

JEE MAIN 2023 · QUESTION PAPER

10 Apr 2023 **Shift 1**

78 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	17 Q1 to Q17	8 Q18 to Q25
● Chemistry	17 Q26 to Q42	9 Q43 to Q51
● Mathematics	18 Q52 to Q69	9 Q70 to Q78
In this PDF	78 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.

prepwise.in/pyqs/paper/2023-04-10-morning · 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? prepwise.in/feedback · Terms: prepwise.in/terms

Q1 Alternating Current

[Step-by-step solution](https://www.prepwiser.in/questions/_n7u7aYZUd) › prepwiser.in/questions/_n7u7aYZUd

Given below are two statements:

Statement I : Maximum power is dissipated in a circuit containing an inductor, a capacitor and a resistor connected in series with an AC source, when resonance occurs

Statement II : Maximum power is dissipated in a circuit containing pure resistor due to zero phase difference between current and voltage.

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

Q2 Atomic Physics

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

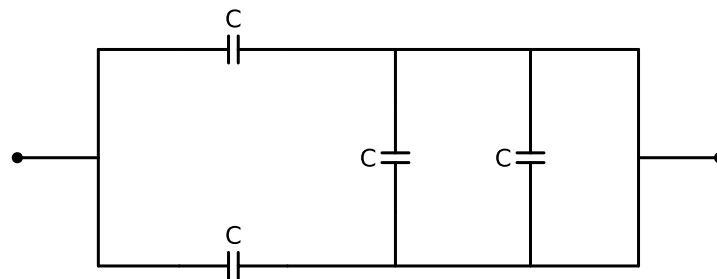
The angular momentum for the electron in Bohr's orbit is L . If the electron is assumed to revolve in second orbit of hydrogen atom, then the change in angular momentum will be

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

Q3 Electrostatics II: Potential & Capacitance

[Step-by-step solution](https://www.prepwiser.in/questions/OLnjkbxBx9) › prepwiser.in/questions/OLnjkbxBx9

The equivalent capacitance of the combination shown is:



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

Q4 Collision

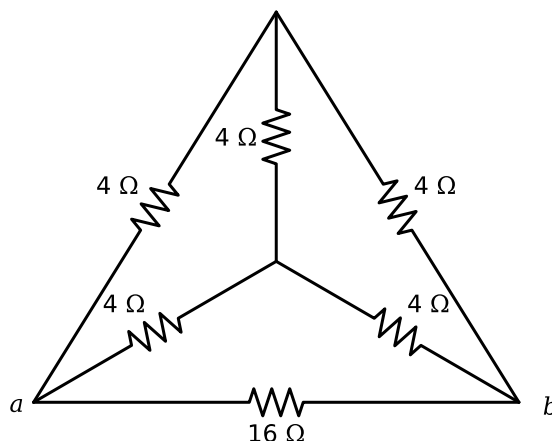
[Step-by-step solution](https://www.prepwiser.in/questions/XHg-6rJzSU) › prepwiser.in/questions/XHg-6rJzSU

A particle of mass m moving with velocity v collides with a stationary particle of mass $2m$. After collision, they stick together and continue to move together with velocity

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

Attempt this paper online with instant answer checking › [prepwiser.in/pyqs/paper/2023-04-10-morning](https://www.prepwiser.in/pyqs/paper/2023-04-10-morning)

The equivalent resistance of the circuit shown below between points a and b is:

(A) 16Ω (B) 20Ω (C) 3.2Ω (D) 24Ω

The de Broglie wavelength of a molecule in a gas at room temperature (300 K) is λ_1 . If the temperature of the gas is increased to 600 K, then the de Broglie wavelength of the same gas molecule becomes

(A) $2\lambda_1$ (B) $\frac{1}{2}\lambda_1$ (C) $\frac{1}{\sqrt{2}}\lambda_1$ (D) $\sqrt{2}\lambda_1$

Given below are two statements:

Statement I : If the number of turns in the coil of a moving coil galvanometer is doubled then the current sensitivity becomes double.

