

JEE MAIN 2024 · QUESTION PAPER

1 Feb 2024 **Shift 2**

87 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	10 Q48 to Q57
● Mathematics	20 Q58 to Q77	10 Q78 to Q87
In this PDF		
87 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.

prepwisar.in/pyqs/paper/2024-02-01-evening · Free, no signup needed to start

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

Q1 Nuclear Physics

[Step-by-step solution](#) > [prepwisar.in/questions/ajR1awTsY1](https://www.prepwisar.in/questions/ajR1awTsY1)

From the statements given below:

- (A) The angular momentum of an electron in n^{th} orbit is an integral multiple of $\hbar$.
- (B) Nuclear forces do not obey inverse square law.
- (C) Nuclear forces are spin dependent.
- (D) Nuclear forces are central and charge independent.
- (E) Stability of nucleus is inversely proportional to the value of packing fraction.

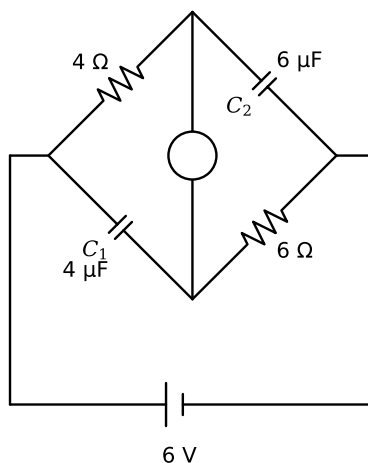
Choose the **correct** answer from the options given below:

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

Q2 Electrostatics II: Potential & Capacitance

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

A galvanometer (G) of 2Ω resistance is connected in the given circuit. The ratio of charge stored in C_1 and C_2 is:



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

Q3 Current Electricity

[Step-by-step solution](#) > [prepwisar.in/questions/C0o3VZCJDC](https://www.prepwisar.in/questions/C0o3VZCJDC)

In a metre-bridge when a resistance in the left gap is 2Ω and unknown resistance in the right gap, the balance length is found to be 40cm. On shunting the unknown resistance with 2Ω , the balance length changes by:

- (A) 62.5 (B) 22.5cm (C) 20cm (D) 65cm

Q4 Moving Charges & Magnetism

[Step-by-step solution](#) > [prepwisar.in/questions/vSZu0wipjr](https://www.prepwisar.in/questions/vSZu0wipjr)

In an ammeter, 5% of the main current passes through the galvanometer. If resistance of the galvanometer is G , the resistance of ammeter will be:

- (A) $199G$ (B) $200G$ (C) $\frac{G}{20}$ (D) $\frac{G}{199}$

Q5 Dual Nature of Radiation & Matter

[Step-by-step solution](#) > [prepwisar.in/questions/hY-PQ-7U9w](https://www.prepwisar.in/questions/hY-PQ-7U9w)

Monochromatic light of frequency $6 \times 10^{14} \text{ Hz}$ is produced by a laser. The power emitted is $2 \times 10^{-3} \text{ W}$. How many photons per second on an average, are emitted by the source?
(Given $h = 6.63 \times 10^{-34} \text{ Js}$)

- (A) 5×10^{15} (B) 7×10^{16} (C) 6×10^{15} (D) 9×10^{18}

Conductivity of a photodiode starts changing only if the wavelength of incident light is less than 660nm . The band gap of photodiode is found to be $\left(\frac{X}{8}\right)\text{eV}$. The value of X is:
(Given, $h = 6.6 \times 10^{-34}\text{Js}$, $e = 1.6 \times 10^{-19}\text{C}$)

- (A) 11 (B) 13 (C) 15 (D) 21

A transformer has an efficiency of 80% and works at 10V and 4kW . If the secondary voltage is 240V , then the current in the secondary coil is:

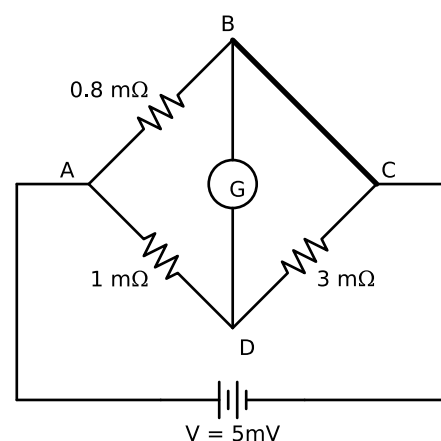
- (A) 1.33A (B) 13.33A (C) 1.59A (D) 15.1A

If frequency of electromagnetic wave is 60MHz and it travels in air along z direction then the corresponding electric and magnetic field vectors will be mutually perpendicular to each other and the wavelength of the wave (in m) is:

- (A) 2.5 (B) 5 (C) 10 (D) 2

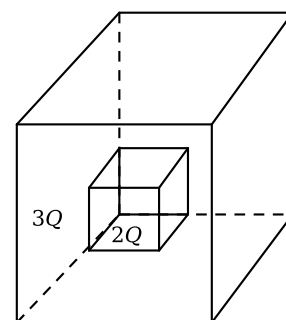
To measure the temperature coefficient of resistivity α of a semiconductor, an electrical arrangement shown in the figure is prepared. The arm BC is made up of the semiconductor. The experiment is being conducted at 25°C and resistance of the semiconductor arm is $3\text{m}\Omega$. Arm BC is cooled at a constant rate of 2°C/s . If the galvanometer G shows no deflection after 10s , then α is:

- (A) $-1 \times 10^{-2}^\circ\text{C}^{-1}$ (B) $-2 \times 10^{-2}^\circ\text{C}^{-1}$
(C) $-2.5 \times 10^{-2}^\circ\text{C}^{-1}$ (D) $-1.5 \times 10^{-2}^\circ\text{C}^{-1}$



C_1 and C_2 are two hollow concentric cubes enclosing charges $2Q$ and $3Q$ respectively as shown in figure. The ratio of electric flux passing through C_1 and C_2 is:

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



A light planet is revolving around a massive star in a circular orbit of radius R with a period of revolution T . If the force of attraction between planet and star is proportional to $R^{-3/2}$ then choose the correct option:

- (A) $T^2 \propto R^{7/2}$ (B) $T^2 \propto R^3$ (C) $T^2 \propto R^{5/2}$ (D) $T^2 \propto R^{3/2}$

Q12 Thermodynamics[Step-by-step solution](https://www.prepwise.in/questions/EhN0hD3oUa) > prepwise.in/questions/EhN0hD3oUa

A diatomic gas ($\gamma = 1.4$) does 200J of work when it is expanded isobarically. The heat given to the gas in the process is:

- (A) 800J (B) 600J (C) 700J (D) 850J

Q13 Kinetic Theory of Gases[Step-by-step solution](https://www.prepwise.in/questions/I2rkpPIWtt) > prepwise.in/questions/I2rkpPIWtt

If the root mean square velocity of hydrogen molecule at a given temperature and pressure is 2km/s , the root mean square velocity of oxygen at the same condition in km/s is:

- (A) 1.0 (B) 1.5 (C) 2.0 (D) 0.5

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

A body of mass 4kg experiences two forces $\vec{F}_1 = 5\hat{i} + 8\hat{j} + 7\hat{k}$ and $\vec{F}_2 = 3\hat{i} - 4\hat{j} - 3\hat{k}$. The acceleration acting on the body is:

- (A) $2\hat{i} + \hat{j} + \hat{k}$ (B) $4\hat{i} + 2\hat{j} + 2\hat{k}$ (C) $-2\hat{i} - \hat{j} - \hat{k}$ (D) $2\hat{i} + 3\hat{j} + 3\hat{k}$

Q15 Centre of Mass & Linear Momentum[Step-by-step solution](https://www.prepwise.in/questions/qanOzAeo7N) > prepwise.in/questions/qanOzAeo7N

A cricket player catches a ball of mass 120g moving with 25m/s speed. If the catching process is completed in 0.1s then the magnitude of force exerted by the ball on the hand of player will be (in SI unit):

- (A) 30 (B) 24 (C) 12 (D) 25

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

Train A is moving along two parallel rail tracks towards north with speed 72km/h and train B is moving towards south with speed 108km/h . Velocity of train B with respect to A and velocity of ground with respect to B are (in ms^{-1}):

- (A) -50 and -30 (B) -50 and 30 (C) -30 and 50 (D) 50 and -30

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

A big drop is formed by coalescing 1000 small droplets of water. The surface energy will become:

- (A) $\frac{1}{100}$ th (B) $\frac{1}{10}$ th (C) 100 times (D) 10 times

Q18 Wave Optics[Step-by-step solution](https://www.prepwise.in/questions/CwbELddvkZ) > prepwise.in/questions/CwbELddvkZ

A microwave of wavelength 2.0cm falls normally on a slit of width 4.0cm . The angular spread of the central maxima of the diffraction pattern obtained on a screen 1.5m away from the slit, will be:

- (A) 60° (B) 45° (C) 15° (D) 30°

Attempt this paper online with instant answer checking > [prepwise.in/pyqs/paper/2024-02-01-evening](https://www.prepwise.in/pyqs/paper/2024-02-01-evening)

Match **List - I** with **List - II**.

