

JEE MAIN 2020 · QUESTION PAPER

5 Sep 2020 **Shift 1**

71 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	20 Q1 to Q20	5 Q21 to Q25
● Chemistry	17 Q26 to Q42	5 Q43 to Q47
● Mathematics	19 Q48 to Q66	5 Q67 to Q71
In this PDF	71 questions · answer key at the end	

- 1 Set a 3 hour timer and attempt the paper in one sitting, like the real exam.
- 2 Check yourself against the answer key at the end. Every question names its chapter, so you can see where marks went.
- 3 Got one wrong? Tap “Step-by-step solution” at the top right of it for the full working, where available.

Attempt this paper online

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

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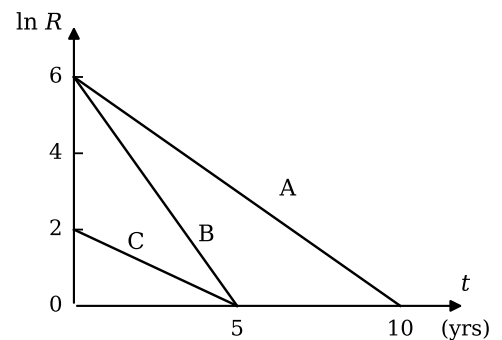
Answers follow NTA's final answer keys. Typing errors are possible, so check doubtful answers against the official key. Spotted a mistake? prepwisar.in/feedback · Terms: prepwisar.in/terms

Q1 Nuclear Physics

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

Activities of three radioactive substances A, B and C are represented by the curves A, B and C, in the figure. Then their half-lives $T_{1/2}(A) : T_{1/2}(B) : T_{1/2}(C)$ are in the ratio:

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



Q2 Electrostatics II: Potential & Capacitance

[Step-by-step solution](https://www.prepwise.in/questions/vFA-LOY7yv) > prepwise.in/questions/vFA-LOY7yv

Two capacitors of capacitances C and $2C$ are charged to potential differences V and $2V$, respectively. These are then connected in parallel in such a manner that the positive terminal of one is connected to the negative terminal of the other. The final energy of this configuration is:

- (A) Zero (B) $\frac{3}{2}CV^2$ (C) $\frac{9}{2}CV^2$ (D) $\frac{25}{6}CV^2$

Q3 Current Electricity

[Step-by-step solution](https://www.prepwise.in/questions/-Z_kb5bnBm) > prepwise.in/questions/-Z_kb5bnBm

An electrical power line, having a total resistance of $2\ \Omega$, delivers 1 kW at 220 V. The efficiency of the transmission line is approximately:

- (A) 85% (B) 96% (C) 72% (D) 91%

Q4 Moving Charges & Magnetism

[Step-by-step solution](https://www.prepwise.in/questions/kecpW69z5Z) > prepwise.in/questions/kecpW69z5Z

A galvanometer of resistance G is converted into a voltmeter of range $0 - 1\text{ V}$ by connecting a resistance R_1 in series with it. The additional resistance that should be connected in series with R_1 to increase the range of the voltmeter to $0 - 2\text{ V}$ will be:

- (A) G (B) R_1 (C) $R_1 + G$ (D) $R_1 - G$

Q5 Moving Charges & Magnetism

[Step-by-step solution](https://www.prepwise.in/questions/vG0HNFAsvH) > prepwise.in/questions/vG0HNFAsvH

An electron is constrained to move along the y -axis with a speed of $0.1\ c$ (c is the speed of light) in the presence of electromagnetic wave, whose electric field is

$$\vec{E} = 30\hat{j} \sin(1.5 \times 10^7 t - 5 \times 10^{-2} x)$$

V/m.

The maximum magnetic force experienced by the electron will be:

(given $c = 3 \times 10^8\text{ ms}^{-1}$ and electron charge $= 1.6 \times 10^{-19}\text{ C}$)

- (A) $4.8 \times 10^{-19}\text{ N}$ (B) $2.4 \times 10^{-18}\text{ N}$ (C) $3.2 \times 10^{-18}\text{ N}$ (D) $1.6 \times 10^{-18}\text{ N}$

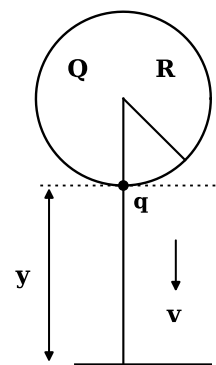
Q6 Semiconductors & Electronic Devices

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

With increasing biasing voltage of a photodiode, the photocurrent magnitude:

- (A) Increases initially and after attaining certain value, it decreases
(B) Increases linearly
(C) Increases initially and saturates finally
(D) Remains constant

A solid sphere of radius R carries a charge $Q + q$ distributed uniformly over its volume. A very small point like piece of it of mass m gets detached from the bottom of the sphere and falls down vertically under gravity. This piece carries charge q . If it acquires a speed v when it has fallen through a vertical height y (see figure), then: (assume the remaining portion to be spherical).



