

JEE MAIN 2020 · QUESTION PAPER

5 Sep 2020 **Shift 2**

68 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	18 Q1 to Q18	5 Q19 to Q23
● Chemistry	17 Q24 to Q40	5 Q41 to Q45
● Mathematics	19 Q46 to Q64	4 Q65 to Q68
In this PDF	68 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.

prepwisar.in/pyqs/paper/2020-09-05-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/mwaoGde5k9](https://www.prepwisar.in/questions/mwaoGde5k9)

A radioactive nucleus decays by two different processes. The half life for the first process is 10 s and that for the second is 100 s. The effective half life of the nucleus is close to:

- (A) 12 sec (B) 9 sec (C) 55 sec (D) 6 sec

Q2 Electrostatics II: Potential & Capacitance

[Step-by-step solution](#) > [prepwisar.in/questions/39aE_rUp24](https://www.prepwisar.in/questions/39aE_rUp24)

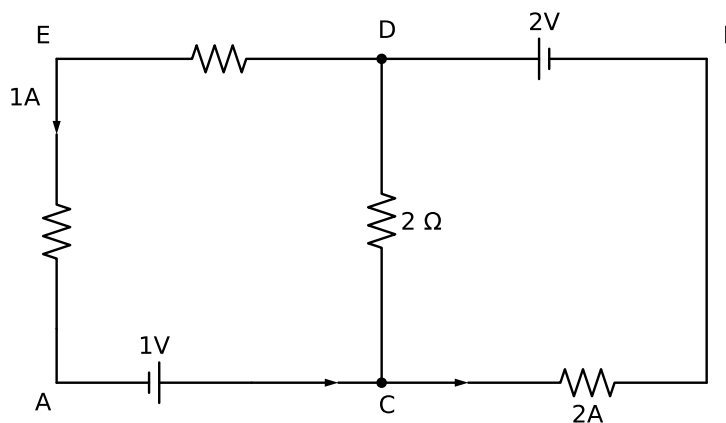
A parallel plate capacitor has plate of length 'l', width 'w' and separation of plates is 'd'. It is connected to a battery of emf V. A dielectric slab of the same thickness 'd' and of dielectric constant $k = 4$ is being inserted between the plates of the capacitor. At what length of the slab inside plates, will the energy stored in the capacitor be two times the initial energy stored?

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

Q3 Current Electricity

[Step-by-step solution](#) > [prepwisar.in/questions/fCgKcHz0-c](https://www.prepwisar.in/questions/fCgKcHz0-c)

In the circuit, given in the figure currents in different branches and value of one resistor are shown. Then potential at point B with respect to the point A is:



- (A) +2 V (B) -2 V (C) +1 V (D) -1 V

Q4 Moving Charges & Magnetism

[Step-by-step solution](#) > [prepwisar.in/questions/Huh30HrePu](https://www.prepwisar.in/questions/Huh30HrePu)

A galvanometer is used in laboratory for detecting the null point in electrical experiments. If, on passing a current of 6 mA it produces a deflection of 2° , its figure of merit is close to:

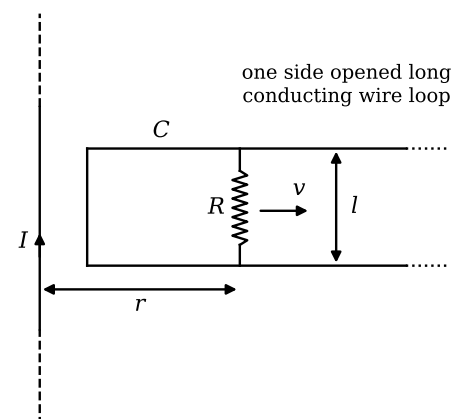
- (A) 6×10^{-3} A/div (B) 666° A/div (C) 3×10^{-3} A/div (D) 333° A/div

Q5 Electromagnetic Induction

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

An infinitely long, straight wire carrying current I, one side opened rectangular loop and a conductor C with a sliding connector are located in the same plane, as shown, in the figure. The connector has length l and resistance R. It slides to the right with a velocity v . The resistance of the conductor and the self inductance of the loop are negligible. The induced current in the loop, as a function of separation r , between the connector and the straight wire is:

- (A) $\frac{\mu_0}{4\pi} \frac{Ivl}{Rr}$ (B) $\frac{\mu_0}{\pi} \frac{Ivl}{Rr}$ (C) $\frac{\mu_0}{2\pi} \frac{Ivl}{Rr}$ (D) $\frac{2\mu_0}{\pi} \frac{Ivl}{Rr}$



Q6 Electromagnetic Waves[Step-by-step solution](https://www.prepwiser.in/questions/f6fY5w0z8Y) > prepwiser.in/questions/f6fY5w0z8Y

The correct match between the entries in column I and column II are:

- (A) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii) (B) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
 (C) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv) (D) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

I	II
Radiation	Wavelength
(a) Microwave	(i) 100 m
(b) Gamma rays	(ii) 10^{-15} m
(c) A.M. radio waves	(iii) 10^{-10} m
(d) X-rays	(iv) 10^{-3} m

Q7 Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution](https://www.prepwiser.in/questions/yrmQ2yk7va) > prepwiser.in/questions/yrmQ2yk7va

Ten charges are placed on the circumference of a circle of radius R with constant angular separation between successive charges. Alternate charges 1, 3, 5, 7, 9 have charge (+q) each, while 2, 4, 6, 8, 10 have charge (-q) each. The potential V and the electric field E at the centre of the circle are respectively.

