

JEE MAIN 2022 · QUESTION PAPER

27 Jun 2022 Shift 1

82 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	19 Q1 to Q19	9 Q20 to Q28
● Chemistry	17 Q29 to Q45	9 Q46 to Q54
● Mathematics	18 Q55 to Q72	10 Q73 to Q82
In this PDF	82 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.

prepwisser.in/pyqs/paper/2022-06-27-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? prepwisser.in/feedback · Terms: prepwisser.in/terms

Q1 Alternating Current

[Step-by-step solution](#) > [prepwisar.in/questions/VTi2qV6Jks](https://www.prepwisar.in/questions/VTi2qV6Jks)

The current flowing through an ac circuit is given by

$$I = 5 \sin(120\pi t) \text{ A}$$

How long will the current take to reach the peak value starting from zero?

- (A) $\frac{1}{60}$ s (B) 60 s (C) $\frac{1}{120}$ s (D) $\frac{1}{240}$ s

Q2 Atomic Physics

[Step-by-step solution](#) > [prepwisar.in/questions/c5FGTMqRCX](https://www.prepwisar.in/questions/c5FGTMqRCX)

A hydrogen atom in its ground state absorbs 10.2 eV of energy. The angular momentum of electron of the hydrogen atom will increase by the value of:

(Given, Planck's constant = 6.6×10^{-34} Js).

- (A) 2.10×10^{-34} Js (B) 1.05×10^{-34} Js (C) 3.15×10^{-34} Js (D) 4.2×10^{-34} Js

Q3 Electrostatics II: Potential & Capacitance

[Step-by-step solution](#) > [prepwisar.in/questions/7rbYc3Bm7p](https://www.prepwisar.in/questions/7rbYc3Bm7p)

A force of 10 N acts on a charged particle placed between two plates of a charged capacitor. If one plate of capacitor is removed, then the force acting on that particle will be.

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

Q4 Centre of Mass & Linear Momentum

[Step-by-step solution](#) > [prepwisar.in/questions/3k9HTJY22q](https://www.prepwisar.in/questions/3k9HTJY22q)

Two blocks of masses 10 kg and 30 kg are placed on the same straight line with coordinates (0, 0) cm and (x, 0) cm respectively. The block of 10 kg is moved on the same line through a distance of 6 cm towards the other block. The distance through which the block of 30 kg must be moved to keep the position of centre of mass of the system unchanged is:

- (A) 4 cm towards the 10 kg block (B) 2 cm away from the 10 kg block
(C) 2 cm towards the 10 kg block (D) 4 cm away from the 10 kg block

Q5 Collision

[Step-by-step solution](#) > [prepwisar.in/questions/9yon4frGrv](https://www.prepwisar.in/questions/9yon4frGrv)

What percentage of kinetic energy of a moving particle is transferred to a stationary particle when it strikes the stationary particle of 5 times its mass?

(Assume the collision to be head-on elastic collision)

- (A) 50.0% (B) 66.6% (C) 55.6% (D) 33.3%

Q6 Moving Charges & Magnetism

[Step-by-step solution](#) > [prepwisar.in/questions/TihcjlDD_7](https://www.prepwisar.in/questions/TihcjlDD_7)

A 72Ω galvanometer is shunted by a resistance of 8Ω . The percentage of the total current which passes through the galvanometer is:

- (A) 0.1% (B) 10% (C) 25% (D) 0.25%

Q7 Dual Nature of Radiation & Matter

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

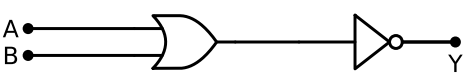
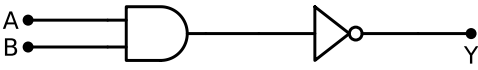
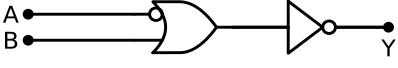
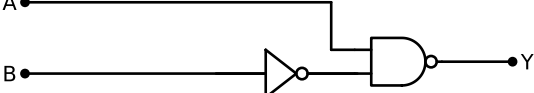
An α particle and a carbon 12 atom has same kinetic energy K. The ratio of their de-Broglie wavelengths ($\lambda_\alpha : \lambda_{C12}$) is:

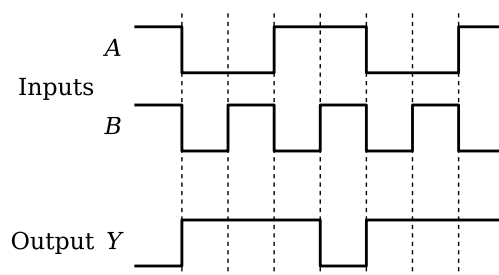
- (A) $1 : \sqrt{3}$ (B) $\sqrt{3} : 1$ (C) $3 : 1$ (D) $2 : \sqrt{3}$

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Q8 Semiconductors & Electronic Devices[Step-by-step solution > prepwisar.in/questions/PMKIPREWtj](https://www.prepwisar.in/questions/PMKIPREWtj)

Identify the correct Logic Gate for the following output (Y) of two inputs A and B.