(A) $v^2 = y \left[\frac{qQ}{4\pi\epsilon_0 R(R+y)m} + g \right]$

(B) $v^2 = 2y \left[\frac{qQR}{4\pi\epsilon_0 (R+y)^3 m} + g \right]$

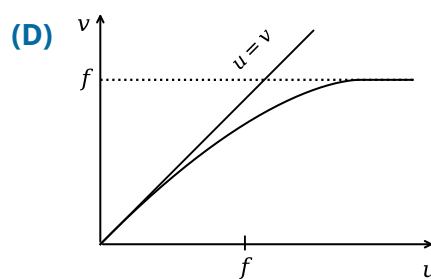
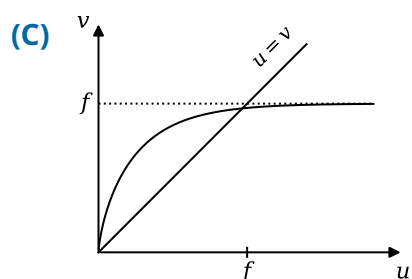
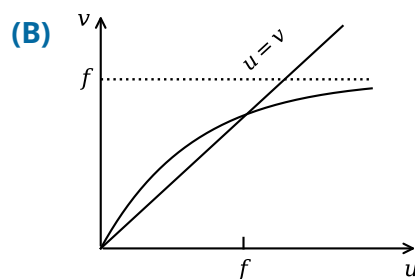
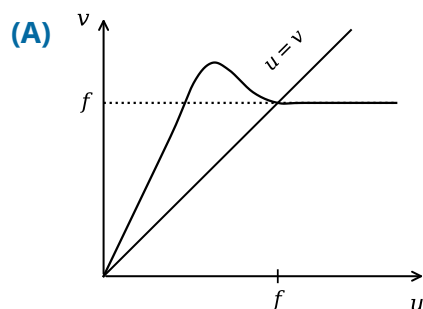
(C) $v^2 = 2y \left[\frac{qQ}{4\pi\epsilon_0 R(R+y)m} + g \right]$

(D) $v^2 = y \left[\frac{qQ}{4\pi\epsilon_0 R^2 y m} + g \right]$

Q8 Ray Optics

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

For a concave lens of focal length f , the relation between object and image distances u and v , respectively, from its pole can best be represented by ($u = v$ is the reference line):



Q9 Gravitation

[Step-by-step solution > prepwiser.in/questions/yvoY1cjRDw](https://www.prepwiser.in/questions/yvoY1cjRDw)

The value of the acceleration due to gravity is g_1 at a height $h = \frac{R}{2}$ (R = radius of the earth) from the surface of the earth. It is again equal to g_1 at a depth d below the surface of the earth. The ratio $\left(\frac{d}{R}\right)$ equals:

(A) $\frac{5}{9}$

(B) $\frac{1}{9}$

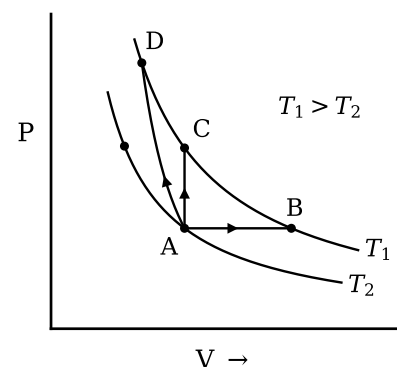
(C) $\frac{7}{9}$

(D) $\frac{4}{9}$

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Q10 Thermodynamics[Step-by-step solution > prepwisar.in/questions/OSS4EE2Odi](https://www.prepwisar.in/questions/OSS4EE2Odi)

Three different processes that can occur in an ideal monoatomic gas are shown in the P vs V diagram. The paths are labelled as $A \rightarrow B$, $A \rightarrow C$ and $A \rightarrow D$. The change in internal energies during these process are taken as E_{AB} , E_{AC} and E_{AD} and the work done as W_{AB} , W_{AC} and W_{AD} . The correct relation between these parameters are:



- (A) $E_{AB} < E_{AC} < E_{AD}$, $W_{AB} > 0$, $W_{AC} > W_{AD}$
 (B) $E_{AB} = E_{AC} = E_{AD}$, $W_{AB} > 0$, $W_{AC} = 0$, $W_{AD} < 0$
 (C) $E_{AB} > E_{AC} > E_{AD}$, $W_{AB} < W_{AC} < W_{AD}$
 (D) $E_{AB} = E_{AC} < E_{AD}$, $W_{AB} > 0$, $W_{AC} = 0$, $W_{AD} < 0$

Q11 Kinetic Theory of Gases[Step-by-step solution > prepwisar.in/questions/Nbfs8QqOgO](https://www.prepwisar.in/questions/Nbfs8QqOgO)

Number of molecules in a volume of 4 cm^3 of a perfect monoatomic gas at some temperature T and at a pressure of 2 cm of mercury is close to?

