

JEE MAIN 2026 · QUESTION PAPER

6 Apr 2026 **Shift 1**

73 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	20 Q1 to Q20	4 Q21 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.

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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? prepwis.in/feedback · Terms: prepwis.in/terms

Q1 Alternating Current

[Step-by-step solution](https://www.prepwisar.in/questions/7MQi0AUgj2)

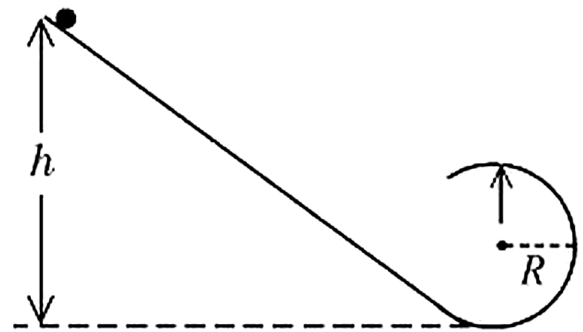
A LCR series circuit driven with $E_{rms} = 90V$ at frequency $f_d = 30Hz$ has resistance $R = 80\Omega$, an inductance with inductive reactance $X_L = 20.0\Omega$ and capacitance with capacitive reactance $X_C = 80.0\Omega$. The power factor of the circuit is ____.

- (A) 0.8 (B) 0.64 (C) 0.9 (D) 0.5

Q2 Circular Motion

[Step-by-step solution](https://www.prepwisar.in/questions/6ffwu2uwqI)

A smooth inclined plane ends in a vertical circular loop, as shown in the figure. A small body is released from height h as shown. If the body exerts a force of three times its weight on the plane at the highest point of circle then the height $h = \alpha R$. The value of α is ____



- (A) 2 (B) 4 (C) 3 (D) 6

Q3 Electromagnetic Waves

[Step-by-step solution](https://www.prepwisar.in/questions/_DlxbVcuS5)

A point light source emits E.M. waves in free space. A detector, placed at a distance of Lm , measures the intensity as I_0 . The detector is now shifted to another location on the same spherical surface ensuring the angle between original location and new location as 45° . The measured intensity at new location will be ____.

- (A) $\frac{I_0}{4}$ (B) I_0 (C) $\frac{I_0}{\sqrt{2}}$ (D) $\frac{I_0}{2}$

Q4 Moving Charges & Magnetism

[Step-by-step solution](https://www.prepwisar.in/questions/p3O3X-Sdm9)

A small cube of side 1 mm is placed at the centre of a circular loop of radius 10 cm carrying a current of 2 A. The magnetic energy stored inside the cube is $\alpha \times 10^{-14}J$. The value of α is ____.

($\mu_0 = 4\pi \times 10^{-7}Tm/A$, $\pi = 3.14$)

- (A) 6.28 (B) 6.28×10^{-6} (C) 628 (D) 6.28×10^{-4}

Q5 Rotational Motion

[Step-by-step solution](https://www.prepwisar.in/questions/a6Cdd-hsGK)

A solid sphere of radius 4 cm and mass 5 kg is rotating (rotation axis is passing through the centre of the sphere) with an angular velocity of 1200 rpm. It is brought to rest in 10 s by applying a constant torque. The torque applied and the number of rotations it made before it comes to rest are ____ and ____ respectively.

- (A) $0.128\pi Nm$, 100 (B) $0.0128\pi Nm$, 50 (C) $0.128\pi Nm$, 50 (D) $0.0128\pi Nm$, 100

Q6 Wave Optics

[Step-by-step solution](https://www.prepwisar.in/questions/8rRSOIE-M1)

In interference experiment the path difference between two interfering waves at a point A on the screen is $\lambda/3$, where λ is the wavelength of these waves, and at another point B the path difference is $\lambda/6$. The ratio of intensities at points A and B is ____.

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

Q7 Atomic Physics[Step-by-step solution](https://www.prepwisar.in/questions/B22IbKS_vG)

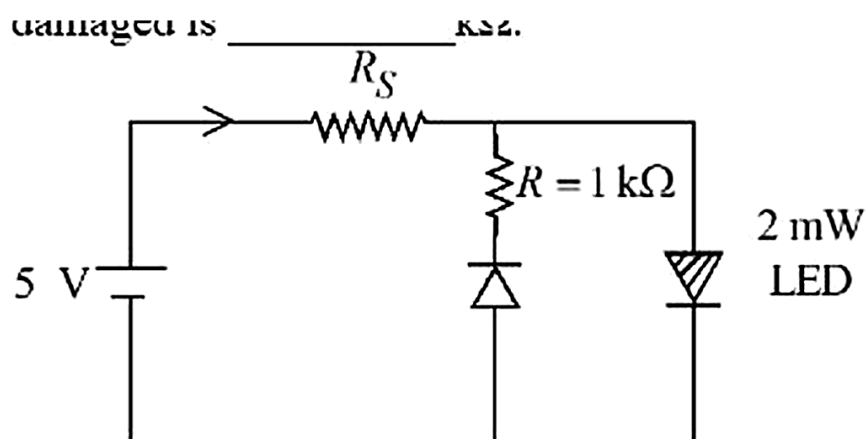
The ratio of momentum of the photons of the 1st and 2nd line of Balmer series of Hydrogen atoms is α/β . The possible values of α and β are:-

- (A) 27 and 20 (B) 3 and 16 (C) 5 and 36 (D) 20 and 27

Q8 Semiconductors & Electronic Devices[Step-by-step solution](https://www.prepwisar.in/questions/2bk-eMXr2v)

The maximum rated power of the LED is 2 mW and it is used in the circuit with input voltage of 5 V as shown in the figure below. The current through resistance R_S is 0.5 mA.

