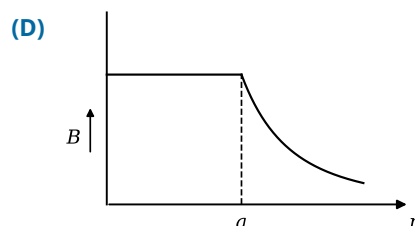
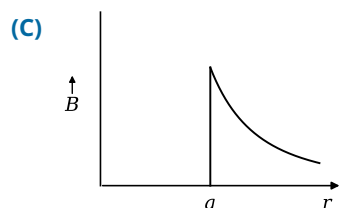
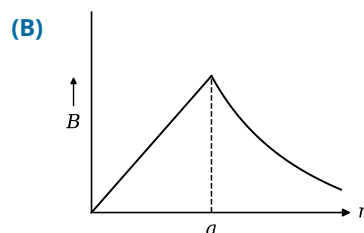
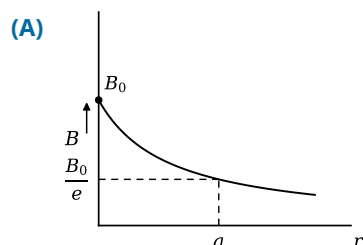
Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : A electron in a certain region of uniform magnetic field is moving with constant velocity in a straight line path.

Reason (R) : The magnetic field in that region is along the direction of velocity of the electron. In the light of the above statements, choose the correct answer from the options given below:

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

A long straight wire of a circular cross-section with radius 'a' carries a steady current I . The current I is uniformly distributed across this cross-section. The plot of magnitude of magnetic field B with distance r from the centre of the wire is given by



Q15 Rectilinear Motion[Step-by-step solution](#) > prepwiser.in/questions/7D1k-dn30C

The position vector of a moving body at any instant of time is given as $\vec{r} = (5t^2\hat{i} - 5t\hat{j})$ m. The magnitude and direction of velocity at $t = 2$ s is,

- (A) $5\sqrt{17}$ m/s, making an angle of $\tan^{-1} 4$ with -ve Y axis
 (B) $5\sqrt{15}$ m/s, making an angle of $\tan^{-1} 4$ with +ve X axis
 (C) $5\sqrt{17}$ m/s, making an angle of $\tan^{-1} 4$ with +ve X axis
 (D) $5\sqrt{15}$ m/s, making an angle of $\tan^{-1} 4$ with -ve Y axis

Q16 Rotational Motion[Step-by-step solution](#) > prepwiser.in/questions/9M1cbpwidD

A solid sphere and a hollow sphere of the same mass and of same radius are rolled on an inclined plane. Let the time taken to reach the bottom by the solid sphere and the hollow sphere be t_1 and t_2 , respectively, then

- (A) $t_1 < t_2$ (B) $t_1 = 2t_2$ (C) $t_1 > t_2$ (D) $t_1 = t_2$

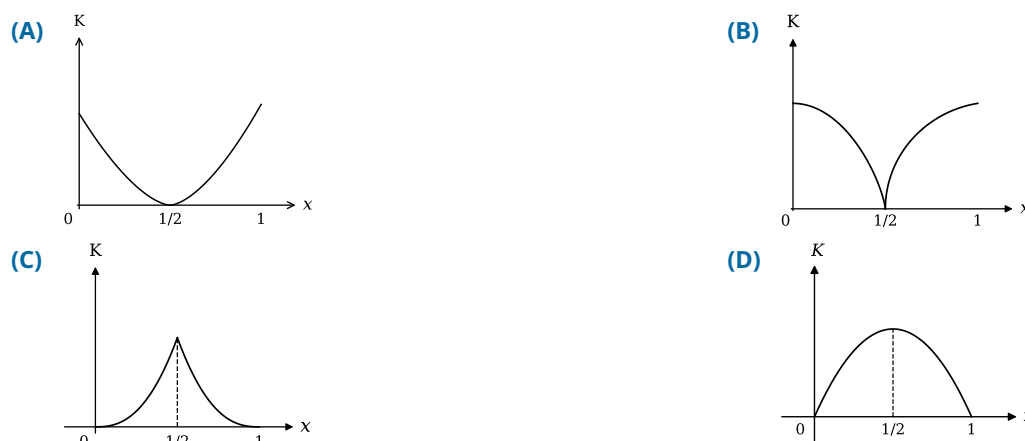
Q17 Rotational Motion[Step-by-step solution](#) > prepwiser.in/questions/x1jfb668z-

