

JEE MAIN 2023 · QUESTION PAPER

6 Apr 2023 **Shift 2**

84 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	19 Q1 to Q19	10 Q20 to Q29
● Chemistry	17 Q30 to Q46	9 Q47 to Q55
● Mathematics	19 Q56 to Q74	10 Q75 to Q84
In this PDF	84 questions · answer key at the end	

- 1 Set a 3 hour timer and attempt the paper in one sitting, like the real exam.
- 2 In the 2021 to 2024 papers, Section B asked you to answer any 5 numerical questions per subject. Try each one here.
- 3 Check yourself against the answer key at the end. Every question names its chapter, so you can see where marks went.
- 4 Got one wrong? Tap "Step-by-step solution" at the top right of it for the full working, where available.

Attempt this paper online

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

prepwise.in/pyqs/paper/2023-04-06-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?
prepwise.in/feedback · Terms: prepwise.in/terms

Q1 Alternating Current

[Step-by-step solution](#) › [prepwisar.in/questions/t5Yio1X1R3](https://www.prepwisar.in/questions/t5Yio1X1R3)

A capacitor of capacitance $150.0\mu\text{F}$ is connected to an alternating source of emf given by $E = 36 \sin(120\pi t)\text{V}$. The maximum value of current in the circuit is approximately equal to:

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

Q2 Atomic Physics

[Step-by-step solution](#) › [prepwisar.in/questions/r2tS1JsXjS](https://www.prepwisar.in/questions/r2tS1JsXjS)

A small particle of mass m moves in such a way that its potential energy $U = \frac{1}{2}m\omega^2 r^2$ where ω is constant and r is the distance of the particle from origin. Assuming Bohr's quantization of momentum and circular orbit, the radius of n^{th} orbit will be proportional to,

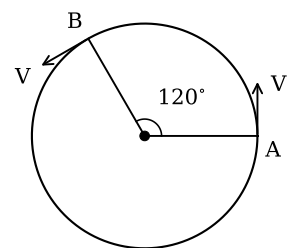
- (A) $\sqrt{n}$ (B) n^2 (C) $\frac{1}{n}$ (D) n

Q3 Rectilinear Motion

[Step-by-step solution](#) › [prepwisar.in/questions/v8I09hDjYd](https://www.prepwisar.in/questions/v8I09hDjYd)

As shown in the figure, a particle is moving with constant speed $\pi\text{m/s}$. Considering its motion from A to B, the magnitude of the average velocity is:

- (A) $\pi\text{m/s}$ (B) $1.5\sqrt{3}\text{m/s}$ (C) $\sqrt{3}\text{m/s}$ (D) $2\sqrt{3}\text{m/s}$



Q4 Circular Motion

[Step-by-step solution](#) › [prepwisar.in/questions/_6OB2mHEI5](https://www.prepwisar.in/questions/_6OB2mHEI5)

A child of mass 5kg is going round a merry-go-round that makes 1 rotation in 3.14s . The radius of the merry-go-round is 2m . The centrifugal force on the child will be

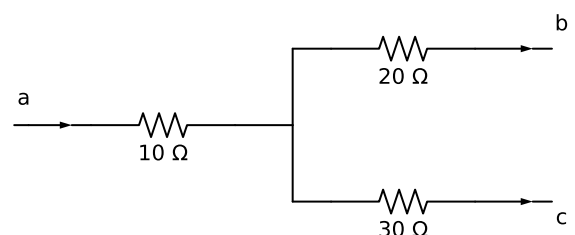
- (A) 50 N (B) 80 N (C) 100 N (D) 40 N

Q5 Current Electricity

[Step-by-step solution](#) › [prepwisar.in/questions/kZtqn5wL6O](https://www.prepwisar.in/questions/kZtqn5wL6O)

