

JEE MAIN 2022 · QUESTION PAPER

26 Jul 2022 **Shift 1**

84 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	18 Q1 to Q18	10 Q19 to Q28
● Chemistry	18 Q29 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.

prepwisar.in/pyqs/paper/2022-07-26-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? prepwisar.in/feedback · Terms: prepwisar.in/terms

Q1 Alternating Current

[Step-by-step solution](#) › [prepwiser.in/questions/wFdi_uy9CC](https://www.prepwiser.in/questions/wFdi_uy9CC)

In a series LR circuit $X_L = R$ and power factor of the circuit is P_1 . When capacitor with capacitance C such that $X_L = X_C$ is put in series, the power factor becomes P_2 . The ratio $\frac{P_1}{P_2}$ is:

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

Q2 Nuclear Physics

[Step-by-step solution](#) › [prepwiser.in/questions/abpjom7LwZ](https://www.prepwiser.in/questions/abpjom7LwZ)

The disintegration rate of a certain radioactive sample at any instant is 4250 disintegrations per minute. 10 minutes later, the rate becomes 2250 disintegrations per minute. The approximate decay constant is:

(Take $\log_{10} 1.88 = 0.274$)

- (A) 0.02 min^{-1} (B) 2.7 min^{-1} (C) 0.063 min^{-1} (D) 6.3 min^{-1}

Q3 Electrostatics II: Potential & Capacitance

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

The total charge on the system of capacitors $C_1 = 1\mu\text{F}$, $C_2 = 2\mu\text{F}$, $C_3 = 4\mu\text{F}$ and $C_4 = 3\mu\text{F}$ connected in parallel is:

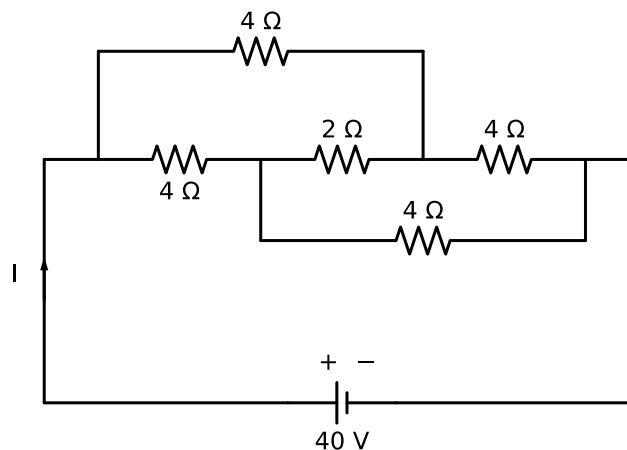
(Assume a battery of 20V is connected to the combination)

- (A) $200 \mu\text{C}$ (B) 200 C (C) $10 \mu\text{C}$ (D) 10 C

Q4 Current Electricity

[Step-by-step solution](#) › [prepwiser.in/questions/z8ScjJlq1Q](https://www.prepwiser.in/questions/z8ScjJlq1Q)

The current I in the given circuit will be:



- (A) 10 A (B) 20 A (C) 4 A (D) 40 A

Q5 Dual Nature of Radiation & Matter

[Step-by-step solution](#) › [prepwiser.in/questions/1mTnqqW6kO](https://www.prepwiser.in/questions/1mTnqqW6kO)

A parallel beam of light of wavelength 900nm and intensity 100 W m^{-2} is incident on a surface perpendicular to the beam. The number of photons crossing 1cm^2 area perpendicular to the beam in one second is:

- (A) 3×10^{16} (B) 4.5×10^{16} (C) 4.5×10^{17} (D) 4.5×10^{20}

Attempt this paper online with instant answer checking › [prepwiser.in/pyqs/paper/2022-07-26-morning](https://www.prepwiser.in/pyqs/paper/2022-07-26-morning)

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

The magnetic field of a plane electromagnetic wave is given by:

$$\vec{B} = 2 \times 10^{-8} \sin(0.5 \times 10^3 x + 1.5 \times 10^{11} t) \hat{j} \text{ T}$$

The amplitude of the electric field would be:

- (A) 6 Vm^{-1} along x -axis (B) 3 Vm^{-1} along z -axis
(C) 6 Vm^{-1} along z -axis (D) $2 \times 10^{-8} \text{ Vm}^{-1}$ along z -axis

Q7 Gravitation[Step-by-step solution > prepwiser.in/questions/9_7a51bhJ](https://www.prepwiser.in/questions/9_7a51bhJ)

The percentage decrease in the weight of a rocket, when taken to a height of 32km above the surface of earth will, be:

(Radius of earth = 6400km)

- (A) 1% (B) 3% (C) 4% (D) 0.5%

Q8 Thermodynamics[Step-by-step solution > prepwiser.in/questions/X02eIF9Z1t](https://www.prepwiser.in/questions/X02eIF9Z1t)

7 mol of a certain monoatomic ideal gas undergoes a temperature increase of 40K at constant pressure. The increase in the internal energy of the gas in this process is:

