

JEE MAIN 2020 · QUESTION PAPER

6 Sep 2020 **Shift 1**

64 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	19 Q1 to Q19	5 Q20 to Q24
● Chemistry	14 Q25 to Q38	4 Q39 to Q42
● Mathematics	19 Q43 to Q61	3 Q62 to Q64
In this PDF	64 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.

prepwise.in/pyqs/paper/2020-09-06-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/CTJGNUHuiu) > prepwiser.in/questions/CTJGNUHuiu

An AC circuit has $R = 100 \Omega$, $C = 2 \mu F$ and $L = 80 \text{ mH}$, connected in series. The quality factor of the circuit is:

- (A) 20 (B) 2 (C) 0.5 (D) 400

Q2 Nuclear Physics

[Step-by-step solution](https://www.prepwiser.in/questions/mf6SF5tiyW) > prepwiser.in/questions/mf6SF5tiyW

You are given that Mass of ${}^7_3\text{Li} = 7.0160u$,

Mass of ${}^4_2\text{He} = 4.0026u$

and Mass of ${}^1_1\text{H} = 1.0079u$.

When 20 g of ${}^7_3\text{Li}$ is converted into ${}^4_2\text{He}$ by proton capture, the energy liberated, (in kWh), is:

[Mass of nucleon = $1 \text{ GeV}/c^2$]

- (A) 6.82×10^5 (B) 4.5×10^5 (C) 8×10^6 (D) 1.33×10^6

Q3 Circular Motion

[Step-by-step solution](https://www.prepwiser.in/questions/ZDd4ap34jB) > prepwiser.in/questions/ZDd4ap34jB

A clock has a continuously moving second's hand of 0.1 m length. The average acceleration of the tip of the hand (in units of ms^{-2}) is of the order of:

- (A) 10^{-3} (B) 10^{-1} (C) 10^{-2} (D) 10^{-4}

Q4 Dual Nature of Radiation & Matter

[Step-by-step solution](https://www.prepwiser.in/questions/Y3UiL7Do6F) > prepwiser.in/questions/Y3UiL7Do6F

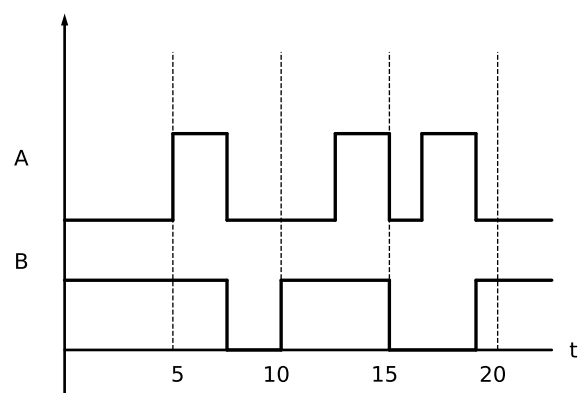
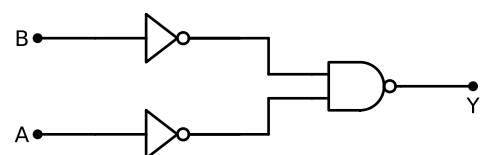
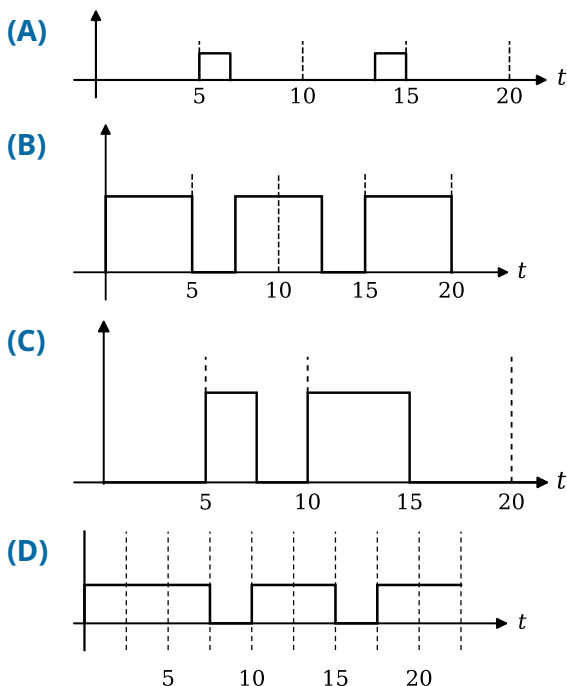
An electron, a doubly ionized helium ion (He^{++}) and a proton are having the same kinetic energy. The relation between their respective de-Broglie wavelengths λ_e , $\lambda_{\text{He}^{++}}$ and λ_p is:

- (A) $\lambda_e > \lambda_{\text{He}^{++}} > \lambda_p$ (B) $\lambda_e < \lambda_p < \lambda_{\text{He}^{++}}$ (C) $\lambda_e > \lambda_p > \lambda_{\text{He}^{++}}$ (D) $\lambda_e < \lambda_{\text{He}^{++}} = \lambda_p$

Q5 Semiconductors & Electronic Devices

[Step-by-step solution](https://www.prepwiser.in/questions/-TpA7hbdTE) > prepwiser.in/questions/-TpA7hbdTE

Identify the correct output signal Y in the given combination of gates (as shown) for the given inputs A and B.

