

JEE MAIN 2022 · QUESTION PAPER

25 Jul 2022 **Shift 2**

85 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	19 Q1 to Q19	10 Q20 to Q29
● Chemistry	18 Q30 to Q47	9 Q48 to Q56
● Mathematics	19 Q57 to Q75	10 Q76 to Q85
In this PDF	85 questions · answer key at the end	

- 1 Set a 3 hour timer and attempt the paper in one sitting, like the real exam.
- 2 In the 2021 to 2024 papers, Section B asked you to answer any 5 numerical questions per subject. Try each one here.
- 3 Check yourself against the answer key at the end. Every question names its chapter, so you can see where marks went.
- 4 Got one wrong? Tap "Step-by-step solution" at the top right of it for the full working, where available.

Attempt this paper online

The same questions in the same order, with instant answer checking and step-by-step solutions where available.

prepwis.in/pyqs/paper/2022-07-25-evening · Free, no signup needed to start

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

Q1 Alternating Current

[Step-by-step solution](#) > [prepwisar.in/questions/dmY7Nq1huN](https://www.prepwisar.in/questions/dmY7Nq1huN)

When you walk through a metal detector carrying a metal object in your pocket, it raises an alarm. This phenomenon works on:

- (A) Electromagnetic induction (B) Resonance in ac circuits
(C) Mutual induction in ac circuits (D) Interference of electromagnetic waves

Q2 Atomic Physics

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

Hydrogen atom from excited state comes to the ground state by emitting a photon of wavelength λ . The value of principal quantum number ' n ' of the excited state will be : (R : Rydberg constant)

- (A) $\sqrt{\frac{\lambda R}{\lambda - 1}}$ (B) $\sqrt{\frac{\lambda R}{\lambda R - 1}}$ (C) $\sqrt{\frac{\lambda}{\lambda R - 1}}$ (D) $\sqrt{\frac{\lambda R^2}{\lambda R - 1}}$

Q3 Electrostatics II: Potential & Capacitance

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

Capacitance of an isolated conducting sphere of radius R_1 becomes n times when it is enclosed by a concentric conducting sphere of radius R_2 connected to earth. The ratio of their radii $\left(\frac{R_2}{R_1}\right)$ is:

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

Q4 Collision

[Step-by-step solution](#) > [prepwisar.in/questions/Vkk48_t9t4](https://www.prepwisar.in/questions/Vkk48_t9t4)

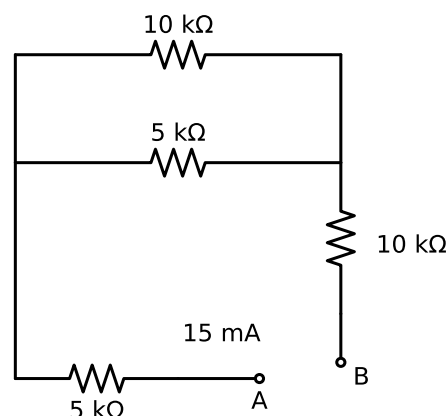
Two billiard balls of mass 0.05 kg each moving in opposite directions with 10 ms^{-1} collide and rebound with the same speed. If the time duration of contact is $t = 0.005 \text{ s}$, then what is the force exerted on the ball due to each other?

- (A) 100 N (B) 200 N (C) 300 N (D) 400 N

Q5 Current Electricity

[Step-by-step solution](#) > [prepwisar.in/questions/di2tweP6y4](https://www.prepwisar.in/questions/di2tweP6y4)

A current of 15 mA flows in the circuit as shown in figure. The value of potential difference between the points A and B will be:



- (A) 50 V (B) 75 V (C) 150 V (D) 275 V

Q6 Dual Nature of Radiation & Matter

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

The ratio of wavelengths of proton and deuteron accelerated by potential V_p and V_d is $1:\sqrt{2}$. Then the ratio of V_p to V_d will be:

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

Q7 Moving Charges & Magnetism[Step-by-step solution](https://www.prepwiser.in/questions/h62C9CSp3q) > prepwiser.in/questions/h62C9CSp3q

The electric current in a circular coil of 2 turns produces a magnetic induction B_1 at its centre. The coil is unwound and is rewound into a circular coil of 5 turns and the same current produces a magnetic induction B_2 at its centre. The ratio of $\frac{B_2}{B_1}$ is

- (A) $\frac{5}{2}$ (B) $\frac{25}{4}$ (C) $\frac{5}{4}$ (D) $\frac{25}{2}$

Q8 Electromagnetic Waves[Step-by-step solution](https://www.prepwiser.in/questions/yOA93SGNhu) > prepwiser.in/questions/yOA93SGNhu

Light wave travelling in air along x-direction is given by $E_y = 540 \sin \pi \times 10^4(x - ct) \text{ Vm}^{-1}$. Then, the peak value of magnetic field of wave will be (Given $c = 3 \times 10^8 \text{ ms}^{-1}$)

- (A) $18 \times 10^{-7} \text{ T}$ (B) $54 \times 10^{-7} \text{ T}$ (C) $54 \times 10^{-8} \text{ T}$ (D) $18 \times 10^{-8} \text{ T}$

Q9 Ray Optics[Step-by-step solution](https://www.prepwiser.in/questions/36zBF0tMDe) > prepwiser.in/questions/36zBF0tMDe

For an object placed at a distance 2.4 m from a lens, a sharp focused image is observed on a screen placed at a distance 12 cm from the lens. A glass plate of refractive index 1.5 and thickness 1 cm is introduced between lens and screen such that the glass plate plane faces parallel to the screen. By what distance should the object be shifted so that a sharp focused image is observed again on the screen?