(Given $R = 8.3 \text{ JK}^{-1} \text{ mol}^{-1}$)

- (A) 5810 J (B) 3486 J (C) 11620 J (D) 6972 J

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

A monoatomic gas at pressure P and volume V is suddenly compressed to one eighth of its original volume. The final pressure at constant entropy will be:

- (A) P (B) $8P$ (C) $32P$ (D) $64P$

Q10 Newton's Laws of Motion[Step-by-step solution > prepwiser.in/questions/VdMnmGcNGf](https://www.prepwiser.in/questions/VdMnmGcNGf)

A monkey of mass 50kg climbs on a rope which can withstand the tension (T) of 350N. If monkey initially climbs down with an acceleration of 4 m/s^2 and then climbs up with an acceleration of 5 m/s^2 . Choose the correct option ($g = 10 \text{ m/s}^2$).

- (A) $T = 700 \text{ N}$ while climbing upward (B) $T = 350 \text{ N}$ while going downward
(C) Rope will break while climbing upward (D) Rope will break while going downward

Q11 Moving Charges & Magnetism[Step-by-step solution > prepwiser.in/questions/-05qmymPBQ](https://www.prepwiser.in/questions/-05qmymPBQ)

A charge particle is moving in a uniform magnetic field $(2\hat{i} + 3\hat{j}) \text{ T}$. If it has an acceleration of $(\alpha\hat{i} - 4\hat{j}) \text{ m/s}^2$, then the value of α will be:

- (A) 3 (B) 6 (C) 12 (D) 2

Q12 Moving Charges & Magnetism[Step-by-step solution > prepwiser.in/questions/gD25u3ahXC](https://www.prepwiser.in/questions/gD25u3ahXC)

B_X and B_Y are the magnetic fields at the centre of two coils X and Y respectively each carrying equal current. If coil X has 200 turns and 20cm radius and coil Y has 400 turns and 20cm radius, the ratio of B_X and B_Y is:

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

Two projectiles thrown at 30° and 45° with the horizontal respectively, reach the maximum height in same time. The ratio of their initial velocities is:

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

A water drop of radius 1cm is broken into 729 equal droplets. If surface tension of water is 75 dyne/cm, then the gain in surface energy upto first decimal place will be:

(Given $\pi = 3.14$)

- (A) $8.5 \times 10^{-4} \text{J}$ (B) $8.2 \times 10^{-4} \text{J}$ (C) $7.5 \times 10^{-4} \text{J}$ (D) $5.3 \times 10^{-4} \text{J}$

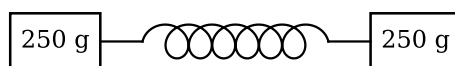
When a particle executes Simple Harmonic Motion, the nature of graph of velocity as a function of displacement will be:

- (A) Circular (B) Elliptical (C) Sinusoidal (D) Straight line

In Young's double slit experiment, the fringe width is 12mm. If the entire arrangement is placed in water of refractive index $\frac{4}{3}$, then the fringe width becomes (in mm):

- (A) 16 (B) 9 (C) 48 (D) 12

As per the given figure, two blocks each of mass 250g are connected to a spring of spring constant 2 Nm^{-1} . If both are given velocity v in opposite directions, then maximum elongation of the spring is:



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

A screw gauge of pitch 0.5mm is used to measure the diameter of uniform wire of length 6.8cm, the main scale reading is 1.5mm and circular scale reading is 7. The calculated curved surface area of wire to appropriate significant figures is:

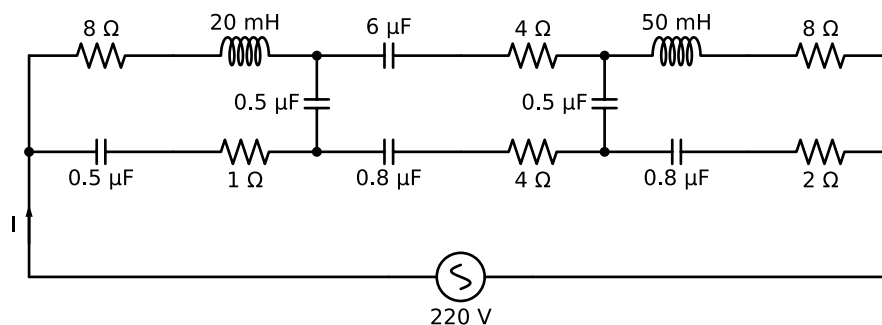
[Screw gauge has 50 divisions on its circular scale]

- (A) 6.8 cm^2 (B) 3.4 cm^2 (C) 3.9 cm^2 (D) 2.4 cm^2

Q19 Alternating Current **NUMERICAL**

[Step-by-step solution](#) > prepwisar.in/questions/Yb2CRNwEZ2

The effective current I in the given circuit at very high frequencies will be _____ A.