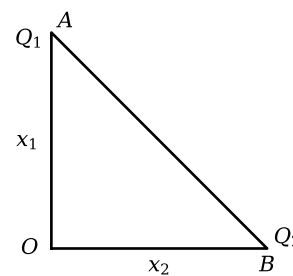


Q6 Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution](#) > [prepwisar.in/questions/8LILHxVAiu](https://www.prepwisar.in/questions/8LILHxVAiu)

Charges Q_1 and Q_2 are at points A and B of a right angle triangle OAB (see figure). The resultant electric field at point O is perpendicular to the hypotenuse, then

$\frac{Q_1}{Q_2}$ is proportional to:

- (A) $\frac{x_1^3}{x_2^3}$ (B) $\frac{x_2^2}{x_1^2}$ (C) $\frac{x_1}{x_2}$ (D) $\frac{x_2}{x_1}$

**Q7** Ray Optics[Step-by-step solution](#) > [prepwisar.in/questions/8-E38az3RM](https://www.prepwisar.in/questions/8-E38az3RM)

A point like object is placed at a distance of 1 m in front of a convex lens of focal length 0.5 m. A plane mirror is placed at a distance of 2 m behind the lens. The position and nature of the final image formed by the system is:

- (A) 2.6 m from the mirror, real (B) 1 m from the mirror, real
(C) 2.6 m from the mirror, virtual (D) 1 m from the mirror, virtual

Q8 Gravitation[Step-by-step solution](#) > [prepwisar.in/questions/ELYJWr89q2](https://www.prepwisar.in/questions/ELYJWr89q2)

A satellite is in an elliptical orbit around a planet P. It is observed that the velocity of the satellite when it is farthest from the planet is 6 times less than that when it is closest to the planet. The ratio of distances between the satellite and the planet at closest and farthest points is:

- (A) 1 : 2 (B) 1 : 3 (C) 1 : 6 (D) 3 : 4

Q9 Kinetic Theory of Gases[Step-by-step solution](#) > [prepwisar.in/questions/JSfYDPI5Y](https://www.prepwisar.in/questions/JSfYDPI5Y)

Molecules of an ideal gas are known to have three translational degrees of freedom and two rotational degrees of freedom. The gas is maintained at a temperature of T . The total internal energy, U of a mole of this gas, and the value of

$\gamma \left(= \frac{C_p}{C_v} \right)$ are given, respectively by:

- (A) $U = \frac{5}{2}RT$ and $\gamma = \frac{7}{5}$ (B) $U = 5RT$ and $\gamma = \frac{6}{5}$
(C) $U = 5RT$ and $\gamma = \frac{7}{5}$ (D) $U = \frac{5}{2}RT$ and $\gamma = \frac{6}{5}$

Q10 Friction[Step-by-step solution](#) > [prepwisar.in/questions/4nIpoqNGjD](https://www.prepwisar.in/questions/4nIpoqNGjD)

An insect is at the bottom of a hemispherical ditch of radius 1 m. It crawls up the ditch but starts slipping after it is at height h from the bottom. If the coefficient of friction between the ground and the insect is 0.75, then h is:

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

- (A) 0.45 m (B) 0.60 m (C) 0.20 m (D) 0.80 m

Q11 Moving Charges & Magnetism[Step-by-step solution](#) > [prepwisar.in/questions/OoLSTPYdVi](https://www.prepwisar.in/questions/OoLSTPYdVi)

A particle of charge q and mass m is moving with a velocity $-v\hat{i}$ ($v \neq 0$) towards a large screen placed in the $Y-Z$ plane at a distance d . If there is a magnetic field $\vec{B} = B_0\hat{k}$, the maximum value of v for which the particle will not hit the screen is:

- (A) $\frac{2qdB_0}{m}$ (B) $\frac{qdB_0}{3m}$ (C) $\frac{qdB_0}{2m}$ (D) $\frac{qdB_0}{m}$

Q12 Moving Charges & Magnetism[Step-by-step solution](#) > [prepwiser.in/questions/_AEGUveiCI](https://www.prepwiser.in/questions/_AEGUveiCI)

An electron is moving along +x direction with a velocity of $6 \times 10^6 \text{ ms}^{-1}$. It enters a region of uniform electric field of 300 V/cm pointing along +y direction. The magnitude and direction of the magnetic field set up in this region such that the electron keeps moving along the x direction will be:

(A) $3 \times 10^{-4} \text{ T}$, along -z direction

(B) $5 \times 10^{-3} \text{ T}$, along -z direction

(C) $5 \times 10^{-3} \text{ T}$, along +z direction

(D) $3 \times 10^{-4} \text{ T}$, along +z direction

Q13 Simple Harmonic Motion[Step-by-step solution](#) > [prepwiser.in/questions/SE_GYMqRYI](https://www.prepwiser.in/questions/SE_GYMqRYI)

An object of mass m is suspended at the end of a massless wire of length L and area of crosssection A . Young modulus of the material of the wire is Y . If the mass is pulled down slightly its frequency of oscillation along the vertical direction is:

(A) $f = \frac{1}{2\pi} \sqrt{\frac{YA}{mL}}$

(B) $f = \frac{1}{2\pi} \sqrt{\frac{mL}{YA}}$

(C) $f = \frac{1}{2\pi} \sqrt{\frac{YL}{mA}}$

(D) $f = \frac{1}{2\pi} \sqrt{\frac{mA}{YL}}$

Q14 Rotational Motion[Step-by-step solution](#) > [prepwiser.in/questions/vWj23isfqS](https://www.prepwiser.in/questions/vWj23isfqS)

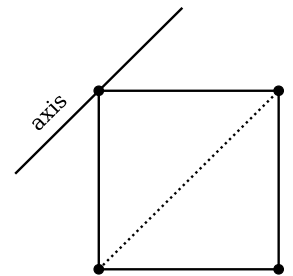
Four point masses, each of mass m , are fixed at the corners of a square of side l . The square is rotating with angular frequency ω , about an axis passing through one of the corners of the square and parallel to its diagonal, as shown in the figure. The angular momentum of the square about this axis is:

(A) $3ml^2\omega$

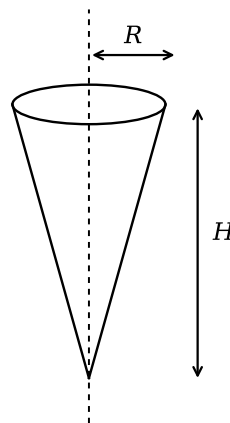
(B) $4ml^2\omega$

(C) $ml^2\omega$

(D) $2ml^2\omega$

**Q15** Rotational Motion[Step-by-step solution](#) > [prepwiser.in/questions/9jjRuypVIb](https://www.prepwiser.in/questions/9jjRuypVIb)

Shown in the figure is a hollow icecream cone (it is open at the top). If its mass is M , radius of its top, R and height, H , then its moment of inertia about its axis is:



(A) $\frac{M(R^2 + H^2)}{3}$

(B) $\frac{MR^2}{2}$

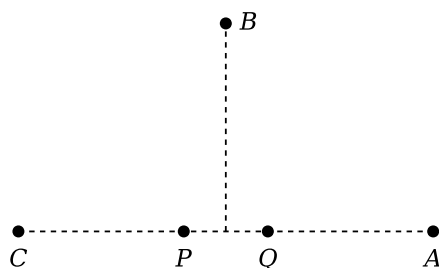
(C) $\frac{MR^2}{3}$

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

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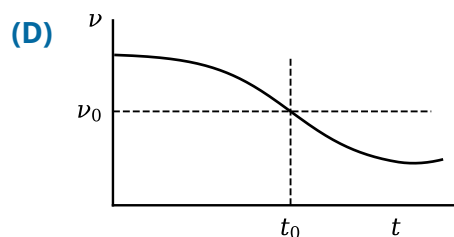
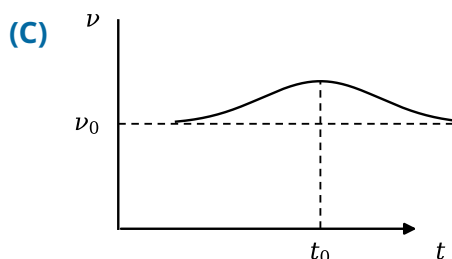
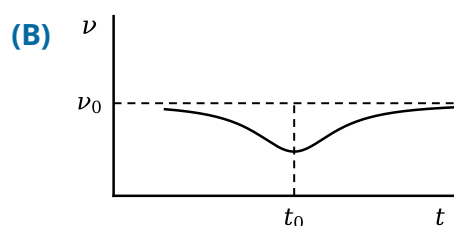
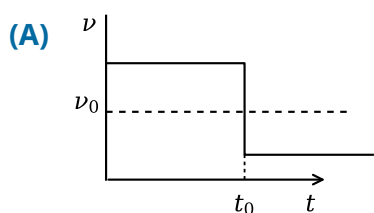
Q16 Wave Optics[Step-by-step solution > prepwisar.in/questions/-QW6fvn8b1](https://www.prepwisar.in/questions/-QW6fvn8b1)

In the figure below, P and Q are two equally intense coherent sources emitting radiation of wavelength 20 m. The separation between P and Q is 5 m and the phase of P is ahead of that of Q by 90° . A, B and C are three distinct points of observation, each equidistant from the midpoint of PQ. The intensities of radiation at A, B, C will be in the ratio:

**(A)** 4 : 1 : 0**(B)** 2 : 1 : 0**(C)** 0 : 1 : 2**(D)** 0 : 1 : 4**Q17** Sound Waves[Step-by-step solution > prepwisar.in/questions/abhSTJHVCK](https://www.prepwisar.in/questions/abhSTJHVCK)

A sound source S is moving along a straight track with speed v , and is emitting, sound of frequency ν_0 (see figure). An observer is standing at a finite distance, at the point O, from the track. The time variation of frequency heard by the observer is best represented by:

(t_0 represents the instant when the distance between the source and observer is minimum)

**Q18** Elasticity[Step-by-step solution > prepwisar.in/questions/u99o2tq_Gg](https://www.prepwisar.in/questions/u99o2tq_Gg)

If the potential energy between two molecules is given by

$$U = -\frac{A}{r^6} + \frac{B}{r^{12}},$$

then at equilibrium, separation between molecules, and the potential energy are:

(A) $\left(\frac{2B}{A}\right)^{1/6}, -\frac{A^2}{4B}$ **(B)** $\left(\frac{2B}{A}\right)^{1/6}, -\frac{A^2}{2B}$ **(C)** $\left(\frac{B}{A}\right)^{1/6}, 0$ **(D)** $\left(\frac{B}{2A}\right)^{1/6}, -\frac{A^2}{2B}$ **Q19** Experimental Skills[Step-by-step solution > prepwisar.in/questions/wOzGTT_FDq](https://www.prepwisar.in/questions/wOzGTT_FDq)

A screw gauge has 50 divisions on its circular scale. The circular scale is 4 units ahead of the pitch scale marking, prior to use. Upon one complete rotation of the circular scale, a displacement of 0.5 mm is noticed on the pitch scale. The nature of zero error involved and the least count of the screw gauge, are respectively:

(A) Positive, 0.1 mm**(B)** Positive, 0.1 μm **(C)** Positive, 10 μm **(D)** Negative, 2 μm

Q20 Collision **NUMERICAL**

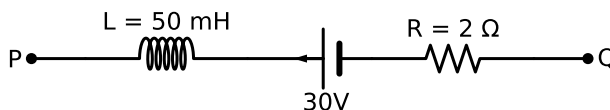
[Step-by-step solution](https://www.prepwiser.in/questions/0kaeFJn2zY) › prepwiser.in/questions/0kaeFJn2zY

Two bodies of the same mass are moving with the same speed, but in different directions in a plane. They have a completely inelastic collision and move together thereafter with a final speed which is half of their initial speed. The angle between the initial velocities of the two bodies (in degree) is _____.

Q21 Electromagnetic Induction **NUMERICAL**

[Step-by-step solution](https://www.prepwiser.in/questions/rzG2lWsd6) › prepwiser.in/questions/rzG2lWsd6

A part of a complete circuit is shown in the figure. At some instant, the value of current I is 1 A and it is decreasing at a rate of 10^2 A s^{-1} . The value of the potential difference $V_P - V_Q$, (in volts) at that instant, is _____.



Q22 Electromagnetic Waves **NUMERICAL**

[Step-by-step solution](https://www.prepwiser.in/questions/ORP2ZNr3I7) › prepwiser.in/questions/ORP2ZNr3I7

Suppose that intensity of a laser is $\frac{315}{\pi} \text{ W/m}^2$.

The rms electric field, in units of V/m associated with this source is close to the nearest integer is _____.

$\epsilon_0 = 8.86 \times 10^{-12} \text{ C}^2 \text{ Nm}^{-2}; c = 3 \times 10^8 \text{ ms}^{-1}$)

Q23 Kinetic Theory of Gases **NUMERICAL**

[Step-by-step solution](https://www.prepwiser.in/questions/9jLzNfGqN8) › prepwiser.in/questions/9jLzNfGqN8

Initially a gas of diatomic molecules is contained in a cylinder of volume V_1 at a pressure P_1 and temperature 250 K. Assuming that 25% of the molecules get dissociated causing a change in number of moles. The pressure of the resulting gas at temperature 2000 K, when contained in a volume $2V_1$ is given by P_2 . The ratio $\frac{P_2}{P_1}$ is _____.

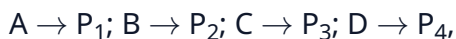
Q24 Units, Dimensions & Errors **NUMERICAL**

[Step-by-step solution](https://www.prepwiser.in/questions/2NpC_8bCxm) › prepwiser.in/questions/2NpC_8bCxm

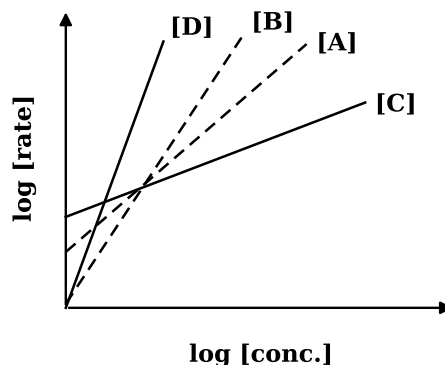
The density of a solid metal sphere is determined by measuring its mass and its diameter. The maximum error in the density of the sphere is $\left(\frac{x}{100}\right)\%$. If the relative errors in measuring the mass and the diameter are 6.0% and 1.5% respectively, the value of x is _____.