List I (Number)	List II (Significant figure)
(A) 1001	(I) 3
(B) 010.1	(II) 4
(C) 100.100	(III) 5
(D) 0.0010010	(IV) 6

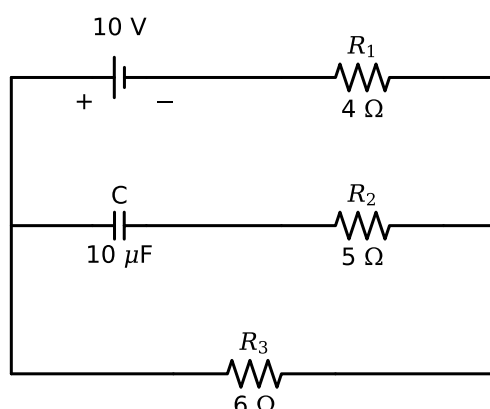
Choose the correct answer from the options given below:

(A) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)**(B)** (A)-(IV), (B)-(III), (C)-(I), (D)-(II)**(C)** (A)-(I), (B)-(II), (C)-(III), (D)-(IV)**(D)** (A)-(III), (B)-(IV), (C)-(II), (D)-(I)**Physics** Section B · Numerical value

Q20 to Q29

Q20 Atomic Physics **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/A0NqM_VO8U) > prepwise.in/questions/A0NqM_VO8U

A particular hydrogen-like ion emits the radiation of frequency $3 \times 10^{15} \text{ Hz}$ when it makes transition from $n = 2$ to $n = 1$. The frequency of radiation emitted in transition from $n = 3$ to $n = 1$ is $\frac{x}{9} \times 10^{15} \text{ Hz}$, when $x = \underline{\hspace{2cm}}$.

Q21 Electrostatics II: Potential & Capacitance **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/G7DGAQgXT3) > prepwise.in/questions/G7DGAQgXT3In an electrical circuit drawn below the amount of charge stored in the capacitor is $\underline{\hspace{2cm}} \mu \text{ C}$.**Q22** Electromagnetic Induction **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/KIyHi36RGO) > prepwise.in/questions/KIyHi36RGO

A coil of 200 turns and area 0.20 m^2 is rotated at half a revolution per second and is placed in uniform magnetic field of 0.01 T perpendicular to axis of rotation of the coil. The maximum voltage generated in the coil is $\frac{2\pi}{\beta}$ volt. The value of β is $\underline{\hspace{2cm}}$.

Q23 Electrostatics I: Charges, Field & Gauss's Law **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/HLCqgEMM_v) > prepwise.in/questions/HLCqgEMM_v

Suppose a uniformly charged wall provides a uniform electric field of $2 \times 10^4 \text{ N/C}$ normally. A charged particle of mass 2 g being suspended through a silk thread of length 20 cm and remain stayed at a distance of 10 cm from the wall.

Then the charge on the particle will be $\frac{1}{\sqrt{x}} \mu \text{ C}$ where $x = \underline{\hspace{2cm}}$. [use $g = 10 \text{ m/s}^2$]**Q24** Moving Charges & Magnetism **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/oiDVXVGTV6) > prepwise.in/questions/oiDVXVGTV6

A moving coil galvanometer has 100 turns and each turn has an area of 2.0 cm^2 . The magnetic field produced by the magnet is 0.01 T and the deflection in the coil is 0.05 radian when a current of 10 mA is passed through it. The torsional constant of the suspension wire is $x \times 10^{-5} \text{ N-m/rad}$. The value of x is $\underline{\hspace{2cm}}$.

A particle initially at rest starts moving from reference point $x = 0$ along x -axis, with velocity v that varies as $v = 4\sqrt{x}\text{ m/s}$. The acceleration of the particle is _____ ms^{-2} .

One end of a metal wire is fixed to a ceiling and a load of 2 kg hangs from the other end. A similar wire is attached to the bottom of the load and another load of 1 kg hangs from this lower wire. Then the ratio of longitudinal strain of upper wire to that of the lower wire will be _____.
[Area of cross section of wire = 0.005 cm^2 , $Y = 2 \times 10^{11}\text{ Nm}^{-2}$ and $g = 10\text{ ms}^{-2}$]

A uniform rod AB of mass 2 kg and length 30 cm at rest on a smooth horizontal surface. An impulse of force 0.2 N s is applied to end B . The time taken by the rod to turn through at right angles will be $\frac{\pi}{x}\text{ s}$, where $x = \underline{\hspace{2cm}}$.

A mass m is suspended from a spring of negligible mass and the system oscillates with a frequency f_1 . The frequency of oscillations if a mass $9m$ is suspended from the same spring is f_2 . The value of $\frac{f_1}{f_2}$ is _____.

In Young's double slit experiment, monochromatic light of wavelength 5000 Å is used. The slits are 1.0 mm apart and screen is placed at 1.0 m away from slits. The distance from the centre of the screen where intensity becomes half of the maximum intensity for the first time is _____ $\times 10^{-6}\text{ m}$.

Chemistry Section A · Multiple choice

Q30 to Q47

Match **List - I** with **List - II**.

