

JEE MAIN 2020 · QUESTION PAPER

8 Jan 2020 Shift 1

66 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	16 Q24 to Q39	3 Q40 to Q42
● Mathematics	19 Q43 to Q61	5 Q62 to Q66
In this PDF	66 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.

prepwis.in/pyqs/paper/2020-01-08-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? prepwis.in/feedback · Terms: prepwis.in/terms

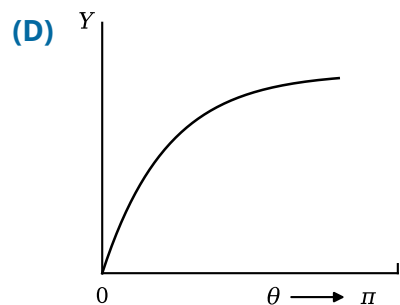
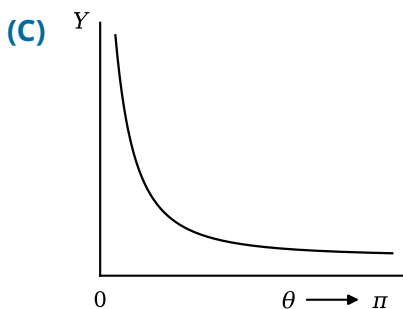
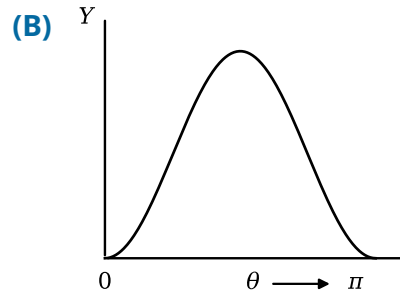
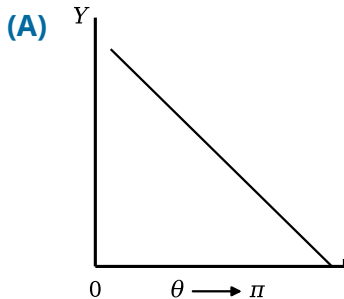
Q1 Atomic Physics

[Step-by-step solution](#) · [prepwisar.in/questions/x0C3hjTeFf](https://www.prepwisar.in/questions/x0C3hjTeFf)

The graph which depicts the results of Rutherford gold foil experiment with α -particales is:

θ : Scattering angle

Y : Number of scattered α -particles detected (Plots are schematic and not to scale)



Q2 Electrostatics II: Potential & Capacitance

[Step-by-step solution](#) · [prepwisar.in/questions/3qN3AYSPPg](https://www.prepwisar.in/questions/3qN3AYSPPg)

Effective capacitance of parallel combination of two capacitors C_1 and C_2 is $10 \mu\text{F}$. When these capacitors are individually connected to a voltage source of 1V , the energy stored in the capacitor C_2 is 4 times that of C_1 . If these capacitors are connected in series, their effective capacitance will be:

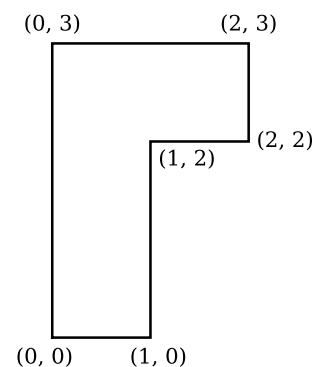
- (A) $4.2 \mu\text{F}$ (B) $8.4 \mu\text{F}$ (C) $1.6 \mu\text{F}$ (D) $3.2 \mu\text{F}$

Q3 Centre of Mass & Linear Momentum

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

The coordinates of centre of mass of a uniform flag shaped lamina (thin flat plate) of mass 4kg . (The coordinates of the same are shown in figure) are:

- (A) $(0.75\text{m}, 1.75\text{m})$ (B) $(1\text{m}, 1.75\text{m})$
(C) $(0.75\text{m}, 0.75\text{m})$ (D) $(1.25\text{m}, 1.50\text{m})$



Q4 Circular Motion

[Step-by-step solution](#) · [prepwisar.in/questions/0BnQTUDQ4r](https://www.prepwisar.in/questions/0BnQTUDQ4r)

A particle of mass m is fixed to one end of a light spring having force constant k and unstretched length ℓ . The other end is fixed. The system is given an angular speed ω about the fixed end of the spring such that it rotates in a circle in gravity free space. Then the stretch in the spring is:

- (A) $\frac{m\ell\omega^2}{k - m\omega^2}$ (B) $\frac{m\ell\omega^2}{k - m\omega}$ (C) $\frac{m\ell\omega^2}{k + m\omega^2}$ (D) $\frac{m\ell\omega^2}{k + m\omega}$

Q5 Current Electricity[Step-by-step solution](https://www.prepwisar.in/questions/kYI3SS25Cf)