Q25 Chemical Kinetics[Step-by-step solution](https://www.prepwisar.in/questions/pYsboi9LH-) · prepwisar.in/questions/pYsboi9LH-

Consider the following reactions



The order of the above reactions are a, b, c, and d, respectively. The following graph is obtained when $\log[\text{rate}]$ vs. $\log[\text{conc.}]$ are plotted



Among the following, the correct sequence for the order of the reactions is:

- (A) $d > b > a > c$ (B) $d > a > b > c$ (C) $a > b > c > d$ (D) $c > a > b > d$

Q26 d & f Block Elements[Step-by-step solution](https://www.prepwisar.in/questions/4YSGCV5K60) · prepwisar.in/questions/4YSGCV5K60

The species that has a spin-only magnetic moment of 5.9 BM, is:

(T_d = tetrahedral)

- (A) $[\text{MnBr}_4]^{2-}$ (T_d) (B) $[\text{NiCl}_4]^{2-}$ (T_d)
(C) $\text{Ni}(\text{CO})_4$ (T_d) (D) $[\text{Ni}(\text{CN})_4]^{2-}$ (square planar)

Q27 d & f Block Elements[Step-by-step solution](https://www.prepwisar.in/questions/GFvdFgINyE) · prepwisar.in/questions/GFvdFgINyE

The set that contains atomic numbers of only transition elements, is:

- (A) 21, 32, 53, 64 (B) 9, 17, 34, 38 (C) 37, 42, 50, 64 (D) 21, 25, 42, 72

Q28 d & f Block Elements[Step-by-step solution](https://www.prepwisar.in/questions/vaabXOZsK3) · prepwisar.in/questions/vaabXOZsK3

The lanthanoid that does NOT show +4 oxidation state is:

- (A) Tb (B) Dy (C) Ce (D) Eu

Q29 Ionic Equilibrium[Step-by-step solution](https://www.prepwisar.in/questions/hzvL8aa-YH) · prepwisar.in/questions/hzvL8aa-YH

Arrange the following solutions in the decreasing order of pOH:

- (A) 0.01 M HCl
(B) 0.01 M NaOH
(C) 0.01 M CH_3COONa
(D) 0.01 M NaCl

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

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The correct statement with respect to dinitrogen is:

- (A) N_2 is paramagnetic in nature
- (B) it can be used as an inert diluent for reactive chemicals
- (C) it can combine with dioxygen at 25°C
- (D) liquid dinitrogen is not used in cryosurgery

Consider the Assertion and Reason given below.

Assertion (A) : Ethene polymerized in the presence of Ziegler Natta Catalyst at high temperature and pressure is used to make buckets and dustbins.

Reason (R) : High density polymers are closely packed and are chemically inert.

Choose the correct answer from the following:

- (A) Both (A) and (R) are correct and (R) is the correct explanation of (A).
- (B) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (C) (A) is correct but (R) is wrong.
- (D) (A) and (R) both are wrong.

Among the sulphates of alkaline earth metals, the solubilities of BeSO_4 and MgSO_4 in water, respectively, are:

- (A) poor and poor
- (B) poor and high
- (C) high and poor
- (D) high and high

A solution of two components containing n_1 moles of the 1st component and n_2 moles of the 2nd component is prepared. M_1 and M_2 are the molecular weights of component 1 and 2 respectively. If d is the density of the solution in g mL^{-1} , C_2 is the molarity and x_2 is the mole fraction of the 2nd component, then C_2 can be expressed as:

- (A) $C_2 = \frac{1000x_2}{M_1 + x_2(M_2 - M_1)}$
- (B) $C_2 = \frac{1000dx_2}{M_1 + x_2(M_2 - M_1)}$
- (C) $C_2 = \frac{dx_2}{M_1 + x_2(M_2 - M_1)}$
- (D) $C_2 = \frac{dx_1}{M_1 + x_2(M_2 - M_1)}$

Kraft temperature is the temperature:

- (A) below which the aqueous solution of detergents starts freezing.
- (B) above which the formation of micelles takes place.
- (C) below which the formation of micelles takes place.
- (D) above which the aqueous solution of detergents starts boiling.

Which of the following compounds shows geometrical isomerism?