- (A) 0.8 m (B) 3.2 m (C) 1.2 m (D) 5.6 m

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

The length of a seconds pendulum at a height $h = 2R$ from earth surface will be:

(Given R = Radius of earth and acceleration due to gravity at the surface of earth, $g = \pi^2 \text{ ms}^{-2}$)

- (A) $\frac{2}{9} \text{ m}$ (B) $\frac{4}{9} \text{ m}$ (C) $\frac{8}{9} \text{ m}$ (D) $\frac{1}{9} \text{ m}$

Q11 Gravitation[Step-by-step solution](https://www.prepwiser.in/questions/VmNk9bH1bu) > prepwiser.in/questions/VmNk9bH1bu

An object is taken to a height above the surface of earth at a distance $\frac{5}{4} R$ from the centre of the earth. Where radius of earth, $R = 6400 \text{ km}$. The percentage decrease in the weight of the object will be:

- (A) 36% (B) 50% (C) 64% (D) 25%

Q12 Kinetic Theory of Gases[Step-by-step solution](https://www.prepwiser.in/questions/R_x0nhYAnj) > prepwiser.in/questions/R_x0nhYAnj

Sound travels in a mixture of two moles of helium and n moles of hydrogen. If rms speed of gas molecules in the mixture is $\sqrt{2}$ times the speed of sound, then the value of n will be:

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

Q13 Thermodynamics[Step-by-step solution](https://www.prepwiser.in/questions/Ia_OLFx1G6) > prepwiser.in/questions/Ia_OLFx1G6

Let η_1 is the efficiency of an engine at $T_1 = 447^\circ\text{C}$ and $T_2 = 147^\circ\text{C}$ while η_2 is the efficiency at $T_1 = 947^\circ\text{C}$ and $T_2 = 47^\circ\text{C}$ The ratio $\frac{\eta_1}{\eta_2}$ will be:

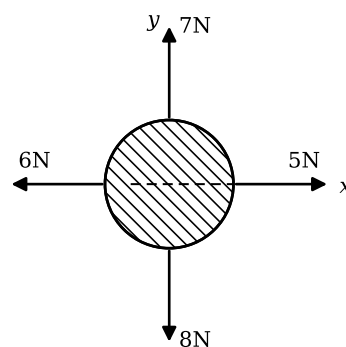
- (A) 0.41 (B) 0.56 (C) 0.73 (D) 0.70

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Q14 Newton's Laws of Motion[Step-by-step solution](https://www.prepwise.in/questions/90Ijm_yufw) > prepwise.in/questions/90Ijm_yufw

For a free body diagram shown in the figure, the four forces are applied in the 'x' and 'y' directions. What additional force must be applied and at what angle with positive x-axis so that the net acceleration of body is zero?

- (A) $\sqrt{2}N, 45^\circ$ (B) $\sqrt{2}N, 135^\circ$ (C) $\frac{2}{\sqrt{3}}N, 30^\circ$ (D) $2N, 45^\circ$

**Q15** Moving Charges & Magnetism[Step-by-step solution](https://www.prepwise.in/questions/VrN-IJTnJX) > prepwise.in/questions/VrN-IJTnJX

An electron with energy 0.1 keV moves at right angle to the earth's magnetic field of $1 \times 10^{-4} \text{ Wbm}^{-2}$. The frequency of revolution of the electron will be:

(Take mass of electron = $9.0 \times 10^{-31} \text{ kg}$)

- (A) $1.6 \times 10^5 \text{ Hz}$ (B) $5.6 \times 10^5 \text{ Hz}$ (C) $2.8 \times 10^6 \text{ Hz}$ (D) $1.8 \times 10^6 \text{ Hz}$

Q16 Projectile Motion & Relative Motion[Step-by-step solution](https://www.prepwise.in/questions/Zt98r1_UzJ) > prepwise.in/questions/Zt98r1_UzJ

A ball is projected from the ground with a speed 15 ms^{-1} at an angle θ with horizontal so that its range and maximum height are equal, then ' $\tan \theta$ ' will be equal to:

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

Q17 Surface Tension[Step-by-step solution](https://www.prepwise.in/questions/5wtLAKu8Yp) > prepwise.in/questions/5wtLAKu8Yp

A drop of liquid of density ρ is floating half immersed in a liquid of density σ and surface tension $7.5 \times 10^{-4} \text{ Ncm}^{-1}$. The radius of drop in cm will be:

($g = 10 \text{ ms}^{-2}$)