The minimum value of the resistance of R_S , to ensure that the LED is not damaged is ____ k Ω .



- (A) 6 (B) 2 (C) 4 (D) 5

Q9 Kinetic Theory of Gases[Step-by-step solution](https://www.prepwisar.in/questions/SISrSEq5Wy)

Two closed vessels of same volume are joined through a narrow tube and both vessels are filled with air of pressure 90 kPa and temperature 400 K. Keeping the temperature of one vessel constant at 400 K the second vessel temperature is raised to 500 K. The final pressure in the vessels is ____ kPa.

- (A) 100 (B) 120 (C) 90 (D) 105

Q10 Simple Harmonic Motion[Step-by-step solution](https://www.prepwisar.in/questions/ThUDJzeC-r)

A particle is executing simple harmonic motion. Its amplitude is A and time period is 5 sec. The time required by it to move from $x = A$ to $x = \frac{A}{\sqrt{2}}$ is ____ sec.

- (A) 1/4 (B) 5/4 (C) 5/8 (D) 3/8

Q11 Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution](https://www.prepwisar.in/questions/pNeUD6nc18)

A thin half ring of radius 35 cm is uniformly charged with a total charge of Q coulomb. If the magnitude of the electric field at centre of the half ring is 100V/m, then the value of Q is ____ nC.

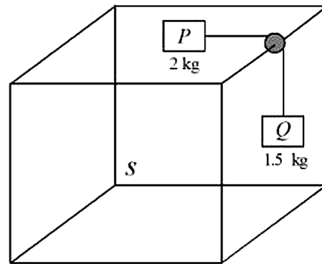
($\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$ and $\pi = 3.14$)

- (A) 2.14 (B) 2.44 (C) 3.25 (D) 0.7

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Q12 Newton's Laws of Motion[Step-by-step solution](https://www.prepwisar.in/questions/WmIeq1ivke)

Two blocks (P and Q) with respectively masses 2 kg and 1.5 kg are joined by a massless thread. These blocks are mounted on a frictionless pulley which is fixed on the edge of a cube (S), as shown in the figure below. Block P is positioned on the top surface which has no friction and block Q is in contact with side-surface, having coefficient friction μ . The cube (S) moves towards the right with acceleration of $\frac{g}{2}$, where g is gravitational acceleration. During this movement the block P and Q remain stationary. The value of μ is ____ (take $g = 10\text{ m/s}^2$)

(take $g = 10\text{ m/s}^2$)**(A)** 0.33**(B)** 0.67**(C)** 1**(D)** 0.5**Q13** Units, Dimensions & Errors[Step-by-step solution](https://www.prepwisar.in/questions/0IY6_8NhX)

The density ρ of a uniform cylinder is determined by measuring its mass m , length l and diameter d . The measured values of m , l and d are $97.42 \pm 0.02\text{g}$, $8.35 \pm 0.05\text{mm}$ and $20.20 \pm 0.02\text{mm}$, respectively. Calculated percentage fractional error in ρ is ____.

(A) 0.63%**(B)** 0.82%**(C)** 0.72%**(D)** 0.25%**Q14** Units, Dimensions & Errors[Step-by-step solution](https://www.prepwisar.in/questions/2ZuQhWMagW)

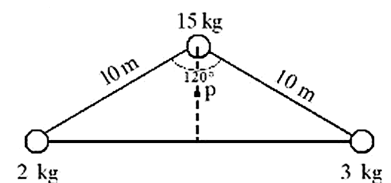
The potential energy of a particle changes with distance x from a fixed origin as $V = \frac{A\sqrt{x}}{x+B}$, where A and B are constant with appropriate dimensions. The dimensions of AB are ____

(A) $[M^1 L^{5/2} T^{-2}]$ **(B)** $[M^{3/2} L^{5/2} T^{-2}]$ **(C)** $[M^1 L^2 T^{-2}]$ **(D)** $[M^1 L^{7/2} T^{-2}]$ **Q15** Work, Energy & Power[Step-by-step solution](https://www.prepwisar.in/questions/mHAz25k6C1)

The rain drop of mass 1 g , starts with zero velocity from a height of 1 km . It hits the ground with a speed of 5 m/s . The work done by the unknown resistive force is ____ J.