A solid sphere is rolling without slipping on a horizontal plane. The ratio of the linear kinetic energy of the centre of mass of the sphere and rotational kinetic energy is:

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

Q18 Simple Harmonic Motion[Step-by-step solution](#) > prepwiser.in/questions/wLtkcryM-F

A particle oscillates along the x -axis according to the law, $x(t) = x_0 \sin^2\left(\frac{t}{2}\right)$ where $x_0 = 1$ m. The kinetic energy (K) of the particle as a function of x is correctly represented by the graph

**Q19** Wave Optics[Step-by-step solution](#) > prepwiser.in/questions/WYXptLRq2X

Young's double slit interference apparatus is immersed in a liquid of refractive index 1.44. It has slit separation of 1.5 mm. The slits are illuminated by a parallel beam of light whose wavelength in air is 690 nm. The fringe-width on a screen placed behind the plane of slits at a distance of 0.72 m, will be:

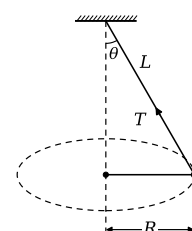
- (A) 0.63 mm (B) 0.33 mm (C) 0.46 mm (D) 0.23 mm

Physics Section B · Numerical value

Q20 to Q24

Q20 Circular Motion **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/9yQ5c28a_j

A string of length L is fixed at one end and carries a mass of M at the other end. The mass makes $\left(\frac{3}{\pi}\right)$ rotations per second about the vertical axis passing through end of the string as shown. The tension in the string is _____ ML.

**Q21** Dual Nature of Radiation & Matter **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/APXTK5eFfM

The ratio of the power of a light source S_1 to that of the light source S_2 is 2. S_1 is emitting 2×10^{15} photons per second at 600 nm. If the wavelength of the source S_2 is 300 nm, then the number of photons per second emitted by S_2 is _____ $\times 10^{14}$.

Acceleration due to gravity on the surface of earth is 'g'. If the diameter of earth is reduced to one third of its original value and mass remains unchanged, then the acceleration due to gravity on the surface of the earth is _____ g.

A tightly wound long solenoid carries a current of 1.5 A. An electron is executing uniform circular motion inside the solenoid with a time period of 75 ns. The number of turns per metre in the solenoid is _____.

[Take mass of electron $m_e = 9 \times 10^{-31} \text{ kg}$, charge of electron $|q_e| = 1.6 \times 10^{-19} \text{ C}$,

$$\mu_0 = 4\pi \times 10^{-7} \frac{\text{N}}{\text{A}^2}, 1 \text{ ns} = 10^{-9} \text{ s}]$$

The increase in pressure required to decrease the volume of a water sample by 0.2% is $P \times 10^5 \text{ Nm}^{-2}$. Bulk modulus of water is $2.15 \times 10^9 \text{ Nm}^{-2}$. The value of P is _____.

Chemistry Section A · Multiple choice

Q25 to Q41

Given below are two statements:

Statement (I) : Experimentally determined oxygen-oxygen bond lengths in the O_3 are found to be same and the bond length is greater than that of a $\text{O}=\text{O}$ (double bond) but less than that of a single ($\text{O}-\text{O}$) bond.

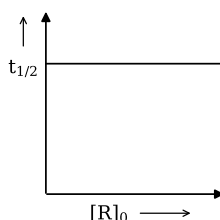
Statement (II) : The strong lone pair-lone pair repulsion between oxygen atoms is solely responsible for the fact that the bond length in ozone is smaller than that of a double bond ($\text{O}=\text{O}$) but more than that of a single bond ($\text{O}-\text{O}$).