Statement II : Increasing current sensitivity of a moving coil galvanometer by only increasing the number of turns in the coil will also increase its voltage sensitivity in the same ratio

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

(A) Statement I is true but Statement II is false

(B) Statement I is false but Statement II is true

(C) Both Statement I and Statement II are false

(D) Both Statement I and Statement II are true

The energy of an electromagnetic wave contained in a small volume oscillates with

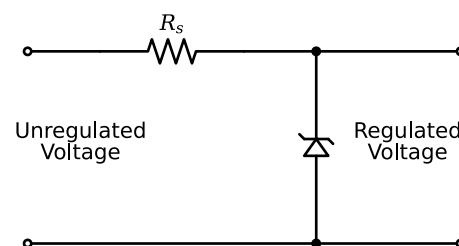
(A) double the frequency of the wave

(B) the frequency of the wave

(C) half the frequency of the wave

(D) zero frequency

A zener diode of power rating 1.6 W is to be used as voltage regulator. If the zener diode has a breakdown of 8V and it has to regulate voltage fluctuating between 3 V and 10 V. The value of resistance R_s for safe operation of diode will be

(A) 13Ω (B) 13.3Ω (C) 10Ω (D) 12Ω 

Q10 Ray Optics[Step-by-step solution](https://www.prepwiser.in/questions/LiKcTzR3ZM) › prepwiser.in/questions/LiKcTzR3ZM

An object is placed at a distance of 12 cm in front of a plane mirror. The virtual and erect image is formed by the mirror. Now the mirror is moved by 4 cm towards the stationary object. The distance by which the position of image would be shifted, will be

- (A) 4 cm towards mirror (B) 2 cm towards mirror
(C) 8 cm away from mirror (D) 8 cm towards mirror

Q11 Gravitation[Step-by-step solution](https://www.prepwiser.in/questions/CsNIY1yLBT) › prepwiser.in/questions/CsNIY1yLBT

Two satellites of masses m and $3m$ revolve around the earth in circular orbits of radii r & $3r$ respectively. The ratio of orbital speeds of the satellites respectively is

- (A) 3 : 1 (B) $\sqrt{3}$: 1 (C) 1 : 1 (D) 9 : 1

Q12 Gravitation[Step-by-step solution](https://www.prepwiser.in/questions/1B4o9Q8QF2) › prepwiser.in/questions/1B4o9Q8QF2

Assuming the earth to be a sphere of uniform mass density, the weight of a body at a depth $d = \frac{R}{2}$ from the surface of earth, if its weight on the surface of earth is 200 N, will be:

(Given R = radius of earth)

- (A) 100 N (B) 400 N (C) 300 N (D) 500 N

Q13 Thermodynamics[Step-by-step solution](https://www.prepwiser.in/questions/xTb5Hzjsu1) › prepwiser.in/questions/xTb5Hzjsu1

Consider two containers A and B containing monoatomic gases at the same Pressure (P), Volume (V) and Temperature (T). The gas in A is compressed isothermally to $\frac{1}{8}$ of its original volume while the gas in B is compressed adiabatically to $\frac{1}{8}$ of its original volume. The ratio of final pressure of gas in B to that of gas in A is

- (A) $\frac{1}{8}$ (B) $8^{\frac{3}{2}}$ (C) 4 (D) 8

Q14 Projectile Motion & Relative Motion[Step-by-step solution](https://www.prepwiser.in/questions/oMufc1kHjG) › prepwiser.in/questions/oMufc1kHjG

The range of the projectile projected at an angle of 15° with horizontal is 50 m. If the projectile is projected with same velocity at an angle of 45° with horizontal, then its range will be

- (A) $50\sqrt{2}$ m (B) 100 m (C) $100\sqrt{2}$ m (D) 50 m

Q15 Fluid Mechanics[Step-by-step solution](https://www.prepwiser.in/questions/jLOiO9lqnD) › prepwiser.in/questions/jLOiO9lqnD

Given below are two statements:

Statement I : Pressure in a reservoir of water is same at all points at the same level of water.

Statement II : The pressure applied to enclosed water is transmitted in all directions equally.

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

Q16 Simple Harmonic Motion[Step-by-step solution](https://www.prepwiser.in/questions/F9m5atekCB) › prepwiser.in/questions/F9m5atekCB

A particle executes S.H.M. of amplitude A along x -axis. At $t = 0$, the position of the particle is $x = \frac{A}{2}$ and it moves along positive x -axis. The displacement of particle in time t is $x = A \sin(\omega t + \delta)$, then the value of δ will be

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

A physical quantity P is given as

$$P = \frac{a^2 b^3}{c \sqrt{d}}$$

The percentage error in the measurement of a, b, c and d are 1%, 2%, 3% and 4% respectively. The percentage error in the measurement of quantity P will be

- (A) 12% (B) 13% (C) 16% (D) 14%

Physics Section B · Numerical value

Q18 to Q25

Q18 Nuclear Physics NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/p8K1t4IZP6](https://www.prepwiser.in/questions/p8K1t4IZP6)

The decay constant for a radioactive nuclide is $1.5 \times 10^{-5} \text{ s}^{-1}$. Atomic weight of the substance is 60 g mole⁻¹, ($N_A = 6 \times 10^{23}$). The activity of 1.0 μg of the substance is _____ $\times 10^{10}$ Bq.