(Take $V = 0$ at infinity)

- (A) $V = 0$; $E = 0$ (B) $V = \frac{10q}{4\pi\epsilon_0 R}$; $E = \frac{10q}{4\pi\epsilon_0 R^2}$
 (C) $V = \frac{10q}{4\pi\epsilon_0 R}$; $E = 0$ (D) $V = 0$; $E = \frac{10q}{4\pi\epsilon_0 R^2}$

Q8 Gravitation[Step-by-step solution](https://www.prepwiser.in/questions/oL20zXbBL0) > prepwiser.in/questions/oL20zXbBL0

The acceleration due to gravity on the earth's surface at the poles is g and angular velocity of the earth about the axis passing through the pole is ω . An object is weighed at the equator and at a height h above the poles by using a spring balance. If the weights are found to be same, then h is ($h \ll R$, where R is the radius of the earth)

- (A) $\frac{R^2\omega^2}{2g}$ (B) $\frac{R^2\omega^2}{g}$ (C) $\frac{R^2\omega^2}{8g}$ (D) $\frac{R^2\omega^2}{4g}$

Q9 Thermodynamics[Step-by-step solution](https://www.prepwiser.in/questions/SQZPGvRMIC) > prepwiser.in/questions/SQZPGvRMIC

In an adiabatic process, the density of a diatomic gas becomes 32 times its initial value. The final pressure of the gas is found to be n times the initial pressure. The value of n is:

- (A) 128 (B) 32 (C) 326 (D) $\frac{1}{32}$

Q10 Thermometry & Calorimetry[Step-by-step solution](https://www.prepwiser.in/questions/MdHxBY_Nc0) > prepwiser.in/questions/MdHxBY_Nc0

Two different wires having lengths L_1 and L_2 , and respective temperature coefficient of linear expansion α_1 and α_2 , are joined end-to-end. Then the effective temperature coefficient of linear expansion is:

- (A) $2\sqrt{\alpha_1\alpha_2}$ (B) $4 \frac{\alpha_1\alpha_2}{\alpha_1 + \alpha_2} \frac{L_2L_1}{(L_2 + L_1)^2}$
 (C) $\frac{\alpha_1 + \alpha_2}{2}$ (D) $\frac{\alpha_1L_1 + \alpha_2L_2}{L_1 + L_2}$

Q11 Centre of Mass & Linear Momentum[Step-by-step solution](https://www.prepwiser.in/questions/xbNI26Uzb6) > prepwiser.in/questions/xbNI26Uzb6

A spaceship in space sweeps stationary interplanetary dust. As a result, its mass increases at a rate $\frac{dM(t)}{dt} = bv^2(t)$, where v(t) is its instantaneous velocity. The instantaneous acceleration of the satellite is:

- (A) $-bv^3(t)$ (B) $-\frac{2bv^3}{M(t)}$ (C) $-\frac{bv^3}{M(t)}$ (D) $-\frac{bv^3}{2M(t)}$

Q12 Magnetism & Matter[Step-by-step solution > prepwisar.in/questions/kcj5_CKZU](https://www.prepwisar.in/questions/kcj5_CKZU)

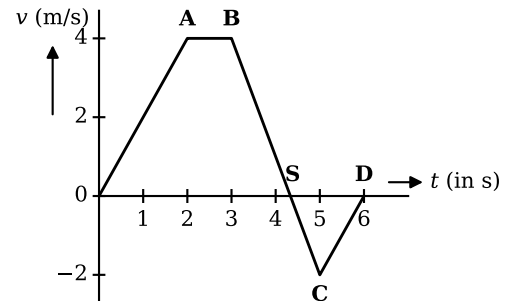
An iron rod of volume 10^{-3} m^3 and relative permeability 1000 is placed as core in a solenoid with 10 turns/cm. If a current of 0.5 A is passed through the solenoid, then the magnetic moment of the rod will be:

- (A) $5 \times 10^2 \text{ Am}^2$ (B) $0.5 \times 10^2 \text{ Am}^2$ (C) $500 \times 10^2 \text{ Am}^2$ (D) $50 \times 10^2 \text{ Am}^2$