- (A) 2-methylpent-1-ene
- (B) 4-methylpent-1-ene
- (C) 2-methylpent-2-ene
- (D) 4-methylpent-2-ene

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Q36 Chemical Equilibrium[Step-by-step solution](#) > [prepwiser.in/questions/mAjrfmI3dJ](https://www.prepwiser.in/questions/mAjrfmI3dJ)

The variation of equilibrium constant with temperature is given below:

Temperature	Equilibrium Constant
$T_1 = 25^\circ\text{C}$	$K_1 = 10$
$T_2 = 100^\circ\text{C}$	$K_2 = 100$

The values of ΔH° , ΔG° at T_1 and ΔG° at T_2 (in kJ mol^{-1}) respectively, are close to:
[Use $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$]

- (A) 28.4, -5.71 and -14.29 (B) 0.64, -7.14 and -5.71
(C) 28.4, -7.14 and -5.71 (D) 0.64, -5.71 and -14.29

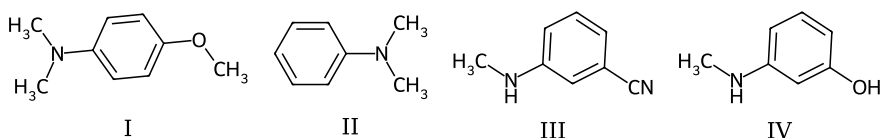
Q37 Chemical Equilibrium[Step-by-step solution](#) > [prepwiser.in/questions/fXlfus_YoW](https://www.prepwiser.in/questions/fXlfus_YoW)

For the reaction
 $\text{Fe}_2\text{N(s)} + \frac{3}{2}\text{H}_2\text{(g)} \rightleftharpoons 2\text{Fe(s)} + \text{NH}_3\text{(g)}$

- (A) $K_C = K_P(RT)^{1/2}$ (B) $K_C = K_P(RT)^{-1/2}$ (C) $K_C = K_P(RT)$ (D) $K_C = K_P(RT)^{3/2}$

Q38 Amines & Diazonium Salts[Step-by-step solution](#) > [prepwiser.in/questions/QVWbRoEocV](https://www.prepwiser.in/questions/QVWbRoEocV)

The increasing order of pK_b values of the following compounds is:



- (A) $\text{I} < \text{II} < \text{IV} < \text{III}$ (B) $\text{I} < \text{II} < \text{III} < \text{IV}$ (C) $\text{II} < \text{I} < \text{III} < \text{IV}$ (D) $\text{II} < \text{IV} < \text{III} < \text{I}$

Chemistry Section B · Numerical value

Q39 to Q42

Q39 Chemical Bonding & Molecular Structure **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/ZIEgljztMy](https://www.prepwiser.in/questions/ZIEgljztMy)

The number of $\text{Cl}=\text{O}$ bonds in perchloric acid is, "_____".

Q40 Electrochemistry **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/_jldcq8XNs](https://www.prepwiser.in/questions/_jldcq8XNs)

Potassium chlorate is prepared by the electrolysis of KCl in basic solution



If only 60% of the current is utilized in the reaction, the time (rounded to the nearest hour) required to produce 10 g of KClO_3 using a current of 2 A is_____.

(Given : $F = 96,500 \text{ C mol}^{-1}$; molar mass of $\text{KClO}_3 = 122 \text{ g mol}^{-1}$)

Q41 Solutions & Colligative Properties **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/f0t-jGaPSR](https://www.prepwiser.in/questions/f0t-jGaPSR)

The elevation of boiling point of 0.10 m aqueous $\text{CrCl}_3 \cdot x\text{NH}_3$ solution is two times that of 0.05 m aqueous CaCl_2 solution. The value of x is _____.

[Assume 100% ionisation of the complex and CaCl_2 , coordination number of Cr as 6, and that all NH_3 molecules are present inside the coordination sphere]

Q42 Purification & Characterisation of Organic Compounds **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/tYXFVOaKhZ](https://www.prepwiser.in/questions/tYXFVOaKhZ)

In an estimation of bromine by Carius method, 1.6 g of an organic compound gave 1.88 g of AgBr . The mass percentage of bromine in the compound is _____.

(Atomic mass, $\text{Ag} = 108$, $\text{Br} = 80 \text{ g mol}^{-1}$)

Q43 Three Dimensional Geometry

[Step-by-step solution](#) › [prepwisar.in/questions/vbhOdkRcp1](https://www.prepwisar.in/questions/vbhOdkRcp1)

The shortest distance between the lines

$$\frac{x-1}{0} = \frac{y+1}{-1} = \frac{z}{1}$$

and $x + y + z + 1 = 0$, $2x - y + z + 3 = 0$ is:

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

Q44 Applications of Derivatives

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

The position of a moving car at time t is

given by $f(t) = at^2 + bt + c$, $t > 0$, where a , b and c are real numbers greater than 1. Then the average speed of the car over the time interval $[t_1, t_2]$ is attained at the point:

- (A) $\frac{(t_1 + t_2)}{2}$ (B) $\frac{(t_2 - t_1)}{2}$ (C) $2a(t_1 + t_2) + b$ (D) $a(t_2 - t_1) + b$

Q45 Binomial Theorem

[Step-by-step solution](#) › [prepwisar.in/questions/cKivdP9BY5](https://www.prepwisar.in/questions/cKivdP9BY5)

If $\{p\}$ denotes the fractional part of the number p , then

$\left\{\frac{3^{200}}{8}\right\}$, is equal to:

- (A) $\frac{5}{8}$ (B) $\frac{7}{8}$ (C) $\frac{1}{8}$ (D) $\frac{3}{8}$

Q46 Complex Numbers

[Step-by-step solution](#) › [prepwisar.in/questions/czbjV24cB2](https://www.prepwisar.in/questions/czbjV24cB2)

The region represented by

$\{z = x + iy \in \mathbb{C} : |z| - \operatorname{Re}(z) \leq 1\}$ is also given by the inequality : $\{z = x + iy \in \mathbb{C} : |z| - \operatorname{Re}(z) \leq 1\}$

- (A) $y^2 \leq 2\left(x + \frac{1}{2}\right)$ (B) $y^2 \leq x + \frac{1}{2}$ (C) $y^2 \geq 2(x + 1)$ (D) $y^2 \geq x + 1$

Q47 Definite Integration

[Step-by-step solution](#) › [prepwisar.in/questions/hjUaVwI4DA](https://www.prepwisar.in/questions/hjUaVwI4DA)

If $I_1 = \int_0^1 (1 - x^{50})^{100} dx$ and

$I_2 = \int_0^1 (1 - x^{50})^{101} dx$ such

that $I_2 = \alpha I_1$ then α equals to:

- (A) $\frac{5051}{5050}$ (B) $\frac{5050}{5051}$ (C) $\frac{5050}{5049}$ (D) $\frac{5049}{5050}$

Q48 Limits

[Step-by-step solution](#) › [prepwisar.in/questions/x90yN0FfPv](https://www.prepwisar.in/questions/x90yN0FfPv)

$$\lim_{x \rightarrow 1} \left(\frac{\int_0^{(x-1)^2} t \cos(t^2) dt}{(x-1) \sin(x-1)} \right)$$

- (A) is equal to 0 (B) is equal to $\frac{1}{2}$ (C) does not exist (D) is equal to $-\frac{1}{2}$

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The general solution of the differential equation

$$\sqrt{1+x^2+y^2+x^2y^2} + xy \frac{dy}{dx} = 0 \text{ is:}$$

(where C is a constant of integration)

(A) $\sqrt{1+y^2} + \sqrt{1+x^2} = \frac{1}{2} \log_e \left(\frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1} \right) + C$

(B) $\sqrt{1+y^2} - \sqrt{1+x^2} = \frac{1}{2} \log_e \left(\frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1} \right) + C$

(C) $\sqrt{1+y^2} + \sqrt{1+x^2} = \frac{1}{2} \log_e \left(\frac{\sqrt{1+x^2}+1}{\sqrt{1+x^2}-1} \right) + C$

(D) $\sqrt{1+y^2} - \sqrt{1+x^2} = \frac{1}{2} \log_e \left(\frac{\sqrt{1+x^2}+1}{\sqrt{1+x^2}-1} \right) + C$

Which of the following points lies on the locus of the foot of perpendicular drawn upon any tangent to the ellipse,

$$\frac{x^2}{4} + \frac{y^2}{2} = 1$$

from any of its foci?

(A) $(-1, \sqrt{3})$

(B) $(-2, \sqrt{3})$

(C) $(-1, \sqrt{2})$

(D) $(1, 2)$

If $f(x+y) = f(x)f(y)$ and $\sum_{x=1}^{\infty} f(x) = 2$, $x, y \in \mathbb{N}$, where $\mathbb{N}$ is the set of all natural number, then the value of

$$\frac{f(4)}{f(2)}$$

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

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

(C) $\frac{1}{3}$

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

The values of λ and μ for which the system of linear equations

$$x + y + z = 2$$

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

$$x + 3y + \lambda z = \mu$$

has infinitely many solutions are, respectively:

(A) 6 and 8

(B) 5 and 8

(C) 5 and 7

(D) 4 and 9

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Q53 Determinants[Step-by-step solution > prepwise.in/questions/hZ34pmxj-w](https://www.prepwise.in/questions/hZ34pmxj-w)

Let m and M be respectively the minimum and maximum values of

$$\begin{vmatrix} \cos^2 x & 1 + \sin^2 x & \sin 2x \\ 1 + \cos^2 x & \sin^2 x & \sin 2x \\ \cos^2 x & \sin^2 x & 1 + \sin 2x \end{vmatrix}$$

Then the ordered pair (m, M) is equal to:

- (A) $(-3, -1)$ (B) $(-4, -1)$ (C) $(1, 3)$ (D) $(-3, 3)$

Q54 Parabola[Step-by-step solution > prepwise.in/questions/OQLrTWPRUH](https://www.prepwise.in/questions/OQLrTWPRUH)

Let L_1 be a tangent to the parabola $y^2 = 4(x + 1)$

and L_2 be a tangent to the parabola $y^2 = 8(x + 2)$

such that L_1 and L_2 intersect at right angles. Then L_1 and L_2 meet on the straight line:

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

Q55 Permutations & Combinations[Step-by-step solution > prepwise.in/questions/vZeeJ3f9K5](https://www.prepwise.in/questions/vZeeJ3f9K5)

Two families with three members each and one family with four members are to be seated in a row. In how many ways can they be seated so that the same family members are not separated?