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

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

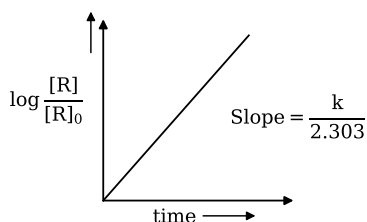
Given below are two statements:

Statement (I):



is valid for first order reaction.

Statement (II):



is valid for first order reaction.

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

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

The conditions and consequence that favours the $t_{2g}^3 e_g^1$ configuration in a metal complex are:

- (A) strong field ligand, low spin complex
 (B) strong field ligand, high spin complex
 (C) weak field ligand, high spin complex
 (D) weak field ligand, low spin complex

Q28 Coordination Compounds[Step-by-step solution](#) > prepwiser.in/questions/BTCGQYDkgk

When Ethane-1,2-diamine is added progressively to an aqueous solution of Nickel (II) chloride, the sequence of colour change observed will be:

(A) Pale Blue → Blue → Green → Violet**(B)** Pale Blue → Blue → Violet → Green**(C)** Green → Pale Blue → Blue → Violet**(D)** Violet → Blue → Pale Blue → Green**Q29** d & f Block Elements[Step-by-step solution](#) > prepwiser.in/questions/eMLD7IajZH

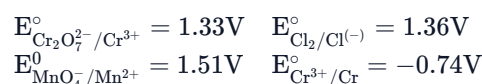
Match List - I with List - II.

	List - I (Transition metal ion)		List - II (Spin only magnetic moment (B.M.))
(A)	Ti ³⁺	(I)	3.87
(B)	V ²⁺	(II)	0.00
(C)	Ni ²⁺	(III)	1.73
(D)	Sc ³⁺	(IV)	2.84

Choose the correct answer from the options given below:

(A) (A) – (III), (B) – (I), (C) – (IV), (D) – (II)**(B)** (A) – (II), (B) – (IV), (C) – (I), (D) – (III)**(C)** (A) – (III), (B) – (I), (C) – (II), (D) – (IV)**(D)** (A) – (IV), (B) – (II), (C) – (III), (D) – (I)**Q30** Electrochemistry[Step-by-step solution](#) > prepwiser.in/questions/1jzQMRV0fg

Based on the data given below:



the strongest reducing agent is:

(A) Cl⁻**(B)** MnO₄⁻**(C)** Cr**(D)** Mn²⁺**Q31** Periodic Table & Periodicity[Step-by-step solution](#) > prepwiser.in/questions/xCzaICc9FF

The successive 5 ionisation energies of an element are 800, 2427, 3658, 25024 and 32824 kJ/mol, respectively. By using the above values predict the group in which the above element is present:

(A) Group 4**(B)** Group 2**(C)** Group 13**(D)** Group 14**Q32** Periodic Table & Periodicity[Step-by-step solution](#) > prepwiser.in/questions/Hdj_1KINBv

Given below are two statements:

Statement (I) : The first ionization energy of Pb is greater than that of Sn.

Statement (II) : The first ionization energy of Ge is greater than that of Si.

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

(A) Statement I is false but Statement II is true**(B)** Both Statement I and Statement II are false**(C)** Both Statement I and Statement II are true**(D)** Statement I is true but Statement II is false**Q33** Mole Concept & Stoichiometry[Step-by-step solution](#) > prepwiser.in/questions/xYh7IWM8Cb

The elemental composition of a compound is 54.2% C, 9.2% H and 36.6% O. If the molar mass of the compound is 132 g mol⁻¹, the molecular formula of the compound is : [Given : The relative atomic mass of C : H : O = 12 : 1 : 16]

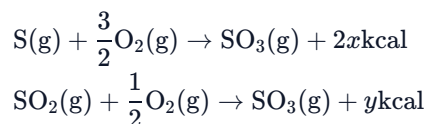
(A) C₄H₈O₂**(B)** C₆H₁₂O₆**(C)** C₄H₉O₃**(D)** C₆H₁₂O₃**Q34** Atomic Structure[Step-by-step solution](#) > prepwiser.in/questions/x-vPR0mU_3

For hydrogen atom, the orbital/s with lowest energy is/are:

(A) 4s**(B)** 3p_x**(C)** 3d_{x²-y²}**(D)** 3d_{z²}**(E)** 4p_z

Choose the correct answer from the options given below:

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



The heat of formation of $\text{SO}_2\text{(g)}$ is given by:

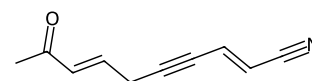
- (A) $2x + y$ kcal (B) $\frac{2x}{y}$ kcal (C) $y - 2x$ kcal (D) $x + y$ kcal

Which of the following mixing of 1 M base and 1 M acid leads to the largest increase in temperature?