Q13 Rectilinear Motion[Step-by-step solution > prepwisar.in/questions/FdbXhuE_-x](https://www.prepwisar.in/questions/FdbXhuE_-x)

The velocity (v) and time (t) graph of a body in a straight line motion is shown in the figure. The point S is at 4.333 seconds. The total distance covered by the body in 6 s is:

- (A) 12 m (B) 11 m (C) $\frac{49}{4} \text{ m}$ (D) $\frac{37}{3} \text{ m}$

**Q14** Fluid Mechanics[Step-by-step solution > prepwisar.in/questions/J4xvxL1q9c](https://www.prepwisar.in/questions/J4xvxL1q9c)

In an experiment to verify Stokes law, a small spherical ball of radius r and density ρ falls under gravity through a distance h in air before entering a tank of water. If the terminal velocity of the ball inside water is same as its velocity just before entering the water surface, then the value of h is proportional to:

(ignore viscosity of air)

- (A) r (B) r^4 (C) r^3 (D) r^2

Q15 Simple Harmonic Motion[Step-by-step solution > prepwisar.in/questions/_Fo34F4vyx](https://www.prepwisar.in/questions/_Fo34F4vyx)

A ring is hung on a nail. It can oscillate, without slipping or sliding

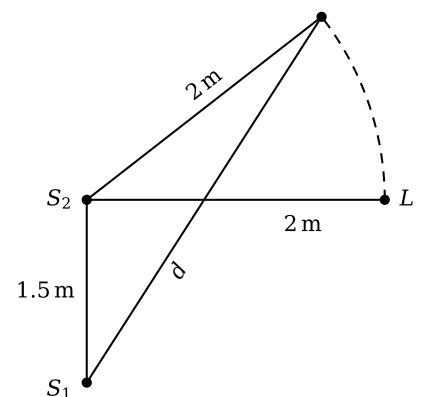
- (i) in its plane with a time period T_1 and,
(ii) back and forth in a direction perpendicular to its plane, with a period T_2 . The ratio $\frac{T_1}{T_2}$ will be:

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

Q16 Mechanical Waves[Step-by-step solution > prepwisar.in/questions/DctPU2iTnT](https://www.prepwisar.in/questions/DctPU2iTnT)

Two coherent sources of sound, S_1 and S_2 , produce sound waves of the same wavelength, $\lambda = 1 \text{ m}$, in phase. S_1 and S_2 are placed 1.5 m apart (see fig). A listener, located at L, directly in front of S_2 finds that the intensity is at a minimum when he is 2 m away from S_2 . The listener moves away from S_1 , keeping his distance from S_2 fixed. The adjacent maximum of intensity is observed when the listener is at a distance d from S_1 . Then, d is:

- (A) 12 m (B) 2 m (C) 3 m (D) 5 m



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Q17 Sound Waves[Step-by-step solution](#) > [prepwiser.in/questions/Tp5JGQ28EF](https://www.prepwiser.in/questions/Tp5JGQ28EF)

A driver in a car, approaching a vertical wall notices that the frequency of his car horn, has changed from 440 Hz to 480 Hz, when it gets reflected from the wall. If the speed of sound in air is 345 m/s, then the speed of the car is:

- (A) 36 km/hr (B) 54 km/hr (C) 24 km/hr (D) 18 km/hr

Q18 Units, Dimensions & Errors[Step-by-step solution](#) > [prepwiser.in/questions/QzClqrMK2g](https://www.prepwiser.in/questions/QzClqrMK2g)

The quantities $x = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$, $y = \frac{E}{B}$ and $z = \frac{l}{CR}$ are

defined where C-capacitance, R-Resistance, l-length, E-Electric field, B-magnetic field and ϵ_0 , μ_0 , - free space permittivity and permeability respectively. Then:

- (A) Only y and z have the same dimension (B) x, y and z have the same dimension
(C) Only x and y have the same dimension (D) Only x and z have the same dimension

Physics Section B · Numerical value

Q19 to Q23

Q19 Dual Nature of Radiation & Matter **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/Fy7UzPNdyl](https://www.prepwiser.in/questions/Fy7UzPNdyl)

The surface of a metal is illuminated alternately with photons of energies $E_1 = 4 \text{ eV}$ and $E_2 = 2.5 \text{ eV}$ respectively. The ratio of maximum speeds of the photoelectrons emitted in the two cases is 2. The work function of the metal in (eV) is ____.

Q20 Ray Optics **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/bcJlCK5XrD](https://www.prepwiser.in/questions/bcJlCK5XrD)

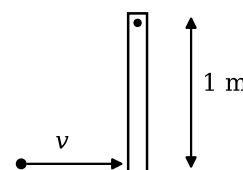
A prism of angle $A = 1^\circ$ has a refractive index $\mu = 1.5$. A good estimate for the minimum angle of deviation (in degrees) is close to $\frac{N}{10}$.
Value of N is ____.