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

**Q9** Ray Optics[Step-by-step solution > prepwisar.in/questions/uB3u3ttVBU](https://www.prepwisar.in/questions/uB3u3ttVBU)

Consider a light ray travelling in air is incident into a medium of refractive index $\sqrt{2n}$. The incident angle is twice that of refracting angle. Then, the angle of incidence will be:

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

Q10 Gravitation[Step-by-step solution > prepwisar.in/questions/qkjfOA-MTa](https://www.prepwisar.in/questions/qkjfOA-MTa)

Given below are two statements:

Statement I : The law of gravitation holds good for any pair of bodies in the universe.

Statement II : The weight of any person becomes zero when the person is at the centre of the earth.

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) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false (D) Statement I is false but Statement II is true

Q11 Kinetic Theory of Gases[Step-by-step solution > prepwisar.in/questions/U6EsEWY44g](https://www.prepwisar.in/questions/U6EsEWY44g)

A mixture of hydrogen and oxygen has volume 2000 cm^3 , temperature 300 K , pressure 100 kPa and mass 0.76 g . The ratio of number of moles of hydrogen to number of moles of oxygen in the mixture will be:

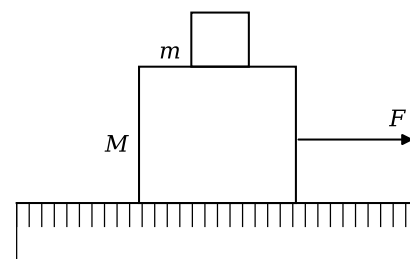
[Take gas constant $R = 8.3 \text{ JK}^{-1}\text{mol}^{-1}$]

- (A) $\frac{1}{3}$ (B) $\frac{3}{1}$ (C) $\frac{1}{16}$ (D) $\frac{16}{1}$

Q12 Friction[Step-by-step solution > prepwisar.in/questions/wD_2k90D3I](https://www.prepwisar.in/questions/wD_2k90D3I)

A system of two blocks of masses $m = 2 \text{ kg}$ and $M = 8 \text{ kg}$ is placed on a smooth table as shown in figure. The coefficient of static friction between two blocks is 0.5 . The maximum horizontal force F that can be applied to the block of mass M so that the blocks move together will be:

- (A) 9.8 N (B) 39.2 N (C) 49 N (D) 78.4 N



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Q13 Magnetism & Matter[Step-by-step solution](#) > [prepwisar.in/questions/O0tdpRrt1](https://www.prepwisar.in/questions/O0tdpRrt1)

The susceptibility of a paramagnetic material is 99. The permeability of the material in Wb/A-m, is:
[Permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ Wb/A-m]

- (A) $4\pi \times 10^{-7}$ (B) $4\pi \times 10^{-4}$ (C) $4\pi \times 10^{-5}$ (D) $4\pi \times 10^{-6}$

Q14 Projectile Motion & Relative Motion[Step-by-step solution](#) > [prepwisar.in/questions/z3L3EswCx9](https://www.prepwisar.in/questions/z3L3EswCx9)

A projectile is launched at an angle ' α ' with the horizontal with a velocity 20 ms^{-1} . After 10 s, its inclination with horizontal is ' β '. The value of $\tan\beta$ will be : ($g = 10 \text{ ms}^{-2}$).

- (A) $\tan\alpha + 5\sec\alpha$ (B) $\tan\alpha - 5\sec\alpha$ (C) $2\tan\alpha - 5\sec\alpha$ (D) $2\tan\alpha + 5\sec\alpha$

Q15 Projectile Motion & Relative Motion[Step-by-step solution](#) > [prepwisar.in/questions/4zyIYP8Sq4](https://www.prepwisar.in/questions/4zyIYP8Sq4)

A girl standing on road holds her umbrella at 45° with the vertical to keep the rain away. If she starts running without umbrella with a speed of $15\sqrt{2} \text{ kmh}^{-1}$, the rain drops hit her head vertically. The speed of rain drops with respect to the moving girl is:

- (A) 30 kmh^{-1} (B) $\frac{25}{\sqrt{2}} \text{ kmh}^{-1}$ (C) $\frac{30}{\sqrt{2}} \text{ kmh}^{-1}$ (D) 25 kmh^{-1}

Q16 Fluid Mechanics[Step-by-step solution](#) > [prepwisar.in/questions/9lIO-SXtvl](https://www.prepwisar.in/questions/9lIO-SXtvl)

The velocity of a small ball of mass ' m ' and density d_1 , when dropped in a container filled with glycerin, becomes constant after some time. If the density of glycerin is d_2 , then the viscous force acting on the ball, will be:

- (A) $mg \left(1 - \frac{d_1}{d_2}\right)$ (B) $mg \left(1 - \frac{d_2}{d_1}\right)$ (C) $mg \left(\frac{d_1}{d_2} - 1\right)$ (D) $mg \left(\frac{d_2}{d_1} - 1\right)$

Q17 Simple Harmonic Motion[Step-by-step solution](#) > [prepwisar.in/questions/uWf5RuxlIq](https://www.prepwisar.in/questions/uWf5RuxlIq)

The displacement of simple harmonic oscillator after 3 seconds starting from its mean position is equal to half of its amplitude. The time period of harmonic motion is:

- (A) 6 s (B) 8 s (C) 12 s (D) 36 s

Q18 Sound Waves[Step-by-step solution](#) > [prepwisar.in/questions/q0ZGI3eAxp](https://www.prepwisar.in/questions/q0ZGI3eAxp)

An observer moves towards a stationary source of sound with a velocity equal to one-fifth of the velocity of sound. The percentage change in the frequency will be:

- (A) 20% (B) 10% (C) 5% (D) 0%

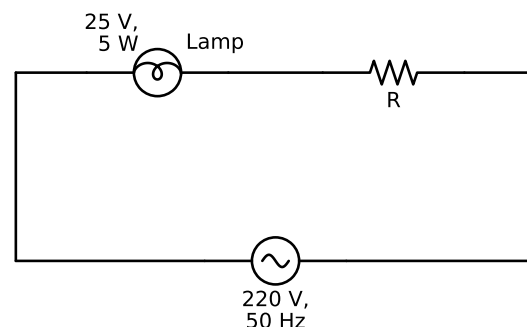
Q19 Units, Dimensions & Errors[Step-by-step solution](#) > [prepwisar.in/questions/LkjxB1mNO](https://www.prepwisar.in/questions/LkjxB1mNO)

A silver wire has a mass $(0.6 \pm 0.006) \text{ g}$, radius $(0.5 \pm 0.005) \text{ mm}$ and length $(4 \pm 0.04) \text{ cm}$. The maximum percentage error in the measurement of its density will be:

- (A) 4% (B) 3% (C) 6% (D) 7%

Q20 Alternating Current **NUMERICAL**
[Step-by-step solution](https://www.prepwiser.in/questions/r_Dz_Hevs0)

A 220 V, 50 Hz AC source is connected to a 25 V, 5 W lamp and an additional resistance R in series (as shown in figure) to run the lamp at its peak brightness, then the value of R (in ohm) will be _____.


Q21 Atomic Physics **NUMERICAL**
[Step-by-step solution](https://www.prepwiser.in/questions/5jvlsqvRww)

A beam of monochromatic light is used to excite the electron in Li^{++} from the first orbit to the third orbit. The wavelength of monochromatic light is found to be $x \times 10^{-10}$ m. The value of x is _____. [Given $hc = 1242$ eV nm]

Q22 Electrostatics II: Potential & Capacitance **NUMERICAL**
[Step-by-step solution](https://www.prepwiser.in/questions/BiDAw5G1wX)

A capacitor of capacitance 50 pF is charged by 100 V source. It is then connected to another uncharged identical capacitor. Electrostatic energy loss in the process is _____ nJ.

Q23 Collision **NUMERICAL**
[Step-by-step solution](https://www.prepwiser.in/questions/3mOMgo7GiC)

A pendulum of length 2 m consists of a wooden bob of mass 50 g. A bullet of mass 75 g is fired towards the stationary bob with a speed v . The bullet emerges out of the bob with a speed $\frac{v}{3}$ and the bob just completes the vertical circle. The value of v is _____ ms^{-1} . (if $g = 10 \text{ m/s}^2$).

Q24 Current Electricity **NUMERICAL**
[Step-by-step solution](https://www.prepwiser.in/questions/duG9qHUf1Z)

A cell, shunted by a 8Ω resistance, is balanced across a potentiometer wire of length 3 m. The balancing length is 2 m when the cell is shunted by 4Ω resistance. The value of internal resistance of the cell will be _____ Ω .

Q25 Current Electricity **NUMERICAL**
[Step-by-step solution](https://www.prepwiser.in/questions/7Q1t9k_s46)

The current density in a cylindrical wire of radius 4 mm is $4 \times 10^6 \text{ Am}^{-2}$. The current through the outer portion of the wire between radial distances $\frac{R}{2}$ and R is _____ $\pi \text{ A}$.

Q26 Thermodynamics **NUMERICAL**
[Step-by-step solution](https://www.prepwiser.in/questions/mP3H0VLkwW)

In a carnot engine, the temperature of reservoir is 527°C and that of sink is 200 K. If the work done by the engine when it transfers heat from reservoir to sink is 12000 kJ, the quantity of heat absorbed by the engine from reservoir is _____ $\times 10^6 \text{ J}$.