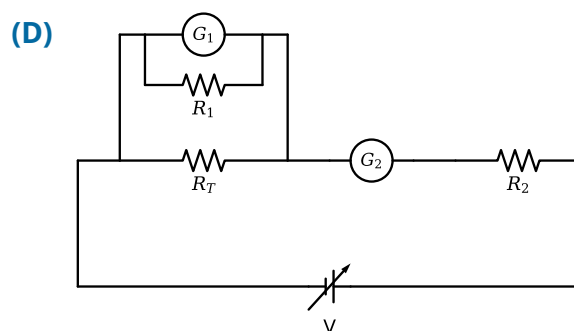
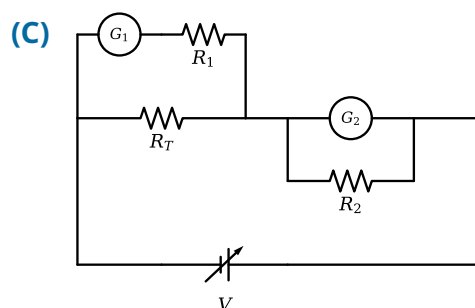
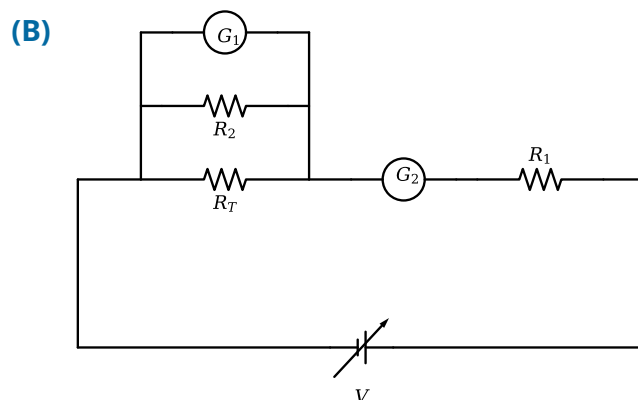
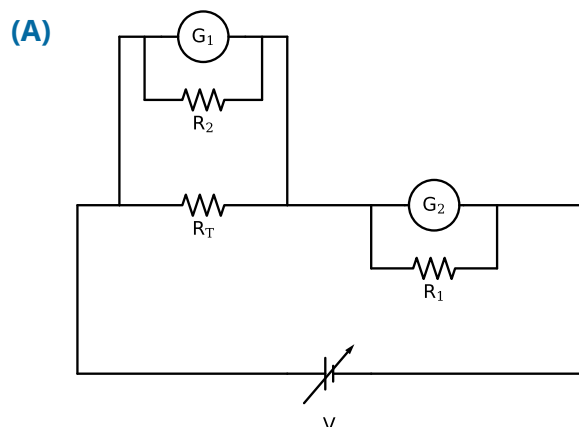
Figure shows a part of an electric circuit. The potentials at points a , b and c are 30V , 12V and 2V respectively. The current through the 20Ω resistor will be,

- (A) 0.2 A (B) 0.6 A (C) 0.4 A (D) 1.0 A



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A student is provided with a variable voltage source V , a test resistor $R_T = 10\Omega$, two identical galvanometers G_1 and G_2 and two additional resistors, $R_1 = 10M\Omega$ and $R_2 = 0.001\Omega$. For conducting an experiment to verify ohm's law, the most suitable circuit is:



The work functions of Aluminium and Gold are 4.1eV and 5.1eV respectively. The ratio of the slope of the stopping potential versus frequency plot for Gold to that of Aluminium is

(A) 1.5

(B) 1.24

(C) 1

(D) 2

The energy density associated with electric field $\vec{E}$ and magnetic field $\vec{B}$ of an electromagnetic wave in free space is given by (ϵ_0 – permittivity of free space, μ_0 – permeability of free space)

(A) $U_E = \frac{\epsilon_0 E^2}{2}, U_B = \frac{B^2}{2\mu_0}$

(B) $U_E = \frac{E^2}{2\epsilon_0}, U_B = \frac{\mu_0 B^2}{2}$

(C) $U_E = \frac{\epsilon_0 E^2}{2}, U_B = \frac{\mu_0 B^2}{2}$

(D) $U_E = \frac{E^2}{2\epsilon_0}, U_B = \frac{B^2}{2\mu_0}$

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R
Assertion A: Diffusion current in a p-n junction is greater than the drift current in magnitude if the junction is forward biased.

Reason R: Diffusion current in a p-n junction is from the n-side to the p-side if the junction is forward biased.

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

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

Q10 Simple Harmonic Motion

[Step-by-step solution](https://www.prepwiser.in/questions/jCnmjS86ds) > prepwiser.in/questions/jCnmjS86ds

A dipole comprises of two charged particles of identical magnitude q and opposite in nature. The mass ' m ' of the positive charged particle is half of the mass of the negative charged particle. The two charges are separated by a distance ' l '. If the dipole is placed in a uniform electric field ' $\vec{E}$ '; in such a way that dipole axis makes a very small angle with the electric field, ' $\vec{E}$ '. The angular frequency of the oscillations of the dipole when released is given by:

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

Q11 Wave Optics

[Step-by-step solution](https://www.prepwiser.in/questions/SEc1IJ9Dww) > prepwiser.in/questions/SEc1IJ9Dww

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R
Assertion A: The phase difference of two light waves change if they travel through different media having same thickness, but different indices of refraction.

Reason R: The wavelengths of waves are different in different media.