- (A) $\frac{15}{\sqrt{(2\rho - \sigma)}}$ (B) $\frac{15}{\sqrt{(\rho - \sigma)}}$ (C) $\frac{3}{2\sqrt{(\rho - \sigma)}}$ (D) $\frac{3}{20\sqrt{(2\rho - \sigma)}}$

Q18 Collision[Step-by-step solution](https://www.prepwise.in/questions/jruL8iD6OI) > prepwise.in/questions/jruL8iD6OI

A bag of sand of mass 9.8 kg is suspended by a rope. A bullet of 200 g travelling with speed 10 ms^{-1} gets embedded in it, then loss of kinetic energy will be:

- (A) 4.9 J (B) 9.8 J (C) 14.7 J (D) 19.6 J

Q19 Units, Dimensions & Errors[Step-by-step solution](https://www.prepwise.in/questions/MFHLByXjwI) > prepwise.in/questions/MFHLByXjwI

The maximum error in the measurement of resistance, current and time for which current flows in an electrical circuit are 1%, 2% and 3% respectively. The maximum percentage error in the detection of the dissipated heat will be:

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

Q20 Atomic Physics **NUMERICAL**

[Step-by-step solution](#) > [prepwise.in/questions/tBE-OTbUud](https://www.prepwise.in/questions/tBE-OTbUud)

$\frac{x}{x+4}$ is the ratio of energies of photons produced due to transition of an electron of hydrogen atom from its

- (i) third permitted energy level to the second level and
- (ii) the highest permitted energy level to the second permitted level.

The value of x will be _____.

Q21 Electrostatics II: Potential & Capacitance **NUMERICAL**

[Step-by-step solution](#) > [prepwise.in/questions/U4wTjF1bF9](https://www.prepwise.in/questions/U4wTjF1bF9)

Two parallel plate capacitors of capacity C and 3C are connected in parallel combination and charged to a potential difference 18 V. The battery is then disconnected and the space between the plates of the capacitor of capacity C is completely filled with a material of dielectric constant 9. The final potential difference across the combination of capacitors will be _____ V.

Q22 Centre of Mass & Linear Momentum **NUMERICAL**

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

Three identical spheres each of mass M are placed at the corners of a right angled triangle with mutually perpendicular sides equal to 3 m each. Taking point of intersection of mutually perpendicular sides as origin, the magnitude of position vector of centre of mass of the system will be $\sqrt{x}$ m. The value of x is _____.

Q23 Current Electricity **NUMERICAL**

[Step-by-step solution](#) > [prepwise.in/questions/P_7gsgqnvD](https://www.prepwise.in/questions/P_7gsgqnvD)

In a potentiometer arrangement, a cell of emf 1.20 V gives a balance point at 36 cm length of wire. This cell is now replaced by another cell of emf 1.80 V. The difference in balancing length of potentiometer wire in above conditions will be _____ cm.

Q24 Electromagnetic Induction **NUMERICAL**

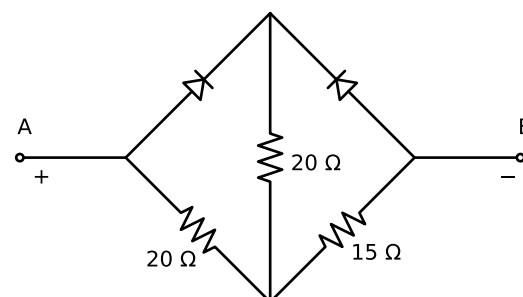
[Step-by-step solution](#) > [prepwise.in/questions/x9m2WE3eyy](https://www.prepwise.in/questions/x9m2WE3eyy)

Magnetic flux (in weber) in a closed circuit of resistance $20\ \Omega$ varies with time t(s) at $\phi = 8t^2 - 9t + 5$. The magnitude of the induced current at $t = 0.25$ s will be _____ mA.

Q25 Semiconductors & Electronic Devices **NUMERICAL**

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

Two ideal diodes are connected in the network as shown in figure. The equivalent resistance between A and B is _____ Ω .



Q26 Ray Optics **NUMERICAL**

[Step-by-step solution](#) > [prepwise.in/questions/QyTRO4YEmy](https://www.prepwise.in/questions/QyTRO4YEmy)

A convex lens of focal length 20 cm is placed in front of a convex mirror with principal axis coinciding each other. The distance between the lens and mirror is 10 cm. A point object is placed on principal axis at a distance of 60 cm from the convex lens. The image formed by combination coincides the object itself. The focal length of the convex mirror is _____ cm.

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Q27 Thermometry & Calorimetry **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/iQSNcyPVI3

A block of ice of mass 120 g at temperature 0°C is put in 300 g of water at 25°C . The x g of ice melts as the temperature of the water reaches 0°C . The value of x is _____.

[Use specific heat capacity of water = $4200\text{ J kg}^{-1}\text{K}^{-1}$, Latent heat of ice = $3.5 \times 10^5\text{ J kg}^{-1}$]

Q28 Rectilinear Motion **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/VWH_SIEp9i

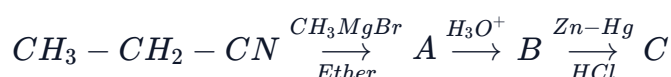
A particle is moving in a straight line such that its velocity is increasing at 5 ms^{-1} per meter. The acceleration of the particle is _____ ms^{-2} at a point where its velocity is 20 ms^{-1} .