Q20 Atomic Physics **NUMERICAL**

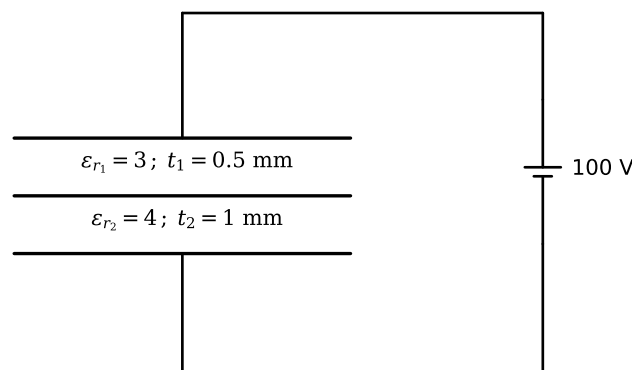
[Step-by-step solution](#) > prepwisar.in/questions/Wasfxj-v2-

In the hydrogen spectrum, λ be the wavelength of first transition line of Lyman series. The wavelength difference will be " $a\lambda$ " between the wavelength of 3rd transition line of Paschen series and that of 2nd transition line of Balmer series where $a =$ _____.

Q21 Electrostatics II: Potential & Capacitance **NUMERICAL**

[Step-by-step solution](#) > prepwisar.in/questions/ntw9XFZcSi

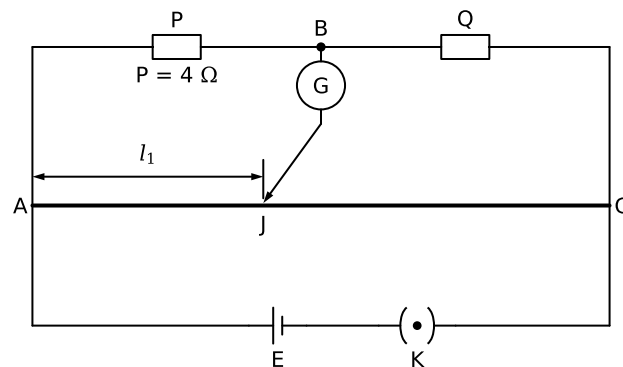
A composite parallel plate capacitor is made up of two different dielectric materials with different thickness (t_1 and t_2) as shown in figure. The two different dielectric materials are separated by a conducting foil F. The voltage of the conducting foil is V.



Q22 Current Electricity **NUMERICAL**

[Step-by-step solution](#) > prepwisar.in/questions/JBNwyLLlec

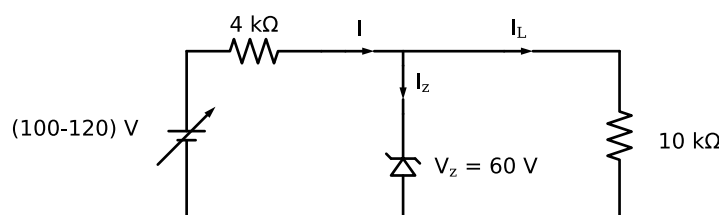
Resistances are connected in a meter bridge circuit as shown in the figure. The balancing length l_1 is 40cm. Now an unknown resistance x is connected in series with P and new balancing length is found to be 80cm measured from the same end. Then the value of x will be _____ Ω.



Q23 Semiconductors & Electronic Devices **NUMERICAL**

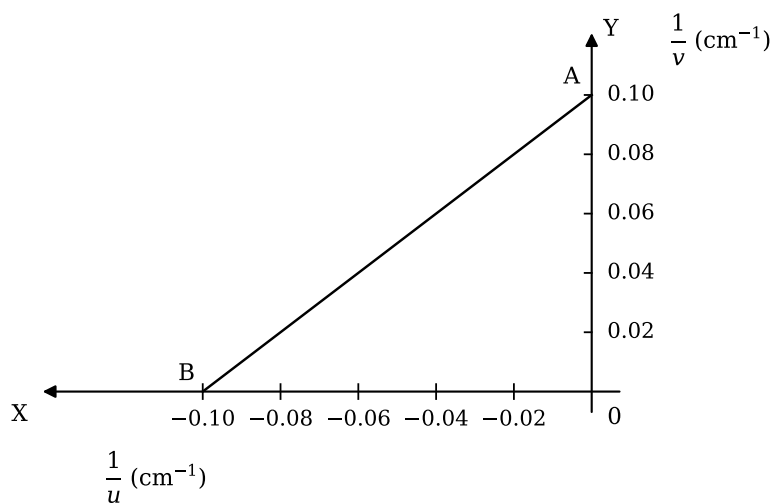
[Step-by-step solution](#) > prepwisar.in/questions/Us202mx-Fc

In the circuit shown below, maximum zener diode current will be _____ mA.