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

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

Q12 Experimental Skills

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

A 2 meter long scale with least count of 0.2cm is used to measure the locations of objects on an optical bench. While measuring the focal length of a convex lens, the object pin and the convex lens are placed at 80cm mark and 1m mark, respectively. The image of the object pin on the other side of lens coincides with image pin that is kept at 180cm mark. The % error in the estimation of focal length is:

- (A) 1.70
- (B) 0.51
- (C) 1.02
- (D) 0.85

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Q13 Gravitation[Step-by-step solution](https://www.prepwiser.in/questions/LGtakVW3cG) > prepwiser.in/questions/LGtakVW3cG

The weight of a body on the surface of the earth is 100N. The gravitational force on it when taken at a height, from the surface of earth, equal to one-fourth the radius of the earth is:

- (A) 50 N (B) 64 N (C) 25 N (D) 100 N

Q14 Gravitation[Step-by-step solution](https://www.prepwiser.in/questions/4omkffO5a9) > prepwiser.in/questions/4omkffO5a9

Choose the incorrect statement from the following:

- (A) The linear speed of a planet revolving around the sun remains constant.
(B) When a body falls towards earth, the displacement of earth towards the body is negligible.
(C) The speed of satellite in a given circular orbit remains constant.
(D) For a planet revolving around the sun in an elliptical orbit, the total energy of the planet remains constant.

Q15 Kinetic Theory of Gases[Step-by-step solution](https://www.prepwiser.in/questions/Bu_2yZO3P4) > prepwiser.in/questions/Bu_2yZO3P4

The temperature of an ideal gas is increased from 200K to 800K. If r.m.s. speed of gas at 200K is v_0 . Then, r.m.s. speed of the gas at 800K will be:

- (A) v_0 (B) $2v_0$ (C) $4v_0$ (D) $\frac{v_0}{4}$

Q16 Heat Transfer[Step-by-step solution](https://www.prepwiser.in/questions/g-UA_ea_PM) > prepwiser.in/questions/g-UA_ea_PM

A body cools in 7 minutes from 60°C to 40°C . The temperature of the surrounding is 10°C . The temperature of the body after the next 7 minutes will be:

- (A) 34°C (B) 28°C (C) 32°C (D) 30°C

Q17 Sound Waves[Step-by-step solution](https://www.prepwiser.in/questions/_FKUxNqjc9) > prepwiser.in/questions/_FKUxNqjc9

The ratio of speed of sound in hydrogen gas to the speed of sound in oxygen gas at the same temperature is:

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

Q18 Rectilinear Motion[Step-by-step solution](https://www.prepwiser.in/questions/4hHi9CK_ys) > prepwiser.in/questions/4hHi9CK_ys

A particle starts with an initial velocity of 10.0ms^{-1} along x -direction and accelerates uniformly at the rate of 2.0ms^{-2} . The time taken by the particle to reach the velocity of 60.0ms^{-1} is _____.

- (A) 30s (B) 6s (C) 3s (D) 25s

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

Assertion A: When you squeeze one end of a tube to get toothpaste out from the other end, Pascal's principle is observed.

Reason R: A change in the pressure applied to an enclosed incompressible fluid is transmitted undiminished to every portion of the fluid and to the walls of its container.

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

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

Physics Section B · Numerical value

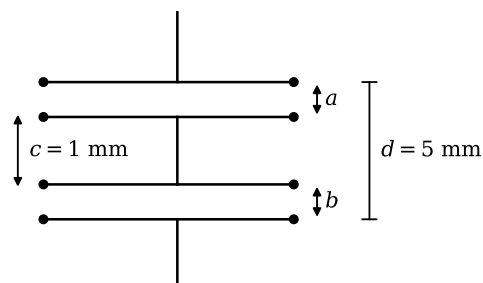
Q20 to Q29

Experimentally it is found that 12.8eV energy is required to separate a hydrogen atom into a proton and an electron. So the orbital radius of the electron in a hydrogen atom is $\frac{9}{x} \times 10^{-10}\text{m}$. The value of the x is _____.

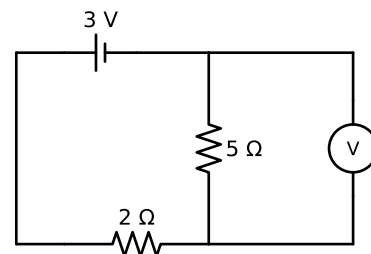
$$\left(1\text{eV} = 1.6 \times 10^{-19}\text{J}, \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{Nm}^2/\text{C}^2\right.$$

and electronic charge $= 1.6 \times 10^{-19}\text{C}$)

As shown in the figure, two parallel plate capacitors having equal plate area of 200cm^2 are joined in such a way that $a \neq b$. The equivalent capacitance of the combination is $x \epsilon_0 \text{F}$. The value of x is _____.