Q19 Current Electricity NUMERICAL

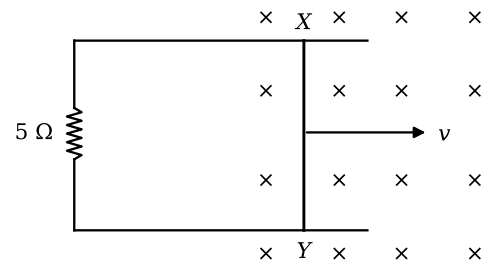
[Step-by-step solution](#) > [prepwiser.in/questions/xFkrLM_-Ao](https://www.prepwiser.in/questions/xFkrLM_-Ao)

10 resistors each of resistance 10Ω can be connected in such as to get maximum and minimum equivalent resistance. The ratio of maximum and minimum equivalent resistance will be _____.

Q20 Electromagnetic Induction NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/ZgTSiGa9AY](https://www.prepwiser.in/questions/ZgTSiGa9AY)

A 1 m long metal rod XY completes the circuit as shown in figure. The plane of the circuit is perpendicular to the magnetic field of flux density 0.15 T. If the resistance of the circuit is 5Ω , the force needed to move the rod in direction, as indicated, with a constant speed of 4 m/s will be _____ 10^{-3} N.



Q21 Electrostatics I: Charges, Field & Gauss's Law NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/ZSL77jle90](https://www.prepwiser.in/questions/ZSL77jle90)

Three concentric spherical metallic shells X, Y and Z of radius a, b and c respectively [$a < b < c$] have surface charge densities σ , $-\sigma$ and σ respectively. The shells X and Z are at same potential. If the radii of X & Y are 2 cm and 3 cm, respectively. The radius of shell Z is _____ cm.

Q22 Rotational Motion NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/se0raoTju3](https://www.prepwiser.in/questions/se0raoTju3)

If the earth suddenly shrinks to $\frac{1}{64}$ th of its original volume with its mass remaining the same, the period of rotation of earth becomes $\frac{24}{x}$ h. The value of x is _____.

Q23 Magnetism & Matter NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/UOFfkqnQ1W](https://www.prepwiser.in/questions/UOFfkqnQ1W)

The current required to be passed through a solenoid of 15 cm length and 60 turns in order of demagnetise a bar magnet of magnetic intensity $2.4 \times 10^3 \text{ Am}^{-1}$ is _____ A.

Q24 Wave Optics NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/tfKTcj66bp](https://www.prepwiser.in/questions/tfKTcj66bp)

Unpolarised light of intensity 32 Wm^{-2} passes through the combination of three polaroids such that the pass axis of the last polaroid is perpendicular to that of the pass axis of first polaroid. If intensity of emerging light is 3 Wm^{-2} , then the angle between pass axis of first two polaroids is _____ $^\circ$.

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A transverse harmonic wave on a string is given by

$$y(x, t) = 5 \sin(6t + 0.003x)$$

where x and y are in cm and t in sec. The wave velocity is _____ ms^{-1} .

Chemistry Section A · Multiple choice

Q26 to Q42

Suitable reaction condition for preparation of Methyl phenyl ether is

- (A) Benzene, MeBr (B) $\text{PhO}^\ominus\text{Na}^\oplus$, MeBr (C) Ph - Br, $\text{MeO}^\ominus\text{Na}^\oplus$ (D) $\text{PhO}^\ominus\text{Na}^\oplus$, MeOH

The one that does not stabilize 2° and 3° structures of proteins is

- (A) $-\text{O}-\text{O}-$ linkage (B) $-\text{S}-\text{S}-$ linkage
(C) van der Waals forces (D) H-bonding

The compound which does not exist is

- (A) $(\text{NH}_4)_2\text{BeF}_4$ (B) PbEt_4 (C) BeH_2 (D) NaO_2

The octahedral diamagnetic low spin complex among the following is:

- (A) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (B) $[\text{NiCl}_4]^{2-}$ (C) $[\text{CoCl}_6]^{3-}$ (D) $[\text{CoF}_6]^{3-}$

Prolonged heating is avoided during the preparation of ferrous ammonium sulphate to:

- (A) prevent hydrolysis (B) prevent breaking (C) prevent oxidation (D) prevent reduction

Which of the following statements are correct?