Q27 Fluid Mechanics **NUMERICAL**
[Step-by-step solution](https://www.prepwiser.in/questions/0g43gvB5gq)

The area of cross-section of a large tank is 0.5 m^2 . It has a narrow opening near the bottom having area of cross-section 1 cm^2 . A load of 25 kg is applied on the water at the top in the tank. Neglecting the speed of water in the tank, the velocity of the water, coming out of the opening at the time when the height of water level in the tank is 40 cm above the bottom, will be _____ cms^{-1} . [Take $g = 10 \text{ ms}^{-2}$]

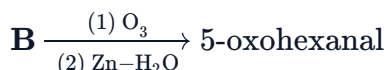
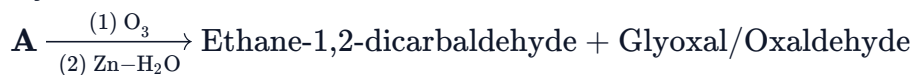
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In Young's double slit experiment the two slits are 0.6 mm distance apart. Interference pattern is observed on a screen at a distance 80 cm from the slits. The first dark fringe is observed on the screen directly opposite to one of the slits. The wavelength of light will be _____ nm.

Chemistry Section A · Multiple choice

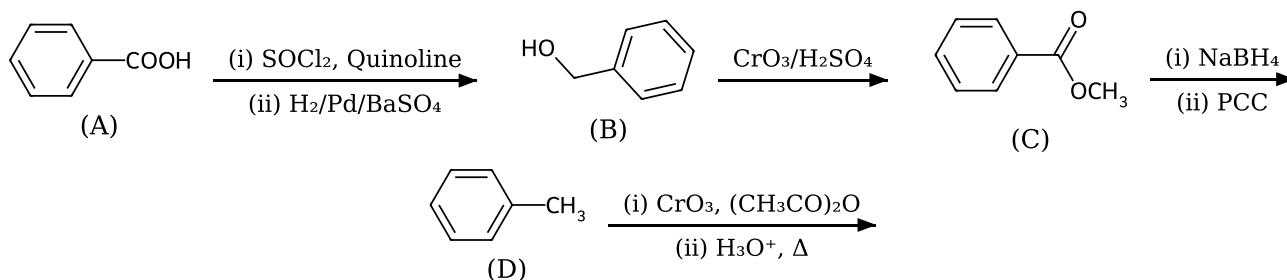
Q29 to Q45

'A' and 'B' respectively are:



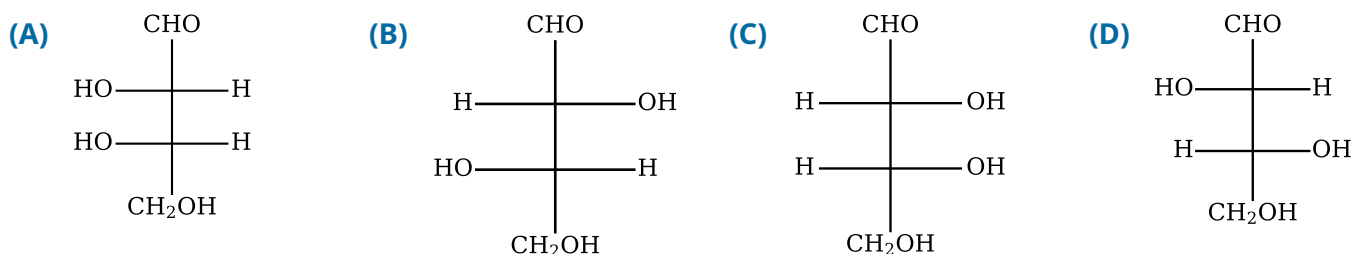
- (A) 1-methylcyclohex-1,3-diene & cyclopentene.
 (B) Cyclohex-1,3-diene & cyclopentene
 (C) 1-methylcyclohex-1,4-diene & 1-methylcyclopent-1-ene
 (D) Cyclohex-1,3-diene & 1-methylcyclopent-1-ene

Which of the following reactions will yield benzaldehyde as a product?



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

L-isomer of a compound 'A' ($\text{C}_4\text{H}_8\text{O}_4$) gives a positive test with $[\text{Ag}(\text{NH}_3)_2]^+$. Treatment of 'A' with acetic anhydride yields triacetate derivative. Compound 'A' produces an optically active compound (B) and an optically inactive compound (C) on treatment with bromine water and HNO_3 respectively. Compound (A) is:



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Based upon VSEPR theory, match the shape (geometry) of the molecules in List-I with the molecules in List-II and select the most appropriate option.