As shown in the figure, the voltmeter reads 2V across 5Ω resistor. The resistance of the voltmeter is _____ Ω .



Two concentric circular coils with radii 1cm and 1000cm , and number of turns 10 and 200 respectively are placed coaxially with centers coinciding. The mutual inductance of this arrangement will be _____ $\times 10^{-8}\text{H}$. (Take, $\pi^2 = 10$)

Q24 Moving Charges & Magnetism **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/QdxPf1ppjI) > prepwiser.in/questions/QdxPf1ppjI

A proton with a kinetic energy of 2.0eV moves into a region of uniform magnetic field of magnitude $\frac{\pi}{2} \times 10^{-3}\text{T}$. The angle between the direction of magnetic field and velocity of proton is 60° . The pitch of the helical path taken by the proton is _____ cm. (Take, mass of proton = $1.6 \times 10^{-27}\text{kg}$ and Charge on proton = $1.6 \times 10^{-19}\text{C}$).

Q25 Elasticity **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/BYn7j1bZoV) > prepwiser.in/questions/BYn7j1bZoV

A metal block of mass m is suspended from a rigid support through a metal wire of diameter 14mm . The tensile stress developed in the wire under equilibrium state is $7 \times 10^5\text{Nm}^{-2}$. The value of mass m is _____ kg. (Take, $g = 9.8\text{ms}^{-2}$ and $\pi = \frac{22}{7}$)

Q26 Rotational Motion **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/CgMyznVN3D) > prepwiser.in/questions/CgMyznVN3D

A ring and a solid sphere rotating about an axis passing through their centers have same radii of gyration. The axis of rotation is perpendicular to plane of ring. The ratio of radius of ring to that of sphere is $\sqrt{\frac{2}{x}}$. The value of x is _____.

Q27 Simple Harmonic Motion **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/K4jmP1USVM) > prepwiser.in/questions/K4jmP1USVM

A simple pendulum with length 100cm and bob of mass 250g is executing S.H.M. of amplitude 10cm . The maximum tension in the string is found to be $\frac{x}{40}\text{N}$. The value of x is _____.

Q28 Wave Optics **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/kM7bROob1A) > prepwiser.in/questions/kM7bROob1A

A beam of light consisting of two wavelengths $7000\text{\AA}$ and $5500\text{\AA}$ is used to obtain interference pattern in Young's double slit experiment. The distance between the slits is 2.5mm and the distance between the plane of slits and the screen is 150cm . The least distance from the central fringe, where the bright fringes due to both the wavelengths coincide, is $n \times 10^{-5}\text{m}$. The value of n is _____.

Q29 Collision **NUMERICAL**[Step-by-step solution](https://www.prepwiser.in/questions/8HCL1u-KzM) > prepwiser.in/questions/8HCL1u-KzM

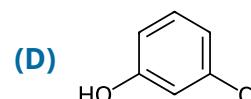
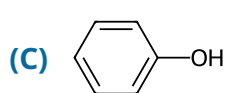
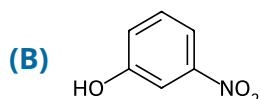
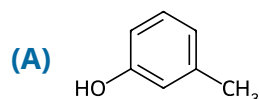
A body is dropped on ground from a height ' h_1 ' and after hitting the ground, it rebounds to a height ' h_2 '. If the ratio of velocities of the body just before and after hitting ground is 4, then percentage loss in kinetic energy of the body is $\frac{x}{4}$. The value of x is _____.

Chemistry Section A · Multiple choice

Q30 to Q46

Q30 General Organic Chemistry (GOC)[Step-by-step solution](https://www.prepwiser.in/questions/ptCWws9LQ7) > prepwiser.in/questions/ptCWws9LQ7

The strongest acid from the following is



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Match List I with List II

	LIST I Natural Amino Acid		LIST II One Letter Code
A.	Arginine	I.	D
B.	Aspartic acid	II.	N
C.	Asparagine	III.	A
D.	Alanine	IV.	R

Choose the correct answer from the options given below:

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

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

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

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

The group of chemicals used as pesticide is:

(A) Dieldrin, Sodium arsinite, Tetrachloroethene

(B) Aldrin, Sodium chlorate, Sodium arsinite

(C) DDT, Aldrin

(D) Sodium chlorate, DDT, PAN

Given below are two statements:

Statement I: Morphine is a narcotic analgesic. It helps in relieving pain without producing sleep.

Statement II: Morphine and its derivatives are obtained from opium poppy.