Q29 Simple Harmonic Motion **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/S1_kCCVyoX

Two waves executing simple harmonic motions travelling in the same direction with same amplitude and frequency are superimposed. The resultant amplitude is equal to the $\sqrt{3}$ times of amplitude of individual motions. The phase difference between the two motions is _____ (degree).

Chemistry Section A · Multiple choice

Q30 to Q47

Q30 Aldehydes & Ketones[Step-by-step solution](#) > prepwiser.in/questions/EzIWNzmS7t

The correct structure of C is

- (A) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$ (B) $\text{CH}_3 - \text{CH}_2 - \overset{\text{O}}{\underset{\text{||}}{\text{C}}} - \text{CH}_3$
 (C) $\text{CH}_3 - \text{CH}_2 - \overset{\text{OH}}{\underset{|}{\text{CH}}} - \text{CH}_3$ (D) $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH}_2$

Q31 Carbohydrates & Biomolecules[Step-by-step solution](#) > prepwiser.in/questions/7ae9tYO7Ic

Glycosidic linkage between C_1 of α -glucose and C_2 of β -fructose is found in

- (A) maltose (B) sucrose (C) lactose (D) amylose

Q32 Chemical Bonding & Molecular Structure[Step-by-step solution](#) > prepwiser.in/questions/Qke7xUWwT5

Match List I with List II:

	List I (molecule)		List II (hybridization ; shape)
(A)	XeO_3	(I)	sp^3d ; linear
(B)	XeF_2	(II)	sp^3 ; pyramidal
(C)	XeOF_4	(III)	sp^3d^3 ; distorted octahedral
(D)	XeF_6	(IV)	sp^3d^2 ; square pyramidal

Choose the correct answer from the options given below:

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

Q33 Chemistry in Everyday Life[Step-by-step solution](#) > prepwiser.in/questions/j4j7Gz8-n8

Some drugs bind to a site other than the active site of an enzyme. This site is known as

- (A) non-active site (B) allosteric site (C) competitive site (D) therapeutic site

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The correct order of energy of absorption for the following metal complexes is:

A : $[\text{Ni}(\text{en})_3]^{2+}$, B : $[\text{Ni}(\text{NH}_3)_6]^{2+}$, C : $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$

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

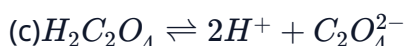
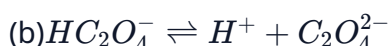
The molar conductivity of a conductivity cell filled with 10 moles of 20 mL NaCl solution is Λ_{m1} and that of 20 moles another identical cell having 80 mL NaCl solution is Λ_{m2} . The conductivities exhibited by these two cells are same. The relationship between Λ_{m2} and Λ_{m1} is

- (A) $\Lambda_{m2} = 2\Lambda_{m1}$ (B) $\Lambda_{m2} = \Lambda_{m1} / 2$ (C) $\Lambda_{m2} = \Lambda_{m1}$ (D) $\Lambda_{m2} = 4\Lambda_{m1}$

High purity (> 99.95%) dihydrogen is obtained by:

- (A) reaction of zinc with aqueous alkali.
(B) electrolysis of acidified water using platinum electrodes.
(C) electrolysis of warm aqueous barium hydroxide solution between nickel electrodes.
(D) reaction of zinc with dilute acid.

K_{a1} , K_{a2} and K_{a3} are the respective ionization constants for the following reactions (a), (b) and (c).



The relationship between K_{a1} , K_{a2} and K_{a3} is given as:

- (A) $K_{a3} = K_{a1} + K_{a2}$ (B) $K_{a3} = K_{a1} - K_{a2}$ (C) $K_{a3} = K_{a1} / K_{a2}$ (D) $K_{a3} = K_{a1} \times K_{a2}$

Given below are two statements.

Statement I : Pig iron is obtained by heating cast iron with scrap iron.

Statement II : Pig iron has a relatively lower carbon content than that of cast iron.

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

- (A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are not correct.
(C) Statement I is correct but Statement II is not correct.
(D) Statement I is not correct but Statement II is correct.

The total number of acidic oxides from the following list is

NO, N_2O , B_2O_3 , N_2O_5 , CO, SO_3 , P_4O_{10}

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

Match List I with List II:

	List I		List II
(A)	Sulphate	(I)	Pesticide
(B)	Fluoride	(II)	Bending of bones
(C)	Nicotine	(III)	Laxative effect
(D)	Sodium arsinite	(IV)	Herbicide

Choose the correct answer from the options given below:

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

The first ionization enthalpies of Be, B, N and O follow the order

- (A) $O < N < B < Be$ (B) $Be < B < N < O$ (C) $B < Be < N < O$ (D) $B < Be < O < N$

Match List I with List II:

	List I		List II
(A)	Nylon 6, 6	(I)	Buckets
(B)	Low density polythene	(II)	Non-stick utensils
(C)	High density polythene	(III)	Bristles of brushes
(D)	Teflon	(IV)	Toys