The length of a potentiometer wire is 1200 cm and it carries a current of 60 mA. For a cell of emf 5V and internal resistance of 20Ω , the null point on it is found to be a 1000 cm. The resistance of whole wire is:

- (A) 80Ω (B) 60Ω (C) 120Ω (D) 100Ω

Q6 Dual Nature of Radiation & Matter[Step-by-step solution](https://www.prepwisar.in/questions/rDesjTwnhG)

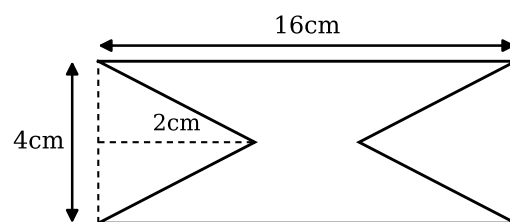
When photon of energy 4.0 eV strikes the surface of a metal A, the ejected photoelectrons have maximum kinetic energy T_A eV and de-Broglie wavelength λ_A . The maximum kinetic energy of photoelectrons liberated from another metal B by photon of energy 4.50 eV is $T_B = (T_A - 1.5)$ eV. If the de-Broglie wavelength of these photoelectrons $\lambda_B = 2\lambda_A$, then the work function of metal B is:

- (A) 1.5eV (B) 4eV (C) 2eV (D) 3eV

Q7 Electromagnetic Induction[Step-by-step solution](https://www.prepwisar.in/questions/00O_PR8G0y)

At time $t = 0$ magnetic field of 1000 Gauss is passing perpendicularly through the area defined by the closed loop shown in the figure. If the magnetic field reduces linearly to 500 Gauss, in the next 5s, then induced EMF in the loop is:

- (A) $48\mu\text{V}$ (B) $28\mu\text{V}$ (C) $56\mu\text{V}$ (D) $36\mu\text{V}$

**Q8** Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution](https://www.prepwisar.in/questions/d-pcOj8iI4)

In finding the electric field using Gauss Law the formula

$$|\vec{E}| = \frac{q_{enc}}{\epsilon_0 |A|}$$

is applicable. In the formula ϵ_0 is permittivity of free space, A is the area of Gaussian surface and q_{enc} is charge enclosed by the Gaussian surface. The equation can be used in which of the following situation?

- (A) Only when $|\vec{E}| = \text{constant}$ on the surface.
(B) For any choice of Gaussian surface.
(C) Only when the Gaussian surface is an equipotential surface.
(D) Only when the Gaussian surface is an equipotential surface and $|\vec{E}|$ is constant on the surface.

Q9 Ray Optics[Step-by-step solution](https://www.prepwisar.in/questions/dpJKNRrGtg)

The magnifying power of a telescope with tube 60 cm is 5. What is the focal length of its eye piece?

- (A) 40 cm (B) 10 cm (C) 30 cm (D) 20 cm

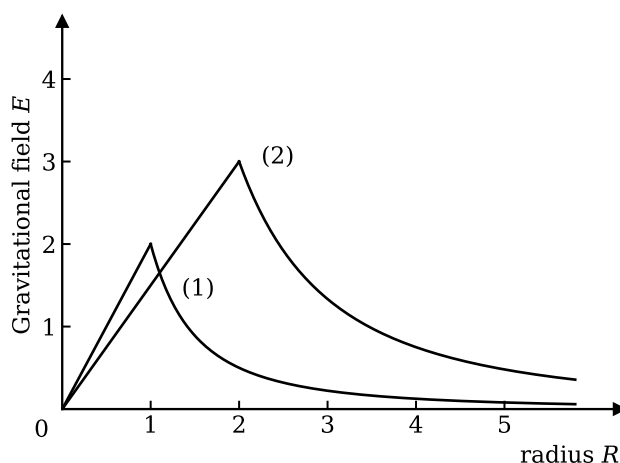
Q10 Ray Optics[Step-by-step solution](https://www.prepwisar.in/questions/pPx0LDwOXb)

The critical angle of a medium for a specific wavelength, if the medium has relative permittivity 3 and relative permeability $\frac{4}{3}$ for this wavelength, will be:

- (A) 45° (B) 15° (C) 30° (D) 60°

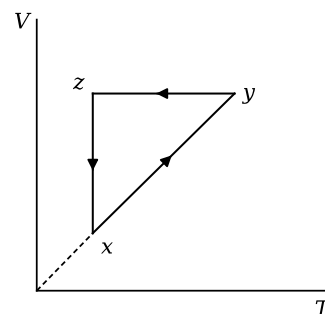
Attempt this paper online with instant answer checking > [prepwisar.in/pyqs/paper/2020-01-08-morning](https://www.prepwisar.in/pyqs/paper/2020-01-08-morning)

Consider two solid spheres of radii $R_1 = 1\text{m}$, $R_2 = 2\text{m}$ and masses M_1 and M_2 , respectively. The gravitational field due to sphere (1) and (2) are shown. The value of $\frac{M_1}{M_2}$ is:



- (A) $\frac{2}{3}$ (B) $\frac{1}{6}$ (C) $\frac{1}{2}$ (D) $\frac{1}{3}$

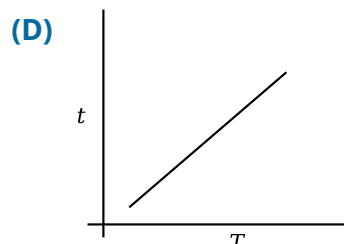
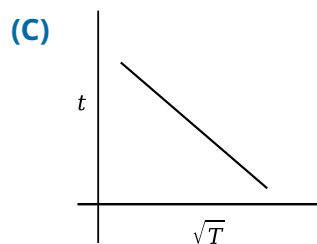
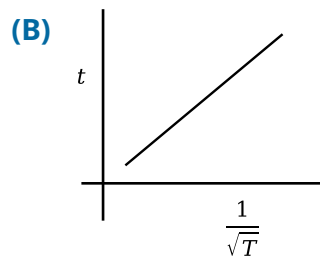
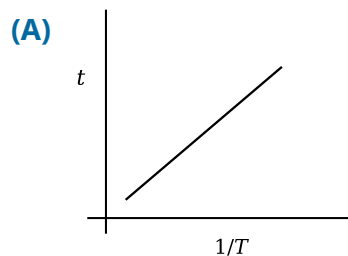
A thermodynamic cycle $xyzx$ is shown on a V - T diagram. The P - V diagram that best describes this cycle is:
(Diagrams are schematic and not to scale)



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

Q13 Kinetic Theory of Gases[Step-by-step solution](https://www.prepwiser.in/questions/hs0JDoWNs6) > prepwiser.in/questions/hs0JDoWNs6

The plot that depicts the behavior of the mean free time t (time between two successive collisions) for the molecules of an ideal gas, as a function of temperature (T), qualitatively, is:
(Graphs are schematic and not drawn to scale)

**Q14** Moving Charges & Magnetism[Step-by-step solution](https://www.prepwiser.in/questions/yURynmrS1N) > prepwiser.in/questions/yURynmrS1N

Proton with kinetic energy of 1 MeV moves from south to north. It gets an acceleration of 10^{12} m/s^2 by an applied magnetic field (west to east). The value of magnetic field : (Rest mass of proton is $1.6 \times 10^{-27} \text{ kg}$):

(A) 0.71 mT

(B) 7.1 mT

(C) 0.071 mT

(D) 71 mT

Q15 Thermometry & Calorimetry[Step-by-step solution](https://www.prepwiser.in/questions/A-fEnM_suj) > prepwiser.in/questions/A-fEnM_suj

A leak proof cylinder of length 1 m, made of a metal which has very low coefficient of expansion is floating vertically in water at 0°C such that its height above the water surface is 20 cm. When the temperature of water is increased to 4°C , the height of the cylinder above the water surface becomes 21 cm. The density of water at $T = 4^\circ\text{C}$, relative to the density at $T = 0^\circ\text{C}$ is close to:

(A) 1.04

(B) 1.26

(C) 1.01

(D) 1.03

Q16 Fluid Mechanics[Step-by-step solution](https://www.prepwiser.in/questions/LCgTb8f-Mv) > prepwiser.in/questions/LCgTb8f-Mv

Consider a solid sphere of radius R and mass density

$$\rho(r) = \rho_0 \left(1 - \frac{r^2}{R^2}\right), 0 < r \leq R$$

The minimum density of a liquid in which it will float is:

(A) $\frac{2\rho_0}{3}$ (B) $\frac{2\rho_0}{5}$ (C) $\frac{\rho_0}{5}$ (D) $\frac{\rho_0}{3}$ **Q17** Rotational Motion[Step-by-step solution](https://www.prepwiser.in/questions/053ONMWDu7) > prepwiser.in/questions/053ONMWDu7

Consider a uniform rod of mass $M = 4m$ and length ℓ pivoted about its centre. A mass m moving with velocity v making angle $\theta = \frac{\pi}{4}$ to the rod's long axis collides with one end of the rod and sticks to it.

The angular speed of the rod-mass system just after the collision is:

(A) $\frac{3\sqrt{2}}{7} \frac{v}{\ell}$ (B) $\frac{3}{7} \frac{v}{\ell}$ (C) $\frac{3}{7\sqrt{2}} \frac{v}{\ell}$ (D) $\frac{4}{7} \frac{v}{\ell}$

Attempt this paper online with instant answer checking > [prepwiser.in/pyqs/paper/2020-01-08-morning](https://www.prepwiser.in/pyqs/paper/2020-01-08-morning)

The dimension of stopping potential V_0 in photoelectric effect in units of Planck's constant 'h', speed of light 'c' and Gravitational constant 'G' and ampere A is:

- (A) $h^{1/3} G^{2/3} c^{1/3} A^{-1}$ (B) $h^0 c^5 G^{-1} A^{-1}$ (C) $h^{2/3} c^{5/3} G^{1/3} A^{-1}$ (D) $h^2 G^{3/2} c^{1/3} A^{-1}$

Physics Section B · Numerical value

Q19 to Q23

Q19 Collision NUMERICAL

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

A body A, of mass $m = 0.1 \text{ kg}$ has an initial velocity of $3\hat{i} \text{ ms}^{-1}$. It collides elastically with another body, B of the same mass which has an initial velocity of $5\hat{j} \text{ ms}^{-1}$. After collision, A moves with a velocity $\vec{v} = 4(\hat{i} + \hat{j})$. The energy of B after collision is written as $\frac{x}{10}$. The value of x is _____.