(take $g = 10\text{ m/s}^2$)**(A)** -8.75**(B)** -8.35**(C)** -9.55**(D)** -9.98**Q16** Centre of Mass & Linear Momentum[Step-by-step solution](https://www.prepwisar.in/questions/FXVBddtm-E)

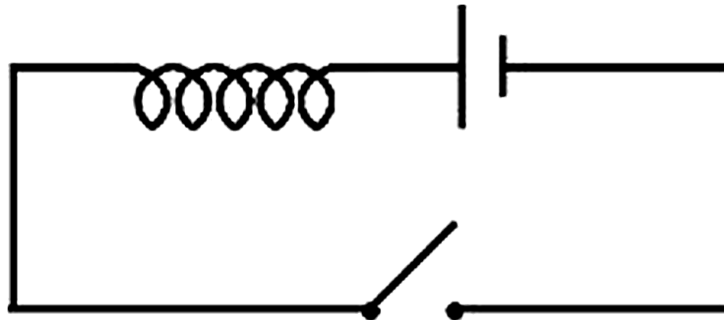
The position of center of mass of three masses 2 kg , 3 kg and 15 kg placed with respect to mid point (p) of normal bisector, as shown in the figure is ____.

(A) $\left(\frac{\sqrt{3}}{4}, 1.25\right)$ **(B)** $\left(\frac{\sqrt{3}}{4}, 1.0\right)$ **(C)** $(0, 0)$ **(D)** $(1.25, 0)$ 

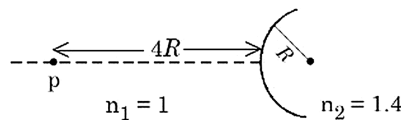
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Q17 Electromagnetic Induction[Step-by-step solution](https://www.prepwiser.in/questions/bjCumUpUaz) › prepwiser.in/questions/bjCumUpUaz

An inductor of inductance 10 mH having resistance of 100Ω is connected to battery of E.M.F. 1.0 V through a switch as shown in the figure below. After switch is closed, the ratio of instantaneous voltages across the inductor when the current passing through it is 2 mA and 4 mA is ____.

**(A)** $4/3$ **(B)** $3/4$ **(C)** $5/3$ **(D)** $3/5$ **Q18** Ray Optics[Step-by-step solution](https://www.prepwiser.in/questions/2Ihe27XBig) › prepwiser.in/questions/2Ihe27XBig

A spherical interface lens of radius R separates two media of refractive indices 1 and 1.4 respectively as shown in the figure below. A point source is placed at a distance of $4R$ in front of spherical interface. The magnitude of the magnification of point source image is ____.

**(A)** 1.66 **(B)** 2.33 **(C)** 2.66 **(D)** 1.33 **Q19** Elasticity[Step-by-step solution](https://www.prepwiser.in/questions/Qm6ZDtwDes) › prepwiser.in/questions/Qm6ZDtwDes

A lift of mass 1600 kg is supported by thick iron wire. If the maximum stress which the wire can withstand is $4 \times 10^8\text{ N/m}^2$ and its radius is 4 mm , then maximum acceleration the lift can take is ____ m/s^2 .

(take $g = 10\text{ m/s}^2$ and $\pi = 3.14$)

(A) 2.56 **(B)** 3.89 **(C)** 4.32 **(D)** 5.16 **Q20** Elasticity[Step-by-step solution](https://www.prepwiser.in/questions/pNrMkl05Iu) › prepwiser.in/questions/pNrMkl05Iu

The two wires A and B of equal cross-section but of different materials are joined together. The ratio of Young's modulus of wire A and wire B is $20/11$. When the joined wire is kept under certain tension the elongations in the wires A and B are equal. If the length of wire A is 2.2 m , then the length of wire B is

____ m .

(A) 1.1 **(B)** 2.22 **(C)** 1.21 **(D)** 4.44

Q21 Wave Optics **NUMERICAL**
[Step-by-step solution](#) > prepwiser.in/questions/BRyUMCFw43

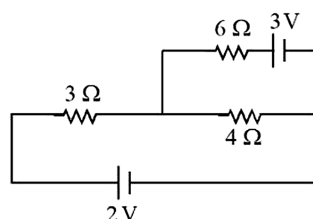
An unpolarized light of intensity I_0 passes through polarizer and then through a certain optically active solution and finally it goes to analyser. If the angle between analyser and polariser is 0° and intensity of light emerged from analyser is $\frac{3}{8}I_0$, the angle of rotation of the light by the solution with respect to analyser is ____ degrees.