List I (Reactants)	List II (Product)
(A) Phenol, Zn/Δ	(I) Salicylaldehyde
(B) Phenol, CHCl_3 , NaOH , HCl	(II) Salicylic acid
(C) Phenol, CO_2 , NaOH , HCl	(III) Benzene
(D) Phenol, Conc. HNO_3	(IV) Picric acid

Choose the correct answer from the options given below:

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

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

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

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

Which among the following has highest boiling point?

(A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2 - \text{OH}$ (B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ (C) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$ (D) $\text{H}_5\text{C}_2 - \text{O} - \text{C}_2\text{H}_5$

Attempt this paper online with instant answer checking › [prepwiser.in/pyqs/paper/2024-02-01-evening](#)

Given below are two statements:

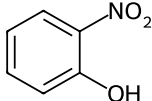
Statement (I): A π bonding MO has lower electron density above and below the inter-nuclear axis.

Statement (II): The π^* antibonding MO has a node between the nuclei.

In the light of the above statements, choose the **most appropriate** 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

Select the compound from the following that will show intramolecular hydrogen bonding.

- (A)  (B) H_2O (C) $\text{C}_2\text{H}_5\text{OH}$ (D) NH_3

Match List - I with List - II.

List I (Compound)	List II (Use)
(A) Carbon tetrachloride	(I) Paint remover
(B) Methylene chloride	(II) Refrigerators and air conditioners
(C) DDT	(III) Fire extinguisher
(D) Freons	(IV) Non Biodegradable insecticide

Choose the correct answer from the options given below:

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

$[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$ are respectively known as:

- (A) Inner orbital Complex, Spin paired Complex (B) Spin paired Complex, Spin free Complex
(C) Spin free Complex, Spin paired Complex (D) Outer orbital Complex, Inner orbital Complex

Given below are two statements:

Statement (I): Dimethyl glyoxime forms a six-membered covalent chelate when treated with NiCl_2 solution in presence of NH_4OH .

Statement (II): Prussian blue precipitate contains iron both in (+2) and (+3) oxidation states.

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

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

Which of the following compounds show colour due to d-d transition?

- (A) $\text{K}_2\text{Cr}_2\text{O}_7$ (B) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (C) KMnO_4 (D) K_2CrO_4

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

Assertion (A): In aqueous solutions Cr^{2+} is reducing while Mn^{3+} is oxidising in nature.

Reason (R): Extra stability to half filled electronic configuration is observed than incompletely filled electronic configuration.

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

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

Solubility of calcium phosphate (molecular mass, M) in water is W_g per 100mL at 25°C . Its solubility product at 25°C will be approximately.

- (A) $10^7 \left(\frac{W}{M}\right)^3$ (B) $10^3 \left(\frac{W}{M}\right)^5$ (C) $10^7 \left(\frac{W}{M}\right)^5$ (D) $10^5 \left(\frac{W}{M}\right)^5$

Given below are two statements:

Statement (I) : SiO_2 and GeO_2 are acidic while SnO and PbO are amphoteric in nature.

Statement (II): Allotropic forms of carbon are due to property of catenation and $p\pi - d\pi$ bond formation.

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

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

The strongest reducing agent among the following is:

- (A) SbH_3 (B) NH_3 (C) BiH_3 (D) PH_3

The transition metal having highest 3rd ionisation enthalpy is:

- (A) Mn (B) Fe (C) Cr (D) V

Attempt this paper online with instant answer checking > [prepwisar.in/pyqs/paper/2024-02-01-evening](https://www.prepwisar.in/pyqs/paper/2024-02-01-evening)

Given below are two statements:

Statement (I): Both metals and non-metals exist in p and d-block elements.

Statement (II): Non-metals have higher ionisation enthalpy and higher electronegativity than the metals.

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

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

The number of radial node/s for $3p$ orbital is:

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

The set of meta directing functional groups from the following sets is:

- (A) $-\text{CN}$, $-\text{NH}_2$, $-\text{NHR}$, $-\text{OCH}_3$ (B) $-\text{CN}$, $-\text{CHO}$, $-\text{NHCOCH}_3$, $-\text{COOR}$
(C) $-\text{NO}_2$, $-\text{NH}_2$, $-\text{COOH}$, $-\text{COOR}$ (D) $-\text{NO}_2$, $-\text{CHO}$, $-\text{SO}_3\text{H}$, $-\text{COR}$

Lassaigne's test is used for detection of:

- (A) Phosphorous and halogens only
(B) Nitrogen, Sulphur and Phosphorous only
(C) Nitrogen, Sulphur, phosphorous and halogens
(D) Nitrogen and Sulphur only

The functional group that shows negative resonance effect is:

- (A) $-\text{OH}$ (B) $-\text{OR}$ (C) $-\text{COOH}$ (D) $-\text{NH}_2$

Chemistry Section B · Numerical value

Q48 to Q57

The number of tripeptides formed by three different amino acids using each amino acid once is ____.