In the light of the above statements, choose the correct answer from the options given below

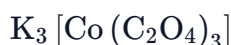
(A) Both Statement I and Statement II are true

(B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are false

(D) Statement I is false but Statement II is true

The IUPAC name of



is:-

(A) Potassium tris(oxalato)cobalt(III)

(B) Potassium tris(oxalato)cobaltate(III)

(C) Potassium trioxalatocobaltate(III)

(D) Potassium trioxalatocobalt(III)

Element not present in Nessler's reagent is:

(A) I

(B) N

(C) K

(D) Hg

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Given below are two statements: one is labelled as "Assertion A" and the other is labelled as "Reason R"

Assertion A : In the complex $\text{Ni}(\text{CO})_4$ and $\text{Fe}(\text{CO})_5$, the metals have zero oxidation state.

Reason R : Low oxidation states are found when a complex has ligands capable of π -donor character in addition to the σ -bonding.

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

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

During the reaction of permanganate with thiosulphate, the change in oxidation of manganese occurs by value of 3. Identify which of the below medium will favour the reaction.

- (A) aqueous neutral
- (B) both aqueous acidic and faintly alkaline
- (C) both aqueous acidic and neutral
- (D) aqueous acidic

Which one of the following elements will remain as liquid inside pure boiling water?

- (A) Li
- (B) Br
- (C) Cs
- (D) Ga

Group-13 elements react with O_2 in amorphous form to form oxides of type M_2O_3 (M = element). Which among the following is the most basic oxide?

- (A) Al_2O_3
- (B) Ti_2O_3
- (C) B_2O_3
- (D) Ga_2O_3

The product, which is not obtained during the electrolysis of brine solution is:

- (A) NaOH
- (B) Cl_2
- (C) H_2
- (D) HCl

Ion having highest hydration enthalpy among the given alkaline earth metal ions is:

- (A) Sr^{2+}
- (B) Ca^{2+}
- (C) Be^{2+}
- (D) Ba^{2+}

Structures of BeCl_2 in solid state, vapour phase and at very high temperature respectively are:

- (A) Polymeric, Dimeric, Monomeric
- (B) Dimeric, Polymeric, Monomeric
- (C) Polymeric, Monomeric, Dimeric
- (D) Monomeric, Dimeric, Polymeric

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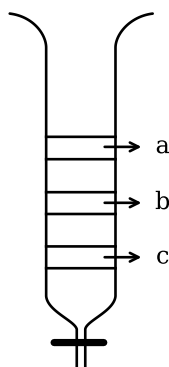
The volume of 0.02M aqueous HBr required to neutralize 10.0mL of 0.01M aqueous Ba(OH)₂ is (Assume complete neutralization)

- (A) 7.5 mL (B) 5.0 mL (C) 10.0 mL (D) 2.5 mL

If the radius of the first orbit of hydrogen atom is α_0 , then de Broglie's wavelength of electron in 3rd orbit is:

- (A) $\frac{\pi\alpha^3}{6}$ (B) $3\pi\alpha_0$ (C) $6\pi\alpha_0$ (D) $\frac{\pi\alpha^3}{3}$

From the figure of column chromatography given below, identify incorrect statements.



- A. Compound 'c' is more polar than 'a' and 'b'
B. Compound 'a' is least polar
C. Compound 'b' comes out of the column before 'c' and after 'a'
D. Compound 'a' spends more time in the column

Choose the correct answer from the options given below:

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

Formation of which complex, among the following, is not a confirmatory test of Pb²⁺ ions:

- (A) lead chromate (B) lead iodide (C) lead sulphate (D) lead nitrate

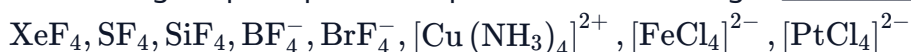
Chemistry Section B · Numerical value

Q47 to Q55

Among the following, the number of compounds which will give positive iodoform reaction is _____

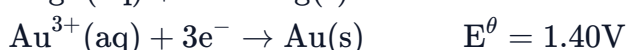
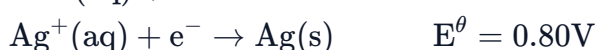
- (a) 1-Phenylbutan-2-one
(b) 2-Methylbutan-2-ol
(c) 3-Methylbutan-2-ol
(d) 1-Phenylethanol
(e) 3,3-dimethylbutan-2-one
(f) 1-Phenylpropan-2-ol

The number of species having a square planar shape from the following is _____.



In an ice crystal, each water molecule is hydrogen bonded to _____ neighbouring molecules.

The standard reduction potentials at 298K for the following half cells are given below:



The number of metal(s) which will be oxidized by NO_3^- in aqueous solution is _____.

Number of crystal systems from the following where body centred unit cell can be found, is _____.

Cubic, tetragonal, orthorhombic, hexagonal, rhombohedral, monoclinic, triclinic

Consider the following pairs of solution which will be isotonic at the same temperature. The number of pairs of solutions is / are _____.