Q24 Ray Optics **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/ONkaEeXOkU

The graph between $\frac{1}{u}$ and $\frac{1}{v}$ for a thin convex lens in order to determine its focal length is plotted as shown in the figure. The refractive index of lens is 1.5 and its both the surfaces have same radius of curvature R . The value of R will be _____ cm. (where u = object distance, v = image distance)

**Q25** Projectile Motion & Relative Motion **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/ya8K7m_Gdc

If the initial velocity in horizontal direction of a projectile is unit vector $\hat{i}$ and the equation of trajectory is $y = 5x(1 - x)$. The y component vector of the initial velocity is _____ $\hat{j}$. (Take $g = 10\text{m/s}^2$)

Q26 Units, Dimensions & Errors **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/0zQ4bKhptu

In an experiment to determine the Young's modulus of wire of a length exactly 1m, the extension in the length of the wire is measured as 0.4mm with an uncertainty of $\pm 0.02\text{mm}$ when a load of 1kg is applied. The diameter of the wire is measured as 0.4mm with an uncertainty of $\pm 0.01\text{mm}$. The error in the measurement of Young's modulus (ΔY) is found to be $x \times 10^{10} \text{Nm}^{-2}$. The value of x is _____. (take $g = 10\text{ms}^{-2}$)

Q27 Rotational Motion **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/hBTnPAR_AY

A disc of mass 1kg and radius R is free to rotate about a horizontal axis passing through its centre and perpendicular to the plane of disc. A body of same mass as that of disc is fixed at the highest point of the disc. Now the system is released, when the body comes to the lowest position, its angular speed will be $4\sqrt{\frac{x}{3R}} \text{rad s}^{-1}$ where $x = \text{_____}$. ($g = 10\text{ms}^{-2}$)

Q28 Sound Waves **NUMERICAL**[Step-by-step solution](#) > prepwiser.in/questions/mjoxXfbChj

When a car is approaching the observer, the frequency of horn is 100Hz. After passing the observer, it is 50Hz. If the observer moves with the car, the frequency will be $\frac{x}{3}\text{Hz}$ where $x = \text{_____}$.

Chemistry Section A · Multiple choice

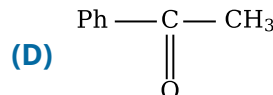
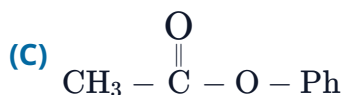
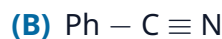
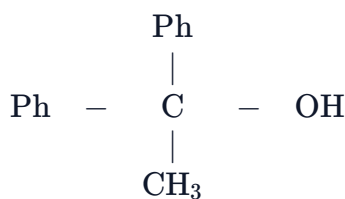
Q29 to Q46

Q29 Alcohols, Phenols & Ethers[Step-by-step solution](#) > prepwiser.in/questions/ySts_G91Mz

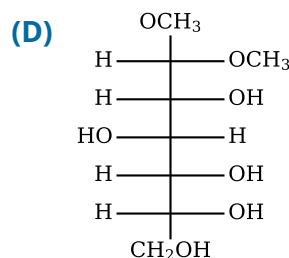
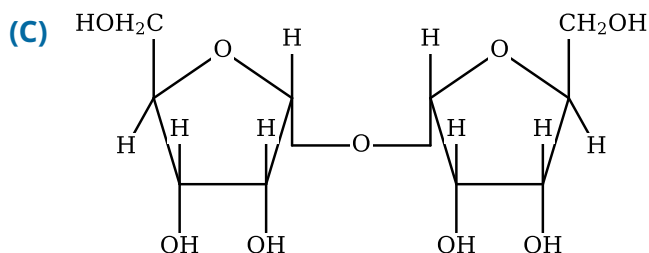
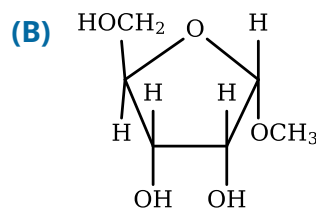
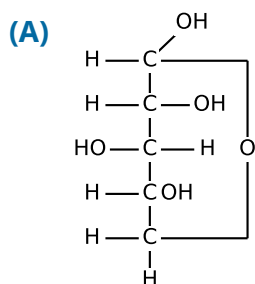
The difference in the reaction of phenol with bromine in chloroform and bromine in water medium is due to:

- | | |
|-----------------------------------|---------------------------------------|
| (A) Hyperconjugation in substrate | (B) Polarity of solvent |
| (C) Free radical formation | (D) Electromeric effect the substrate |

Which reactant will give the following alcohol on reaction with one mole of phenyl magnesium bromide (PhMgBr) followed by acidic hydrolysis?



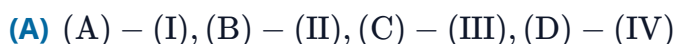
Which one of the following is a reducing sugar?



Match List-I with List-II:

	List I (Compound)		List II (Shape)
(A)	BrF_5	(I)	bent
(B)	$[\text{CrF}_6]^{3-}$	(II)	square pyramidal
(C)	O_3	(III)	trigonal bipyramidal
(D)	PCl_5	(IV)	octahedral

Choose the correct answer from the options given below:



Stearic acid and polyethylene glycol react to form which one of the following soap/s detergents?