Q22 Nuclear Physics **NUMERICAL**
[Step-by-step solution](#) > prepwiser.in/questions/NHQtlEX8fH

The energy released when $\frac{7}{17.13}$ kg of ${}^7_3\text{Li}$ is converted into ${}^4_2\text{He}$ by proton bombardment is $\alpha \times 10^{32}$ eV. The value of α is _____. (Nearest integer) (Mass of ${}^7_3\text{Li} = 7.0183\text{u}$, mass of ${}^4_2\text{He} = 4.004\text{u}$, mass of proton = 1.008u and $1\text{u} = 931\text{MeV}/c^2$ and Avogadro number = 6.0×10^{23})

Q23 Current Electricity **NUMERICAL**
[Step-by-step solution](#) > prepwiser.in/questions/3FLroDkRb3

Refer to the circuit diagram given below. The heat generated across the 6Ω resistance in 100 second is $\frac{\alpha}{100}$ J. The value of α is _____. (Nearest integer)


Q24 Electrostatics II: Potential & Capacitance **NUMERICAL**
[Step-by-step solution](#) > prepwiser.in/questions/BdiiIbINbD

A three coulomb charge moves from the point $(0, -2, -5)$ to the point $(5, 1, 2)$ in an electric field expressed as $\vec{E} = 2x\hat{i} + 3y^2\hat{j} + 4z\hat{k}$ N/C. The work done in moving the charge is ____ J.

Chemistry Section A · Multiple choice

Q25 General Organic Chemistry (GOC)

[Step-by-step solution](#) > prepwiser.in/questions/AW1m2CwfR_

Given below are two statements:

Statement I: 2, 6-diethylcyclohexanone and 6-methyl-2-n-propylcyclohexanone are metamers.

Statement II: 2, 2, 6, 6 - tetramethylcyclohexanone exhibits keto-enol tautomerism.

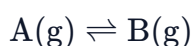
In the light of the above statements, choose the correct answer from the options given below

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

Q26 Chemical Equilibrium

[Step-by-step solution](#) > prepwiser.in/questions/2JAeCgXGd

One mole each of He and A(g) are taken in a 10 L closed flask and heated to 400 K to establish the following equilibrium.



K_c for this reaction at 400 K is 4.0. The partial pressures (in atm) of He and B(g) are respectively (at equilibrium)

(Assume He, A(g) and B(g) behave as ideal gases)

(Given: $R = 0.082\text{LatmK}^{-1}\text{mol}^{-1}$)

- (A) 3.28, 2.624 (B) 2.624, 3.28 (C) 3.28, 0.656 (D) 0.656, 6.56

Match the LIST-I with LIST-II

List-I Electronic configuration of tetrahedral metal ion		List-II Crystal Field Stabilization Energy (Δ_t)	
A.	d^2	I.	-0.6
B.	d^4	II.	-0.8
C.	d^6	III.	-1.2
D.	d^8	IV.	-0.4

Choose the correct answer from the options given below:

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

Which of the following are true about the energy of the given d-orbitals of a tetrahedral complex?

- A. $d_{xy} = d_{xz} > d_{x^2-y^2}$
 B. $d_{xy} = d_{yz} > d_{z^2}$
 C. $d_{x^2-y^2} > d_{z^2} > d_{xz}$
 D. $d_{x^2-y^2} = d_{z^2} < d_{xz}$

Choose the correct answer from the given below:

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

If shortest wavelength of hydrogen atom in Lyman series is x , then longest wavelength in Balmer series of He^+ is:

- (A) $\frac{9x}{5}$ (B) $\frac{36x}{5}$ (C) $\frac{x}{4}$ (D) $\frac{5x}{9}$

Match the LIST-I with LIST-II

List-I Orbital		List-II Radial nodes and nodal plane	
A.	2s	I.	1 Radial node + two nodal planes
B.	3s	II.	1 Radial node + one nodal plane
C.	3p	III.	2 Radial nodes + No nodal plane
D.	4d	IV.	1 Radial node + No nodal plane

Choose the correct answer from the options given below:

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

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The correct statements among the following are:

- A. Basic vanadium oxide is used in the manufacture of H_2SO_4 .
- B. The spin-only magnetic moment value of the transition metal halide employed in Ziegler-Natta polymerization is 2.84 BM.
- C. The p-block metal compound employed in Ziegler-Natta polymerization has the metal in +3 oxidation state.
- D. The number of electrons present in the outer most 'd' orbital of metal halide employed in Wacker process is 8.

Choose the correct answer from the options given below:

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

Given below are two statements:

Statement I: 3-phenylpropene reacts with HBr and gives secondary alkyl bromide having a chiral carbon atom as the major product.

Statement II: Aryl chlorides and aryl cyanides can be prepared by Sandmeyer reaction as well as Gattermann 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 true (B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false (D) Statement I is false but Statement II is true

R_f value for 2-methylpropene in a solvent system (Ethyl acetate + ether) is 0.42. 2-methylpropene is treated with dilute H_2SO_4 to give major organic product (X). R_f value for (X) in the same solvent system under identical condition will be:

- (A) 0.42 (B) 0.82 (C) 0.62 (D) 0.12

Match the List-I with List-II

List-I Deficiency Disease		List-I Vitamin	
A.	Scurvy	I.	Pyridoxine
B.	Convulsions	II.	Vitamin A
C.	Cheilosis	III.	Ascorbic Acid
D.	Xerophthalmia	IV.	Riboflavin

Choose the correct answer from the options given below:

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

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Match the List-I with List-II

List-I		List-II	
Amino acid		Positive reaction/Test for functional group present in side chain of amino acid	
A.	Glutamine	I.	Hinsberg's test
B.	Lysine	II.	Neutral FeCl_3 test
C.	Tyrosine	III.	Ceric ammonium nitrate test
D.	Serine	IV.	Hoffman bromamide degradation

Choose the correct answer from the options given below:

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

Consider the following data.