Choose the correct answer from the options given below:

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

The correct order of density is:

- (A) $Be > Mg > Ca > Sr$ (B) $Sr > Ca > Mg > Be$ (C) $Sr > Be > Mg > Ca$ (D) $Be > Sr > Mg > Ca$

Two solutions A and B are prepared by dissolving 1 g of non-volatile solutes X and Y, respectively in 1 kg of water. The ratio of depression in freezing points for A and B is found to be 1 : 4. The ratio of molar masses of X and Y is

- (A) 1 : 4 (B) 1 : 0.25 (C) 1 : 0.20 (D) 1 : 5

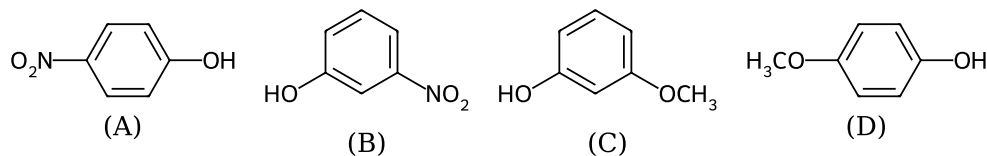
For micelle formation, which of the following statements are correct?

- A. Micelle formation is an exothermic process.
 B. Micelle formation is an endothermic process.
 C. The entropy change is positive.
 D. The entropy change is negative.

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

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Arrange the following in decreasing acidic strength.

(A) $A > B > C > D$ (B) $B > A > C > D$ (C) $D > C > A > B$ (D) $D > C > B > A$

In base vs. acid titration, at the end point methyl orange is present as

(A) quinonoid form

(B) heterocyclic form

(C) phenolic form

(D) benzenoid form

Chemistry Section B · Numerical value

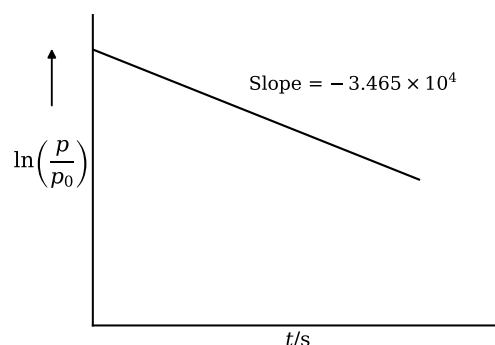
Q48 to Q56

The sum of number of lone pairs of electrons present on the central atoms of XeO_3 , XeOF_4 and XeF_6 , is _____

For the decomposition of azomethane.

$\text{CH}_3\text{N}_2\text{CH}_3(\text{g}) \rightarrow \text{CH}_3\text{CH}_3(\text{g}) + \text{N}_2(\text{g})$, a first order reaction, the variation in partial pressure with time at 600 K is given as

The half life of the reaction is _____ $\times 10^{-5}$ s. [Nearest integer]



The spin-only magnetic moment value of M^{3+} ion (in gaseous state) from the pairs $\text{Cr}^{3+} / \text{Cr}^{2+}$, $\text{Mn}^{3+} / \text{Mn}^{2+}$, $\text{Fe}^{3+} / \text{Fe}^{2+}$ and $\text{Co}^{3+} / \text{Co}^{2+}$ that has negative standard electrode potential, is _____ B.M. [Nearest integer]

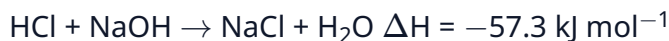
56.0 L of nitrogen gas is mixed with excess hydrogen gas and it is found that 20 L of ammonia gas is produced. The volume of unused nitrogen gas is found to be _____ L.

A sample of 4.5 mg of an unknown monohydric alcohol, R-OH was added to methylmagnesium iodide. A gas is evolved and is collected and its volume measured to be 3.1 mL. The molecular weight of the unknown alcohol is _____ g/mol. [Nearest integer]

When the excited electron of a H atom from $n = 5$ drops to the ground state, the maximum number of emission lines observed are _____.

Q54 Chemical Thermodynamics **NUMERICAL**[Step-by-step solution](#) › [prepwisar.in/questions/5CUvSK_ItC](https://www.prepwisar.in/questions/5CUvSK_ItC)

While performing a thermodynamics experiment, a student made the following observations.



The enthalpy of ionization of CH_3COOH as calculated by the student is _____ kJ mol^{-1} . (nearest integer)

Q55 Purification & Characterisation of Organic Compounds **NUMERICAL**[Step-by-step solution](#) › [prepwisar.in/questions/ITr6aXzOGY](https://www.prepwisar.in/questions/ITr6aXzOGY)

The separation of two coloured substances was done by paper chromatography. The distances travelled by solvent front, substance A and substance B from the base line are 3.25 cm, 2.08 cm and 1.05 cm, respectively. The ratio of R_f values of A to B is _____.

Q56 Hydrocarbons: Alkanes **NUMERICAL**[Step-by-step solution](#) › [prepwisar.in/questions/hIxVo0VInC](https://www.prepwisar.in/questions/hIxVo0VInC)

The total number of monobromo derivatives formed by the alkanes with molecular formula C_5H_{12} is (excluding stereo isomers) _____.