The dark purple colour of KMnO_4 disappears in the titration with oxalic acid in acidic medium. The overall change in the oxidation number of manganese in the reaction is:

- (A) 5 (B) 1 (C) 7 (D) 2



A and B in the above atmospheric reaction step are:

- (A) C_2H_6 and Cl_2 (B) $\cdot\text{C}$ HCl_2 and H_2 (C) $\cdot\text{C}$ H_3 and HCl (D) C_2H_6 and HCl

Which of the following can be used to prevent the decomposition of H_2O_2 ?

- (A) Urea (B) Formaldehyde (C) Formic acid (D) Ethanol

Refining using liquation method is the most suitable for metals with:

- (A) Low melting point
(B) High boiling point
(C) High electrical conductivity
(D) Less tendency to be soluble in melts than impurities

Match List - I with List - II.

	List I (Processes / Reactions)		List II (Catalyst)
(A)	$2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$	(I)	$\text{Fe}(\text{s})$
(B)	$4\text{NH}_3(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{g})$	(II)	$\text{Pt}(\text{s}) - \text{Rh}(\text{s})$
(C)	$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$	(III)	V_2O_5
(D)	$\text{Vegetable oil}(\text{l}) + \text{H}_2 \rightarrow \text{Vegetable ghee}(\text{s})$	(IV)	$\text{Ni}(\text{s})$

Choose the correct answer from the options given below:

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

Borazine, also known as inorganic benzene, can be prepared by the reaction of 3-equivalents of "X" with 6-equivalents of "Y". "X" and "Y", respectively are:

- (A) $\text{B}(\text{OH})_3$ and NH_3 (B) B_2H_6 and NH_3 (C) B_2H_6 and HN_3 (D) NH_3 and B_2O_3

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Given two statements below:

Statement I : In Cl_2 molecule the covalent radius is double of the atomic radius of chlorine.

Statement II : Radius of anionic species is always greater than their parent atomic radius.

Choose the most appropriate answer from options given below:

- (A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

Which of the given reactions is not an example of disproportionation reaction?

- (A) $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$
(B) $2\text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{HNO}_3 + \text{HNO}_2$
(C) $\text{MnO}_4^- + 4\text{H}^+ + 3\text{e}^- \rightarrow \text{MnO}_2 + 2\text{H}_2\text{O}$
(D) $3\text{MnO}_4^{2-} + 4\text{H}^+ \rightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$

Reaction of BeCl_2 with LiAlH_4 gives:

- (A) AlCl_3
(B) BeH_2
(C) LiH
(D) LiCl
(E) BeAlH_4

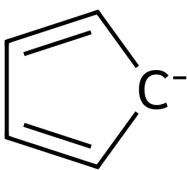
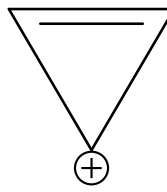
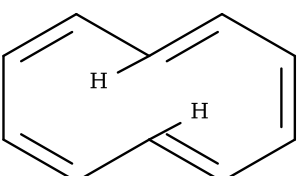
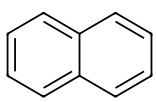
Choose the correct answer from options given below:

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

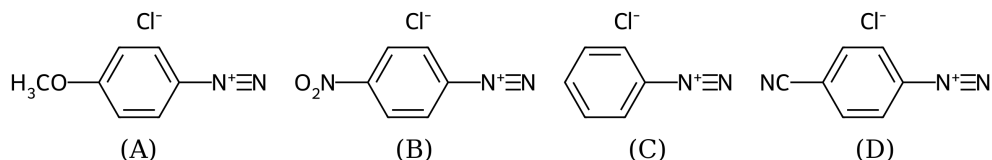
Which technique among the following, is most appropriate in separation of a mixture of 100 mg of *p*-nitrophenol and picric acid?

- (A) Steam distillation (B) 2-5 ft long column of silica gel
(C) Sublimation (D) Preparative TLC (Thin Layer Chromatography)

Which of the following compounds is not aromatic?

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

The correct stability order of the following diazonium salt is



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

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

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

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

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

Assertion (A) : Experimental reaction of CH_3Cl with aniline and anhydrous AlCl_3 does not give *o* and *p* -methylaniline.

Reason (R): The $-\text{NH}_2$ group of aniline becomes deactivating because of salt formation with anhydrous AlCl_3 and hence yields *m*-methyl aniline as the product.

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

(A) Both A and R are true and (R) is the correct explanation of (A).

(B) Both A and R are true but (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

Chemistry Section B · Numerical value

Q47 to Q55

For a reaction $\text{A} \rightarrow 2\text{B} + \text{C}$ the half lives are 100s and 50s when the concentration of reactant A is 0.5 and 1.0molL^{-1} respectively. The order of the reaction is _____. (Nearest Integer)

The difference between spin only magnetic moment values of



and



is _____.

The amount of charge in F (Faraday) required to obtain one mole of iron from Fe_3O_4 is _____. (Nearest Integer)

In the presence of sunlight, benzene reacts with Cl_2 to give product, X. The number of hydrogens in X is _____.