- (A) 50 mL HCl and 20 mL NaOH (B) 30 mL HCl and 30 mL NaOH
(C) 45 mL CH_3COOH and 25 mL NaOH (D) 30 mL CH_3COOH and 30 mL NaOH

In the given structure, number of sp and sp^2 hybridized carbon atoms present respectively are:

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



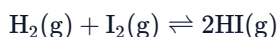
Identify correct statement/s:

- (A) $-\text{OCH}_3$ and $-\text{NHCOCH}_3$ are activating group.
(B) $-\text{CN}$ and $-\text{OH}$ are meta directing group.
(C) $-\text{CN}$ and $-\text{SO}_3\text{H}$ are meta directing group.
(D) Activating groups act as ortho - and para directing groups.
(E) Halides are activating groups.

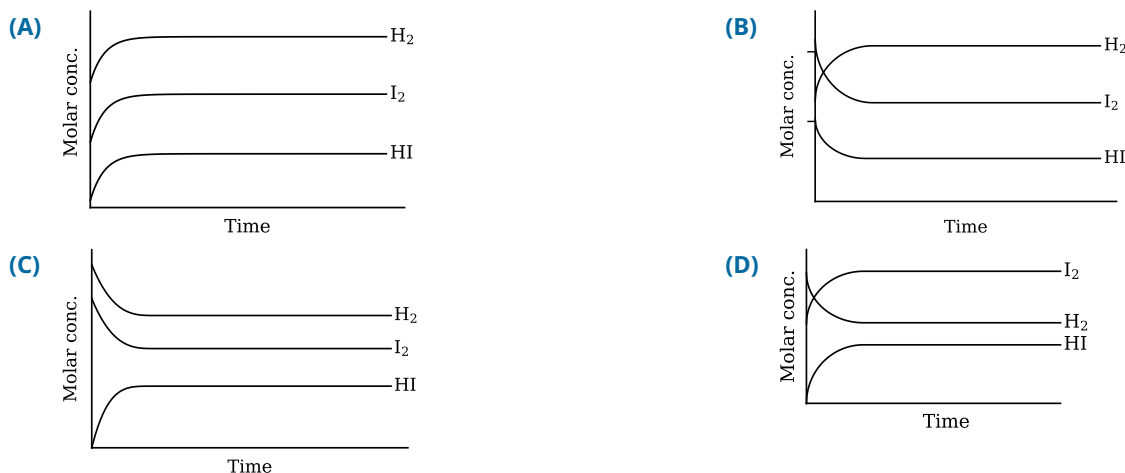
Choose the correct answer from the options given below:

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

For the reaction,

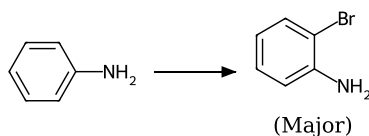


Attainment of equilibrium is predicted correctly by:



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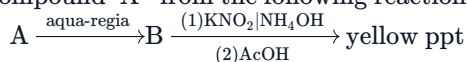
For reaction



The correct order of set of reagents for the above conversion is:

- (A) Ac_2O , Br_2 , $\text{H}_2\text{O}(\Delta)$, NaOH (B) H_2SO_4 , Ac_2O , Br_2 , $\text{H}_2\text{O}(\Delta)$, NaOH
 (C) Br_2 | FeBr_3 , $\text{H}_2\text{O}(\Delta)$, NaOH (D) Ac_2O , H_2SO_4 , Br_2 , NaOH

Find the compound 'A' from the following reaction sequences.