Mathematics Section A · Multiple choice

Q57 to Q75

Q57 Three Dimensional Geometry[Step-by-step solution](#) › [prepwisar.in/questions/80B61htqBD](https://www.prepwisar.in/questions/80B61htqBD)

A plane E is perpendicular to the two planes $2x - 2y + z = 0$ and $x - y + 2z = 4$, and passes through the point $P(1, -1, 1)$. If the distance of the plane E from the point $Q(a, a, 2)$ is $3\sqrt{2}$, then $(PQ)^2$ is equal to:

- (A) 9 (B) 12 (C) 21 (D) 33

Q58 Three Dimensional Geometry[Step-by-step solution](#) › [prepwisar.in/questions/BoMfCy4Rcg](https://www.prepwisar.in/questions/BoMfCy4Rcg)

The shortest distance between the lines $\frac{x+7}{-6} = \frac{y-6}{7} = z$ and $\frac{7-x}{2} = y - 2 = z - 6$ is:

- (A) $2\sqrt{29}$ (B) 1 (C) $\sqrt{\frac{37}{29}}$ (D) $\frac{\sqrt{29}}{2}$

Q59 Binomial Theorem[Step-by-step solution](#) › [prepwisar.in/questions/LxrTaISJ43](https://www.prepwisar.in/questions/LxrTaISJ43)

The remainder when $(11)^{1011} + (1011)^{11}$ is divided by 9 is

- (A) 1 (B) 4 (C) 6 (D) 8

Q60 Complex Numbers[Step-by-step solution](#) › [prepwisar.in/questions/ShAcSm94kz](https://www.prepwisar.in/questions/ShAcSm94kz)

For $z \in \mathbb{C}$ if the minimum value of $(|z - 3\sqrt{2}| + |z - p\sqrt{2}i|)$ is $5\sqrt{2}$, then a value Question: of p is _____.

- (A) 3 (B) $\frac{7}{2}$ (C) 4 (D) $\frac{9}{2}$

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Q61 Definite Integration[Step-by-step solution > prepwisar.in/questions/mIhGhf2vOw](https://www.prepwisar.in/questions/mIhGhf2vOw)

$$\lim_{n \rightarrow \infty} \frac{1}{2^n} \left(\frac{1}{\sqrt{1 - \frac{1}{2^n}}} + \frac{1}{\sqrt{1 - \frac{2}{2^n}}} + \frac{1}{\sqrt{1 - \frac{3}{2^n}}} + \dots + \frac{1}{\sqrt{1 - \frac{2^n-1}{2^n}}} \right)$$

is equal to

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

Q62 Definite Integration[Step-by-step solution > prepwisar.in/questions/dmITFZzcj](https://www.prepwisar.in/questions/dmITFZzcj)Let $[t]$ denote the greatest integer less than or equal to t . Then the value of the integral $\int_{-3}^{101} ([\sin(\pi x)] + e^{\cos(2\pi x)}) dx$ is equal to

- (A) $\frac{52(1-e)}{e}$ (B) $\frac{52}{e}$ (C) $\frac{52(2+e)}{e}$ (D) $\frac{104}{e}$

Q63 Differential Equations[Step-by-step solution > prepwisar.in/questions/iNFfRaKxcT](https://www.prepwisar.in/questions/iNFfRaKxcT)Let a smooth curve $y = f(x)$ be such that the slope of the tangent at any point (x, y) on it is directly proportional to $(\frac{-y}{x})$. If the curve passes through the points $(1, 2)$ and $(8, 1)$, then $|y(\frac{1}{8})|$ is equal to

- (A) $2 \log_e 2$ (B) 4 (C) 1 (D) $4 \log_e 2$

Q64 Ellipse[Step-by-step solution > prepwisar.in/questions/zLDcACSpn](https://www.prepwisar.in/questions/zLDcACSpn)If the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ meets the line $\frac{x}{7} + \frac{y}{2\sqrt{6}} = 1$ on the x -axis and the line $\frac{x}{7} - \frac{y}{2\sqrt{6}} = 1$ on the y -axis, then the eccentricity of the ellipse is:

- (A) $\frac{5}{7}$ (B) $\frac{2\sqrt{6}}{7}$ (C) $\frac{3}{7}$ (D) $\frac{2\sqrt{5}}{7}$

Q65 Permutations & Combinations[Step-by-step solution > prepwisar.in/questions/ecQIPuUqVh](https://www.prepwisar.in/questions/ecQIPuUqVh)The number of bijective functions $f : \{1, 3, 5, 7, \dots, 99\} \rightarrow \{2, 4, 6, 8, \dots, 100\}$, such that $f(3) \geq f(9) \geq f(15) \geq f(21) \geq \dots \geq f(99)$, is _____.