Electrolyte $\wedge_m^\circ (\text{Scm}^2\text{mol}^{-1})$ BaCl_2 x_1 H_2SO_4 x_2 HCl x_3

BaSO_4 is sparingly soluble in water. If the conductivity of the saturated BaSO_4 solution is $x \text{Scm}^{-1}$ then the solubility product of BaSO_4 can be given as (Here $\wedge_m = \wedge_m^\circ$)

- (A) $\frac{10^6 x^2}{\alpha^2 (x_1 + x_2 - 2x_3)^2}$ (B) $\frac{x^2}{(x_1 + x_2 - 2x_3)^2}$
- (C) $\frac{\alpha^2 (x_1 + x_2 - 2x_3)^2}{10^6 x^2}$ (D) $\frac{x^2}{(x_1 + x_2 + 2x_3)^2}$

Given below are two statements:

Statement I: Methane can be prepared by decarboxylation of sodium ethanoate, Kolbe's electrolysis of sodium acetate and reaction of CH_3MgBr with water.

Statement II: Methane cannot be prepared from unsaturated hydrocarbons and by Wurtz 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 true (B) Both Statement I and Statement II are false
- (C) Statement I is true but Statement II is false (D) Statement I is false but Statement II is true

Given below are two statements:

Statement I: Aluminium is more electropositive than thallium as the standard electrode potential value of $\text{E}^\circ \text{Al}^{3+}/\text{Al}$ is negative and $\text{E}^\circ \text{Tl}^{3+}/\text{Tl}$ is positive.

Statement II: The sum of first three ionization enthalpies of boron is very high when compared to that of aluminium. Due to this reason boron forms covalent compounds only and aluminium forms Al^{3+} ion.

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

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

When 0.25 moles of a non-volatile, non-ionizable solute was dissolved in 1 mole of a solvent the vapor pressure of solution was $x\%$ of vapor pressure of pure solvent. What is $x\%$?

- (A) 50% (B) 60% (C) 70% (D) 80%

Arrange the following isothermal processes in order of the magnitude of the work ($p - V$) involved between states 1 and 2.

- A. Expansion in single stage w_A
B. Expansion in multi stages w_B
C. Compression in single stage w_C
D. Compression in multi stages w_D

Choose the correct option.

- (A) $|w_B| > |w_A| > |w_C| > |w_D|$ (B) $|w_C| > |w_D| > |w_A| > |w_B|$
(C) $|w_C| > |w_D| > |w_B| > |w_A|$ (D) $|w_B| > |w_A| > |w_D| > |w_C|$

The pairs among

$A = [\text{SO}_3^{2-}, \text{CO}_3^{2-}]$, $B = [\text{O}_2^{2-}, \text{F}_2]$, $C = [\text{CN}^-, \text{CO}]$, $D = [\text{NH}_3, \text{H}_3\text{O}^+]$ and $E = [\text{MnO}_4^{2-}, \text{CrO}_4^{2-}]$ that do not have similar Lewis dot structure are

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

Arrange the following compounds according to increasing order of boiling points.

$n - \text{C}_4\text{H}_9\text{OH}$ (A), $n - \text{C}_4\text{H}_9\text{NH}_2$ (B), $n - \text{C}_4\text{H}_{10}$ (C) and $\text{C}_2\text{H}_5\text{NHC}_2\text{H}_5$ (D).

- (A) $C < B < A < D$ (B) $D < C < B < A$ (C) $C < D < B < A$ (D) $D < B < A < C$

An oxide of iron contains 69.9% iron, its empirical formula, is:

(Given : Molar mass of Fe and O are 56 and 16gmol^{-1} respectively.)

- (A) FeO (B) Fe_2O_3 (C) Fe_3O_4 (D) FeO_3

Chemistry Section B · Numerical value

Q44 to Q48

Sucrose hydrolyses in acidic medium into glucose and fructose by first order rate law with $t_{1/2} = 3$ hour. The percentage of sucrose remaining after 6 hours is _____. (Nearest integer)

(Given : $\log 2 = 0.3010$ and $\log 3 = 0.4771$)

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Q45 Chemical Thermodynamics **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/8mJiqzrdeR)