- (A) NiS (B) MnS (C) ZnS (D) CoS

Chemistry Section B · Numerical value

Q42 to Q46

Consider a complex reaction taking place in three steps with rate constants k_1 , k_2 and k_3 respectively. The overall rate constant k is given by the expression $k = \sqrt{\frac{k_1 k_3}{k_2}}$. If the activation energies of the three steps are 60, 30 and 10kJmol^{-1} respectively, then the overall energy of activation in kJmol^{-1} is _____. (Nearest integer)

The observed and normal molar masses of compound MX_2 are 65.6 and 164 respectively. The percent degree of ionisation of MX_2 is _____. (Nearest integer)

The hydrocarbon (X) with molar mass 80gmol^{-1} and 90% carbon has _____ degree of unsaturation.

The possible number of stereoisomers for 5-phenylpent-4-en-2-ol is _____.

In Carius method of estimation of halogen, 0.25 g of an organic compound gave 0.15 g of silver bromide (AgBr). The percentage of Bromine in the organic compound is _____ $\times 10^{-1}\%$ (Nearest integer).
 (Given : Molar mass of Ag is 108 and Br is 80gmol^{-1})

Mathematics Section A · Multiple choice

Q47 to Q65

Let $(2, 3)$ be the largest open interval in which the function $f(x) = 2\log_e(x-2) - x^2 + ax + 1$ is strictly increasing and (b, c) be the largest open interval, in which the function $g(x) = (x-1)^3(x+2-a)^2$ is strictly decreasing. Then $100(a+b-c)$ is equal to:

- (A) 360 (B) 420 (C) 160 (D) 280

Suppose A and B are the coefficients of 30^{th} and 12^{th} terms respectively in the binomial expansion of $(1+x)^{2n-1}$. If $2A = 5B$, then n is equal to:

- (A) 20 (B) 19 (C) 22 (D) 21

Let $f: (0, \infty) \rightarrow \mathbf{R}$ be a function which is differentiable at all points of its domain and satisfies the condition $x^2 f'(x) = 2x f(x) + 3$, with $f(1) = 4$. Then $2f(2)$ is equal to:

- (A) 19 (B) 23 (C) 29 (D) 39

Q50 Ellipse[Step-by-step solution](#) › prepwiser.in/questions/8411eGjq06

The equation of the chord, of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$, whose mid-point is $(3, 1)$ is:

- (A) $5x + 16y = 31$ (B) $48x + 25y = 169$ (C) $4x + 122y = 134$ (D) $25x + 101y = 176$

Q51 Relations & Functions (Basic)[Step-by-step solution](#) › prepwiser.in/questions/u00kn2SiRU

The function $f : (-\infty, \infty) \rightarrow (-\infty, 1)$, defined by $f(x) = \frac{2^x - 2^{-x}}{2^x + 2^{-x}}$ is:

- (A) One-one but not onto (B) Onto but not one-one
(C) Both one-one and onto (D) Neither one-one nor onto

Q52 Inverse Trigonometric Functions[Step-by-step solution](#) › prepwiser.in/questions/qFgD-tzcd9

If $\alpha > \beta > \gamma > 0$, then the expression $\cot^{-1} \left\{ \beta + \frac{(1+\beta^2)}{(\alpha-\beta)} \right\} + \cot^{-1} \left\{ \gamma + \frac{(1+\gamma^2)}{(\beta-\gamma)} \right\} + \cot^{-1} \left\{ \alpha + \frac{(1+\alpha^2)}{(\gamma-\alpha)} \right\}$ is equal to:

- (A) 3π (B) $\frac{\pi}{2} - (\alpha + \beta + \gamma)$ (C) π (D) 0

Q53 Continuity & Differentiability[Step-by-step solution](#) › prepwiser.in/questions/QUD4I54LtE

Let $[x]$ denote the greatest integer function, and let m and n respectively be the numbers of the points, where the function $f(x) = [x] + |x - 2|$, $-2 < x < 3$, is not continuous and not differentiable. Then $m + n$ is equal to:

- (A) 6 (B) 9 (C) 8 (D) 7

Q54 Limits[Step-by-step solution](#) › prepwiser.in/questions/Rd8zIT39ND

For some a, b , let $f(x) = \begin{vmatrix} a + \frac{\sin x}{x} & 1 & b \\ a & 1 + \frac{\sin x}{x} & b \\ a & 1 & b + \frac{\sin x}{x} \end{vmatrix}$, $x \neq 0$, $\lim_{x \rightarrow 0} f(x) = \lambda + \mu a + \nu b$. Then $(\lambda + \mu + \nu)^2$ is equal to:

- (A) 25 (B) 16 (C) 9 (D) 36

Q55 Determinants[Step-by-step solution](#) › prepwiser.in/questions/kf8h_KNX9u

If the system of equations

$$\begin{aligned} x + 2y - 3z &= 2 \\ 2x + \lambda y + 5z &= 5 \\ 14x + 3y + \mu z &= 33 \end{aligned}$$

has infinitely many solutions, then $\lambda + \mu$ is equal to:

- (A) 13 (B) 10 (C) 12 (D) 11

Q56 Parabola[Step-by-step solution](#) › prepwiser.in/questions/DpYlReWYR5

If the equation of the parabola with vertex $V\left(\frac{3}{2}, 3\right)$ and the directrix $x + 2y = 0$ is $\alpha x^2 + \beta y^2 - \gamma xy - 30x - 60y + 225 = 0$, then $\alpha + \beta + \gamma$ is equal to:

- (A) 6 (B) 8 (C) 7 (D) 9

Q57 Permutations & Combinations[Step-by-step solution](#) › prepwiser.in/questions/ui_nN7wkLd

Group A consists of 7 boys and 3 girls, while group B consists of 6 boys and 5 girls. The number of ways, 4 boys and 4 girls can be invited for a picnic if 5 of them must be from group A and the remaining 3 from group B, is equal to:

- (A) 8925 (B) 9100 (C) 8575 (D) 8750

Q58 Probability: Basic[Step-by-step solution](#) › prepwiser.in/questions/KXKh1zpN3_

Let $A = [a_{ij}]$ be a square matrix of order 2 with entries either 0 or 1. Let E be the event that A is an invertible matrix. Then the probability $P(E)$ is:

- (A) $\frac{3}{8}$ (B) $\frac{1}{8}$ (C) $\frac{3}{16}$ (D) $\frac{5}{8}$

Q59 Sequences & Series[Step-by-step solution](#) › prepwiser.in/questions/wI4Pkjgab2

In an arithmetic progression, if $S_{40} = 1030$ and $S_{12} = 57$, then $S_{30} - S_{10}$ is equal to:

- (A) 525 (B) 505 (C) 510 (D) 515

Q60 Sequences & Series[Step-by-step solution](#) > prepwiser.in/questions/U45GjD0Q4T

If $7 = 5 + \frac{1}{7}(5 + \alpha) + \frac{1}{7^2}(5 + 2\alpha) + \frac{1}{7^3}(5 + 3\alpha) + \dots \dots \dots \infty$, then the value of α is:

- (A) $\frac{1}{7}$ (B) 1 (C) $\frac{6}{7}$ (D) 6

Q61 Sets[Step-by-step solution](#) > prepwiser.in/questions/MTukc3NVnm

Let $A = \left\{x \in (0, \pi) - \left\{\frac{\pi}{2}\right\} : \log_{(2/\pi)} |\sin x| + \log_{(2/\pi)} |\cos x| = 2\right\}$ and $B = \{x \geq 0 : \sqrt{x}(\sqrt{x} - 4) - 3|\sqrt{x} - 2| + 6 = 0\}$. Then $n(A \cup B)$ is equal to:

- (A) 4 (B) 8 (C) 6 (D) 2

Q62 Vectors[Step-by-step solution](#) > prepwiser.in/questions/2qKA4-EOiA

Let the position vectors of three vertices of a triangle be $4\vec{p} + \vec{q} - 3\vec{r}$, $-5\vec{p} + \vec{q} + 2\vec{r}$ and $2\vec{p} - \vec{q} + 2\vec{r}$. If the position vectors of the orthocenter and the circumcenter of the triangle are $\frac{\vec{p} + \vec{q} + \vec{r}}{4}$ and $\alpha\vec{p} + \beta\vec{q} + \gamma\vec{r}$ respectively, then $\alpha + 2\beta + 5\gamma$ is equal to:

- (A) 4 (B) 3 (C) 1 (D) 6

Q63 Vectors[Step-by-step solution](#) > prepwiser.in/questions/qbFxxnOb3a

Let $\vec{a} = 3\hat{i} - \hat{j} + 2\hat{k}$, $\vec{b} = \vec{a} \times (\hat{i} - 2\hat{k})$ and $\vec{c} = \vec{b} \times \hat{k}$. Then the projection of $\vec{c} - 2\hat{j}$ on $\vec{a}$ is:

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

Q64 Area Under Curves[Step-by-step solution](#) > prepwiser.in/questions/wBxxetDSiX

The area of the region enclosed by the curves $y = e^x$, $y = |e^x - 1|$ and y -axis is:

- (A) $1 + \log_e 2$ (B) $\log_e 2$ (C) $1 - \log_e 2$ (D) $2 \log_e 2 - 1$

Q65 Straight Lines[Step-by-step solution](#) > prepwiser.in/questions/IBBZIIkcyo

Let the points $\left(\frac{11}{2}, \alpha\right)$ lie on or inside the triangle with sides $x + y = 11$, $x + 2y = 16$ and $2x + 3y = 29$. Then the product of the smallest and the largest values of α is equal to:

- (A) 22 (B) 33 (C) 55 (D) 44

Mathematics Section B · Numerical value

Q66 to Q70

Q66 Three Dimensional Geometry **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/n9ZIMBez6P

Let P be the image of the point Q(7, -2, 5) in the line $L : \frac{x-1}{2} = \frac{y+1}{3} = \frac{z}{4}$ and R(5, p, q) be a point on L. Then the square of the area of $\triangle PQR$ is _____.

Q67 Differential Equations **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/_ovTfalXxG

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

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

Q68 Hyperbola **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/15fbD6rkqH

Let $H_1 : \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $H_2 : -\frac{x^2}{A^2} + \frac{y^2}{B^2} = 1$ be two hyperbolas having length of latus rectums $15\sqrt{2}$ and $12\sqrt{5}$ respectively. Let their eccentricities be $e_1 = \sqrt{\frac{5}{2}}$ and e_2 respectively. If the product of the lengths of their transverse axes is $100\sqrt{10}$, then $25e_2^2$ is equal to _____.

Q69 Permutations & Combinations **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/P8kM0MV3EH

Number of functions $f : \{1, 2, \dots, 100\} \rightarrow \{0, 1\}$, that assign 1 to exactly one of the positive integers less than or equal to 98, is equal to _____.

Q70 Indefinite Integration **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/2tIr7vgVhN

If $\int \frac{2x^2 + 5x + 9}{\sqrt{x^2 + x + 1}} dx = x\sqrt{x^2 + x + 1} + \alpha\sqrt{x^2 + x + 1} + \beta \log_e \left|x + \frac{1}{2} + \sqrt{x^2 + x + 1}\right| + C$, where C is the constant of integration, then $\alpha + 2\beta$ is equal to _____.

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1. C	2. A	3. B	4. C	5. B	6. D	7. D	8. B	9. C	10. C
11. D	12. B	13. B	14. B	15. A	16. A	17. C	18. D	19. D	20. 36
21. 5	22. 9	23. 250	24. 43						

Chemistry

25. C	26. B	27. C	28. C	29. A	30. C	31. C	32. D	33. D	34. C
35. C	36. B	37. A	38. A	39. C	40. B	41. D	42. 20	43. 75	44. 3
45. 4	46. 255								

Mathematics

47. A	48. D	49. D	50. B	51. A	52. C	53. C	54. B	55. C	56. D
57. A	58. A	59. D	60. D	61. B	62. B	63. D	64. C	65. B	66. 957
67. 1	68. 55	69. 392	70. 16						

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