A. 1M aq. NaCl and 2M aq. urea

B. 1M aq. CaCl_2 and 1.5M aq. KCl

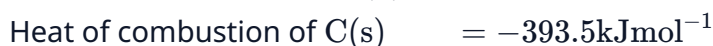
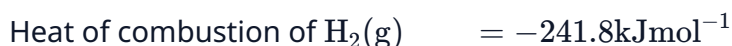
C. 1.5M aq. AlCl_3 and 2M aq. Na_2SO_4

D. 2.5M aq. KCl and 1M aq. $\text{Al}_2(\text{SO}_4)_3$

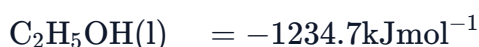
The number of colloidal systems from the following, which will have 'liquid' as the dispersion medium, is _____.

Gem stones, paints, smoke, cheese, milk, hair cream, insecticide sprays, froth, soap lather

Consider the following data



Heat of combustion of



The heat of formation of $\text{C}_2\text{H}_5\text{OH}(\text{l})$ is (–) _____ kJmol^{-1} (Nearest integer).

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The equilibrium composition for the reaction $\text{PCl}_3 + \text{Cl}_2 \rightleftharpoons \text{PCl}_5$ at 298K is given below:

$$[\text{PCl}_3]_{\text{eq}} = 0.2\text{molL}^{-1}, [\text{Cl}_2]_{\text{eq}} = 0.1\text{molL}^{-1}, [\text{PCl}_5]_{\text{eq}} = 0.40\text{molL}^{-1}$$

If 0.2mol of Cl_2 is added at the same temperature, the equilibrium concentrations of PCl_5 is _____ $\times 10^{-2}\text{molL}^{-1}$

Given: K_c for the reaction at 298K is 20

Mathematics Section A · Multiple choice

Q56 to Q74

A plane P contains the line of intersection of the plane $\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 6$ and $\vec{r} \cdot (2\hat{i} + 3\hat{j} + 4\hat{k}) = -5$. If P passes through the point $(0, 2, -2)$, then the square of distance of the point $(12, 12, 18)$ from the plane P is:

- (A) 310 (B) 620 (C) 1240 (D) 155

Let the line L pass through the point $(0, 1, 2)$, intersect the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and be parallel to the plane $2x + y - 3z = 4$. Then the distance of the point $P(1, -9, 2)$ from the line L is:

- (A) 9 (B) $\sqrt{74}$ (C) $\sqrt{69}$ (D) $\sqrt{54}$

If the coefficient of x^7 in $(ax^2 + \frac{1}{2bx})^{11}$ and x^{-7} in $(ax - \frac{1}{3bx^2})^{11}$ are equal, then:

- (A) $243ab = 64$ (B) $32ab = 729$ (C) $64ab = 243$ (D) $729ab = 32$

Among the statements:

(S1): $2023^{2022} - 1999^{2022}$ is divisible by 8

(S2): $13(13)^n - 12n - 13$ is divisible by 144 for infinitely many $n \in \mathbb{N}$

- (A) both (S1) and (S2) are incorrect (B) only (S1) is correct
(C) only (S2) is correct (D) both (S1) and (S2) are correct

If the tangents at the points P and Q on the circle $x^2 + y^2 - 2x + y = 5$ meet at the point $R(\frac{9}{4}, 2)$, then the area of the triangle PQR is:

- (A) $\frac{13}{8}$ (B) $\frac{5}{8}$ (C) $\frac{5}{4}$ (D) $\frac{13}{4}$

Let $a \neq b$ be two non-zero real numbers. Then the number of elements in the set $X = \{z \in \mathbb{C} : \text{Re}(az^2 + bz) = a \text{ and } \text{Re}(bz^2 + az) = b\}$ is equal to:

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

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Q62 Definite Integration[Step-by-step solution](#) › [prepwisar.in/questions/8H1RyBHSIn](#)

Let $f(x)$ be a function satisfying $f(x) + f(\pi - x) = \pi^2, \forall x \in \mathbb{R}$. Then $\int_0^\pi f(x) \sin x dx$ is equal to:

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

Q63 Limits[Step-by-step solution](#) › [prepwisar.in/questions/oWeBBVj5HQ](#)

$$\lim_{n \rightarrow \infty} \left\{ \left(2^{\frac{1}{2}} - 2^{\frac{1}{3}} \right) \left(2^{\frac{1}{2}} - 2^{\frac{1}{5}} \right) \dots \left(2^{\frac{1}{2}} - 2^{\frac{1}{2n+1}} \right) \right\}$$

is equal to:

- (A) $\sqrt{2}$ (B) 1 (C) $\frac{1}{\sqrt{2}}$ (D) 0

Q64 Differential Equations[Step-by-step solution](#) › [prepwisar.in/questions/0oV5J9-9oJ](#)

If the solution curve $f(x, y) = 0$ of the differential equation

$$(1 + \log_e x) \frac{dx}{dy} - x \log_e x = e^y, x > 0,$$

passes through the points $(1, 0)$ and $(\alpha, 2)$, then α^α is equal to:

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

Q65 Ellipse[Step-by-step solution](#) › [prepwisar.in/questions/Kyp1xjOKOM](#)

In a group of 100 persons 75 speak English and 40 speak Hindi. Each person speaks at least one of the two languages. If the number of persons, who speak only English is α and the number of persons who speak only Hindi is β , then the eccentricity of the ellipse $25(\beta^2 x^2 + \alpha^2 y^2) = \alpha^2 \beta^2$ is:

- (A) $\frac{\sqrt{129}}{12}$ (B) $\frac{3\sqrt{15}}{12}$ (C) $\frac{\sqrt{119}}{12}$ (D) $\frac{\sqrt{117}}{12}$

Q66 Relations & Functions (Basic)[Step-by-step solution](#) › [prepwisar.in/questions/uY3l0UgFoh](#)

Let the sets A and B denote the domain and range respectively of the function $f(x) = \frac{1}{\sqrt{[x]-x}}$, where $[x]$ denotes the smallest integer greater than or equal to x . Then among the statements

(S1): $A \cap B = (1, \infty) - \mathbb{N}$ and

(S2): $A \cup B = (1, \infty)$

- (A) only (S2) is true (B) only (S1) is true
(C) neither (S1) nor (S2) is true (D) both (S1) and (S2) are true

Q67 Matrices[Step-by-step solution](#) › [prepwisar.in/questions/YqtjiHZvxM](#)

Let P be a square matrix such that $P^2 = I - P$. For $\alpha, \beta, \gamma, \delta \in \mathbb{N}$, if $P^\alpha + P^\beta = \gamma I - 29P$ and $P^\alpha - P^\beta = \delta I - 13P$, then $\alpha + \beta + \gamma - \delta$ is equal to:

- (A) 18 (B) 22 (C) 24 (D) 40

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Q68 Determinants[Step-by-step solution](https://www.prepwiser.in/questions/DxuMMbTD22) › prepwiser.in/questions/DxuMMbTD22

For the system of equations

$$x + y + z = 6$$

$$x + 2y + \alpha z = 10$$

$$x + 3y + 5z = \beta, \text{ which one of the following is NOT true?}$$

- (A) System has a unique solution for $\alpha = 3, \beta \neq 14$.
(B) System has infinitely many solutions for $\alpha = 3, \beta = 14$.
(C) System has no solution for $\alpha = 3, \beta = 24$.
(D) System has a unique solution for $\alpha = -3, \beta = 14$.

Q69 Permutations & Combinations[Step-by-step solution](https://www.prepwiser.in/questions/wH7sLK3P16) › prepwiser.in/questions/wH7sLK3P16

All the letters of the word PUBLIC are written in all possible orders and these words are written as in a dictionary with serial numbers. Then the serial number of the word PUBLIC is:

- (A) 578 (B) 576 (C) 580 (D) 582

Q70 Probability: Basic[Step-by-step solution](https://www.prepwiser.in/questions/UPY_qvIBBn) › prepwiser.in/questions/UPY_qvIBBn

Three dice are rolled. If the probability of getting different numbers on the three dice is $\frac{p}{q}$, where p and q are co-prime, then $q - p$ is equal to:

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

Q71 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/2TiGSN3qQJ) › prepwiser.in/questions/2TiGSN3qQJ

If $\gcd(m, n) = 1$ and

$$1^2 - 2^2 + 3^2 - 4^2 + \dots + (2021)^2 - (2022)^2 + (2023)^2 = 1012m^2n$$

then $m^2 - n^2$ is equal to:

- (A) 220 (B) 200 (C) 240 (D) 180

Q72 Vectors[Step-by-step solution](https://www.prepwiser.in/questions/JDMsruocci) › prepwiser.in/questions/JDMsruocci

Let the vectors $\vec{a}, \vec{b}, \vec{c}$ represent three coterminal edges of a parallelopiped of volume V . Then the volume of the parallelopiped, whose coterminal edges are represented by $\vec{a}, \vec{b} + \vec{c}$ and $\vec{a} + 2\vec{b} + 3\vec{c}$ is equal to:

- (A) $3V$ (B) $2V$ (C) $6V$ (D) V

Q73 Vectors[Step-by-step solution](https://www.prepwiser.in/questions/NVzdFFH7TO) › prepwiser.in/questions/NVzdFFH7TO