(Given, mean kinetic energy of a molecule (at T) is $4 \times 10^{-14} \text{ erg}$, $g = 980 \text{ cm/s}^2$, density of mercury = 13.6 g/cm^3)

- (A) 5.8×10^{18} (B) 4.0×10^{16} (C) 5.8×10^{16} (D) 4.0×10^{18}

Q12 Thermometry & Calorimetry[Step-by-step solution > prepwisar.in/questions/kgyaNzp9Y3](https://www.prepwisar.in/questions/kgyaNzp9Y3)

A bullet of mass 5 g, travelling with a speed of 210 m/s, strikes a fixed wooden target. One half of its kinetic energy is converted into heat in the bullet while the other half is converted into heat in the wood. The rise of temperature of the bullet if the specific heat of its material is $0.030 \text{ cal/(g } ^\circ\text{C)}$ ($1 \text{ cal} = 4.2 \times 10^7 \text{ ergs}$) close to:

- (A) $87.5 ^\circ\text{C}$ (B) $83.3 ^\circ\text{C}$ (C) $38.4 ^\circ\text{C}$ (D) $119.2 ^\circ\text{C}$

Q13 Moving Charges & Magnetism[Step-by-step solution > prepwisar.in/questions/jjKAer6NZR](https://www.prepwisar.in/questions/jjKAer6NZR)

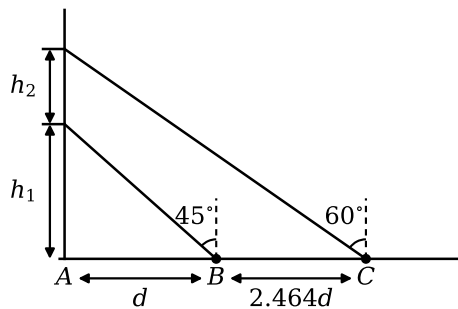
A square loop of side $2a$, and carrying current I , is kept in XZ plane with its centre at origin. A long wire carrying the same current I is placed parallel to the z-axis and passing through the point $(0, b, 0)$, ($b \gg a$). The magnitude of the torque on the loop about zaxis is given by:

- (A) $\frac{2\mu_0 I^2 a^2}{\pi b}$ (B) $\frac{\mu_0 I^2 a^2}{2\pi b}$ (C) $\frac{\mu_0 I^2 a^3}{2\pi b^2}$ (D) $\frac{2\mu_0 I^2 a^3}{\pi b^2}$

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Q14 Basic Mathematics for Physics[Step-by-step solution](https://www.prepwisar.in/questions/64PHyD-oQe) > prepwisar.in/questions/64PHyD-oQe

A balloon is moving up in air vertically above a point A on the ground. When it is at a height h_1 , a girl standing at a distance (point B) from A (see figure) sees it at an angle 45° with respect to the vertical. When the balloon climbs up a further height h_2 , it is seen at an angle 60° with respect to the vertical if the girl moves further by a distance $2.464d$ (point C). Then the height h_2 is (given $\tan 30^\circ = 0.5774$)



- (A) $0.464d$ (B) d (C) $0.732d$ (D) $1.464d$

Q15 Rectilinear Motion[Step-by-step solution](https://www.prepwisar.in/questions/nEm5Ot1SiZ) > prepwisar.in/questions/nEm5Ot1SiZ

A helicopter rises from rest on the ground vertically upwards with a constant acceleration g . A food packet is dropped from the helicopter when it is at a height h . The time taken by the packet to reach the ground is close to:

[g is the acceleration due to gravity]

- (A) $t = 3.4\sqrt{\left(\frac{h}{g}\right)}$ (B) $t = 1.8\sqrt{\left(\frac{h}{g}\right)}$ (C) $t = \sqrt{\frac{2h}{3g}}$ (D) $t = \frac{2}{3}\sqrt{\left(\frac{h}{g}\right)}$

Q16 Fluid Mechanics[Step-by-step solution](https://www.prepwisar.in/questions/8BhJ-3nJ1R) > prepwisar.in/questions/8BhJ-3nJ1R

A hollow spherical shell at outer radius R floats just submerged under the water surface. The inner radius of the shell is r . If the specific gravity of the shell material is $\frac{27}{8}$ w.r.t water, the value of r is:

- (A) $\frac{2}{3}R$ (B) $\frac{4}{9}R$ (C) $\frac{1}{3}R$ (D) $\frac{8}{9}R$

Q17 Rotational Motion[Step-by-step solution](https://www.prepwisar.in/questions/Fm7tM60lbn) > prepwisar.in/questions/Fm7tM60lbn

A wheel is rotating freely with an angular speed ω on a shaft. The moment of inertia of the wheel is I and the moment of inertia of the shaft is negligible. Another wheel of moment of inertia $3I$ initially at rest is suddenly coupled to the same shaft. The resultant fractional loss in the kinetic energy of the system is:

- (A) 0 (B) $\frac{5}{6}$ (C) $\frac{1}{4}$ (D) $\frac{3}{4}$

Q18 Units, Dimensions & Errors[Step-by-step solution](https://www.prepwisar.in/questions/2nN7ULFbV4) > prepwisar.in/questions/2nN7ULFbV4

Assume that the displacement (s) of air is proportional to the pressure difference (Δp) created by a sound wave. Displacement (s) further depends on the speed of sound (v), density of air (ρ) and the frequency (f). If $\Delta p \sim 10$ Pa, $v \sim 300$ m/s, $\rho \sim 1$ kg/m³ and $f \sim 1000$ Hz, then s will be of the order of (take the multiplicative constant to be 1):

- (A) 1 mm (B) $\frac{3}{100}$ mm (C) 10 mm (D) $\frac{1}{10}$ mm

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Q19 Sound Waves[Step-by-step solution](#) > [prepwise.in/questions/efLso7ZrWq](https://www.prepwise.in/questions/efLso7ZrWq)