Q21 Kinetic Theory of Gases **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/rdmDP4IOFY](https://www.prepwiser.in/questions/rdmDP4IOFY)

Nitrogen gas is at 300°C temperature. The temperature (in K) at which the rms speed of a H_2 molecule would be equal to the rms speed of a nitrogen molecule, is _____. (Round off to the nearest integer) (Molar mass of N_2 gas 28 g).

Q22 Rotational Motion **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/-yd-VIvJm6](https://www.prepwiser.in/questions/-yd-VIvJm6)

A thin rod of mass 0.9 kg and length 1 m is suspended, at rest, from one end so that it can freely oscillate in the vertical plane. A particle of mass 0.1 kg moving in a straight line with velocity 80 m/s hits the rod at its bottom most point and sticks to it (see figure). The angular speed (in rad/s) of the rod immediately after the collision will be _____.

**Q23** Work, Energy & Power **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/M5Hy9_Q3g0](https://www.prepwiser.in/questions/M5Hy9_Q3g0)

A body of mass 2 kg is driven by an engine delivering a constant power of 1 J/s. The body starts from rest and moves in a straight line. After 9 seconds, the body has moved a distance (in m) ____.

Chemistry Section A · Multiple choice

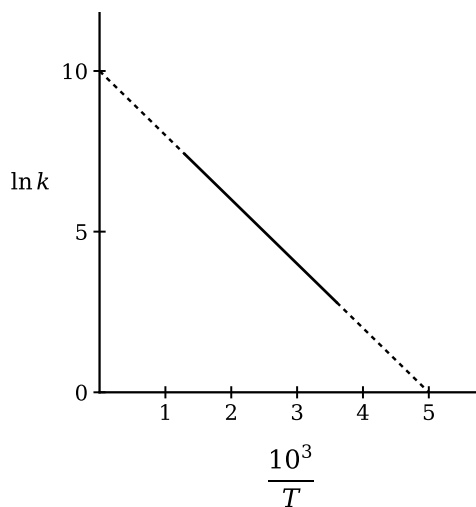
Q24 to Q40

Q24 Chemical Bonding & Molecular Structure[Step-by-step solution](#) > [prepwiser.in/questions/Gzy_mRQU5r](https://www.prepwiser.in/questions/Gzy_mRQU5r)

The compound that has the largest H-M-H bond angle (M = N, O, S, C) is:

- (A) CH_4 (B) H_2S (C) NH_3 (D) H_2O

The rate constant (k) of a reaction is measured at different temperatures (T), and the data are plotted in the given figure. The activation energy of the reaction in kJ mol^{-1} is:
(R is gas constant)

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

Consider the complex ions,
 $\text{trans}[\text{Co}(\text{en})_2\text{Cl}_2]^+$ (A) and
 $\text{cis}[\text{Co}(\text{en})_2\text{Cl}_2]^+$ (B).

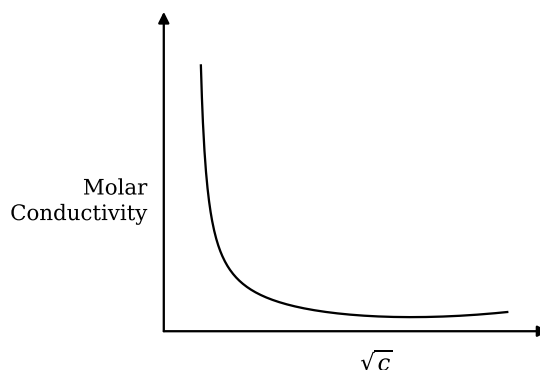
The correct statement regarding them is:

- (A) both (A) and (B) can be optically active.
(B) both (A) and (B) can not be optically active.
(C) (A) can not be optically active, but (B) can be optically active.
(D) (A) can be optically active, but (B) can not be optically active.

The variation of molar conductivity with concentration of an electrolyte (X) in aqueous solution is shown in the given figure.

The electrolyte X is:

- (A) HCl (B) CH_3COOH
(C) NaCl (D) KNO_3



The major product formed in the following reaction is:



- (A) $\text{Br}(\text{CH}_2)_3\text{CH}(\text{CH}_3)_2$ (B) $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{CH}(\text{CH}_3)_2$
(C) $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{CH}(\text{CH}_3)_2$ (D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}(\text{Br})(\text{CH}_3)_2$

The one that is NOT suitable for the removal of permanent hardness of water is:

- (A) Ion-exchange method (B) Calgon's method
(C) Treatment with sodium carbonate (D) Clark's method

Hydrogen peroxide, in the pure state, is:

- (A) Linear and blue in color (B) Linear and almost colorless
(C) Non-planar and almost colorless (D) Planar and blue in color

Reaction of ammonia with excess Cl_2 gives:

- (A) NH_4Cl and N_2 (B) NH_4Cl and HCl (C) NCl_3 and HCl (D) NCl_3 and NH_4Cl

Boron and silicon of very high purity can be obtained through:

- (A) Liquation (B) Electrolytic refining
(C) Zone refining (D) Vapour phase refining

The correct order of the ionic radii of O^{2-} , N^{3-} , F^- , Mg^{2+} , Na^+ and Al^{3+} is:

- (A) $\text{N}^{3-} < \text{O}^{2-} < \text{F}^- < \text{Na}^+ < \text{Mg}^{2+} < \text{Al}^{3+}$ (B) $\text{N}^{3-} < \text{F}^- < \text{O}^{2-} < \text{Mg}^{2+} < \text{Na}^+ < \text{Al}^{3+}$
(C) $\text{Al}^{3+} < \text{Na}^+ < \text{Mg}^{2+} < \text{O}^{2-} < \text{F}^- < \text{N}^{3-}$ (D) $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{F}^- < \text{O}^{2-} < \text{N}^{3-}$

Which one of the following polymers is not obtained by condensation polymerisation?

- (A) Bakelite (B) Nylon 6 (C) Buna-N (D) Nylon 6, 6

An element crystallises in a face-centred cubic (fcc) unit cell with cell edge a . The distance between the centres of two nearest octahedral voids in the crystal lattice is:

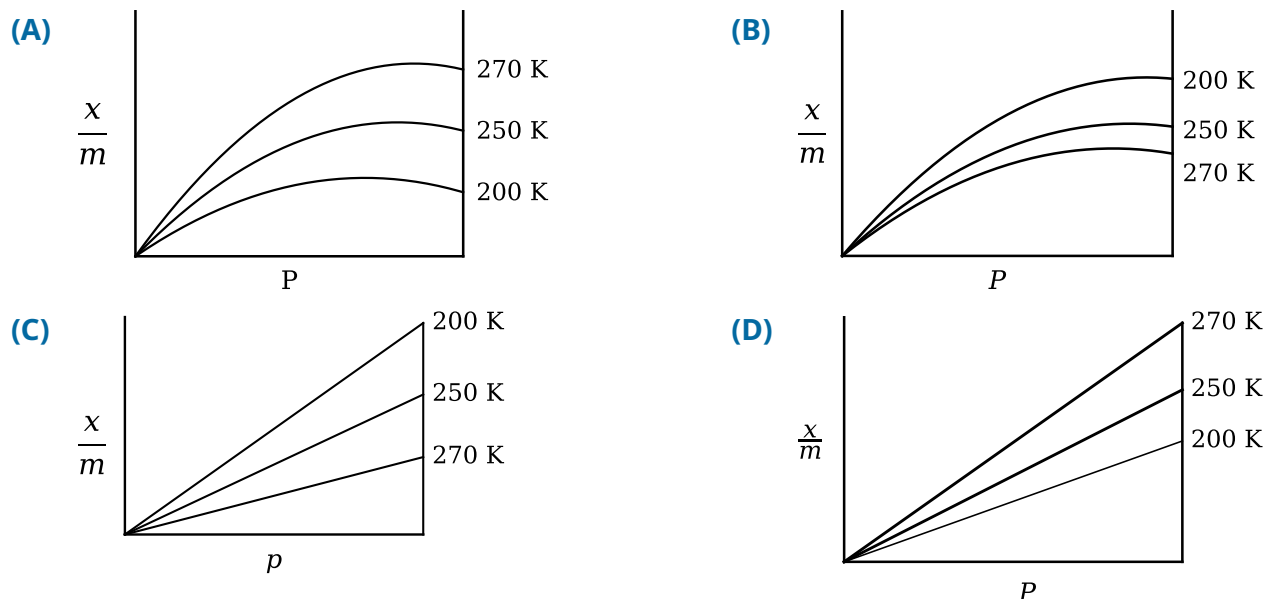
- (A) a (B) $\frac{a}{2}$ (C) $\frac{a}{\sqrt{2}}$ (D) $\sqrt{2}a$

The correct statement about probability density (except at infinite distance from nucleus) is:

- (A) It can be zero for 1s orbital (B) It can be zero for 3p orbital
(C) It can never be zero for 2s orbital (D) It can be negative for 2p orbital

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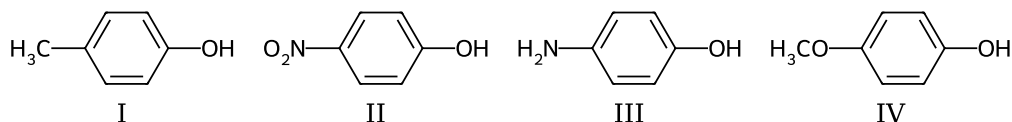
Adsorption of a gas follows Freundlich adsorption isotherm. If x is the mass of the gas adsorbed on mass m of the adsorbent, the correct plot of $\frac{x}{m}$ versus p is:



Lattice enthalpy and enthalpy of solution of NaCl are 788 kJ mol^{-1} , and 4 kJ mol^{-1} , respectively. The hydration enthalpy of NaCl is:

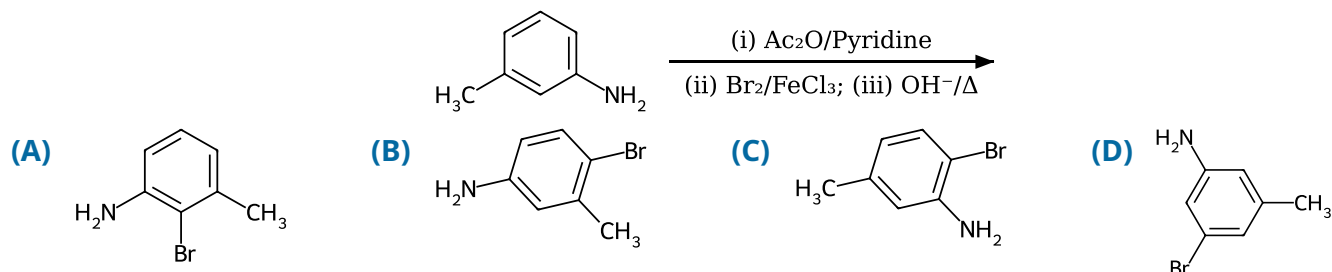
- (A) -780 kJ mol^{-1} (B) -784 kJ mol^{-1} (C) 780 kJ mol^{-1} (D) 784 kJ mol^{-1}

The increasing order of boiling points of the following compounds is:



- (A) $I < III < IV < II$ (B) $IV < I < II < III$ (C) $I < IV < III < II$ (D) $III < I < II < IV$

The final major product of the following reaction is:



Q41 Carbohydrates & Biomolecules **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/w9AUkg0Ltc](https://www.prepwiser.in/questions/w9AUkg0Ltc)

The number of chiral carbons present in sucrose is ____.

Q42 Coordination Compounds **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/K-1TDeuqd8](https://www.prepwiser.in/questions/K-1TDeuqd8)

Considering that $\Delta_0 > P$, the magnetic moment (in BM) of $[\text{Ru}(\text{H}_2\text{O})_6]^{2+}$ would be ____.

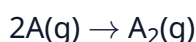
Q43 Redox Reactions **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/ibiWpH5w1O](https://www.prepwiser.in/questions/ibiWpH5w1O)

The volume, in mL, of 0.02 M $\text{K}_2\text{Cr}_2\text{O}_7$ solution required to react with 0.288 g of ferrous oxalate in acidic medium is ____.

(Molar mass of Fe = 56 g mol⁻¹)

Q44 Chemical Thermodynamics **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/AXyExqUQM5](https://www.prepwiser.in/questions/AXyExqUQM5)

For a dimerization reaction,



at 298 K, $\Delta U^\circ = -20 \text{ kJ mol}^{-1}$, $\Delta S^\circ = -30 \text{ JK}^{-1} \text{ mol}^{-1}$,

then the ΔG° will be ____ J. (Round off to the nearest integer)

Q45 Chemical Equilibrium **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/VQ9zzrryft](https://www.prepwiser.in/questions/VQ9zzrryft)

For a reaction $\text{X} + \text{Y} \rightleftharpoons 2\text{Z}$, 1.0 mol of X, 1.5 mol of Y and 0.5 mol of Z were taken in a 1 L vessel and allowed to react. At equilibrium, the concentration of Z was 1.0 mol L⁻¹. The equilibrium constant of reaction is $\frac{x}{15}$. The value of x is ____.

Mathematics Section A · Multiple choice

Q46 to Q64

Q46 Three Dimensional Geometry[Step-by-step solution](#) › [prepwiser.in/questions/Rgm2bfmfKd](https://www.prepwiser.in/questions/Rgm2bfmfKd)

If for some $\alpha \in \mathbb{R}$, the lines

$$L_1: \frac{x+1}{2} = \frac{y-2}{-1} = \frac{z-1}{1} \text{ and}$$

$$L_2: \frac{x+2}{\alpha} = \frac{y+1}{5-\alpha} = \frac{z+1}{1} \text{ are coplanar,}$$

then the line L_2 passes through the point:

(A) (10, 2, 2)**(B)** (2, -10, -2)**(C)** (10, -2, -2)**(D)** (-2, 10, 2)**Q47** Applications of Derivatives[Step-by-step solution](#) › [prepwiser.in/questions/PcgowFACgA](https://www.prepwiser.in/questions/PcgowFACgA)

Which of the following points lies on the tangent to the curve

$$x^4 e^y + 2\sqrt{y+1} = 3 \text{ at the point } (1, 0)?$$

(A) (2, 2)**(B)** (-2, 4)**(C)** (2, 6)**(D)** (-2, 6)

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Q48 Applications of Derivatives[Step-by-step solution](#) › prepwiser.in/questions/xApSr7Vn3a

If $x = 1$ is a critical point of the function

$f(x) = (3x^2 + ax - 2 - a)e^x$, then:

(A) $x = 1$ is a local maxima and $x = -\frac{2}{3}$ is a local minima of f .