	List - I (Shape)		List - II (Molecules)
(A)	T-shaped	(I)	XeF_4
(B)	Trigonal planar	(II)	SF_4
(C)	Square planar	(III)	ClF_3
(D)	See-saw	(IV)	BF_3

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

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

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

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

Which of the following will have maximum stabilization due to crystal field?

(A) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ (B) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ (C) $[\text{Co}(\text{CN})_6]^{3-}$ (D) $[\text{Cu}(\text{NH}_3)_4]^{2+}$

Match List-I with List-II

	List - I		List - II
(A)	Concentration of gold ore	(I)	Aniline
(B)	Leaching of alumina	(II)	NaOH
(C)	Froth stabiliser	(III)	SO_2
(D)	Blister copper	(IV)	NaCN

Choose the correct answer from the options given below:

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

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

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

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

Which of the following is structure of a separating funnel?



Match List - I with List - II.

	List - I (Si-Compounds)		List - II (Si-Polymeric/Other Products)
(A)	$(\text{CH}_3)_4\text{Si}$	(I)	Chain Silicone
(B)	$(\text{CH}_3)\text{Si}(\text{OH})_3$	(II)	Dimeric Silicone
(C)	$(\text{CH}_3)_2\text{Si}(\text{OH})_2$	(III)	Silane
(D)	$(\text{CH}_3)_3\text{Si}(\text{OH})$	(IV)	2D - Silicone

Choose the correct answer from the options given below:

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

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

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

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

Heating white phosphorus with conc. NaOH solution gives mainly:

- (A) Na_3P and H_2O (B) H_3PO and NaH
 (C) P(OH)_3 and NaH_2PO_4 (D) PH_3 and NaH_2PO_2

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

Assertion (A) : The ionic radii of O^{2-} and Mg^{2+} are same.

Reason (R) : Both O^{2-} and Mg^{2+} are isoelectronic species.

In the light of the above statements, choose the correct 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.

Match List - I with List - II

	List - I (Polymer)		List - II (Used in)
(A)	Bakelite	(I)	Radio and television cabinets
(B)	Glyptal	(II)	Electrical switches
(C)	PVC	(III)	Paints and Lacquers
(D)	Polystyrene	(IV)	Water pipes

Choose the correct answer from the options given below:

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

Addition of H_2SO_4 to BaO_2 produces:

- (A) BaO , SO_2 and H_2O (B) BaHSO_4 and O_2 (C) BaSO_4 , H_2 and O_2 (D) BaSO_4 and H_2O_2

BeCl_2 reacts with LiAlH_4 to give:

- (A) $\text{Be} + \text{Li}[\text{AlCl}_4] + \text{H}_2$ (B) $\text{Be} + \text{AlH}_3 + \text{LiCl} + \text{HCl}$
 (C) $\text{BeH}_2 + \text{LiCl} + \text{AlCl}_3$ (D) $\text{BeH}_2 + \text{Li}[\text{AlCl}_4]$

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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) : At 10°C , the density of a 5 M solution of KCl [atomic masses of K & Cl are 39 & 35.5 g mol $^{-1}$ respectively], is 'x' g ml $^{-1}$. The solution is cooled to -21°C . The molality of the solution will remain unchanged.

Reason (R) : The molality of a solution does not change with temperature as mass remains unaffected with temperature.

In the light of the above statements, choose the correct 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.

Match List-I with List-II

	List - I		List - II
(A)	Lyophilic colloid	(I)	Liquid-liquid colloid
(B)	Emulsion	(II)	Protective colloid
(C)	Positively charged colloid	(III)	$\text{FeCl}_3 + \text{NaOH}$
(D)	Negatively charged colloid	(IV)	$\text{FeCl}_3 + \text{hot water}$

Choose the correct answer from the options given below:

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

Match List-I with List-II.

	List - I		List - II
(A)	Spontaneous process	(I)	$\Delta H < 0$
(B)	Process with $\Delta P = 0$, $\Delta T = 0$	(II)	$\Delta G_{T,P} < 0$
(C)	$\Delta H_{\text{reaction}}$	(III)	Isothermal and isobaric process
(D)	Exothermic Process	(IV)	[Bond energies of molecules in reactants] – [Bond energies of product molecules]

Choose the correct answer from the options given below:

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

Given below are two statements:

Statement I : In Hofmann degradation reaction, the migration of only an alkyl group takes place from carbonyl carbon of the amide to the nitrogen atom.

Statement II : The group is migrated in Hofmann degradation reaction to electron deficient atom.

In the light of the above statements, choose the most appropriate answer from the 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.