In a resonance tube experiment when the tube is filled with water up to a height of 17.0 cm from bottom, it resonates with a given tuning fork. When the water level is raised the next resonance with the same tuning fork occurs at a height of 24.5 cm. If the velocity of sound in air is 330 m/s, the tuning fork frequency is:

- (A) 2200 Hz (B) 3300 Hz (C) 1100 Hz (D) 550 Hz

Q20 Units, Dimensions & Errors[Step-by-step solution](#) > [prepwise.in/questions/A95NXV7xYN](https://www.prepwise.in/questions/A95NXV7xYN)

A physical quantity z depends on four observables

a, b, c and d , as $z = \frac{a^2 b^{\frac{2}{3}}}{\sqrt{cd^3}}$. The percentages of error in the measurement of a, b, c and d are 2%, 1.5%, 4% and 2.5% respectively. The percentage of error in z is:

- (A) 13.5 % (B) 14.5% (C) 16.5% (D) 12.25%

Physics Section B · Numerical value

Q21 to Q25

Q21 Collision **NUMERICAL**[Step-by-step solution](#) > [prepwise.in/questions/ztfXO1VgNX](https://www.prepwise.in/questions/ztfXO1VgNX)

A particle of mass $200 \text{ MeV}/c^2$ collides with a hydrogen atom at rest. Soon after the collision the particle comes to rest, and the atom recoils and goes to its first excited state. The initial kinetic energy of the particle (in eV) is

$\frac{N}{4}$. The value of N is:

(Given the mass of the hydrogen atom to be $1 \text{ GeV}/c^2$) ____.

Q22 Dual Nature of Radiation & Matter **NUMERICAL**[Step-by-step solution](#) > [prepwise.in/questions/Qy5nXmIjQ](https://www.prepwise.in/questions/Qy5nXmIjQ)

A beam of electrons of energy E scatters from a target having atomic spacing of $1 \text{ \AA}$. The first maximum intensity occurs at $\theta = 60^\circ$. Then E (in eV) is _____. (Round off to the nearest integer)

(Planck constant $h = 6.64 \times 10^{-34} \text{ Js}$,

$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$, electron

mass $m = 9.1 \times 10^{-31} \text{ kg}$)

Q23 Electromagnetic Induction **NUMERICAL**[Step-by-step solution](#) > [prepwise.in/questions/GOJ2GrElRS](https://www.prepwise.in/questions/GOJ2GrElRS)

Two concentric circular coils, C_1 and C_2 are placed in the XY plane. C_1 has 500 turns, and a radius of 1 cm. C_2 has 200 turns and radius of 20 cm. C_2 carries a time dependent current $I(t) = (5t^2 - 2t + 3) \text{ A}$ where t is in s. The emf induced in C_1 (in mV), at the instant $t = 1 \text{ s}$ is $\frac{4}{x}$. The value of x is ____.

Q24 Ray Optics **NUMERICAL**[Step-by-step solution](#) > [prepwise.in/questions/bE1pFUQff0](https://www.prepwise.in/questions/bE1pFUQff0)

A compound microscope consists of an objective lens of focal length 1 cm and an eyepiece of focal length 5 cm with a separation of 10 cm.

The distance between an object and the objective lens, at which the strain on the eye is minimum is $\frac{n}{40} \text{ cm}$. The value of n is ____.

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A force $\vec{F} = (\hat{i} + 2\hat{j} + 3\hat{k})$ N acts at a point $(4\hat{i} + 3\hat{j} - \hat{k})$ m. Then the magnitude of torque about the point $(\hat{i} + 2\hat{j} + \hat{k})$ m will be $\sqrt{x}$ N m. The value of x is _____.

Chemistry Section A · Multiple choice

Q26 to Q42

Q26 General Organic Chemistry (GOC)

Step-by-step solution > [prepwisar.in/questions/oxTERJm3Jc](https://www.prepwisar.in/questions/oxTERJm3Jc)

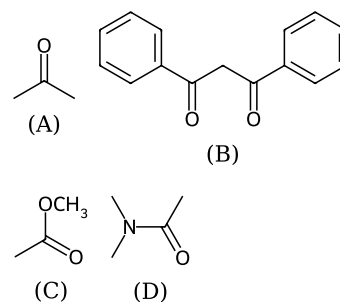
The increasing order of the acidity of the α -hydrogen of the following compounds is:

(A) (C) < (A) < (B) < (D)

(B) (B) < (C) < (A) < (D)

(C) (A) < (C) < (D) < (B)

(D) (D) < (C) < (A) < (B)



Q27 Carbohydrates & Biomolecules

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

Which of the following is not an essential amino acid:

(A) Valine

(B) Leucine

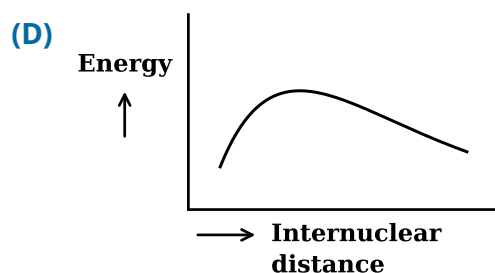
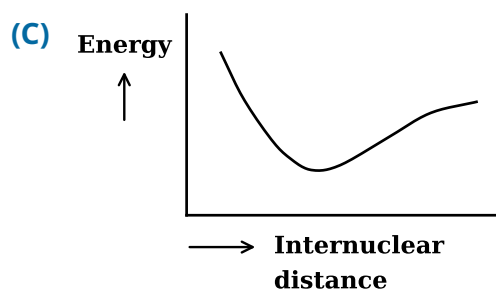
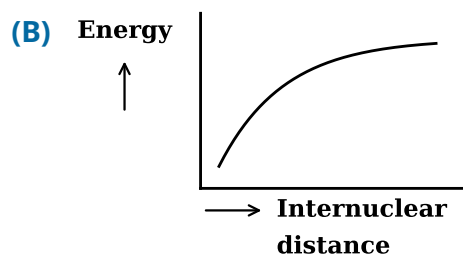
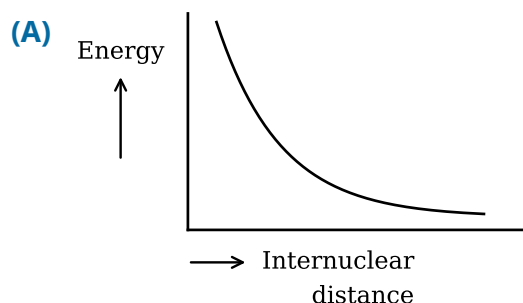
(C) Lysine

(D) Tyrosine

Q28 Chemical Bonding & Molecular Structure

Step-by-step solution > [prepwisar.in/questions/MjLecB0-bz](https://www.prepwisar.in/questions/MjLecB0-bz)

The potential energy curve for the H_2 molecule as a function of internuclear distance is:



Q29 Chemical Bonding & Molecular Structure

Step-by-step solution > [prepwisar.in/questions/A9OraAbSVz](https://www.prepwisar.in/questions/A9OraAbSVz)

The structure of PCl_5 in the solid state is:

(A) square pyramidal

(B) tetrahedral $[PCl_4]^+$ and octahedral $[PCl_6]^-$ (C) square planar $[PCl_4]^+$ and octahedral $[PCl_6]^-$

(D) trigonal bipyramidal

Q30 Chemical Kinetics[Step-by-step solution](https://www.prepwiser.in/questions/NAgqCkiZ6y) › prepwiser.in/questions/NAgqCkiZ6y

A flask contains a mixture of compounds A and B. Both compounds decompose by first-order kinetics. The half-lives for A and B are 300 s and 180 s, respectively. If the concentrations of A and B are equal initially, the time required for the concentration of A to be four times that of B(in s):
(Use $\ln 2 = 0.693$)

- (A) 180 (B) 120 (C) 300 (D) 900

Q31 Chemistry in Everyday Life[Step-by-step solution](https://www.prepwiser.in/questions/yY1wuytiHv) › prepwiser.in/questions/yY1wuytiHv

If a person is suffering from the deficiency of nor-adrenaline, what kind of drug can be suggested?

- (A) Anti-inflammatory (B) Antihistamine (C) Analgesic (D) Antidepressant

Q32 Coordination Compounds[Step-by-step solution](https://www.prepwiser.in/questions/8Gxut0GIXD) › prepwiser.in/questions/8Gxut0GIXD

The values of the crystal field stabilization energies for a high spin d^6 metal ion in octahedral and tetrahedral fields, respectively, are:

- (A) $-0.4\Delta_0$ and $-0.27\Delta_t$ (B) $-1.6\Delta_0$ and $-0.4\Delta_t$
(C) $-0.4\Delta_0$ and $-0.6\Delta_t$ (D) $-2.4\Delta_0$ and $-0.27\Delta_t$

Q33 Atomic Structure[Step-by-step solution](https://www.prepwiser.in/questions/sOz3GjMIZb) › prepwiser.in/questions/sOz3GjMIZb

The correct electronic configuration and spin-only magnetic moment (BM) of Gd^{3+} ($Z = 64$), respectively, are:

- (A) $[Xe]5f^7$ and 8.9 (B) $[Xe]4f^7$ and 7.9 (C) $[Xe]5f^7$ and 7.9 (D) $[Xe]4f^7$ and 8.9

Q34 Atomic Structure[Step-by-step solution](https://www.prepwiser.in/questions/-KdABU2VYO) › prepwiser.in/questions/-KdABU2VYO

In the sixth period, the orbitals that are filled are:

- (A) 6s, 5d, 5f, 6p (B) 6s, 4f, 5d, 6p (C) 6s, 6p, 6d, 6f (D) 6s, 5f, 6d, 6p

Q35 Hydrogen & s-Block Elements[Step-by-step solution](https://www.prepwiser.in/questions/pTczIeQ7S7) › prepwiser.in/questions/pTczIeQ7S7

The equation that represents the water-gas shift reaction is:

- (A) $CO(g) + H_2O(g) \xrightarrow[Catalyst]{673K} CO_2(g) + H_2(g)$ (B) $CH_4(g) + H_2O(g) \xrightarrow[Ni]{1270K} CO(g) + 3H_2(g)$
(C) $C(s) + H_2O(g) \xrightarrow{1270K} CO(g) + H_2(g)$ (D) $2C(s) + O_2(g) + 4N_2(g) \xrightarrow{1273K} 2CO(g) + 4N_2(g)$