- (A) The M^{3+}/M^{2+} reduction potential for iron is greater than manganese.
(B) The higher oxidation states of first row d-block elements get stabilized by oxide ion.
(C) Aqueous solution of Cr^{2+} can liberate hydrogen from dilute acid.
(D) Magnetic moment of V^{2+} is observed between 4.4 - 5.2 BM.

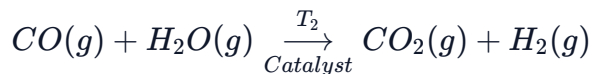
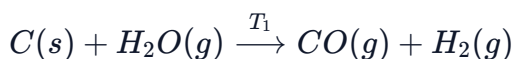
Choose the correct answer from the options given below:

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

The pair from the following pairs having both compounds with net non-zero dipole moment is

- (A) cis-butene, trans-butene (B) CH_2Cl_2 , CHCl_3
(C) Benzene, anisidine (D) 1,4-Dichlorobenzene, 1,3-Dichlorobenzene

Given below are two reactions, involved in the commercial production of dihydrogen (H_2). The two reactions are carried out at temperature " T_1 " and " T_2 ", respectively



The temperatures T_1 and T_2 are correctly related as:

- (A) $T_1 < T_2$ (B) $T_1 = T_2$
 (C) $T_1 = 100\text{ K}, T_2 = 1270\text{ K}$ (D) $T_1 > T_2$

Which of the following is used as a stabilizer during the concentration of sulphide ores?

- (A) Cresols (B) Xanthates (C) Fatty acids (D) Pine oils

Match List I with List II

	List I Polymer		List II Type/Class
(A)	Nylon-2-Nylon-6	(I)	Thermosetting polymer
(B)	Buna-N	(II)	Biodegradable polymer
(C)	Urea-formaldehyde resin	(III)	Synthetic rubber
(D)	Dacron	(IV)	Polyester

Choose the correct answer from the options given below:

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

Lime reacts exothermally with water to give 'A' which has low solubility in water. Aqueous solution of 'A' is often used for the test of CO_2 , a test in which insoluble B is formed. If B is further reacted with CO_2 then soluble compound is formed, 'A' is:

- (A) Quick lime (B) White lime (C) Lime water (D) Slaked lime

The number of molecules and moles in 2.8375 litres of O_2 at STP are respectively

- (A) 1.505×10^{23} and 0.250 mol (B) 7.527×10^{22} and 0.250 mol
 (C) 7.527×10^{23} and 0.125 mol (D) 7.527×10^{22} and 0.125 mol

The enthalpy change for the adsorption process and micelle formation respectively are

- (A) $\Delta H_{ads} > 0$ and $\Delta H_{mic} < 0$ (B) $\Delta H_{ads} > 0$ and $\Delta H_{mic} > 0$
 (C) $\Delta H_{ads} < 0$ and $\Delta H_{mic} < 0$ (D) $\Delta H_{ads} < 0$ and $\Delta H_{mic} > 0$

Given

(A)	$2\text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g})$	$\Delta H_1^0 = -x\text{kJmol}^{-1}$
(B)	$\text{C}(\text{graphite}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$	$\Delta H_2^0 = -y\text{kJmol}^{-1}$

 ΔH^0 for the reaction $\text{C}(\text{graphite}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{CO}(\text{g})$ is:

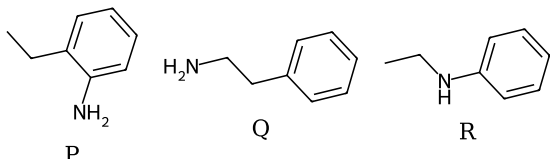
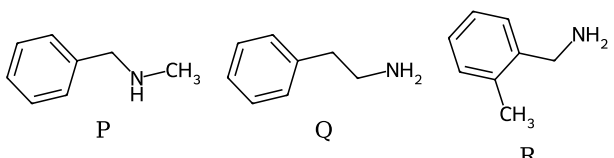
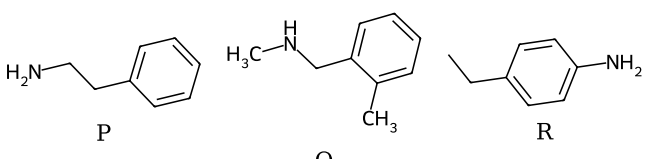
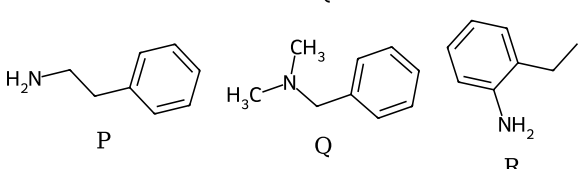
- (A) $\frac{x - 2y}{2}$ (B) $\frac{x + 2y}{2}$ (C) $2y - x$ (D) $\frac{2x - y}{2}$

Using column chromatography, mixture of two compounds 'A' and 'B' was separated. 'A' eluted first, this indicates 'B' has

- (A) high R_f , weaker adsorption (B) high R_f , stronger adsorption
(C) low R_f , weaker adsorption (D) low R_f , stronger adsorption

Isomeric amines with molecular formula $\text{C}_8\text{H}_{11}\text{N}$ give the following testsIsomer (P) $\Rightarrow$ Can be prepared by Gabriel phthalimide synthesisIsomer (Q) $\Rightarrow$ Reacts with Hinsberg's reagent to give solid insoluble in NaOHIsomer (R) $\Rightarrow$ Reacts with HONO followed by β -naphthol in NaOH to give red dye.

Isomers (P), (Q) and (R) respectively are

- (A) 
- (B) 
- (C) 
- (D) 

Given below are two statements:

Statement I : Aqueous solution of $K_2Cr_2O_7$ is preferred as a primary standard in volumetric analysis over $Na_2Cr_2O_7$ aqueous solution.

Statement II : $K_2Cr_2O_7$ has a higher solubility in water than $Na_2Cr_2O_7$.

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

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

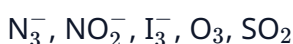
Chemistry Section B · Numerical value

Q43 to Q51

Q43 Chemical Bonding & Molecular Structure NUMERICAL

[Step-by-step solution > prepwisar.in/questions/OvGK8MD-hp](https://www.prepwisar.in/questions/OvGK8MD-hp)

The number of bent-shaped molecule/s from the following is _____



Q44 Chemical Bonding & Molecular Structure NUMERICAL

[Step-by-step solution > prepwisar.in/questions/Q0H4Vb_Snd](https://www.prepwisar.in/questions/Q0H4Vb_Snd)

The sum of lone pairs present on the central atom of the interhalogen IF_5 and IF_7 is _____

Q45 Chemical Kinetics NUMERICAL

[Step-by-step solution > prepwisar.in/questions/8f1Plu0D40](https://www.prepwisar.in/questions/8f1Plu0D40)

A molecule undergoes two independent first order reactions whose respective half lives are 12 min and 3 min. If both the reactions are occurring then the time taken for the 50% consumption of the reactant is _____ min. (Nearest integer)

Q46 Coordination Compounds NUMERICAL

[Step-by-step solution > prepwisar.in/questions/6slCfcTP3n](https://www.prepwisar.in/questions/6slCfcTP3n)

In potassium ferrocyanide, there are _____ pairs of electrons in the t_{2g} set of orbitals.

Q47 Electrochemistry NUMERICAL

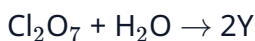
[Step-by-step solution > prepwisar.in/questions/h1GbGKdLML](https://www.prepwisar.in/questions/h1GbGKdLML)

$E_{FeO_4^{2-}/Fe^{2+}}^\theta$ is $x \times 10^{-3}$ V. The value of x is _____

Q48 p-Block Elements: Part II (Group 15-18) NUMERICAL

[Step-by-step solution > prepwisar.in/questions/LW3-MTIis8](https://www.prepwisar.in/questions/LW3-MTIis8)

In the following reactions, the total number of oxygen atoms in X and Y is _____.