- (A) $2! 3! 4!$ (B) $(3!)^3 \cdot (4!)$ (C) $3! (4!)^3$ (D) $(3!)^2 \cdot (4!)$

Q56 Probability: Basic[Step-by-step solution > prepwise.in/questions/qQb6s2owzv](https://www.prepwise.in/questions/qQb6s2owzv)

Out of 11 consecutive natural numbers if three numbers are selected at random (without repetition), then the probability that they are in A.P. with positive common difference, is:

- (A) $\frac{10}{99}$ (B) $\frac{5}{33}$ (C) $\frac{15}{101}$ (D) $\frac{5}{101}$

Q57 Quadratic Equations & Polynomial Inequalities[Step-by-step solution > prepwise.in/questions/odjN9KHeQr](https://www.prepwise.in/questions/odjN9KHeQr)

If α and β be two roots of the equation

$x^2 - 64x + 256 = 0$. Then the value of

$$\left(\frac{\alpha^3}{\beta^5}\right)^{1/8} + \left(\frac{\beta^3}{\alpha^5}\right)^{1/8}$$

is:

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

Q58 Quadratic Equations & Polynomial Inequalities[Step-by-step solution > prepwise.in/questions/LmByL5dAhA](https://www.prepwise.in/questions/LmByL5dAhA)

Let a, b, c, d and p be any non zero distinct real numbers such that

$(a^2 + b^2 + c^2)p^2 - 2(ab + bc + cd)p + (b^2 + c^2 + d^2) = 0$. Then:

- (A) a, c, p are in G.P. (B) a, b, c, d are in G.P. (C) a, b, c, d are in A.P. (D) a, c, p are in A.P.

Q59 Statistics[Step-by-step solution > prepwise.in/questions/tjFepmd6l4](https://www.prepwise.in/questions/tjFepmd6l4)

If $\sum_{i=1}^n (x_i - a) = n$ and $\sum_{i=1}^n (x_i - a)^2 = na$

($n, a > 1$) then the standard deviation of n observations $x_1, x_2, \dots, x_n$ is:

- (A) $a - 1$ (B) $n\sqrt{a - 1}$ (C) $\sqrt{n(a - 1)}$ (D) $\sqrt{a - 1}$

The area (in sq. units) of the region

$$A = \{(x, y) : |x| + |y| \leq 1, 2y^2 \geq |x|\}$$

(A) $\frac{1}{6}$

(B) $\frac{5}{6}$

(C) $\frac{1}{3}$

(D) $\frac{7}{6}$

A ray of light coming from the point $(2, 2\sqrt{3})$ is incident at an angle 30° on the line $x = 1$ at the point A. The ray gets reflected on the line $x = 1$ and meets x-axis at the point B. Then, the line AB passes through the point:

(A) $(3, -\sqrt{3})$

(B) $(4, -\sqrt{3})$

(C) $\left(4, -\frac{\sqrt{3}}{2}\right)$

(D) $\left(3, -\frac{1}{\sqrt{3}}\right)$

Mathematics Section B · Numerical value

Q62 to Q64

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined as

$$f(x) = \begin{cases} x^5 \sin\left(\frac{1}{x}\right) + 5x^2, & x < 0 \\ 0, & x = 0 \\ x^5 \cos\left(\frac{1}{x}\right) + \lambda x^2, & x > 0 \end{cases}$$

The value of λ for which $f''(0)$ exists, is _____.

Set A has m elements and set B has n elements. If the total number of subsets of A is 112 more than the total number of subsets of B, then the value of $m.n$ is _____.

If $\vec{a}$ and $\vec{b}$ are unit vectors, then the greatest value of

$$\sqrt{3} \left| \vec{a} + \vec{b} \right| + \left| \vec{a} - \vec{b} \right|$$

is _____.

Answer key: JEE Main 2020 · 6 Sep · Shift 1

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Physics

1.	B	2.	D	3.	A	4.	C	5.	D	6.	C	7.	A	8.	C
9.	A	10.	C	11.	D	12.	C	13.	A	14.	A	15.	B	16.	B
17.	D	18.	A	19.	C	20.	120	21.	33	22.	194	23.	5	24.	1050

Chemistry

25.	A	26.	A	27.	D	28.	D	29.	B	30.	B	31.	A	32.	D
33.	B	34.	B	35.	D	36.	A	37.	A	38.	A	39.	3	40.	11
41.	5	42.	50												

Mathematics

43.	D	44.	A	45.	C	46.	A	47.	B	48.	A	49.	C	50.	A
51.	D	52.	B	53.	A	54.	A	55.	B	56.	B	57.	C	58.	B
59.	D	60.	B	61.	A	62.	5	63.	28	64.	4				

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