Q36 Metallurgy[Step-by-step solution](https://www.prepwiser.in/questions/Eu6XscXTN6) › prepwiser.in/questions/Eu6XscXTN6

An Ellingham diagram provides information about:

- (A) the temperature dependence of the standard Gibbs energies of formation of some metal oxides
(B) the pressure dependence of the standard electrode potentials of reduction reactions involved in the extraction of metals
(C) the conditions of pH and potential under which a species is thermodynamically stable
(D) the kinetics of the reduction process

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Q37 Solid State[Step-by-step solution](https://www.prepwiser.in/questions/p8mKOKcyS2)

A diatomic molecule X_2 has a body-centred cubic (bcc) structure with a cell edge of 300 pm. The density of the molecule is 6.17 g cm^{-3} . The number of molecules present in 200 g of X_2 is: (Avogadro constant (N_A) = $6 \times 10^{23} \text{ mol}^{-1}$)

- (A) $8 N_A$ (B) $40 N_A$ (C) $4 N_A$ (D) $2 N_A$

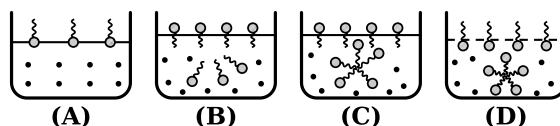
Q38 Atomic Structure[Step-by-step solution](https://www.prepwiser.in/questions/SrMwxXEmeo)

The difference between the radii of 3^{rd} and 4^{th} orbits of Li^{2+} is R_1 . The difference between the radii of 3^{rd} and 4^{th} orbits of He^+ is ΔR_2 . Ratio $\Delta R_1 : \Delta R_2$ is:

- (A) 8 : 3 (B) 3 : 2 (C) 2 : 3 (D) 3 : 8

Q39 Surface Chemistry[Step-by-step solution](https://www.prepwiser.in/questions/bMMDH_0Fn)

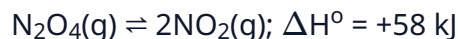
Identify the correct molecular picture showing that happens at the critical micellar concentration (CMC) of an aqueous solution of a surfactant ($\bigcirc$ polar head; $\sim$ non-polar tail; $\bullet$ water).



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

Q40 Chemical Equilibrium[Step-by-step solution](https://www.prepwiser.in/questions/dwrPpdsMly)

Consider the following reaction:



For each of the following cases (a, b), the direction in which the equilibrium shifts is:

(a) Temperature is decreased.

(b) Pressure is increased by adding N_2 at constant T.

- (A) (a) towards reactant, (b) towards product (B) (a) towards reactant, (b) no change
(C) (a) towards product, (b) towards reactant (D) (a) towards product, (b) no change

Q41 Amines & Diazonium Salts[Step-by-step solution](https://www.prepwiser.in/questions/MiR0A_OYWA)

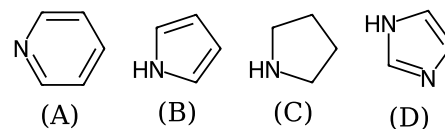
The most appropriate reagent for conversion of $\text{C}_2\text{H}_5\text{CN}$ into $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ is

- (A) NaBH_4 (B) CaH_2 (C) $\text{Na}(\text{CN})\text{BH}_3$ (D) LiAlH_4

Q42 Amines & Diazonium Salts[Step-by-step solution](https://www.prepwiser.in/questions/U5VhH8DRUA)

The increasing order of basicity of the following compounds is:

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



Q43 Carbohydrates & Biomolecules **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/VOuJLaI2FF) › prepwise.in/questions/VOuJLaI2FF

The number of chiral carbon(s) present in peptide, Ile-Arg-Pro, is ____.

Q44 Coordination Compounds **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/9dR0kdRxo2) › prepwise.in/questions/9dR0kdRxo2

The total number of coordination sites in ethylenediaminetetraacetate (EDTA^{4-}) is ____.

Q45 Electrochemistry **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/XrnNsCMTdb) › prepwise.in/questions/XrnNsCMTdb

An oxidation-reduction reaction in which 3 electrons are transferred has a ΔG° of $17.37 \text{ kJ mol}^{-1}$ at 25°C . The value of E° cell (in V) is ____ $\times 10^{-2}$.
($1 \text{ F} = 96,500 \text{ C mol}^{-1}$)

Q46 Mole Concept & Stoichiometry **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/HXF7T9-xIR) › prepwise.in/questions/HXF7T9-xIR

The minimum number of moles of O_2 required for complete combustion of 1 mole of propane and 2 moles of butane is ____.

Q47 Ionic Equilibrium **NUMERICAL**[Step-by-step solution](https://www.prepwise.in/questions/eh8jLoN1iU) › prepwise.in/questions/eh8jLoN1iU

A soft drink was bottled with a partial pressure of CO_2 of 3 bar over the liquid at room temperature. The partial pressure of CO_2 over the solution approaches a value of 30 bar when 44 g of CO_2 is dissolved in 1 kg of water at room temperature. The approximate pH of the soft drink is ____ $\times 10^{-1}$.
(First dissociation constant of $\text{H}_2\text{CO}_3 = 4.0 \times 10^{-7}$; $\log 2 = 0.3$; density of the soft drink = 1 g mL^{-1}).