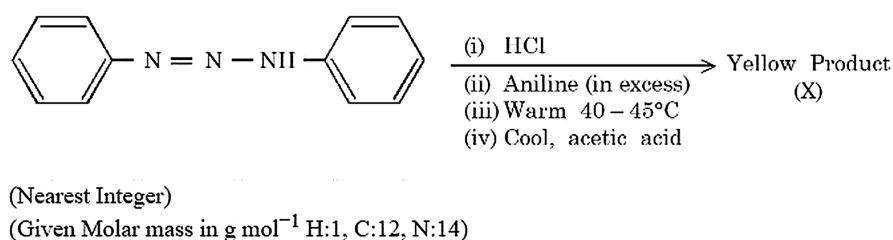
Consider the reaction $X \rightleftharpoons Y$ at 300 K. If ΔH^θ and K are $28.40 \text{ kJ mol}^{-1}$ and 1.8×10^{-7} at the same temperature, then the magnitude of ΔS^θ for the reaction in $\text{JK}^{-1} \text{ mol}^{-1}$ is _____. (Nearest integer)
(Given: $R = 8.3 \text{ JK}^{-1} \text{ mol}^{-1}$, $\ln 10 = 2.3$, $\log 3 = 0.48$, $\log 2 = 0.30$)

Q46 Mole Concept & Stoichiometry **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/c1fcWZ-_tl)

4.7 g of phenol is heated with Zn to give product X. If this reaction goes to 60% completion then the number of moles of compound X formed will be _____ $\times 10^{-2}$. (Nearest Integer)
(Given molar mass in g mol^{-1} : H : 1, C : 12, O : 16)

Q47 Amines & Diazonium Salts **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/gGVV6nS971)

Consider the following sequence of reactions.



The percentage of nitrogen in the yellow product (X) formed is _____ %.

(Nearest Integer)

(Given Molar mass in g mol^{-1} H : 1, C : 12, N : 14)

Q48 Periodic Table & Periodicity **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/0HRAKyIWQR)

First and second ionization enthalpies of lithium are 520 kJ mol^{-1} and 7297 kJ mol^{-1} respectively. Energy required to convert 3.5 mg lithium (g) into $\text{Li}^{2+}(\text{g})$ [$\text{Li}(\text{g}) \rightarrow \text{Li}^{2+}(\text{g})$] is _____ kJ mol^{-1} . (nearest integer)

[Molar mass of Li = 7 g mol^{-1}]

Mathematics Section A · Multiple choice

Q49 to Q68

Q49 Complex Numbers[Step-by-step solution](https://www.prepwiser.in/questions/Z1y6uLP4Q0)

Let the set of all values of $k \in \mathbb{R}$ such that the equation $z(\bar{z} + 2 + i) + k(2 + 3i) = 0$, $z \in \mathbb{C}$, has at least one solution, be the interval $[\alpha, \beta]$. Then $9(\alpha + \beta)$ is equal to:

- (A) -10 (B) -8 (C) $10\sqrt{13}$ (D) $8\sqrt{13}$

Q50 Statistics[Step-by-step solution](https://www.prepwiser.in/questions/CTVdd2zio0)

A data consists of 20 observations $x_1, x_2, \dots, x_{20}$. If $\sum_{i=1}^{20} (x_i + 5)^2 = 2500$ and $\sum_{i=1}^{20} (x_i - 5)^2 = 100$, then the ratio of mean to standard deviation of this data is:

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

Q51 Area Under Curves[Step-by-step solution](https://www.prepwiser.in/questions/6CoxGanAwb)

The area of the region $\{(x, y) : 0 \leq y \leq 6 - x, y^2 \geq 4x - 3, x \geq 0\}$ is:

- (A) 8 (B) 9 (C) 12 (D) 15

Q52 Area Under Curves[Step-by-step solution](https://www.prepwiser.in/questions/1_jd1bMk6) › prepwiser.in/questions/1_jd1bMk6

Let e be the base of natural logarithm and let $f : \{1, 2, 3, 4\} \rightarrow \{1, e, e^2, e^3\}$ and $g : \{1, e, e^2, e^3\} \rightarrow \{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}\}$ be two bijective functions such that f is strictly decreasing and g is strictly increasing. If $\phi(x) = [f^{-1}\{g^{-1}(\frac{1}{2})\}]^x$, then the area of the region $R = \{(x, y) : x^2 \leq y \leq \phi(x), 0 \leq x \leq 1\}$ is:

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

Q53 Definite Integration[Step-by-step solution](https://www.prepwiser.in/questions/DTyefPeb_A) › prepwiser.in/questions/DTyefPeb_A

The value of the integral $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \left(\frac{32 \cos^4 x}{1 + e^{\sin x}} \right) dx$ is:

- (A) $4\pi + 2$ (B) $3\pi + 8$ (C) $3\pi + 4$ (D) $4\pi + 3$

Q54 Relations & Functions (Basic)[Step-by-step solution](https://www.prepwiser.in/questions/2DvcBGsNjZ) › prepwiser.in/questions/2DvcBGsNjZ

Let $[\cdot]$ denote the greatest integer function. If the domain of the function $f(x) = \sin^{-1}\left(\frac{x+[x]}{3}\right)$ is $[\alpha, \beta)$, then $\alpha^2 + \beta^2$ is equal to:

- (A) 2 (B) 5 (C) 10 (D) 13

Q55 Inverse Trigonometric Functions[Step-by-step solution](https://www.prepwiser.in/questions/ovcxV4-REF) › prepwiser.in/questions/ovcxV4-REF