Q20 Current Electricity NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/70wVHjFesN](#)

Four resistances of 15Ω , 12Ω , 4Ω and 10Ω respectively in cyclic order to form Wheatstone's network. The resistance that is to be connected in parallel with the resistance of 10Ω to balance the network is _____ Ω .

Q21 Ray Optics NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/4SYNuuP8UR](#)

A point object in air is in front of the curved surface of a plano-convex lens. The radius of curvature of the curved surface is 30 cm and the refractive index of the lens material is 1.5 , then the focal length of the lens (in cm) is _____.

Q22 Projectile Motion & Relative Motion NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/S62nP5M8XI](#)

A particle is moving along the x-axis with its coordinate with the time 't' given by $x(t) = 10 + 8t - 3t^2$. Another particle is moving the y-axis with its coordinate as a function of time given by $y(t) = 5 - 8t^3$.

At $t = 1 \text{ s}$, the speed of the second particle as measured in the frame of the first particle is given as $\sqrt{v}$. Then v (in m/s) is _____.

Q23 Mechanical Waves NUMERICAL

[Step-by-step solution](#) > [prepwiser.in/questions/7_aqTd2KtN](#)

A one metre long (both ends open) organ pipe is kept in a gas that has double the density of air at STP. Assuming the speed of sound in air at STP is 300 m/s , the frequency difference between the fundamental and second harmonic of this pipe is _____ Hz. (Round off to the nearest integer)

Chemistry Section A · Multiple choice

Q24 to Q39

Q24 Alcohols, Phenols & Ethers

[Step-by-step solution](#) > [prepwiser.in/questions/h7DVNwfmFW](#)

Arrange the following compounds in increasing order of C–OH bond length:
methanol, phenol, p-ethoxyphenol

- (A) phenol < methanol < p-ethoxyphenol (B) methanol < p-ethoxyphenol < phenol
(C) methanol < phenol < p-ethoxyphenol (D) phenol < p-ethoxyphenol < methanol

Attempt this paper online with instant answer checking > [prepwiser.in/pyqs/paper/2020-01-08-morning](#)

The predominant intermolecular forces present in ethyl acetate, a liquid, are:

- (A) Dipole-dipole and hydrogen bonding
- (B) hydrogen bonding and London dispersion
- (C) London dispersion, dipole-dipole and hydrogen bonding
- (D) London dispersion and dipole-dipole

Which of the following statement is not true for glucose?

- (A) Glucose gives Schiff's test for aldehyde
- (B) Glucose reacts with hydroxylamine to form oxime
- (C) The pentaacetate of glucose does not react with hydroxylamine to give oxime
- (D) Glucose exists in two crystalline forms α and β

The rate of a certain biochemical reaction at physiological temperature (T) occurs 10^6 times faster with enzyme than without. The change in the activation energy upon adding enzyme is:

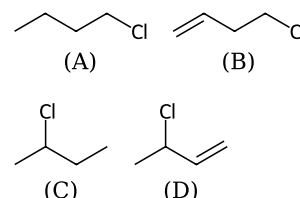
- (A) $+6RT$
- (B) $-6(2.303)RT$
- (C) $-6RT$
- (D) $+6(2.303)RT$

The complex that can show fac- and mer-isomers is:

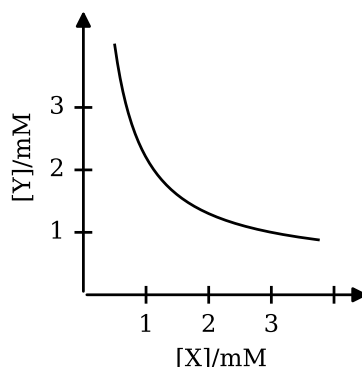
- (A) $[\text{CoCl}_2(\text{en})_2]$
- (B) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
- (C) $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$
- (D) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$

The decreasing order of reactivity towards dehydrohalogenation (E_1) reaction of the following compounds is:

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



The stoichiometry and solubility product of a salt with the solubility curve given below is, respectively:



- (A) XY , $2 \times 10^{-6} \text{ M}^3$
- (B) XY_2 , $1 \times 10^{-9} \text{ M}^3$
- (C) XY_2 , $4 \times 10^{-9} \text{ M}^3$
- (D) X_2Y , $2 \times 10^{-9} \text{ M}^3$