Mathematics Section A · Multiple choice

Q48 Three Dimensional Geometry[Step-by-step solution](https://www.prepwise.in/questions/WZ58zpWVFE) › prepwise.in/questions/WZ58zpWVFE

If (a, b, c) is the image of the point (1, 2, -3) in the line $\frac{x+1}{2} = \frac{y-3}{-2} = \frac{z}{-1}$, then $a + b + c$ is:

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

Q49 Applications of Derivatives[Step-by-step solution](https://www.prepwise.in/questions/iFh-HwDDRb) › prepwise.in/questions/iFh-HwDDRb

If the point P on the curve, $4x^2 + 5y^2 = 20$ is farthest from the point Q(0, -4), then PQ^2 is equal to:

- (A) 36 (B) 48 (C) 21 (D) 29

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Q50 Complex Numbers[Step-by-step solution](#) › prepwiser.in/questions/7-Uuuzkjpj

If the four complex numbers

$$z, \bar{z}, \bar{z} - 2\operatorname{Re}(\bar{z})$$

and $z - 2\operatorname{Re}(z)$ represent the vertices of a square of side 4 units in the Argand plane, then $|z|$ is equal to:

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

Q51 Definite Integration[Step-by-step solution](#) › prepwiser.in/questions/rYaFjF-o6C

The value of

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{1}{1 + e^{\sin x}} dx$$

is:

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

Q52 Differential Equations[Step-by-step solution](#) › prepwiser.in/questions/RMRpaBkbYB

If $y = y(x)$ is the solution of the differential

equation $\frac{5+e^x}{2+y} \cdot \frac{dy}{dx} + e^x = 0$ satisfying $y(0) = 1$, then a value of $y(\log_e 13)$ is:

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

Q53 Ellipse[Step-by-step solution](#) › prepwiser.in/questions/n_HQtCbVx3

If the co-ordinates of two points A and B

are $(\sqrt{7}, 0)$ and $(-\sqrt{7}, 0)$ respectively and

P is any point on the conic, $9x^2 + 16y^2 = 144$, then $PA + PB$ is equal to:

- (A) 8 (B) 9 (C) 16 (D) 6

Q54 Inverse Trigonometric Functions[Step-by-step solution](#) › prepwiser.in/questions/7Ywvf0bBZW

If S is the sum of the first 10 terms of the series

$$\tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{13}\right) + \tan^{-1}\left(\frac{1}{21}\right) + \dots$$

then $\tan(S)$ is equal to:

- (A) $\frac{10}{11}$ (B) $\frac{5}{11}$ (C) $-\frac{6}{5}$ (D) $\frac{5}{6}$

Q55 Continuity & Differentiability[Step-by-step solution](#) › prepwiser.in/questions/LNcgTrmHr4

If the function

$$f(x) = \begin{cases} k_1(x - \pi)^2 - 1, & x \leq \pi \\ k_2 \cos x, & x > \pi \end{cases}$$

is

twice differentiable, then the ordered pair (k_1, k_2) is equal to:

- (A) $\left(\frac{1}{2}, -1\right)$ (B) (1, 1) (C) (1, 0) (D) $\left(\frac{1}{2}, 1\right)$

Q56 Limits[Step-by-step solution](https://www.prepwiser.in/questions/ydl3xL8VZ2)

If α is positive root of the equation, $p(x) = x^2 - x - 2 = 0$, then

$$\lim_{x \rightarrow \alpha^+} \frac{\sqrt{1 - \cos(p(x))}}{x + \alpha - 4}$$

is equal to:

(A) $\frac{1}{\sqrt{2}}$

(B) $\frac{1}{2}$

(C) $\frac{3}{\sqrt{2}}$

(D) $\frac{3}{2}$

Q57 Determinants[Step-by-step solution](https://www.prepwiser.in/questions/ZZi38BzYr5)

Let $\lambda \in \mathbb{R}$. The system of linear equations

$$2x_1 - 4x_2 + \lambda x_3 = 1$$

$$x_1 - 6x_2 + x_3 = 2$$

$$\lambda x_1 - 10x_2 + 4x_3 = 3$$

is inconsistent for:

(A) exactly one positive value of λ **(B)** exactly one negative value of λ **(C)** exactly two values of λ **(D)** every value of λ **Q58** Determinants[Step-by-step solution](https://www.prepwiser.in/questions/N06XzsTaPn)

If the minimum and the maximum values of the function $f : \left[\frac{\pi}{4}, \frac{\pi}{2}\right] \rightarrow \mathbb{R}$, defined by

$$f(\theta) = \begin{vmatrix} -\sin^2\theta & -1 - \sin^2\theta & 1 \\ -\cos^2\theta & -1 - \cos^2\theta & 1 \\ 12 & 10 & -2 \end{vmatrix}$$

are m and M respectively, then the ordered pair (m, M) is equal to:

(A) $(0, 2\sqrt{2})$

(B) $(-4, 0)$

(C) $(-4, 4)$

(D) $(0, 4)$

Q59 Parabola[Step-by-step solution](https://www.prepwiser.in/questions/z7hbjAb2Gr)

If the common tangent to the parabolas,

$$y^2 = 4x \text{ and } x^2 = 4y \text{ also touches the circle, } x^2 + y^2 = c^2,$$

then c is equal to:

(A) $\frac{1}{\sqrt{2}}$

(B) $\frac{1}{2\sqrt{2}}$

(C) $\frac{1}{2}$

(D) $\frac{1}{4}$

Q60 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](https://www.prepwiser.in/questions/oTCwkhHrxz)

The product of the roots of the

$$\text{equation } 9x^2 - 18|x| + 5 = 0 \text{ is:}$$

(A) $\frac{5}{9}$

(B) $\frac{5}{27}$

(C) $\frac{25}{81}$

(D) $\frac{25}{9}$

Q61 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/2_boksrzps)

If $3^{2 \sin 2\alpha - 1}$, 14 and $3^{4 - 2 \sin 2\alpha}$ are the first three terms of an A.P. for some α , then the sixth terms of this A.P. is:

(A) 66

(B) 81

(C) 65

(D) 78

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Q62 Binomial Theorem[Step-by-step solution](#) › prepwiser.in/questions/SePwy8OUcm

If $2^{10} + 2^9 \cdot 3^1 + 2^8 \cdot 3^2 + \dots + 2 \cdot 3^9 + 3^{10} = S - 2^{11}$, then S is equal to:

- (A) $\frac{3^{11}}{2} + 2^{10}$ (B) $3^{11} - 2^{12}$ (C) $2 \cdot 3^{11}$ (D) 3^{11}

Q63 Probability: Basic[Step-by-step solution](#) › prepwiser.in/questions/cYcizNMRJm

A survey shows that 73% of the persons working in an office like coffee, whereas 65% like tea. If x denotes the percentage of them, who like both coffee and tea, then x cannot be:

- (A) 63 (B) 36 (C) 54 (D) 38

Q64 Statistics[Step-by-step solution](#) › prepwiser.in/questions/h7v-KW5sbk

The mean and variance of 7 observations are 8 and 16, respectively. If five observations are 2, 4, 10, 12, 14, then the absolute difference of the remaining two observations is:

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

Q65 Vectors[Step-by-step solution](#) › prepwiser.in/questions/21i0gjpHW5

If the volume of a parallelopiped, whose coterminal edges are given by the

vectors $\vec{a} = \hat{i} + \hat{j} + n\hat{k}$,

$\vec{b} = 2\hat{i} + 4\hat{j} - n\hat{k}$ and

$\vec{c} = \hat{i} + n\hat{j} + 3\hat{k}$ ($n \geq 0$), is 158 cu. units, then:

- (A) $n = 7$ (B) $\vec{b} \cdot \vec{c} = 10$ (C) $\vec{a} \cdot \vec{c} = 17$ (D) $n = 9$

Q66 Indefinite Integration[Step-by-step solution](#) › prepwiser.in/questions/rd2llk_r6b

If

$$\int (e^{2x} + 2e^x - e^{-x} - 1) e^{(e^x + e^{-x})} dx = g(x) e^{(e^x + e^{-x})} + c$$

where c is a constant of integration, then g(0) is equal to:

- (A) 1 (B) 2 (C) e (D) e^2

Mathematics Section B · Numerical value

Q67 to Q71

Q67 Binomial Theorem **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/UHt7BhCGMA

The natural number m, for which the coefficient of x in the binomial expansion of

$(x^m + \frac{1}{x^2})^{22}$ is 1540, is

Q68 Continuity & Differentiability **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/4ZiiMNztIW

Let $f(x) = x \cdot \left[\frac{x}{2}\right]$, for $-10 < x < 10$, where $[t]$ denotes the greatest integer function. Then the number of points of discontinuity of f is equal to ____.

Q69 Probability: Advanced **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/jWzf3v1vcz

Four fair dice are thrown independently 27 times. Then the expected number of times, at least two dice show up a three or a five, is _____.

The number of words, with or without meaning, that can be formed by taking 4 letters at a time from the letters of the word 'SYLLABUS' such that two letters are distinct and two letters are alike, is:

If the line, $2x - y + 3 = 0$ is at a distance

$\frac{1}{\sqrt{5}}$ and $\frac{2}{\sqrt{5}}$ from the lines $4x - 2y + \alpha = 0$

and $6x - 3y + \beta = 0$, respectively, then the sum of all possible values of α and β is:

Answer key: JEE Main 2020 · 5 Sep · Shift 1

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Physics

1.	D	2.	B	3.	B	4.	C	5.	A	6.	C	7.	C	8.	D	9.	A	10.	B
11.	D	12.	A	13.	A	14.	B	15.	A	16.	D	17.	D	18.	B	19.	A	20.	B
21.	51	22.	50	23.	5	24.	50	25.	195										

Chemistry

26.	D	27.	D	28.	C	29.	B	30.	D	31.	D	32.	C	33.	B	34.	B	35.	A
36.	A	37.	C	38.	C	39.	C	40.	B	41.	D	42.	D	43.	4	44.	6	45.	-6
46.	18	47.	37																

Mathematics

48.	B	49.	A	50.	D	51.	C	52.	A	53.	A	54.	D	55.	D	56.	C	57.	B
58.	B	59.	A	60.	C	61.	A	62.	D	63.	B	64.	A	65.	B	66.	B	67.	13
68.	8	69.	11	70.	240	71.	30												

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