Q49 Solutions & Colligative Properties NUMERICAL

[Step-by-step solution > prepwisar.in/questions/oEkV3SYBdq](https://www.prepwisar.in/questions/oEkV3SYBdq)

If the degree of dissociation of aqueous solution of weak monobasic acid is determined to be 0.3, then the observed freezing point will be _____ % higher than the expected/theoretical freezing point. (Nearest integer)

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The number of incorrect statement/s about the black body from the following is _____

- (A) Emit or absorb energy in the form of electromagnetic radiation.
- (B) Frequency distribution of the emitted radiation depends on temperature.
- (C) At a given temperature, intensity vs frequency curve passes through a maximum value.
- (D) The maximum of the intensity vs frequency curve is at a higher frequency at higher temperature compared to that at lower temperature.

Q51 Chemical Equilibrium NUMERICAL

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

The number of correct statement/s involving equilibria in physical processes from the following is _____

- (A) Equilibrium is possible only in a closed system at a given temperature.
- (B) Both the opposing processes occur at the same rate.
- (C) When equilibrium is attained at a given temperature, the value of all its parameters became equal.
- (D) For dissolution of solids in liquids, the solubility is constant at a given temperature.

Mathematics Section A · Multiple choice

Q52 to Q69

Q52 Three Dimensional Geometry

[Step-by-step solution](#) > [prepwisar.in/questions/n-Fu-H6zgd](https://www.prepwisar.in/questions/n-Fu-H6zgd)

The shortest distance between the lines $\frac{x+2}{1} = \frac{y}{-2} = \frac{z-5}{2}$ and $\frac{x-4}{1} = \frac{y-1}{2} = \frac{z+3}{0}$ is:

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

Q53 Three Dimensional Geometry

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

Let two vertices of a triangle ABC be (2, 4, 6) and (0, -2, -5), and its centroid be (2, 1, -1). If the image of the third vertex in the plane $x + 2y + 4z = 11$ is (α, β, γ) , then $\alpha\beta + \beta\gamma + \gamma\alpha$ is equal to:

- (A) 72 (B) 74 (C) 76 (D) 70

Q54 Three Dimensional Geometry

[Step-by-step solution](#) > [prepwisar.in/questions/HnrKXKY8ir](https://www.prepwisar.in/questions/HnrKXKY8ir)

Let P be the point of intersection of the line $\frac{x+3}{3} = \frac{y+2}{1} = \frac{1-z}{2}$ and the plane $x + y + z = 2$. If the distance of the point P from the plane $3x - 4y + 12z = 32$ is q, then q and 2q are the roots of the equation:

- (A) $x^2 + 18x - 72 = 0$ (B) $x^2 - 18x - 72 = 0$ (C) $x^2 + 18x + 72 = 0$ (D) $x^2 - 18x + 72 = 0$

Q55 Differential Equations

[Step-by-step solution](#) > [prepwisar.in/questions/xOF4pCEJfi](https://www.prepwisar.in/questions/xOF4pCEJfi)

The slope of tangent at any point (x, y) on a curve $y = y(x)$ is $\frac{x^2+y^2}{2xy}$, $x > 0$. If $y(2) = 0$, then a value of $y(8)$ is:

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

Q56 Applications of Derivatives

[Step-by-step solution](#) > [prepwisar.in/questions/VdFK8eTSGc](https://www.prepwisar.in/questions/VdFK8eTSGc)

A square piece of tin of side 30 cm is to be made into a box without top by cutting a square from each corner and folding up the flaps to form a box. If the volume of the box is maximum, then its surface area (in cm^2) is equal to:

- (A) 1025 (B) 900 (C) 800 (D) 675

Q57 Binomial Theorem[Step-by-step solution](#) › [prepwiser.in/questions/RKigFz3tCO](https://www.prepwiser.in/questions/RKigFz3tCO)

If the coefficient of x^7 in $(ax - \frac{1}{bx^2})^{13}$ and the coefficient of x^{-5} in $(ax + \frac{1}{bx^2})^{13}$ are equal, then a^4b^4 is equal to:

- (A) 22 (B) 33 (C) 44 (D) 11

Q58 Complex Numbers[Step-by-step solution](#) › [prepwiser.in/questions/27AFKLVYuh](https://www.prepwiser.in/questions/27AFKLVYuh)

Let the complex number $z = x + iy$ be such that $\frac{2z-3i}{2z+i}$ is purely imaginary. If $x + y^2 = 0$, then $y^4 + y^2 - y$ is equal to:

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

Q59 Differential Equations[Step-by-step solution](#) › [prepwiser.in/questions/L3MDiojsDC](https://www.prepwiser.in/questions/L3MDiojsDC)