Attempt this paper online with instant answer checking > [prepwisar.in/pyqs/paper/2020-01-08-morning](https://www.prepwisar.in/pyqs/paper/2020-01-08-morning)

Q31 Ionic Equilibrium[Step-by-step solution](https://www.prepwisar.in/questions/tDT_0v9q49) › prepwisar.in/questions/tDT_0v9q49

The strength of an aqueous NaOH solution is most accurately determined by titrating:
(Note : consider that an appropriate indicator is used)

- (A) Aq. NaOH in a pipette and aqueous oxalic acid in a burette
(B) Aq. NaOH in a burette and aqueous oxalic acid in a conical flask
(C) Aq. NaOH in a volumetric flask and concentrated H_2SO_4 in a conical flask
(D) Aq. NaOH in a burette and concentrated H_2SO_4 in a conical flask

Q32 Chemical Bonding & Molecular Structure[Step-by-step solution](https://www.prepwisar.in/questions/jnHGvzeygv) › prepwisar.in/questions/jnHGvzeygv

The number of bonds between sulphur and oxygen atoms in $\text{S}_2\text{O}_8^{2-}$ and the number of bonds between sulphur and sulphur atoms in rhombic sulphur, respectively, are:

- (A) 4 and 8 (B) 8 and 6 (C) 4 and 6 (D) 8 and 8

Q33 Periodic Table & Periodicity[Step-by-step solution](https://www.prepwisar.in/questions/RXB4Or-WLF) › prepwisar.in/questions/RXB4Or-WLF

The first ionization energy (in kJ/mol) of Na, Mg, Al and Si respectively, are:

- (A) 496, 577, 786, 737 (B) 496, 737, 577, 786 (C) 786, 737, 577, 496 (D) 496, 577, 737, 786

Q34 Periodic Table & Periodicity[Step-by-step solution](https://www.prepwisar.in/questions/9MGZhoW-vY) › prepwisar.in/questions/9MGZhoW-vY

The third ionization enthalpy is minimum for:

- (A) Ni (B) Co (C) Mn (D) Fe

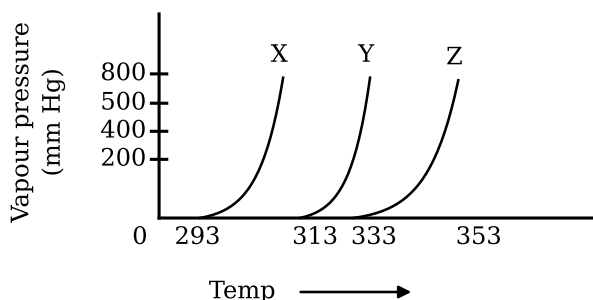
Q35 Hydrogen & s-Block Elements[Step-by-step solution](https://www.prepwisar.in/questions/aCbf30035W) › prepwisar.in/questions/aCbf30035W

When gypsum is heated to 393 K, it forms:

- (A) $\text{CaSO}_4 \cdot 0.5\text{H}_2\text{O}$ (B) $\text{CaSO}_4 \cdot 5\text{H}_2\text{O}$ (C) Dead burnt plaster (D) Anhydrous CaSO_4

Q36 Solutions & Colligative Properties[Step-by-step solution](https://www.prepwisar.in/questions/ieb8fKIrBX) › prepwisar.in/questions/ieb8fKIrBX

A graph of vapour pressure and temperature for three different liquids X, Y, and Z is shown below:



The following inferences are made:

- (A) X has higher intermolecular interactions compared to Y.
(B) X has lower intermolecular interactions compared to Y.
(C) Z has lower intermolecular interactions compared to Y.

The correct inference (s) is / are:

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

Attempt this paper online with instant answer checking › [prepwisar.in/pyqs/paper/2020-01-08-morning](https://www.prepwisar.in/pyqs/paper/2020-01-08-morning)

For the Balmer series in the spectrum of H atom,

$\bar{\nu} = R_H \left\{ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right\}$, the correct statements among (I) to (IV) are:

(I) As wavelength decreases, the lines in the series converge

(II) The integer n_1 is equal to 2

(III) The lines of longest wavelength corresponds to $n_2 = 3$

(IV) The ionization energy of hydrogen can be calculated from wave number of these lines

(A) (II), (III), (IV)

(B) (I), (II), (III)

(C) (I), (III), (IV)

(D) (I), (II), (IV)

As per Hardy-Schulze formulation, the flocculation values of the following for ferric hydroxide sol are in the order:

(A) $\text{AlCl}_3 > \text{K}_3[\text{Fe}(\text{CN})_6] > \text{K}_2\text{CrO}_4 > \text{KBr} = \text{KNO}_3$

(B) $\text{K}_3[\text{Fe}(\text{CN})_6] < \text{K}_2\text{CrO}_4 < \text{KBr} = \text{KNO}_3 = \text{AlCl}_3$

(C) $\text{K}_3[\text{Fe}(\text{CN})_6] < \text{K}_2\text{CrO}_4 < \text{AlCl}_3 < \text{KBr} < \text{KNO}_3$

(D) $\text{K}_3[\text{Fe}(\text{CN})_6] > \text{AlCl}_3 > \text{K}_2\text{CrO}_4 > \text{KBr} > \text{KNO}_3$

A flask contains a mixture of isohexane and 3-methylpentane. One of the liquids boils at 63°C while the other boils at 60°C . What is the best way to separate the two liquids and which one will be distilled out first?