The following data were obtained during the first order thermal decomposition of a gas A at constant volume:

$\text{A(g)} \rightarrow 2\text{B(g)} + \text{C(g)}$ The rate constant of the reaction is _____ $\times 10^{-2}\text{s}^{-1}$ (nearest integer)

S.No.	Time /s	Total pressure /(atm)
1.	0	0.1
2.	115	0.28

The amount of electricity in Coulomb required for the oxidation of 1mol of H_2O to O_2 is _____ $\times 10^5\text{C}$.

Consider the following redox reaction:



The standard reduction potentials are given as below (E_{red}^0):

$$E_{\text{MnO}_4^-/\text{Mn}^{2+}}^0 = +1.51\text{V}$$

$$E_{\text{CO}_2/\text{H}_2\text{C}_2\text{O}_4}^0 = -0.49\text{V}$$

If the equilibrium constant of the above reaction is given as $K_{\text{eq}} = 10^x$, then the value of x = _____ (nearest integer)

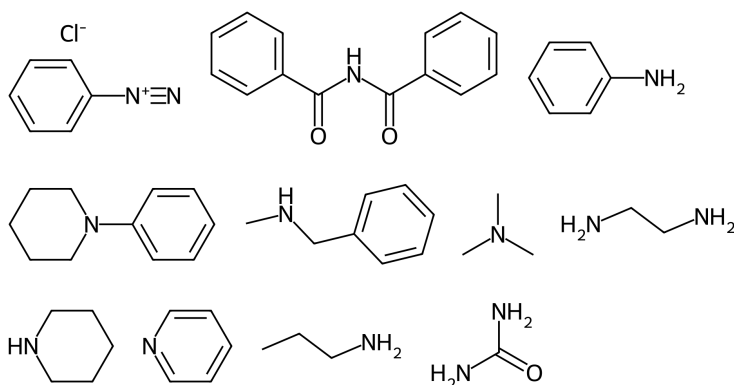
Mass of ethylene glycol (antifreeze) to be added to 18.6kg of water to protect the freezing point at -24°C is _____ kg (Molar mass in g mol^{-1} for ethylene glycol 62, K_f of water = 1.86K kg mol^{-1})

10mL of gaseous hydrocarbon on combustion gives 40mL of $\text{CO}_2(\text{g})$ and 50mL of water vapour. Total number of carbon and hydrogen atoms in the hydrocarbon is _____.

For a certain reaction at 300K, $K = 10$, then ΔG° for the same reaction is - _____ $\times 10^{-1}\text{kJ mol}^{-1}$.
(Given $R = 8.314\text{JK}^{-1}\text{mol}^{-1}$)

Total number of isomeric compounds (including stereoisomers) formed by monochlorination of 2-methylbutane is _____.

Number of compounds which give reaction with Hinsberg's reagent is _____.



Following Kjeldahl's method, 1g of organic compound released ammonia, that neutralised 10mL of $2\text{MH}_2\text{SO}_4$. The percentage of nitrogen in the compound is _____ %.

Q58 Vectors

[Step-by-step solution](#) › [prepwisar.in/questions/0c5prlM2YL](https://www.prepwisar.in/questions/0c5prlM2YL)

Consider a $\triangle ABC$ where $A(1, 3, 2)$, $B(-2, 8, 0)$ and $C(3, 6, 7)$. If the angle bisector of $\angle BAC$ meets the line BC at D , then the length of the projection of the vector $\overrightarrow{AD}$ on the vector $\overrightarrow{AC}$ is:

- (A) $\frac{37}{2\sqrt{38}}$ (B) $\sqrt{19}$ (C) $\frac{39}{2\sqrt{38}}$ (D) $\frac{\sqrt{38}}{2}$

Q59 Three Dimensional Geometry

[Step-by-step solution](#) › [prepwisar.in/questions/oG6HF60n-z](https://www.prepwisar.in/questions/oG6HF60n-z)

Let P and Q be the points on the line $\frac{x+3}{8} = \frac{y-4}{2} = \frac{z+1}{2}$ which are at a distance of 6 units from the point $R(1, 2, 3)$. If the centroid of the triangle PQR is (α, β, γ) , then $\alpha^2 + \beta^2 + \gamma^2$ is:

- (A) 18 (B) 24 (C) 26 (D) 36

Q60 Three Dimensional Geometry

[Step-by-step solution](#) › [prepwisar.in/questions/LX97tKNLYa](https://www.prepwisar.in/questions/LX97tKNLYa)

If the mirror image of the point $P(3, 4, 9)$ in the line $\frac{x-1}{3} = \frac{y+1}{2} = \frac{z-2}{1}$ is (α, β, γ) , then $14(\alpha + \beta + \gamma)$ is:

- (A) 102 (B) 138 (C) 132 (D) 108

Q61 Binomial Theorem

[Step-by-step solution](#) › [prepwisar.in/questions/Yddjv4mAhh6](https://www.prepwisar.in/questions/Yddjv4mAhh6)

Let m and n be the coefficients of seventh and thirteenth terms respectively

in the expansion of $\left(\frac{1}{3}x^{\frac{1}{3}} + \frac{1}{2x^{\frac{2}{3}}}\right)^{18}$. Then $\left(\frac{n}{m}\right)^{\frac{1}{3}}$ is:

- (A) $\frac{1}{9}$ (B) $\frac{1}{4}$ (C) $\frac{4}{9}$ (D) $\frac{9}{4}$

Q62 Circles

[Step-by-step solution](#) › [prepwisar.in/questions/rDwI7P2qgI](https://www.prepwisar.in/questions/rDwI7P2qgI)

Let the locus of the midpoints of the chords of the circle $x^2 + (y - 1)^2 = 1$ drawn from the origin intersect the line $x + y = 1$ at P and Q. Then, the length of PQ is:

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

Q63 Complex Numbers

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

If z is a complex number such that $|z| \leq 1$, then the minimum value of $\left|z + \frac{1}{2}(3 + 4i)\right|$ is:

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

Q64 Definite Integration

[Step-by-step solution](#) › [prepwisar.in/questions/sk0saAnd_Q](https://www.prepwisar.in/questions/sk0saAnd_Q)

If $\int_0^{\frac{\pi}{3}} \cos^4 x dx = a\pi + b\sqrt{3}$, where a and b are rational numbers, then $9a + 8b$ is equal to:

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

Q65 Definite Integration

[Step-by-step solution](#) › [prepwisar.in/questions/0mhBG1EjgF](https://www.prepwisar.in/questions/0mhBG1EjgF)

The value of $\int_0^1 (2x^3 - 3x^2 - x + 1)^{\frac{1}{3}} dx$ is equal to:

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

Q66 Differential Equations[Step-by-step solution](#) › [prepwisar.in/questions/tnol7MYGu-](https://www.prepwisar.in/questions/tnol7MYGu-)

Let α be a non-zero real number. Suppose $f : \mathbf{R} \rightarrow \mathbf{R}$ is a differentiable function such that $f(0) = 2$ and $\lim_{x \rightarrow -\infty} f(x) = 1$. If $f'(x) = \alpha f(x) + 3$, for all $x \in \mathbf{R}$, then $f(-\log_e 2)$ is equal to:

- (A) 7 (B) 9 (C) 3 (D) 5

Q67 Ellipse[Step-by-step solution](#) › [prepwisar.in/questions/mM3nhW-erv](https://www.prepwisar.in/questions/mM3nhW-erv)

Let P be a point on the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$. Let the line passing through P and parallel to y-axis meet the circle $x^2 + y^2 = 9$ at point Q such that P and Q are on the same side of the x-axis. Then, the eccentricity of the locus of the point R on PQ such that $PR : RQ = 4 : 3$ as P moves on the ellipse, is:

- (A) $\frac{13}{21}$ (B) $\frac{\sqrt{139}}{23}$ (C) $\frac{\sqrt{13}}{7}$ (D) $\frac{11}{19}$

Q68 Functions (Advanced)[Step-by-step solution](#) › [prepwisar.in/questions/BlTbmHoqo-](https://www.prepwisar.in/questions/BlTbmHoqo-)

If the domain of the function

$f(x) = \frac{\sqrt{x^2-25}}{(4-x^2)} + \log_{10}(x^2 + 2x - 15)$ is $(-\infty, \alpha) \cup [\beta, \infty)$, then $\alpha^2 + \beta^3$ is equal to:

- (A) 140 (B) 175 (C) 125 (D) 150

Q69 Continuity & Differentiability[Step-by-step solution](#) › [prepwisar.in/questions/Y-uyeZtLnX](https://www.prepwisar.in/questions/Y-uyeZtLnX)

Let $f(x) = |2x^2 + 5|x| - 3|$, $x \in \mathbf{R}$. If m and n denote the number of points where f is not continuous and not differentiable respectively, then $m + n$ is equal to:

- (A) 5 (B) 3 (C) 2 (D) 0

Q70 Limits[Step-by-step solution](#) › [prepwisar.in/questions/GZFR_3SRcv](https://www.prepwisar.in/questions/GZFR_3SRcv)

Let $f(x) = \begin{cases} x - 1, & x \text{ is even,} \\ 2x, & x \text{ is odd,} \end{cases} \quad x \in \mathbf{N}.$

If for some $a \in \mathbf{N}$, $f(f(f(a))) = 21$, then $\lim_{x \rightarrow a^-} \left\{ \frac{|x|^3}{a} - \left[\frac{x}{a} \right] \right\}$, where $[t]$ denotes the greatest integer less than or equal to t, is equal to:

- (A) 169 (B) 121 (C) 225 (D) 144

Q71 Determinants[Step-by-step solution](#) › [prepwisar.in/questions/TH50WeIUW9](https://www.prepwisar.in/questions/TH50WeIUW9)

Let the system of equations $x + 2y + 3z = 5$, $2x + 3y + z = 9$, $4x + 3y + \lambda z = \mu$ have infinite number of solutions. Then $\lambda + 2\mu$ is equal to:

- (A) 22 (B) 17 (C) 15 (D) 28

Q72 Probability: Basic[Step-by-step solution](#) › [prepwisar.in/questions/FEdFTsFQmU](https://www.prepwisar.in/questions/FEdFTsFQmU)

Let Ajay will not appear in JEE exam with probability $p = \frac{2}{7}$, while both Ajay and Vijay will appear in the exam with probability $q = \frac{1}{5}$. Then the probability, that Ajay will appear in the exam and Vijay will not appear is:

- (A) $\frac{9}{35}$ (B) $\frac{3}{35}$ (C) $\frac{24}{35}$ (D) $\frac{18}{35}$

Attempt this paper online with instant answer checking › [prepwisar.in/pyqs/paper/2024-02-01-evening](https://www.prepwisar.in/pyqs/paper/2024-02-01-evening)

Q73 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](#) > [prepwiser.in/questions/aLUV2P2P7p](#)

Let α and β be the roots of the equation $px^2 + qx - r = 0$, where $p \neq 0$. If p, q and r be the consecutive terms of a non constant G.P. and $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{3}{4}$, then the value of $(\alpha - \beta)^2$ is:

- (A) 8 (B) 9 (C) $\frac{20}{3}$ (D) $\frac{80}{9}$

Q74 Sequences & Series[Step-by-step solution](#) > [prepwiser.in/questions/FmHoknyn9K](#)

Let S_n denote the sum of the first n terms of an arithmetic progression. If $S_{10} = 390$ and the ratio of the tenth and the fifth terms is $15 : 7$, then $S_{15} - S_5$ is equal to:

- (A) 800 (B) 890 (C) 790 (D) 690

Q75 Relations & Functions (Basic)[Step-by-step solution](#) > [prepwiser.in/questions/CSRs8brL9l](#)

Consider the relations R_1 and R_2 defined as $aR_1b \Leftrightarrow a^2 + b^2 = 1$ for all $a, b \in \mathbf{R}$ and $(a, b)R_2(c, d) \Leftrightarrow a + d = b + c$ for all $(a, b), (c, d) \in \mathbf{N} \times \mathbf{N}$. Then:

- (A) R_1 and R_2 both are equivalence relations (B) Only R_1 is an equivalence relation
(C) Only R_2 is an equivalence relation (D) Neither R_1 nor R_2 is an equivalence relation

Q76 Statistics[Step-by-step solution](#) > [prepwiser.in/questions/iDKXq1UQ1T](#)

Consider 10 observations $x_1, x_2, \dots, x_{10}$ such that $\sum_{i=1}^{10} (x_i - \alpha) = 2$ and $\sum_{i=1}^{10} (x_i - \beta)^2 = 40$, where α, β are positive integers. Let the mean and the variance of the observations be $\frac{6}{5}$ and $\frac{84}{25}$ respectively. Then $\frac{\beta}{\alpha}$ is equal to:

- (A) 2 (B) 1 (C) $\frac{5}{2}$ (D) $\frac{3}{2}$

Q77 Trigonometric Equations[Step-by-step solution](#) > [prepwiser.in/questions/oFqJrkpwrl](#)

The number of solutions of the equation $4 \sin^2 x - 4 \cos^3 x + 9 - 4 \cos x = 0$; $x \in [-2\pi, 2\pi]$ is:

- (A) 0 (B) 3 (C) 1 (D) 2

Mathematics Section B · Numerical value

Q78 to Q87

Q78 Definite Integration **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/o4vOzbmmG6](#)

Let $f : (0, \infty) \rightarrow \mathbf{R}$ and $F(x) = \int_0^x t f(t) dt$. If $F(x^2) = x^4 + x^5$, then $\sum_{r=1}^{12} f(r^2)$ is equal to _____.

Q79 Differential Equations **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/OZAcHRUaYs](#)

If $\frac{dx}{dy} = \frac{1+x-y^2}{y}$, $x(1) = 1$, then $5x(2)$ is equal to _____.

Q80 Differentiation **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/g_IS9du5bQ](#)

If $y = \frac{(\sqrt{x}+1)(x^2-\sqrt{x})}{x\sqrt{x}+x+\sqrt{x}} + \frac{1}{15} (3 \cos^2 x - 5) \cos^3 x$, then $96y' \left(\frac{\pi}{6} \right)$ is equal to:

Q81 Matrices **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/hywlGrrgG](#)

Let $A = I_2 - 2MM^T$, where M is a real matrix of order 2×1 such that the relation $M^T M = I_1$ holds. If λ is a real number such that the relation $AX = \lambda X$ holds for some non-zero real matrix X of order 2×1 , then the sum of squares of all possible values of λ is equal to _____.