- (A) ${}^{50}P_{17}$ (B) ${}^{50}P_{33}$ (C) $33! \times 17!$ (D) $\frac{50!}{2}$

Q66 Hyperbola[Step-by-step solution > prepwisar.in/questions/ydpEtZTUcQ](https://www.prepwisar.in/questions/ydpEtZTUcQ)Let the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{7} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{\alpha} = \frac{1}{25}$ coincide. Then the length of the latus rectum of the hyperbola is:

- (A) $\frac{32}{9}$ (B) $\frac{18}{5}$ (C) $\frac{27}{4}$ (D) $\frac{27}{10}$

Q67 Limits[Step-by-step solution > prepwisar.in/questions/vQnng7zsry](https://www.prepwisar.in/questions/vQnng7zsry)

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{8\sqrt{2} - (\cos x + \sin x)^7}{\sqrt{2} - \sqrt{2} \sin 2x}$$

is equal to

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

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Q68 Determinants[Step-by-step solution](https://www.prepwise.in/questions/KfZgYcYP8k) › prepwise.in/questions/KfZgYcYP8k

The number of real values of λ , such that the system of linear equations

$$2x - 3y + 5z = 9$$

$$x + 3y - z = -18$$

$$3x - y + (\lambda^2 - |\lambda|)z = 16$$

has no solutions, is

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

Q69 Parabola[Step-by-step solution](https://www.prepwise.in/questions/GRhP3LUCOj) › prepwise.in/questions/GRhP3LUCOj

The tangents at the points $A(1, 3)$ and $B(1, -1)$ on the parabola $y^2 - 2x - 2y = 1$ meet at the point P . Then the area (in unit²) of the triangle PAB is:

- (A) 4 (B) 6 (C) 7 (D) 8

Q70 Probability: Advanced[Step-by-step solution](https://www.prepwise.in/questions/GDp50ggyRw) › prepwise.in/questions/GDp50ggyRw

If A and B are two events such that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{5}$ and $P(A \cup B) = \frac{1}{2}$, then $P(A | B') + P(B | A')$ is equal to:

- (A) $\frac{3}{4}$ (B) $\frac{5}{8}$ (C) $\frac{5}{4}$ (D) $\frac{7}{8}$

Q71 Sequences & Series[Step-by-step solution](https://www.prepwise.in/questions/KcELEoa8mI) › prepwise.in/questions/KcELEoa8mI

The sum $\sum_{n=1}^{21} \frac{3}{(4n-1)(4n+3)}$ is equal to

- (A) $\frac{7}{87}$ (B) $\frac{7}{29}$ (C) $\frac{14}{87}$ (D) $\frac{21}{29}$

Q72 Statistics[Step-by-step solution](https://www.prepwise.in/questions/cruMXhOpWZ) › prepwise.in/questions/cruMXhOpWZ

If the mean deviation about median for the numbers 3, 5, 7, 2k, 12, 16, 21, 24, arranged in the ascending order, is 6 then the median is:

- (A) 11.5 (B) 10.5 (C) 12 (D) 11

Q73 Vectors[Step-by-step solution](https://www.prepwise.in/questions/yOa0AmixwS) › prepwise.in/questions/yOa0AmixwS

Let $\vec{a} = \hat{i} - \hat{j} + 2\hat{k}$ and let $\vec{b}$ be a vector such that $\vec{a} \times \vec{b} = 2\hat{i} - \hat{k}$ and $\vec{a} \cdot \vec{b} = 3$. Then the projection of $\vec{b}$ on the vector $\vec{a} - \vec{b}$ is:

- (A) $\frac{2}{\sqrt{21}}$ (B) $2\sqrt{\frac{3}{7}}$ (C) $\frac{2}{3}\sqrt{\frac{7}{3}}$ (D) $\frac{2}{3}$

Q74 Straight Lines[Step-by-step solution](https://www.prepwise.in/questions/8BIKheLdmd) › prepwise.in/questions/8BIKheLdmd

Let the point $P(\alpha, \beta)$ be at a unit distance from each of the two lines $L_1 : 3x - 4y + 12 = 0$, and $L_2 : 8x + 6y + 11 = 0$. If P lies below L_1 and above L_2 , then $100(\alpha + \beta)$ is equal to:

- (A) -14 (B) 42 (C) -22 (D) 14

Q75 Trigonometric Ratios & Identities[Step-by-step solution](https://www.prepwise.in/questions/UpIkBqChZ_) › prepwise.in/questions/UpIkBqChZ_

$2 \sin\left(\frac{\pi}{22}\right) \sin\left(\frac{3\pi}{22}\right) \sin\left(\frac{5\pi}{22}\right) \sin\left(\frac{7\pi}{22}\right) \sin\left(\frac{9\pi}{22}\right)$ is equal to:

- (A) $\frac{3}{16}$ (B) $\frac{1}{16}$ (C) $\frac{1}{32}$ (D) $\frac{9}{32}$

Q76 Relations & Functions (Basic) **NUMERICAL**

[Step-by-step solution](#) › [prepwiser.in/questions/iee7586OL2](https://www.prepwiser.in/questions/iee7586OL2)

The sum of the maximum and minimum values of the function $f(x) = |5x - 7| + [x^2 + 2x]$ in the interval $[\frac{5}{4}, 2]$, where $[t]$ is the greatest integer $\leq t$, is _____.