(A) fractional distillation, 3-methylpentane

(B) simple distillation, 3-methylpentane

(C) fractional distillation, isohexane

(D) simple distillation, isohexane

Chemistry Section B · Numerical value

Q40 to Q42

The number of chiral centres in penicillin is _____.

The volume (in mL) of 0.125 M AgNO_3 required to quantitatively precipitate chloride ions in 0.3 g of $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ is _____. (Round off to the nearest integer)

$M_{[\text{Co}(\text{NH}_3)_6\text{Cl}_3]} = 267.46 \text{ g/mol}$

$M_{\text{AgNO}_3} = 169.87 \text{ g/mol}$

Ferrous sulphate heptahydrate is used to fortify foods with iron. The amount (in grams) of the salt required to achieve 10 ppm of iron in 100 kg of wheat is _____. (Round off to the nearest integer)

Atomic weight : Fe = 55.85; S = 32.00; O = 16.00

Q43 Three Dimensional Geometry

[Step-by-step solution](#) › prepwiser.in/questions/NaXRz0aMrO

The shortest distance between the lines

$$\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1} \text{ and } \frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4} \text{ is:}$$

- (A) 3 (B) $\frac{7}{2}\sqrt{30}$ (C) $3\sqrt{30}$ (D) $2\sqrt{30}$

Q44 Inverse Trigonometric Functions

[Step-by-step solution](#) › prepwiser.in/questions/gD0kIBnAz1

Let $f(x) = x\cos^{-1}(-\sin|x|)$, $x \in [-\frac{\pi}{2}, \frac{\pi}{2}]$, then which of the following is true?

- (A) f' is decreasing in $(-\frac{\pi}{2}, 0)$ and increasing in $(0, \frac{\pi}{2})$
 (B) $f'(0) = -\frac{\pi}{2}$
 (C) f is not differentiable at $x = 0$
 (D) f' is increasing in $(-\frac{\pi}{2}, 0)$ and decreasing in $(0, \frac{\pi}{2})$

Q45 Applications of Derivatives

[Step-by-step solution](#) › prepwiser.in/questions/OA_DuJnI4b

If c is a point at which Rolle's theorem holds for the function,

$f(x) = \log_e \left(\frac{x^2+a}{7x} \right)$ in the interval $[3, 4]$, where $a \in \mathbb{R}$, then $f'(c)$ is equal to

- (A) $\frac{1}{12}$ (B) $\frac{\sqrt{3}}{7}$ (C) $-\frac{1}{12}$ (D) $-\frac{1}{24}$

Q46 Complex Numbers

[Step-by-step solution](#) › prepwiser.in/questions/1_nZhar7T0

If the equation, $x^2 + bx + 45 = 0$ ($b \in \mathbb{R}$) has conjugate complex roots and they satisfy $|z+1| = 2\sqrt{10}$, then:

- (A) $b^2 - b = 42$ (B) $b^2 + b = 12$ (C) $b^2 + b = 72$ (D) $b^2 - b = 30$

Q47 Differential Equations

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

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

$$\sqrt{1-x^2} \frac{dy}{dx} + \sqrt{1-y^2} = 0, |x| < 1.$$

If $y(\frac{1}{2}) = \frac{\sqrt{3}}{2}$, then $y(-\frac{1}{\sqrt{2}})$ is equal to:

- (A) $-\frac{\sqrt{3}}{2}$ (B) None of those (C) $\frac{1}{\sqrt{2}}$ (D) $-\frac{1}{\sqrt{2}}$

Q48 Inverse Trigonometric Functions

[Step-by-step solution](#) › prepwiser.in/questions/zv2KilxHWm

Let $f(x) = (\sin(\tan^{-1}x) + \sin(\cot^{-1}x))^2 - 1$, $|x| > 1$.