The sum of all values of α , for which the points whose position vectors are

$$\hat{i} - 2\hat{j} + 3\hat{k}, 2\hat{i} - 3\hat{j} + 4\hat{k}, (\alpha + 1)\hat{i} + 2\hat{k}$$

and $9\hat{i} + (\alpha - 8)\hat{j} + 6\hat{k}$ are coplanar, is equal to:

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

Q74 Area Under Curves[Step-by-step solution](https://www.prepwiser.in/questions/E6Iv1zQ63-) › prepwiser.in/questions/E6Iv1zQ63-

The area bounded by the curves $y = |x - 1| + |x - 2|$ and $y = 3$ is equal to:

- (A) 5 (B) 4 (C) 6 (D) 3

Q75 Three Dimensional Geometry **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/tF2INAZeIw

If the lines $\frac{x-1}{2} = \frac{2-y}{-3} = \frac{z-3}{\alpha}$ and $\frac{x-4}{5} = \frac{y-1}{2} = \frac{z}{\beta}$ intersect, then the magnitude of the minimum value of $8\alpha\beta$ is _____.

Q76 Applications of Derivatives **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/HvK8D96pUy

Let a curve $y = f(x)$, $x \in (0, \infty)$ pass through the points $P(1, \frac{3}{2})$ and $Q(a, \frac{1}{2})$. If the tangent at any point $R(b, f(b))$ to the given curve cuts the y-axis at the point $S(0, c)$ such that $bc = 3$, then $(PQ)^2$ is equal to _____.

Q77 Applications of Derivatives **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/i1JxHMLrAu

The number of points, where the curve $y = x^5 - 20x^3 + 50x + 2$ crosses the x-axis, is _____.

Q78 Complex Numbers **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/_e64JxynRr

For $\alpha, \beta, z \in \mathbb{C}$ and $\lambda > 1$, if $\sqrt{\lambda - 1}$ is the radius of the circle $|z - \alpha|^2 + |z - \beta|^2 = 2\lambda$, then $|\alpha - \beta|$ is equal to _____.

Q79 Definite Integration **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/uR7NcGQBal

Let

$$f(x) = \frac{x}{(1+x^n)^{\frac{1}{n}}}, x \in \mathbb{R} - \{-1\}, n \in \mathbb{N}, n > 2$$

If $f^n(x) = (f \circ f \circ f \dots \text{upto } n \text{ times})(x)$, then

$$\lim_{n \rightarrow \infty} \int_0^1 x^{n-2} (f^n(x)) dx$$

is equal to _____.

Q80 Ellipse **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/4qQ1kig29y

Let the eccentricity of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is reciprocal to that of the hyperbola $2x^2 - 2y^2 = 1$. If the ellipse intersects the hyperbola at right angles, then square of length of the latus-rectum of the ellipse is _____.

Q81 Permutations & Combinations **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/Ao-k8P-Qcm

The number of 4-letter words, with or without meaning, each consisting of 2 vowels and 2 consonants, which can be formed from the letters of the word UNIVERSE without repetition is _____.

Q82 Binomial Theorem **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/3GAEI6tqLd

If

$$(20)^{19} + 2(21)(20)^{18} + 3(21)^2(20)^{17} + \dots + 20(21)^{19} = k(20)^{19},$$

then k is equal to _____.

If the mean and variance of the frequency distribution

x_i	2	4	6	8	10	12	14	16
f_i	4	4	α	15	8	β	4	5

are 9 and 15.08 respectively, then the value of $\alpha^2 + \beta^2 - \alpha\beta$ is _____.

The value of $\tan 9^\circ - \tan 27^\circ - \tan 63^\circ + \tan 81^\circ$ is _____.

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Physics

1. D	2. A	3. B	4. D	5. C	6. C	7. C	8. A	9. B	10. A
11. D	12. A	13. B	14. A	15. B	16. B	17. D	18. D	19. D	20. 16
21. 5	22. 20	23. 4	24. 40	25. 11	26. 5	27. 101	28. 462	29. 375	

Chemistry

30. B	31. C	32. C	33. D	34. C	35. B	36. B	37. A	38. D	39. B
40. D	41. C	42. A	43. C	44. C	45. D	46. D	47. 4	48. 4	49. 4
50. 3	51. 3	52. 4	53. 5	54. 278	55. 49				

Mathematics

56. B	57. B	58. D	59. D	60. B	61. D	62. A	63. D	64. D	65. C
66. B	67. C	68. A	69. D	70. B	71. C	72. D	73. D	74. B	75. 18
76. 5	77. 5	78. 2	79. 0	80. 2	81. 432	82. 400	83. 25	84. 4	

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