If three successive terms of a G.P. with common ratio r ($r > 1$) are the lengths of the sides of a triangle and $[r]$ denotes the greatest integer less than or equal to r , then $3[r] + [-r]$ is equal to _____.

Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = -\hat{i} - 8\hat{j} + 2\hat{k}$ and $\vec{c} = 4\hat{i} + c_2\hat{j} + c_3\hat{k}$ be three vectors such that $\vec{b} \times \vec{a} = \vec{c} \times \vec{a}$. If the angle between the vector $\vec{c}$ and the vector $3\hat{i} + 4\hat{j} + \hat{k}$ is θ , then the greatest integer less than or equal to $\tan^2 \theta$ is _____.

Three points $O(0, 0)$, $P(a, a^2)$, $Q(-b, b^2)$, $a > 0$, $b > 0$, are on the parabola $y = x^2$. Let S_1 be the area of the region bounded by the line PQ and the parabola, and S_2 be the area of the triangle OPQ . If the minimum value of $\frac{S_1}{S_2}$ is $\frac{m}{n}$, $\gcd(m, n) = 1$, then $m + n$ is equal to _____.

The sum of squares of all possible values of k , for which area of the region bounded by the parabolas $2y^2 = kx$ and $ky^2 = 2(y - x)$ is maximum, is equal to:

Let ABC be an isosceles triangle in which A is at $(-1, 0)$, $\angle A = \frac{2\pi}{3}$, $AB = AC$ and B is on the positive x -axis. If $BC = 4\sqrt{3}$ and the line BC intersects the line $y = x + 3$ at (α, β) , then $\frac{\beta^4}{\alpha^2}$ is _____.

The lines $L_1, L_2, \dots, L_{20}$ are distinct. For $n = 1, 2, 3, \dots, 10$ all the lines L_{2n-1} are parallel to each other and all the lines L_{2n} pass through a given point P . The maximum number of points of intersection of pairs of lines from the set $\{L_1, L_2, \dots, L_{20}\}$ is equal to _____.

Answer key: JEE Main 2024 · 1 Feb · Shift 2

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

Numbers match the question numbers above. For full working, open the solution link at the top right of each question.

Attempt this paper online with instant answer checking › prepwiser.in/pyqs/paper/2024-02-01-evening

Physics

1.	C	2.	D	3.	B	4.	C	5.	A	6.	C	7.	B	8.	B	9.	A	10.	C
11.	C	12.	C	13.	D	14.	A	15.	A	16.	B	17.	B	18.	A	19.	A	20.	32
21.	60	22.	5	23.	3	24.	4	25.	8	26.	3	27.	4	28.	3	29.	125		

Chemistry

30.	B	31.	A	32.	D	33.	A	34.	B	35.	B	36.	A	37.	B	38.	B	39.	C
40.	D	41.	C	42.	A	43.	C	44.	C	45.	D	46.	C	47.	C	48.	6	49.	2
50.	2	51.	338	52.	15	53.	14	54.	57	55.	6	56.	5	57.	56				

Mathematics

58.	A	59.	A	60.	D	61.	D	62.	C	63.	C	64.	A	65.	C	66.	B	67.	C
68.	D	69.	B	70.	D	71.	B	72.	D	73.	D	74.	C	75.	C	76.	A	77.	A
78.	219	79.	5	80.	105	81.	2	82.	1	83.	38	84.	7	85.	8	86.	36	87.	101

PrepWiser is an independent practice platform and is not affiliated with the National Testing Agency (NTA). Questions are from official JEE Main papers; answers follow NTA's final answer keys.



Attempt this paper online

Done with the paper version? Take the same paper online: check each answer instantly and read step-by-step solutions where available. It is free, and you can start without signing up.



- 1 Scan the code to open this paper online, or go to prepwisser.in/pyqs/paper/2024-02-01-evening.
- 2 Mark the questions you got wrong. Each one names its chapter at the top left.
- 3 Practise those chapters next with the free chapter-wise PYQ PDFs at prepwisser.in/pyq-pdfs.

Also free on PrepWiser

All JEE Main 2024 papers

Every shift of 2024 as a PDF, and the year's questions chapter-wise: prepwisser.in/pyq-pdfs/jee-main/2024/

Chapter-wise PYQ PDFs

Every chapter with answer keys, 2020 to 2026: prepwisser.in/pyq-pdfs/

Daily Arena

10 questions from one chapter, every day: prepwisser.in/arena

Spotted a mistake in this PDF? Tell us at prepwisser.in/feedback.