If

$$\frac{dy}{dx} = \frac{1}{2} \frac{d}{dx} (\sin^{-1}(f(x)))$$

and $y(\sqrt{3}) = \frac{\pi}{6}$, then $y(-\sqrt{3})$ is equal to:

- (A) $\frac{5\pi}{6}$ (B) $-\frac{\pi}{6}$ (C) $\frac{\pi}{3}$ (D) $\frac{2\pi}{3}$

Attempt this paper online with instant answer checking › prepwiser.in/pyqs/paper/2020-01-08-morning

Q49 Ellipse[Step-by-step solution](https://www.prepwise.in/questions/Ow6mUhjfv)

Let the line $y = mx$ and the ellipse $2x^2 + y^2 = 1$ intersect at a point P in the first quadrant. If the normal to this ellipse at P meets the co-ordinate axes at $\left(-\frac{1}{3\sqrt{2}}, 0\right)$ and $(0, \beta)$, then β is equal to:

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

Q50 Functions (Advanced)[Step-by-step solution](https://www.prepwise.in/questions/L4xlhBjpXy)

The inverse function of

$f(x) = \frac{8^{2x} - 8^{-2x}}{8^{2x} + 8^{-2x}}$, $x \in (-1, 1)$, is:

- (A) $\frac{1}{4} \log_e \left(\frac{1-x}{1+x} \right)$ (B) $\frac{1}{4} (\log_8 e) \log_e \left(\frac{1-x}{1+x} \right)$
 (C) $\frac{1}{4} (\log_8 e) \log_e \left(\frac{1+x}{1-x} \right)$ (D) $\frac{1}{4} \log_e \left(\frac{1+x}{1-x} \right)$

Q51 Limits[Step-by-step solution](https://www.prepwise.in/questions/HNRimRzGUi)

$$\lim_{x \rightarrow 0} \left(\frac{3x^2 + 2}{7x^2 + 2} \right)^{\frac{1}{x^2}}$$

is equal to

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

Q52 Determinants[Step-by-step solution](https://www.prepwise.in/questions/vsy8IY6NsF)

For which of the following ordered pairs (μ, δ) , the system of linear equations

$$x + 2y + 3z = 1$$

$$3x + 4y + 5z = \mu$$

$$4x + 4y + 4z = \delta$$

is inconsistent?

- (A) (1, 0) (B) (4, 3) (C) (4, 6) (D) (3, 4)

Q53 Parabola[Step-by-step solution](https://www.prepwise.in/questions/ISCYKw4ATZ)

The locus of a point which divides the line segment joining the point (0, -1) and a point on the parabola, $x^2 = 4y$, internally in the ratio 1 : 2, is:

- (A) $9x^2 - 3y = 2$ (B) $4x^2 - 3y = 2$ (C) $x^2 - 3y = 2$ (D) $9x^2 - 12y = 8$

Q54 Binomial Theorem[Step-by-step solution](https://www.prepwise.in/questions/PfRT4-a8bu)

If a , b and c are the greatest value of ${}^{19}C_p$, ${}^{20}C_q$ and ${}^{21}C_r$ respectively, then:

- (A) $\frac{a}{11} = \frac{b}{22} = \frac{c}{21}$ (B) $\frac{a}{10} = \frac{b}{22} = \frac{c}{21}$ (C) $\frac{a}{10} = \frac{b}{11} = \frac{c}{42}$ (D) $\frac{a}{11} = \frac{b}{22} = \frac{c}{42}$

Q55 Probability: Advanced[Step-by-step solution](https://www.prepwise.in/questions/INu8IfRfNw)

Let A and B be two independent events such that

$$P(A) = \frac{1}{3} \text{ and } P(B) = \frac{1}{6}.$$

Then, which of the following is TRUE?

- (A) $P\left(\frac{A}{A \cup B}\right) = \frac{1}{4}$ (B) $P\left(\frac{A}{B}\right) = \frac{2}{3}$ (C) $P\left(\frac{A'}{B'}\right) = \frac{1}{3}$ (D) $P\left(\frac{A}{B'}\right) = \frac{1}{3}$

Q56 Sequences & Series[Step-by-step solution](#) › prepwiser.in/questions/uTcZ4wG95p

Let $f: \mathbf{R} \rightarrow \mathbf{R}$ be such that for all $x \in \mathbf{R}$
 $(2^{1+x} + 2^{1-x}), f(x)$ and $(3^x + 3^{-x})$ are in A.P.,
then the minimum value of $f(x)$ is

- (A) 2 (B) 0 (C) 3 (D) 4

Q57 Statistics[Step-by-step solution](#) › prepwiser.in/questions/xc5JK3U5_3

The mean and the standard deviation (s.d.) of 10 observations are 20 and 2 respectively. Each of these 10 observations is multiplied by p and then reduced by q , where $p \neq 0$ and $q \neq 0$. If the new mean and new s.d. become half of their original values, then q is equal to

- (A) 10 (B) -20 (C) -10 (D) -5

Q58 Vectors[Step-by-step solution](#) › prepwiser.in/questions/4IKtd1SjM3

Let the volume of a parallelopiped whose coterminous edges are given by

$$\vec{u} = \hat{i} + \hat{j} + \lambda \hat{k}, \vec{v} = \hat{i} + \hat{j} + 3\hat{k} \text{ and}$$