Let $0 < \alpha < 1, \beta = \frac{1}{3\alpha}$ and $\tan^{-1}(1 - \alpha) + \tan^{-1}(1 - \beta) = \frac{\pi}{4}$. Then $6(\alpha + \beta)$ is equal to:

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

Q56 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](https://www.prepwiser.in/questions/DKPNgud_Wb) › prepwiser.in/questions/DKPNgud_Wb

Let one root of the quadratic equation in x :

$$(k^2 - 15k + 27)x^2 + 9(k - 1)x + 18 = 0$$

be twice the other. Then the length of the latus rectum of the parabola $y^2 = 6kx$ is equal to:

- (A) 4 (B) 6 (C) 8 (D) 12

Q57 Parabola[Step-by-step solution](https://www.prepwiser.in/questions/eQVBqqNs3B) › prepwiser.in/questions/eQVBqqNs3B

Let chord PQ of length $3\sqrt{13}$ of the parabola $y^2 = 12x$ be such that the ordinates of points P and Q are in the ratio 1:2. If the chord PQ subtends an angle α at the focus of the parabola, then $\sin \alpha$ is equal to:

- (A) $\frac{3}{5}$ (B) $\frac{4}{5}$ (C) $\frac{5}{13}$ (D) $\frac{12}{13}$

Q58 Binomial Theorem[Step-by-step solution](https://www.prepwiser.in/questions/s6cpzHS6MV) › prepwiser.in/questions/s6cpzHS6MV

If the coefficients of the middle terms in the binomial expansions of $(1 + \alpha x)^{26}$ and $(1 - \alpha x)^{28}, \alpha \neq 0$, are equal, then the value of α is:

- (A) 1 (B) $\frac{14}{13}$ (C) $\frac{27}{7}$ (D) $\frac{7}{27}$

Q59 Limits[Step-by-step solution](https://www.prepwiser.in/questions/IWEodmx55S) › prepwiser.in/questions/IWEodmx55S

The value of $\lim_{x \rightarrow 0} \left(\frac{x^2 \sin^2 x}{x^2 - \sin^2 x} \right)$ is:

- (A) 2 (B) 3 (C) 4 (D) 6

Q60 Permutations & Combinations[Step-by-step solution](https://www.prepwiser.in/questions/xf9YqZqOXI) › prepwiser.in/questions/xf9YqZqOXI

The number of 4-letter words, with or without meaning, each consisting of two vowels and two consonants that can be formed from the letters of the word INCONSEQUENTIAL, without repeating any letter, is:

- (A) 2670 (B) 2840 (C) 2920 (D) 3600

Q61 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/dXu4gE38AP) › prepwiser.in/questions/dXu4gE38AP

The value of $1^3 - 2^3 + 3^3 - \dots + 15^3$ is:

- (A) 1706 (B) 1856 (C) 1982 (D) 2403

Q62 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/JdInjyOYF7) › prepwiser.in/questions/JdInjyOYF7

The sum of the first ten terms of an A.P. is 160 and the sum of the first two terms of a G.P. is 8. If the first term of the A.P. is equal to the common ratio of the G.P. and the first term of the G.P. is equal to common difference of the A.P., then the sum of all possible values of the first term of the G.P. is:

- (A) $\frac{34}{9}$ (B) $\frac{34}{13}$ (C) $\frac{32}{9}$ (D) $\frac{32}{13}$

Q63 Trigonometric Equations[Step-by-step solution](https://www.prepwiser.in/questions/rOSRycMeHy) › prepwiser.in/questions/rOSRycMeHy

Let $S = \{\theta \in (-2\pi, 2\pi) : \cos \theta + 1 = \sqrt{3} \sin \theta\}$.

Then $\sum_{\theta \in S} \theta$ is equal to:

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

Q64 Three Dimensional Geometry[Step-by-step solution](https://www.prepwiser.in/questions/B8hQkUYuGk) › prepwiser.in/questions/B8hQkUYuGk

Let the image of the point $P(1, 6, a)$ in the line $L : \frac{x}{1} = \frac{y-1}{2} = \frac{z-a+1}{b}, b > 0$, be $(\frac{a}{3}, 0, a+c)$. If $S(\alpha, \beta, \gamma), \alpha > 0$, is the point on L such that the distance of S from the foot of perpendicular from the point P on L is $2\sqrt{14}$, then $\alpha + \beta + \gamma$ is equal to:

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

Q65 Three Dimensional Geometry[Step-by-step solution](https://www.prepwiser.in/questions/i7SWKor4sa) › prepwiser.in/questions/i7SWKor4sa

Let a line L be perpendicular to both the lines $L_1 : \frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $L_2 : \frac{x-2}{1} = \frac{y-4}{4} = \frac{z-6}{7}$.