Q77 Circles **NUMERICAL**

[Step-by-step solution](#) › [prepwiser.in/questions/WW4C5SzCqK](https://www.prepwiser.in/questions/WW4C5SzCqK)

If the circles $x^2 + y^2 + 6x + 8y + 16 = 0$ and

$$x^2 + y^2 + 2(3 - \sqrt{3})x + 2(4 - \sqrt{6})y = k + 6\sqrt{3} + 8\sqrt{6}$$

, $k > 0$, touch internally at the point $P(\alpha, \beta)$, then $(\alpha + \sqrt{3})^2 + (\beta + \sqrt{6})^2$ is equal to _____.

Q78 Definite Integration **NUMERICAL**

[Step-by-step solution](#) › [prepwiser.in/questions/F3k_TBolEz](https://www.prepwiser.in/questions/F3k_TBolEz)

Let f be a twice differentiable function on $\mathbb{R}$. If $f'(0) = 4$ and

$$f(x) + \int_0^x (x-t)f'(t)dt = (e^{2x} + e^{-2x}) \cos 2x + \frac{2}{a}x$$

, then $(2a + 1)^5 a^2$ is equal to _____.

Q79 Definite Integration **NUMERICAL**

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

Let

$$a_n = \int_{-1}^n \left(1 + \frac{x}{2} + \frac{x^2}{3} + \dots + \frac{x^{n-1}}{n} \right) dx$$

for every $n \in \mathbb{N}$. Then the sum of all the elements of the set $\{n \in \mathbb{N} : a_n \in (2, 30)\}$ is _____.

Q80 Differential Equations **NUMERICAL**

[Step-by-step solution](#) › [prepwiser.in/questions/nNeq2B7LT1](https://www.prepwiser.in/questions/nNeq2B7LT1)

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

$$\frac{dy}{dx} = \frac{4y^3 + 2yx^2}{3xy^2 + x^3}, y(1) = 1.$$

If for some $n \in \mathbb{N}$, $y(2) \in [n-1, n)$, then n is equal to _____.

Q81 Quadratic Equations & Polynomial Inequalities **NUMERICAL**

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

Let $f(x)$ be a quadratic polynomial with leading coefficient 1 such that $f(0) = p, p \neq 0$, and $f(1) = \frac{1}{3}$.

If the equations $f(x) = 0$ and $f \circ f \circ f \circ f(x) = 0$ have a common real root, then $f(-3)$ is equal to _____.

Q82 Inverse Trigonometric Functions **NUMERICAL**

[Step-by-step solution](#) › [prepwiser.in/questions/URij33H88v](https://www.prepwiser.in/questions/URij33H88v)

Let $x = \sin(2\tan^{-1}\alpha)$ and $y = \sin(\frac{1}{2}\tan^{-1}\frac{4}{3})$. If $S = \{a \in \mathbb{R} : y^2 = 1 - x\}$, then $\sum_{\alpha \in S} 16\alpha^3$ is equal to _____.

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Let

$$A = \begin{bmatrix} 1 & a & a \\ 0 & 1 & b \\ 0 & 0 & 1 \end{bmatrix}, a, b \in \mathbb{R}$$

. If for some

$$n \in \mathbb{N}, A^n = \begin{bmatrix} 1 & 48 & 2160 \\ 0 & 1 & 96 \\ 0 & 0 & 1 \end{bmatrix}$$

then $n + a + b$ is equal to _____.

Let $A = \{1, 2, 3, 4, 5, 6, 7\}$. Define $B = \{T \subseteq A : \text{either } 1 \notin T \text{ or } 2 \in T\}$ and $C = \{T \subseteq A : T \text{ the sum of all the elements of } T \text{ is a prime number}\}$. Then the number of elements in the set $B \cup C$ is _____.

Let the area enclosed by the x-axis, and the tangent and normal drawn to the curve $4x^3 - 3xy^2 + 6x^2 - 5xy - 8y^2 + 9x + 14 = 0$ at the point $(-2, 3)$ be A. Then 8A is equal to _____.

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Physics

1.	B	2.	B	3.	A	4.	B	5.	D	6.	D	7.	B	8.	A	9.	B	10.	D
11.	A	12.	B	13.	B	14.	A	15.	C	16.	D	17.	A	18.	B	19.	D	20.	5
21.	6	22.	2	23.	18	24.	250	25.	25	26.	10	27.	90	28.	100	29.	60		

Chemistry

30.	A	31.	B	32.	A	33.	B	34.	A	35.	A	36.	C	37.	D	38.	B	39.	B
40.	C	41.	D	42.	B	43.	C	44.	B	45.	C	46.	A	47.	A	48.	3	49.	2
50.	4	51.	46	52.	33	53.	10	54.	2	55.	2	56.	8						

Mathematics

57.	C	58.	A	59.	D	60.	C	61.	C	62.	B	63.	B	64.	A	65.	B	66.	D
67.	A	68.	C	69.	D	70.	B	71.	B	72.	D	73.	A	74.	D	75.	B	76.	15
77.	25	78.	8	79.	5	80.	3	81.	25	82.	130	83.	24	84.	107	85.	170		

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