(B) $x = 1$ and $x = -\frac{2}{3}$ are local maxima of f .

(C) $x = 1$ and $x = -\frac{2}{3}$ are local minima of f .

(D) $x = 1$ is a local minima and $x = -\frac{2}{3}$ is a local maxima of f .

Q49 Circles[Step-by-step solution](#) › prepwiser.in/questions/B-APPW_gdX

If the length of the chord of the circle,

$x^2 + y^2 = r^2$ ($r > 0$) along the line, $y - 2x = 3$ is r ,

then r^2 is equal to:

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

(B) $\frac{24}{5}$

(C) $\frac{12}{5}$

(D) 12

Q50 Complex Numbers[Step-by-step solution](#) › prepwiser.in/questions/6GZ2uzByKx

The value of $\left(\frac{-1+i\sqrt{3}}{1-i}\right)^{30}$ is:

(A) $-2^{15}i$

(B) -2^{15}

(C) $2^{15}i$

(D) 6^5

Q51 Differential Equations[Step-by-step solution](#) › prepwiser.in/questions/5A_8MS5N8d

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

$\cos x \frac{dy}{dx} + 2y \sin x = \sin 2x$, $x \in (0, \frac{\pi}{2})$.

If $y(\frac{\pi}{3}) = 0$, then $y(\frac{\pi}{4})$ is equal to:

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

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

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

(D) $2 + \sqrt{2}$

Q52 Differentiation[Step-by-step solution](#) › prepwiser.in/questions/08tkIcIfgQ

The derivative of

$\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with

respect to $\tan^{-1}\left(\frac{2x\sqrt{1-x^2}}{1-2x^2}\right)$ at $x = \frac{1}{2}$ is:

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

(B) $\frac{2\sqrt{3}}{5}$

(C) $\frac{\sqrt{3}}{10}$

(D) $\frac{\sqrt{3}}{12}$

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

If the line $y = mx + c$ is a common tangent to the hyperbola

$\frac{x^2}{100} - \frac{y^2}{64} = 1$ and the circle $x^2 + y^2 = 36$, then which one of the following is true?

(A) $5m = 4$

(B) $8m + 5 = 0$

(C) $c^2 = 369$

(D) $4c^2 = 369$

Q54 Limits[Step-by-step solution](#) › prepwiser.in/questions/zXF7XvKNJn

$$\lim_{x \rightarrow 0} \frac{x \left(e^{(\sqrt{1+x^2+x^4}-1)/x} - 1 \right)}{\sqrt{1+x^2+x^4} - 1}$$

(A) is equal to 0.

(B) is equal to $\sqrt{e}$.

(C) is equal to 1.

(D) does not exist.

Q55 Determinants[Step-by-step solution](https://www.prepwiser.in/questions/PD81C3zGqL) > prepwiser.in/questions/PD81C3zGqL

If the system of linear equations

$$x + y + 3z = 0$$

$$x + 3y + k^2z = 0$$

$$3x + y + 3z = 0$$

has a non-zero solution (x, y, z) for some $k \in \mathbb{R}$, then $x + \left(\frac{y}{z}\right)$ is equal to:

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

Q56 Determinants[Step-by-step solution](https://www.prepwiser.in/questions/Up-GLNebrF) > prepwiser.in/questions/Up-GLNebrF

If $a + x = b + y = c + z + 1$, where a, b, c, x, y, z are non-zero distinct real numbers, then

$$\begin{vmatrix} x & a + y & x + a \\ y & b + y & y + b \\ z & c + y & z + c \end{vmatrix}$$

is equal to:

- (A) $y(b - a)$ (B) $y(a - b)$ (C) $y(a - c)$ (D) 0

Q57 Permutations & Combinations[Step-by-step solution](https://www.prepwiser.in/questions/czVh8EOvut) > prepwiser.in/questions/czVh8EOvut

There are 3 sections in a question paper and each section contains 5 questions. A candidate has to answer a total of 5 questions, choosing at least one question from each section. Then the number of ways, in which the candidate can choose the questions, is:

- (A) 2250 (B) 2255 (C) 3000 (D) 1500

Q58 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](https://www.prepwiser.in/questions/PL3bu8WYPN) > prepwiser.in/questions/PL3bu8WYPN