Chlorophyll extracted from the crushed green leaves was dissolved in water to make 2L solution of Mg of concentration 48 ppm. The number of atoms of Mg in this solution is $x \times 10^{20}$ atoms. The value of x is _____. (Nearest Integer)

(Given : Atomic mass of Mg is

$$24\text{g mol}^{-1}; N_A = 6.02 \times 10^{23}\text{mol}^{-1}$$

)

When 800 mL of 0.5 M nitric acid is heated in a beaker, its volume is reduced to half and 11.5 g of nitric acid is evaporated. The molarity of the remaining nitric acid solution is $x \times 10^{-2}$ M. (Nearest integer)

(Molar mass of nitric acid is 63 g mol^{-1})

The wavelength of an electron and a neutron will become equal when the velocity of the electron is x times the velocity of neutron. The value of x is _____. (Nearest Integer)

(Mass of electron is $9.1 \times 10^{-31}\text{kg}$ and mass of neutron is $1.6 \times 10^{-27}\text{kg}$)

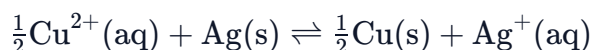
2.4g coal is burnt in a bomb calorimeter in excess of oxygen at 298K and 1atm pressure. The temperature of the calorimeter rises from 298K to 300K. The enthalpy change during the combustion of coal is $-x\text{kJ mol}^{-1}$. The value of x is _____. (Nearest Integer)

(Given : Heat capacity of bomb calorimeter 20.0kJ K^{-1} . Assume coal to be pure carbon)

At 298K, the equilibrium constant is 2×10^{15} for the reaction:



The equilibrium constant for the reaction



is $x \times 10^{-8}$. The value of x is _____. (Nearest Integer)

Mathematics Section A · Multiple choice

Q56 to Q74

The length of the perpendicular from the point $(1, -2, 5)$ on the line passing through $(1, 2, 4)$ and parallel to the line $x + y - z = 0 = x - 2y + 3z - 5$ is:

(A) $\sqrt{\frac{21}{2}}$

(B) $\sqrt{\frac{9}{2}}$

(C) $\sqrt{\frac{73}{2}}$

(D) 1

Let O be the origin and A be the point $z_1 = 1 + 2i$. If B is the point z_2 , $\text{Re}(z_2) < 0$, such that OAB is a right angled isosceles triangle with OB as hypotenuse, then which of the following is NOT true?

(A) $\arg z_2 = \pi - \tan^{-1}3$

(B) $\arg(z_1 - 2z_2) = -\tan^{-1}\frac{4}{3}$

(C) $|z_2| = \sqrt{10}$

(D) $|2z_1 - z_2| = 5$

If

$$a = \lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{2n}{n^2 + k^2}$$

and $f(x) = \sqrt{\frac{1-\cos x}{1+\cos x}}$, $x \in (0, 1)$, then:

- (A) $2\sqrt{2}f\left(\frac{a}{2}\right) = f'\left(\frac{a}{2}\right)$ (B) $f\left(\frac{a}{2}\right)f'\left(\frac{a}{2}\right) = \sqrt{2}$ (C) $\sqrt{2}f\left(\frac{a}{2}\right) = f'\left(\frac{a}{2}\right)$ (D) $f\left(\frac{a}{2}\right) = \sqrt{2}f'\left(\frac{a}{2}\right)$

If $\frac{dy}{dx} + 2y \tan x = \sin x$, $0 < x < \frac{\pi}{2}$ and $y\left(\frac{\pi}{3}\right) = 0$, then the maximum value of $y(x)$ is:

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

Let the tangent drawn to the parabola $y^2 = 24x$ at the point (α, β) is perpendicular to the line $2x + 2y = 5$. Then the normal to the hyperbola $\frac{x^2}{\alpha^2} - \frac{y^2}{\beta^2} = 1$ at the point $(\alpha + 4, \beta + 4)$ does NOT pass through the point:

- (A) (25, 10) (B) (20, 12) (C) (30, 8) (D) (15, 13)

$$\tan \left(2 \tan^{-1} \frac{1}{5} + \sec^{-1} \frac{\sqrt{5}}{2} + 2 \tan^{-1} \frac{1}{8} \right)$$

is equal to:

- (A) 1 (B) 2 (C) $\frac{1}{4}$ (D) $\frac{5}{4}$

Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function such that $f(3x) - f(x) = x$. If $f(8) = 7$, then $f(14)$ is equal to:

- (A) 4 (B) 10 (C) 11 (D) 16

If the function

$$f(x) = \begin{cases} \frac{\log_e(1-x+x^2) + \log_e(1+x+x^2)}{k \sec x - \cos x} & , \quad x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) - \{0\} \\ & , \quad x = 0 \end{cases}$$

is continuous at $x = 0$, then k is equal to:

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

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If

$$f(x) = \begin{cases} x + a & , \quad x \leq 0 \\ |x - 4| & , \quad x > 0 \end{cases}$$

and

$$g(x) = \begin{cases} x + 1 & , \quad x < 0 \\ (x - 4)^2 + b & , \quad x \geq 0 \end{cases}$$

are continuous on $\mathbb{R}$, then $(g \circ f)(2) + (f \circ g)(-2)$ is equal to:

(A) -10

(B) 10

(C) 8

(D) -8

Let

$$f(x) = \begin{cases} x^3 - x^2 + 10x - 7, & x \leq 1 \\ -2x + \log_2(b^2 - 4), & x > 1 \end{cases}$$

Then the set of all values of b , for which $f(x)$ has maximum value at $x = 1$, is:(A) $(-6, -2)$ (B) $(2, 6)$ (C) $[-6, -2) \cup (2, 6]$ (D) $[-\sqrt{6}, -2) \cup (2, \sqrt{6}]$

If the system of linear equations.

$$8x + y + 4z = -2$$

$$x + y + z = 0$$

$$\lambda x - 3y = \mu$$

has infinitely many solutions, then the distance of the point $(\lambda, \mu, -\frac{1}{2})$ from the plane $8x + y + 4z + 2 = 0$ is:(A) $3\sqrt{5}$

(B) 4

(C) $\frac{26}{9}$ (D) $\frac{10}{3}$ Let A be a 2×2 matrix with $\det(A) = -1$ and $\det((A + I)(\text{Adj}(A) + I)) = 4$. Then the sum of the diagonal elements of A can be:

(A) -1

(B) 2

(C) 1

(D) $-\sqrt{2}$ The mean and variance of a binomial distribution are α and $\frac{\alpha}{3}$ respectively. If $P(X = 1) = \frac{4}{243}$, then $P(X = 4 \text{ or } 5)$ is equal to:(A) $\frac{5}{9}$ (B) $\frac{64}{81}$ (C) $\frac{16}{27}$ (D) $\frac{145}{243}$ Attempt this paper online with instant answer checking › prepwiser.in/pyqs/paper/2022-07-26-morning

Q69 Probability: Basic[Step-by-step solution](https://www.prepwisar.in/questions/dxnVRDGZzk)

Let E_1, E_2, E_3 be three mutually exclusive events such that

$$P(E_1) = \frac{2+3p}{6}, P(E_2) = \frac{2-p}{8}$$

and $P(E_3) = \frac{1-p}{2}$. If the maximum and minimum values of p are p_1 and p_2 , then $(p_1 + p_2)$ is equal to:

- (A) $\frac{2}{3}$ (B) $\frac{5}{3}$ (C) $\frac{5}{4}$ (D) 1

Q70 Sequences & Series[Step-by-step solution](https://www.prepwisar.in/questions/0judO-XHTT)

Consider two G.Ps. $2, 2^2, 2^3, \dots$ and $4, 4^2, 4^3, \dots$ of 60 and n terms respectively. If the geometric mean of all the $60 + n$ terms is $(2)^{\frac{225}{8}}$, then $\sum_{k=1}^n k(n-k)$ is equal to:

- (A) 560 (B) 1540 (C) 1330 (D) 2600

Q71 Trigonometric Equations[Step-by-step solution](https://www.prepwisar.in/questions/EhcMnblAm5)

Let

$$S = \left\{ \theta \in [0, 2\pi] : 8^{2\sin^2 \theta} + 8^{2\cos^2 \theta} = 16 \right\}.$$

Then

$$n(s) + \sum_{\theta \in S} \left(\sec \left(\frac{\pi}{4} + 2\theta \right) \operatorname{cosec} \left(\frac{\pi}{4} + 2\theta \right) \right)$$

is equal to:

- (A) 0 (B) -2 (C) -4 (D) 12

Q72 Vectors[Step-by-step solution](https://www.prepwisar.in/questions/qOnC1cbHVK)

Let $\vec{a} = \alpha \hat{i} + \hat{j} - \hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} - \alpha \hat{k}$, $\alpha > 0$. If the projection of $\vec{a} \times \vec{b}$ on the vector $-\hat{i} + 2\hat{j} - 2\hat{k}$ is 30, then α is equal to:

- (A) $\frac{15}{2}$ (B) 8 (C) $\frac{13}{2}$ (D) 7

Q73 Area Under Curves[Step-by-step solution](https://www.prepwisar.in/questions/KM7bkFF_6Z)

The odd natural number a , such that the area of the region bounded by $y = 1$, $y = 3$, $x = 0$, $x = y^a$ is $\frac{364}{3}$, is equal to:

- (A) 3 (B) 5 (C) 7 (D) 9

Q74 Straight Lines[Step-by-step solution](https://www.prepwisar.in/questions/MxzdjMBr_b)

A point P moves so that the sum of squares of its distances from the points $(1, 2)$ and $(-2, 1)$ is 14.