Chemistry Section B · Numerical value

Q46 to Q54

Q46 Chemical Kinetics NUMERICAL

[Step-by-step solution](#) › [prepwiser.in/questions/eOz3jogXW_](https://www.prepwiser.in/questions/eOz3jogXW_)

The rate constant for a first order reaction is given by the following equation:

$$\ln k = 33.24 - \frac{2.0 \times 10^4 K}{T}$$

The activation energy for the reaction is given by _____ kJ mol⁻¹. (In nearest integer) (Given : R = 8.3 J K⁻¹ mol⁻¹)

Q47 d & f Block Elements NUMERICAL

[Step-by-step solution](#) › [prepwiser.in/questions/wq7F4wmW4C](https://www.prepwiser.in/questions/wq7F4wmW4C)

Acidified potassium permanganate solution oxidises oxalic acid. The spin-only magnetic moment of the manganese product formed from the above reaction is _____ B.M. (Nearest integer)

Q48 d & f Block Elements NUMERICAL

[Step-by-step solution](#) › [prepwiser.in/questions/TBpyF6zAQn](https://www.prepwiser.in/questions/TBpyF6zAQn)

The number of statements correct from the following for Copper (at. no. 29) is/are _____.

- (A) Cu(II) complexes are always paramagnetic.
- (B) Cu(I) complexes are generally colourless
- (C) Cu(I) is easily oxidized
- (D) In Fehling solution, the active reagent has Cu(I)

Q49 Electrochemistry NUMERICAL

[Step-by-step solution](#) › [prepwiser.in/questions/gJInuPqM-4](https://www.prepwiser.in/questions/gJInuPqM-4)

The limiting molar conductivities of NaI, NaNO₃ and AgNO₃ are 12.7, 12.0 and 13.3 mS m² mol⁻¹, respectively (all at 25°C). The limiting molar conductivity of AgI at this temperature is _____ mS m² mol⁻¹.

Q50 Solid State NUMERICAL

[Step-by-step solution](#) › [prepwiser.in/questions/qIbd7cOe7C](https://www.prepwiser.in/questions/qIbd7cOe7C)

Metal deficiency defect is shown by Fe_{0.93}O. In the crystal, some Fe²⁺ cations are missing and loss of positive charge is compensated by the presence of Fe³⁺ ions. The percentage of Fe²⁺ ions in the Fe_{0.93}O crystals is _____. (Nearest integer)

Q51 Solutions & Colligative Properties NUMERICAL

[Step-by-step solution](#) › [prepwiser.in/questions/Jl9xwvmqP](https://www.prepwiser.in/questions/Jl9xwvmqP)

2 g of a non-volatile non-electrolyte solute is dissolved in 200 g of two different solvents A and B whose ebullioscopic constants are in the ratio of 1 : 8. The elevation in boiling points of A and B are in the ratio $\frac{x}{y}$ (x : y). The value of y is _____. (Nearest integer)

Q52 Mole Concept & Stoichiometry **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/YKjtHtUqG-](https://www.prepwiser.in/questions/YKjtHtUqG-)

Two elements A and B which form 0.15 moles of A_2B and AB_3 type compounds. If both A_2B and AB_3 weigh equally, then the atomic weight of A is _____ times of atomic weight of B.

Q53 Atomic Structure **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/m641fOpit5](https://www.prepwiser.in/questions/m641fOpit5)

If the uncertainty in velocity and position of a minute particle in space are, $2.4 \times 10^{-26} \text{ (m s}^{-1}\text{)}$ and 10^{-7} (m) respectively. The mass of the particle in g is _____. (Nearest integer)
(Given : $h = 6.626 \times 10^{-34} \text{ Js}$)

Q54 Chemical Equilibrium **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/yxYuORH9ch](https://www.prepwiser.in/questions/yxYuORH9ch)

In an experiment, 2.0 moles of NOCl was placed in a one-litre flask and the concentration of NO after equilibrium established, was found to be 0.4 mol/L. The equilibrium constant at 30°C is _____ $\times 10^{-4}$.

Mathematics Section A · Multiple choice

Q55 to Q72

Q55 Three Dimensional Geometry[Step-by-step solution](#) › [prepwiser.in/questions/bJTP5PGHuO](https://www.prepwiser.in/questions/bJTP5PGHuO)

If two straight lines whose direction cosines are given by the relations $l + m - n = 0$, $3l^2 + m^2 + cnl = 0$ are parallel, then the positive value of c is:

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

Q56 Complex Numbers[Step-by-step solution](#) › [prepwiser.in/questions/g6D9guiaNE](https://www.prepwiser.in/questions/g6D9guiaNE)

The area of the polygon, whose vertices are the non-real roots of the equation $\bar{z} = iz^2$ is:

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

Q57 Definite Integration[Step-by-step solution](#) › [prepwiser.in/questions/HJuIBDySVR](https://www.prepwiser.in/questions/HJuIBDySVR)

The value of the integral

$$\int_{-2}^2 \frac{|x^3 + x|}{(e^{|x|} + 1)} dx \text{ is equal to:}$$

- (A) $5e^2$ (B) $3e^{-2}$ (C) 4 (D) 6

Q58 Circles[Step-by-step solution](#) › [prepwiser.in/questions/GrnCYSFMc_](https://www.prepwiser.in/questions/GrnCYSFMc_)