If α and β are the roots of the equation,

$$7x^2 - 3x - 2 = 0, \text{ then the value of}$$

$$\frac{\alpha}{1-\alpha^2} + \frac{\beta}{1-\beta^2} \text{ is equal to:}$$

- (A) $\frac{1}{24}$ (B) $\frac{27}{32}$ (C) $\frac{27}{16}$ (D) $\frac{3}{8}$

Q59 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/XJgJO9vAxN) > prepwiser.in/questions/XJgJO9vAxN

If the sum of the first 20 terms of the series

$$\log_{(7^{1/2})} x + \log_{(7^{1/3})} x + \log_{(7^{1/4})} x + \dots$$

is 460,

then x is equal to:

- (A) e^2 (B) $7^{1/2}$ (C) 7^2 (D) $7^{46/21}$

Q60 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/3M7r888Vl6) > prepwiser.in/questions/3M7r888Vl6

If the sum of the second, third and fourth terms of a positive term G.P. is 3 and the sum of its sixth, seventh and eighth terms is 243, then the sum of the first 50 terms of this G.P. is:

- (A) $\frac{2}{13} (3^{50} - 1)$ (B) $\frac{1}{13} (3^{50} - 1)$ (C) $\frac{1}{26} (3^{49} - 1)$ (D) $\frac{1}{26} (3^{50} - 1)$

Attempt this paper online with instant answer checking > [prepwiser.in/pyqs/paper/2020-09-05-evening](https://www.prepwiser.in/pyqs/paper/2020-09-05-evening)

If the mean and the standard deviation of the data 3, 5, 7, a, b are 5 and 2 respectively, then a and b are the roots of the equation:

- (A) $x^2 - 20x + 18 = 0$ (B) $2x^2 - 20x + 19 = 0$ (C) $x^2 - 10x + 18 = 0$ (D) $x^2 - 10x + 19 = 0$

The area (in sq. units) of the region

$A = \{(x, y) : (x - 1)[x] \leq y \leq 2\sqrt{x}, 0 \leq x \leq 2\}$, where $[t]$ denotes the greatest integer function, is:

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

If

$$\int \frac{\cos \theta}{5+7 \sin \theta-2 \cos ^2 \theta} d \theta = A \log _e |B(\theta)| + C,$$

where C is a constant of integration, then $\frac{B(\theta)}{A}$ can be:

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

If $L = \sin^2\left(\frac{\pi}{16}\right) - \sin^2\left(\frac{\pi}{8}\right)$ and

$M = \cos^2\left(\frac{\pi}{16}\right) - \sin^2\left(\frac{\pi}{8}\right)$, then:

- (A) $L = -\frac{1}{2\sqrt{2}} + \frac{1}{2} \cos \frac{\pi}{8}$ (B) $M = \frac{1}{2\sqrt{2}} + \frac{1}{2} \cos \frac{\pi}{8}$ (C) $M = \frac{1}{4\sqrt{2}} + \frac{1}{4} \cos \frac{\pi}{8}$ (D) $L = \frac{1}{4\sqrt{2}} - \frac{1}{4} \cos \frac{\pi}{8}$

Mathematics Section B · Numerical value

Q65 to Q68

The coefficient of x^4 in the expansion of $(1 + x + x^2 + x^3)^6$ in powers of x, is ____.

Let $A = \{a, b, c\}$ and $B = \{1, 2, 3, 4\}$. Then the number of elements in the set $C = \{f : A \rightarrow B \mid 2 \in f(A) \text{ and } f \text{ is not one-one}\}$ is ____.

In a bombing attack, there is 50% chance that a bomb will hit the target. Atleast two independent hits are required to destroy the target completely. Then the minimum number of bombs, that must be dropped to ensure that there is at least 99% chance of completely destroying the target, is ____.

Let the vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ be such that $|\vec{a}| = 2$, $|\vec{b}| = 4$ and $|\vec{c}| = 4$. If the projection of $\vec{b}$ on $\vec{a}$ is equal to the projection of $\vec{c}$ on $\vec{a}$ and $\vec{b}$ is perpendicular to $\vec{c}$, then the value of $|\vec{a} + \vec{b} - \vec{c}|$ is _____.

Answer key: JEE Main 2020 · 5 Sep · Shift 2

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Physics

1. B	2. D	3. C	4. C	5. C	6. B	7. A	8. A
9. A	10. D	11. C	12. A	13. D	14. B	15. B	16. C
17. B	18. B	19. 2	20. 5	21. 41	22. 20	23. 18	

Chemistry

24. A	25. B	26. C	27. B	28. D	29. D	30. C	31. C
32. C	33. D	34. C	35. C	36. B	37. B	38. B	39. C
40. B	41. 9	42. 0	43. 50	44. -13538	45. 16		

Mathematics

46. B	47. D	48. D	49. C	50. A	51. B	52. C	53. D
54. C	55. D	56. B	57. A	58. C	59. C	60. D	61. D
62. C	63. C	64. B	65. 120	66. 19	67. 11	68. 6	

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