Let $f(x, y) = 0$ be the locus of P , which intersects the x -axis at the points A, B and the y -axis at the points C, D . Then the area of the quadrilateral $ACBD$ is equal to:

- (A) $\frac{9}{2}$ (B) $\frac{3\sqrt{17}}{2}$ (C) $\frac{3\sqrt{17}}{4}$ (D) 9

Q75 Three Dimensional Geometry **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/pH54_PyZck](https://www.prepwisar.in/questions/pH54_PyZck)

Let Q and R be two points on the line $\frac{x+1}{2} = \frac{y+2}{3} = \frac{z-1}{2}$ at a distance $\sqrt{26}$ from the point $P(4, 2, 7)$. Then the square of the area of the triangle PQR is _____.

Q76 Parabola **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/vwI2Fe-IY-](https://www.prepwisar.in/questions/vwI2Fe-IY-)

Let the function $f(x) = 2x^2 - \log_e x, x > 0$, be decreasing in $(0, a)$ and increasing in $(a, 4)$. A tangent to the parabola $y^2 = 4ax$ at a point P on it passes through the point $(8a, 8a - 1)$ but does not pass through the point $(-\frac{1}{a}, 0)$. If the equation of the normal at P is: $\frac{x}{\alpha} + \frac{y}{\beta} = 1$, then $\alpha + \beta$ is equal to _____.

Q77 Binomial Theorem **NUMERICAL**

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

If the coefficients of x and x^2 in the expansion of $(1+x)^p(1-x)^q, p, q \leq 15$, are -3 and -5 respectively, then the coefficient of x^3 is equal to _____.

Q78 Definite Integration **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/ongoSAYTK1](https://www.prepwisar.in/questions/ongoSAYTK1)

If
$$n(2n+1) \int_0^1 (1-x^n)^{2n} dx = 1177 \int_0^1 (1-x^n)^{2n+1} dx$$
, then $n \in \mathbf{N}$ is equal to _____.

Q79 Differential Equations **NUMERICAL**

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

Let a curve $y = y(x)$ pass through the point $(3, 3)$ and the area of the region under this curve, above the x -axis and between the abscissae 3 and $x(> 3)$ be $(\frac{y}{x})^3$. If this curve also passes through the point $(\alpha, 6\sqrt{10})$ in the first quadrant, then α is equal to _____.

Q80 Permutations & Combinations **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/pQHDE6uVWX](https://www.prepwisar.in/questions/pQHDE6uVWX)

The number of 5-digit natural numbers, such that the product of their digits is 36, is _____.

Q81 Quadratic Equations & Polynomial Inequalities **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/aWX3Uux3D1](https://www.prepwisar.in/questions/aWX3Uux3D1)

If for some $p, q, r \in \mathbf{R}$, not all have same sign, one of the roots of the equation

$$(p^2 + q^2)x^2 - 2q(p+r)x + q^2 + r^2 = 0$$

is also a root of the equation $x^2 + 2x - 8 = 0$, then $\frac{q^2+r^2}{p^2}$ is equal to _____.

Q82 Quadratic Equations & Polynomial Inequalities **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/KW2T3UvHY5](https://www.prepwisar.in/questions/KW2T3UvHY5)

The number of distinct real roots of the equation $x^5(x^3 - x^2 - x + 1) + x(3x^3 - 4x^2 - 2x + 4) - 1 = 0$ is _____.

Q83 Sequences & Series **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/H7rmS12r2M](https://www.prepwisar.in/questions/H7rmS12r2M)

The series of positive multiples of 3 is divided into sets: $\{3\}, \{6, 9, 12\}, \{15, 18, 21, 24, 27\}, \dots$. Then the sum of the elements in the 11^{th} set is equal to _____.

Q84 Straight Lines **NUMERICAL**

[Step-by-step solution](#) › [prepwisar.in/questions/SIbW4pgCzh](https://www.prepwisar.in/questions/SIbW4pgCzh)

The equations of the sides AB, BC and CA of a triangle ABC are $2x + y = 0, x + py = 15a$ and $x - y = 3$ respectively. If its orthocentre is $(2, a), -\frac{1}{2} < a < 2$, then p is equal to _____.

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Physics

1. B	2. C	3. A	4. A	5. B	6. C	7. A	8. B
9. C	10. C	11. B	12. B	13. C	14. C	15. B	16. B
17. B	18. B	19. 44	20. 5	21. 60	22. 20	23. 9	24. 10
25. 5	26. 2	27. 5	28. 200				

Chemistry

29. B	30. D	31. A	32. C	33. D	34. A	35. C	36. A
37. A	38. B	39. B	40. D	41. C	42. B	43. D	44. C
45. B	46. C	47. 2	48. 0	49. 3	50. 6	51. 24	52. 54
53. 1758	54. 200	55. 2					

Mathematics

56. A	57. D	58. C	59. A	60. D	61. B	62. B	63. A
64. D	65. C	66. D	67. B	68. C	69. B	70. C	71. C
72. D	73. B	74. B	75. 153	76. 45	77. 23	78. 24	79. 6
80. 180	81. 272	82. 3	83. 6993	84. 3			

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