$\vec{w} = 2\hat{i} + \hat{j} + \hat{k}$ be 1 cu. unit. If θ be the angle between the edges $\vec{u}$ and $\vec{w}$, then $\cos\theta$ can be:

- (A) $\frac{7}{6\sqrt{3}}$ (B) $\frac{7}{6\sqrt{6}}$ (C) $\frac{5}{7}$ (D) $\frac{5}{3\sqrt{3}}$

Q59 Area Under Curves[Step-by-step solution](#) › prepwiser.in/questions/hXdVkHP4Xh

For $a > 0$, let the curves $C_1: y^2 = ax$ and $C_2: x^2 = ay$ intersect at origin O and a point P. Let the line $x = b$ ($0 < b < a$) intersect the chord OP and the x-axis at points Q and R, respectively. If the line $x = b$ bisects the area bounded by the curves, C_1 and C_2 , and the area of $\Delta OQR = \frac{1}{2}$, then 'a' satisfies the equation:

- (A) $x^6 - 12x^3 + 4 = 0$ (B) $x^6 - 12x^3 - 4 = 0$ (C) $x^6 + 6x^3 - 4 = 0$ (D) $x^6 - 6x^3 + 4 = 0$

Q60 Straight Lines[Step-by-step solution](#) › prepwiser.in/questions/sX4GkYA10-

Let two points be A(1, -1) and B(0, 2). If a point P(x', y') be such that the area of $\Delta PAB = 5$ sq. units and it lies on the line, $3x + y - 4\lambda = 0$, then a value of λ is:

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

Q61 Indefinite Integration[Step-by-step solution](#) › prepwiser.in/questions/5G41et5IUg

$$\text{If } \int \frac{\cos x dx}{\sin^3 x (1 + \sin^6 x)^{2/3}} = f(x) (1 + \sin^6 x)^{1/\lambda} + c$$

where c is a constant of integration, then $\lambda f\left(\frac{\pi}{3}\right)$ is equal to

- (A) $\frac{9}{8}$ (B) 2 (C) -2 (D) $-\frac{9}{8}$

Q62 Applications of Derivatives **NUMERICAL** [Step-by-step solution](#) › [prepwiser.in/questions/-Oe2o1PJw6](https://www.prepwiser.in/questions/-Oe2o1PJw6)

Let the normal at a point P on the curve $y^2 - 3x^2 + y + 10 = 0$ intersect the y-axis at $(0, \frac{3}{2})$.

If m is the slope of the tangent at P to the curve, then $|m|$ is equal to

Q63 Matrices **NUMERICAL** [Step-by-step solution](#) › [prepwiser.in/questions/uTvRbIIhYX](https://www.prepwiser.in/questions/uTvRbIIhYX)

The number of all 3×3 matrices A, with entries from the set $\{-1, 0, 1\}$ such that the sum of the diagonal elements of AA^T is 3, is

Q64 Permutations & Combinations **NUMERICAL** [Step-by-step solution](#) › [prepwiser.in/questions/wYU0BCFKSL](https://www.prepwiser.in/questions/wYU0BCFKSL)

An urn contains 5 red marbles, 4 black marbles and 3 white marbles. Then the number of ways in which 4 marbles can be drawn so that at the most three of them are red is _____.

Q65 Quadratic Equations & Polynomial Inequalities **NUMERICAL** [Step-by-step solution](#) › [prepwiser.in/questions/IgREIP2Meu](https://www.prepwiser.in/questions/IgREIP2Meu)

The least positive value of 'a' for which the equation

$$2x^2 + (a - 10)x + \frac{33}{2} = 2a$$

has real roots is

Q66 Sequences & Series **NUMERICAL** [Step-by-step solution](#) › [prepwiser.in/questions/FjX0QoLU1g](https://www.prepwiser.in/questions/FjX0QoLU1g)

The sum $\sum_{k=1}^{20} (1 + 2 + 3 + \dots + k)$ is:

Answer key: JEE Main 2020 · 8 Jan · Shift 1

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](https://www.prepwiser.in/feedback) · Terms: [prepwiser.in/terms](https://www.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/2020-01-08-morning](https://www.prepwiser.in/pyqs/paper/2020-01-08-morning)

Physics

1. C	2. C	3. A	4. A	5. D	6. B	7. C	8. D
9. B	10. C	11. B	12. A	13. B	14. A	15. C	16. B
17. A	18. B	19. 1	20. 10	21. 60	22. 580	23. 106	

Chemistry

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

Mathematics

43. C	44. A	45. A	46. D	47. C	48. B	49. A	50. C
51. C	52. B	53. D	54. D	55. D	56. C	57. B	58. A
59. A	60. D	61. C	62. 4	63. 672	64. 490	65. 8	66. 1540



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/2020-01-08-morning.
- 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 2020 papers

Every shift of 2020 as a PDF, and the year's questions chapter-wise: prepwisser.in/pyq-pdfs/jee-main/2020/

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.