Let f be a differentiable function such that $x^2 f(x) - x = 4 \int_0^x t f(t) dt$, $f(1) = \frac{2}{3}$. Then $18f(3)$ is equal to:

- (A) 160 (B) 210 (C) 150 (D) 180

Q60 Ellipse[Step-by-step solution](#) › [prepwiser.in/questions/8z3yZZaXFe](https://www.prepwiser.in/questions/8z3yZZaXFe)

Let the ellipse $E : x^2 + 9y^2 = 9$ intersect the positive x and y-axes at the points A and B respectively. Let the major axis of E be a diameter of the circle C. Let the line passing through A and B meet the circle C at the point P. If the area of the triangle with vertices A, P and the origin O is $\frac{m}{n}$, where m and n are coprime, then $m - n$ is equal to:

- (A) 15 (B) 16 (C) 17 (D) 18

Q61 Functions (Advanced)[Step-by-step solution](#) › [prepwiser.in/questions/cVcTudWQ_S](https://www.prepwiser.in/questions/cVcTudWQ_S)

If

$$f(x) = \frac{(\tan 1^\circ)x + \log_e(123)}{x \log_e(1234) - (\tan 1^\circ)}, x > 0$$

, then the least value of $f(f(x)) + f\left(f\left(\frac{4}{x}\right)\right)$ is:

- (A) 2 (B) 4 (C) 0 (D) 8

Q62 Determinants[Step-by-step solution](#) › [prepwiser.in/questions/DrnZbXckBT](https://www.prepwiser.in/questions/DrnZbXckBT)

If A is a 3×3 matrix and $|A| = 2$, then $|3 \operatorname{adj}(|3A|A^2)|$ is equal to:

- (A) $3^{12} \cdot 6^{10}$ (B) $3^{11} \cdot 6^{10}$ (C) $3^{12} \cdot 6^{11}$ (D) $3^{10} \cdot 6^{11}$

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Q63 Determinants[Step-by-step solution](https://www.prepwise.in/questions/c_h4Uuy9UQ)

For the system of linear equations

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

$$3x + 2y - z = 7$$

$$4x + 5y + \alpha z = \beta,$$

which of the following is **NOT** correct?

- (A) The system has infinitely many solutions for $\alpha = -6$ and $\beta = 9$
 (B) The system has a unique solution for $\alpha \neq -5$ and $\beta = 8$
 (C) The system is inconsistent for $\alpha = -5$ and $\beta = 8$
 (D) The system has infinitely many solutions for $\alpha = -5$ and $\beta = 9$

Q64 Probability: Basic[Step-by-step solution](https://www.prepwise.in/questions/Nt-TNGCI7u)

Let N denote the sum of the numbers obtained when two dice are rolled. If the probability that $2^N < N!$ is $\frac{m}{n}$, where m and n are coprime, then $4m - 3n$ is equal to:

- (A) 12 (B) 6 (C) 8 (D) 10

Q65 Sequences & Series[Step-by-step solution](https://www.prepwise.in/questions/S12nVtUj5h)

Let the first term α and the common ratio r of a geometric progression be positive integers. If the sum of squares of its first three terms is 33033, then the sum of these three terms is equal to

- (A) 241 (B) 231 (C) 220 (D) 210

Q66 Vectors[Step-by-step solution](https://www.prepwise.in/questions/YIhvTkFn8w)

Let O be the origin and the position vector of the point P be $-\hat{i} - 2\hat{j} + 3\hat{k}$. If the position vectors of the points A , B and C are $-2\hat{i} + \hat{j} - 3\hat{k}$, $2\hat{i} + 4\hat{j} - 2\hat{k}$ and $-4\hat{i} + 2\hat{j} - \hat{k}$ respectively, then the projection of the vector $\overrightarrow{OP}$ on a vector perpendicular to the vectors $\overrightarrow{AB}$ and $\overrightarrow{AC}$ is:

- (A) $\frac{7}{3}$ (B) 3 (C) $\frac{10}{3}$ (D) $\frac{8}{3}$

Q67 Vectors[Step-by-step solution](https://www.prepwise.in/questions/6c_C8kk1_w)

An arc PQ of a circle subtends a right angle at its centre O . The mid point of the arc PQ is R . If

$$\overrightarrow{OP} = \vec{u}, \overrightarrow{OR} = \vec{v}$$

, and $\overrightarrow{OQ} = \alpha\vec{u} + \beta\vec{v}$, then α, β^2 are the roots of the equation:

- (A) $x^2 + x - 2 = 0$ (B) $3x^2 + 2x - 1 = 0$ (C) $3x^2 - 2x - 1 = 0$ (D) $x^2 - x - 2 = 0$

Q68 Indefinite Integration[Step-by-step solution](https://www.prepwise.in/questions/o53KyNe7Li)

If $I(x) = \int e^{\sin^2 x} (\cos x \sin 2x - \sin x) dx$ and $I(0) = 1$, then $I\left(\frac{\pi}{3}\right)$ is equal to:

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

Q69 Trigonometric Ratios & Identities[Step-by-step solution](https://www.prepwise.in/questions/nhCBsUdxaZ)

$96 \cos \frac{\pi}{33} \cos \frac{2\pi}{33} \cos \frac{4\pi}{33} \cos \frac{8\pi}{33} \cos \frac{16\pi}{33}$ is equal to:

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

Q70 Binomial Theorem **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/gfhjRt3BKS

The coefficient of x^7 in $(1 - x + 2x^3)^{10}$ is _____.

Q71 Continuity & Differentiability **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/Z028eMH2tb

Let $f : (-2, 2) \rightarrow \mathbb{R}$ be defined by

$$f(x) = \begin{cases} x[x], & -2 < x < 0 \\ (x-1)[x], & 0 \leq x \leq 2 \end{cases}$$

where $[x]$ denotes the greatest integer function. If m and n respectively are the number of points in $(-2, 2)$ at which $y = |f(x)|$ is not continuous and not differentiable, then $m + n$ is equal to _____.

Q72 Parabola **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/BInOmdayx5

Let a common tangent to the curves $y^2 = 4x$ and $(x-4)^2 + y^2 = 16$ touch the curves at the points P and Q. Then $(PQ)^2$ is equal to _____.

Q73 Permutations & Combinations **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/sEnSb0BuGi

The number of permutations, of the digits 1, 2, 3, ..., 7 without repetition, which neither contain the string 153 nor the string 2467, is _____.

Q74 Permutations & Combinations **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/-D-tFc_D2-

Some couples participated in a mixed doubles badminton tournament. If the number of matches played, so that no couple played in a match, is 840, then the total number of persons, who participated in the tournament, is _____.

Q75 Sequences & Series **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/Ns8fSILcfN

The sum of all those terms, of the arithmetic progression 3, 8, 13, ..., 373, which are not divisible by 3, is equal to _____.

Q76 Sets **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/JNot8k1mpQ

The number of elements in the set $\{n \in \mathbb{Z} : |n^2 - 10n + 19| < 6\}$ is _____.

Q77 Statistics **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/6vZxSVNA9m

If the mean of the frequency distribution

Class :	0-10	10-20	20-30	30-40	40-50
Frequency :	2	3	x	5	4

is 28, then its variance is _____.

Q78 Area Under Curves **NUMERICAL**

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

Let $y = p(x)$ be the parabola passing through the points $(-1, 0)$, $(0, 1)$ and $(1, 0)$. If the area of the region $\{(x, y) : (x+1)^2 + (y-1)^2 \leq 1, y \leq p(x)\}$ is A, then $12(\pi - 4A)$ is equal to _____.

Answer key: JEE Main 2023 · 10 Apr · Shift 1

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Physics

1.	D	2.	A	3.	D	4.	B	5.	C	6.	C	7.	A	8.	A
9.	C	10.	D	11.	B	12.	A	13.	C	14.	B	15.	D	16.	D
17.	B	18.	15	19.	100	20.	18	21.	5	22.	16	23.	6	24.	30
25.	20														

Chemistry

26.	B	27.	A	28.	D	29.	A	30.	C	31.	A	32.	B	33.	D
34.	A	35.	C	36.	D	37.	D	38.	D	39.	A	40.	D	41.	C
42.	A	43.	3	44.	1	45.	2	46.	3	47.	1825	48.	5	49.	30
50.	0	51.	3												

Mathematics

52.	D	53.	B	54.	D	55.	C	56.	C	57.	A	58.	C	59.	A
60.	C	61.	B	62.	B	63.	A	64.	C	65.	B	66.	B	67.	D
68.	D	69.	D	70.	960	71.	4	72.	32	73.	4898	74.	16	75.	9525
76.	6	77.	151	78.	16										

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