Let $\frac{dy}{dx} = \frac{ax - by + a}{bx + cy + a}$, where a, b, c are constants, represent a circle passing through the point (2, 5). Then the shortest distance of the point (11, 6) from this circle is:

- (A) 10 (B) 8 (C) 7 (D) 5

Q59 Differential Equations[Step-by-step solution](#) › [prepwiser.in/questions/PFGg3uEHas](https://www.prepwiser.in/questions/PFGg3uEHas)

If $\frac{dy}{dx} + \frac{2^{x-y}(2^y - 1)}{2^x - 1} = 0$, $x, y > 0$, $y(1) = 1$, then $y(2)$ is equal to:

- (A) $2 + \log_2 3$ (B) $2 + \log_3 2$ (C) $2 - \log_3 2$ (D) $2 - \log_2 3$

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If

$$\cos^{-1}\left(\frac{y}{2}\right) = \log_e\left(\frac{x}{5}\right)^5, |y| < 2$$

, then:

(A) $x^2y'' + xy' - 25y = 0$

(B) $x^2y'' - xy' - 25y = 0$

(C) $x^2y'' - xy' + 25y = 0$

(D) $x^2y'' + xy' + 25y = 0$

Let the eccentricity of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, $a > b$, be $\frac{1}{4}$. If this ellipse passes through the point $\left(-4\sqrt{\frac{2}{5}}, 3\right)$, then $a^2 + b^2$ is equal to:

(A) 29

(B) 31

(C) 32

(D) 34

$$\sin^{-1}\left(\sin \frac{2\pi}{3}\right) + \cos^{-1}\left(\cos \frac{7\pi}{6}\right) + \tan^{-1}\left(\tan \frac{3\pi}{4}\right)$$

is equal to:

(A) $\frac{11\pi}{12}$

(B) $\frac{17\pi}{12}$

(C) $\frac{31\pi}{12}$

(D) $-\frac{3\pi}{4}$

Let a be an integer such that $\lim_{x \rightarrow 7} \frac{18 - [1-x]}{[x-3a]}$ exists, where $[t]$ is greatest integer $\leq t$. Then a is equal to:

(A) -6

(B) -2

(C) 2

(D) 6

Let the system of linear equations

$x + 2y + z = 2,$

$\alpha x + 3y - z = \alpha,$

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

be inconsistent. Then α is equal to:

(A) $\frac{5}{2}$

(B) $-\frac{5}{2}$

(C) $\frac{7}{2}$

(D) $-\frac{7}{2}$

Five numbers x_1, x_2, x_3, x_4, x_5 are randomly selected from the numbers 1, 2, 3, ..., 18 and are arranged in the increasing order ($x_1 < x_2 < x_3 < x_4 < x_5$). The probability that $x_2 = 7$ and $x_4 = 11$ is:

(A) $\frac{1}{136}$

(B) $\frac{1}{72}$

(C) $\frac{1}{68}$

(D) $\frac{1}{34}$

Let X be a random variable having binomial distribution $B(7, p)$. If $P(X = 3) = 5P(X = 4)$, then the sum of the mean and the variance of X is:

(A) $\frac{105}{16}$

(B) $\frac{7}{16}$

(C) $\frac{77}{36}$

(D) $\frac{49}{16}$

The number of distinct real roots of $x^4 - 4x + 1 = 0$ is:

- (A) 4 (B) 2 (C) 1 (D) 0

$$x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} c^n$$

, where a, b, c are in A.P. and $|a| < 1, |b| < 1, |c| < 1, abc \neq 0$, then:

- (A) x, y, z are in A.P. (B) x, y, z are in G.P.
 (C) $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are in A.P. (D) $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1 - (a + b + c)$

Let $\vec{a} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{c} = 2\hat{i} - 3\hat{j} + 2\hat{k}$. Then the number of vectors $\vec{b}$ such that $\vec{b} \times \vec{c} = \vec{a}$ and $|\vec{b}| \in \{1, 2, \dots, 10\}$ is:

- (A) 0 (B) 1 (C) 2 (D) 3

In an isosceles triangle ABC, the vertex A is (6, 1) and the equation of the base BC is $2x + y = 4$. Let the point B lie on the line $x + 3y = 7$. If (α, β) is the centroid of $\triangle ABC$, then $15(\alpha + \beta)$ is equal to:

- (A) 39 (B) 41 (C) 51 (D) 63

If $\int \frac{(x^2+1)e^x}{(x+1)^2} dx = f(x)e^x + C$, where C is a constant, then $\frac{d^3f}{dx^3}$ at $x = 1$ is equal to:

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

The value of $\cos\left(\frac{2\pi}{7}\right) + \cos\left(\frac{4\pi}{7}\right) + \cos\left(\frac{6\pi}{7}\right)$ is equal to:

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

Mathematics Section B · Numerical value

Q73 to Q82

Let the mirror image of the point (a, b, c) with respect to the plane $3x - 4y + 12z + 19 = 0$ be $(a - 6, \beta, \gamma)$. If $a + b + c = 5$, then $7\beta - 9\gamma$ is equal to _____.