If θ is the acute angle between the lines L and $L_3 : \frac{x-\frac{8}{7}}{2} = \frac{y-\frac{4}{7}}{1} = \frac{z}{2}$, then $\tan \theta$ is equal to:

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

Q66 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](https://www.prepwiser.in/questions/pTME1G2uwe) › prepwiser.in/questions/pTME1G2uwe

Let e_1 and e_2 be two distinct roots of the equation $x^2 - ax + 2 = 0$. Let the sets $\{a \in \mathbb{R} : e_1 \text{ and } e_2 \text{ are the eccentricities of hyperbolas}\} = (\alpha, \beta)$, and $\{a \in \mathbb{R} : e_1 \text{ and } e_2 \text{ are the eccentricities of an ellipse and a hyperbola, respectively}\} = (\gamma, \infty)$.

Then $\alpha^2 + \beta^2 + \gamma^2$ is equal to:

- (A) 18 (B) 22 (C) 26 (D) 34

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Q67 Hyperbola[Step-by-step solution](#) › prepwiser.in/questions/l8OjUVKdT2

If the eccentricity e of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, passing through $(6, 4\sqrt{3})$, satisfies $15(e^2 + 1) = 34e$, then the length of the latus rectum of the hyperbola $\frac{x^2}{b^2} - \frac{y^2}{2(a^2+1)} = 1$ is:

- (A) 10 (B) 20 (C) 25 (D) 30

Q68 Probability: Advanced[Step-by-step solution](#) › prepwiser.in/questions/DfWb9DptEB

A bag contains $(N + 1)$ coins - N fair coins, and one coin with 'Head' on both sides. A coin is selected at random and tossed. If the probability of getting 'Head' is $\frac{9}{16}$, then N is equal to:

- (A) 5 (B) 7 (C) 8 (D) 9

Mathematics Section B · Numerical value

Q69 to Q73

Q69 Determinants **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/l_0j9m9gQW

Let $A = \begin{bmatrix} -1 & 1 & -1 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ satisfy

$$A^2 + \alpha(\text{adj}(\text{adj}(A))) + \beta(\text{adj}(A)(\text{adj}(\text{adj}(A)))) = \begin{bmatrix} 2 & -2 & 2 \\ -2 & 0 & -1 \\ 0 & 0 & -1 \end{bmatrix} \text{ for some } \alpha, \beta \in \mathbb{R}.$$

Then $(\alpha - \beta)^2$ is equal to ____

Q70 Vectors **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/3824hYXygM

If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{j} - \hat{k}$ and $\vec{c}$ be three vectors such that $\vec{a} \times \vec{c} = \vec{b}$ and $\vec{a} \cdot \vec{c} = 3$, then $\vec{c} \cdot (\vec{a} - 2\vec{b})$ is equal to ____.

Q71 Differential Equations **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/t9VwF4_6Iw

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

$(x^2 - x\sqrt{x^2 - 1}) dy + (y(x - \sqrt{x^2 - 1}) - x) dx = 0, x \geq 1$. If $y(1) = 1$, then the greatest integer less than $y(\sqrt{5})$ is ____.

Q72 Sequences & Series **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/ldSWCABR1L

For the functions $f(\theta) = \alpha \tan^2 \theta + \beta \cot^2 \theta$, and $g(\theta) = \alpha \sin^2 \theta + \beta \cos^2 \theta, \alpha > \beta > 0$, let

$\min_{0 < \theta < \frac{\pi}{2}} f(\theta) = \max_{0 < \theta < \pi} g(\theta)$. If the first term of a G.P. is $\left(\frac{\alpha}{2\beta}\right)$, its common ratio is $\left(\frac{2\beta}{\alpha}\right)$ and the sum of its first 10 terms is $\frac{m}{n}$, $\gcd(m, n) = 1$, then $m + n$ is equal to ____.

Q73 Circles **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/ZxShVmsEvC

Let the centre of the circle $x^2 + y^2 + 2gx + 2fy + 25 = 0$ be in the first quadrant and lie on the line $2x - y = 4$. Let the area of an equilateral triangle inscribed in the circle be $27\sqrt{3}$. Then the square of the length of the chord of the circle on the line $x = 1$ is ____.

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Physics

1.	A	2.	B	3.	B	4.	A	5.	D	6.	C	7.	D	8.	B
9.	A	10.	C	11.	A	12.	B	13.	B	14.	D	15.	D	16.	A
17.	A	18.	A	19.	A	20.	C	21.	30	22.	6	23.	3477	24.	186

Chemistry

25.	C	26.	A	27.	C	28.	A	29.	A	30.	D	31.	C	32.	C
33.	D	34.	C	35.	B	36.	A	37.	D	38.	A	39.	D	40.	C
41.	B	42.	C	43.	B	44.	25	45.	34	46.	3	47.	21	48.	4

Mathematics

49.	A	50.	B	51.	B	52.	A	53.	B	54.	B	55.	B	56.	D
57.	A	58.	D	59.	B	60.	D	61.	B	62.	A	63.	B	64.	C
65.	B	66.	C	67.	A	68.	B	69.	4	70.	3	71.	3	72.	1279
73.	80														

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