If the coefficient of x^{10} in the binomial expansion of

$$\left(\frac{\sqrt{x}}{5^{\frac{1}{4}}} + \frac{\sqrt{5}}{x^{\frac{1}{3}}}\right)^{60}$$

is $5^k \cdot l$, where $l, k \in \mathbb{N}$ and l is co-prime to 5, then k is equal to _____.

Q75 Circles **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/ZPr2u1I53o) › prepwisar.in/questions/ZPr2u1I53o

A rectangle R with end points of one of its sides as (1, 2) and (3, 6) is inscribed in a circle. If the equation of a diameter of the circle is $2x - y + 4 = 0$, then the area of R is _____.

Q76 Functions (Advanced) **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/8K5maySycj) › prepwisar.in/questions/8K5maySycj

Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function defined by $f(x) = \frac{2e^{2x}}{e^{2x} + e}$. Then

$$f\left(\frac{1}{100}\right) + f\left(\frac{2}{100}\right) + f\left(\frac{3}{100}\right) + \dots + f\left(\frac{99}{100}\right)$$

is equal to _____.

Q77 Determinants **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/H5-WcyXlJj) › prepwisar.in/questions/H5-WcyXlJj

The positive value of the determinant of the matrix A, whose

$\text{Adj}(\text{Adj}(A)) =$

$$\begin{pmatrix} 14 & 28 & -14 \\ -14 & 14 & 28 \\ 28 & -14 & 14 \end{pmatrix}$$

, is _____.

Q78 Parabola **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/r8Vy2KtFbG) › prepwisar.in/questions/r8Vy2KtFbG

A circle of radius 2 unit passes through the vertex and the focus of the parabola $y^2 = 2x$ and touches the parabola $y = \left(x - \frac{1}{4}\right)^2 + \alpha$, where $\alpha > 0$. Then $(4\alpha - 8)^2$ is equal to _____.

Q79 Permutations & Combinations **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/frAc-poK6_) › prepwisar.in/questions/frAc-poK6_

The number of ways, 16 identical cubes, of which 11 are blue and rest are red, can be placed in a row so that between any two red cubes there should be at least 2 blue cubes, is _____.

Q80 Quadratic Equations & Polynomial Inequalities **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/KafbZ2Bmsk) › prepwisar.in/questions/KafbZ2Bmsk

If the sum of all the roots of the equation

$e^{2x} - 11e^x - 45e^{-x} + \frac{81}{2} = 0$ is $\log_e p$, then p is equal to _____.

Q81 Sequences & Series **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/G93yMkAuG0) › prepwisar.in/questions/G93yMkAuG0

If the sum of the first ten terms of the series

$$\frac{1}{5} + \frac{2}{65} + \frac{3}{325} + \frac{4}{1025} + \frac{5}{2501} + \dots$$

is $\frac{m}{n}$, where m and n are co-prime numbers, then m + n is equal to _____.

Q82 Area Under Curves **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/bDPaKLIMY6) › prepwisar.in/questions/bDPaKLIMY6

Let

$A_1 = \{(x, y) : |x| \leq y^2, |x| + 2y \leq 8\}$ and

$A_2 = \{(x, y) : |x| + |y| \leq k\}$. If $27(\text{Area } A_1) = 5(\text{Area } A_2)$, then k is equal to:

Answer key: JEE Main 2022 · 27 Jun · Shift 1

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Physics

1.	D	2.	B	3.	A	4.	C	5.	C	6.	B	7.	B	8.	B	9.	D	10.	A
11.	B	12.	C	13.	C	14.	B	15.	C	16.	B	17.	D	18.	A	19.	A	20.	975
21.	114	22.	125	23.	10	24.	8	25.	48	26.	16	27.	300	28.	450				

Chemistry

29.	D	30.	C	31.	A	32.	B	33.	C	34.	B	35.	A	36.	D	37.	D	38.	D
39.	A	40.	D	41.	C	42.	A	43.	A	44.	B	45.	D	46.	166	47.	6	48.	3
49.	14	50.	85	51.	8	52.	2	53.	22	54.	125								

Mathematics

55.	A	56.	A	57.	D	58.	B	59.	D	60.	D	61.	B	62.	A	63.	A	64.	D
65.	C	66.	C	67.	B	68.	C	69.	A	70.	C	71.	B	72.	B	73.	137	74.	5
75.	16	76.	99	77.	14	78.	63	79.	56	80.	2	81.	276	82.	6				

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