

JEE MAIN 2022 · QUESTION PAPER

26 Jun 2022 **Shift 2**

83 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	8 Q47 to Q54
● Mathematics	19 Q55 to Q73	10 Q74 to Q83
In this PDF	83 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/2022-06-26-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 Nuclear Physics

[Step-by-step solution](#) · [prepwiser.in/questions/TRRZ-orV1u](https://www.prepwiser.in/questions/TRRZ-orV1u)

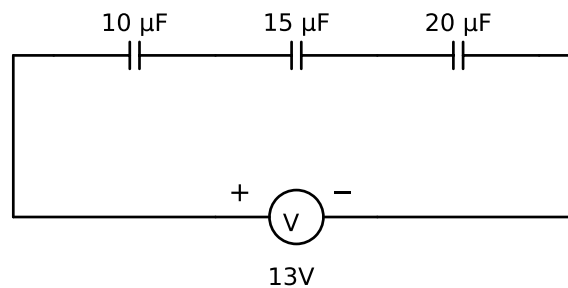
A radioactive nucleus can decay by two different processes. Half-life for the first process is 3.0 hours while it is 4.5 hours for the second process. The effective half-life of the nucleus will be:

- (A) 3.75 hours (B) 0.56 hours (C) 0.26 hours (D) 1.80 hours

Q2 Electrostatics II: Potential & Capacitance

[Step-by-step solution](#) · [prepwiser.in/questions/LY4Gzy15LJ](https://www.prepwiser.in/questions/LY4Gzy15LJ)

The charge on capacitor of capacitance $15\mu\text{F}$ in the figure given below is:

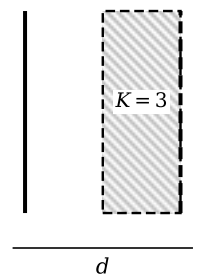


- (A) $60\mu\text{C}$ (B) $130\mu\text{C}$ (C) $260\mu\text{C}$ (D) $585\mu\text{C}$

Q3 Electrostatics II: Potential & Capacitance

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

A parallel plate capacitor with plate area A and plate separation $d = 2\text{ m}$ has a capacitance of $4\mu\text{F}$. The new capacitance of the system if half of the space between them is filled with a dielectric material of dielectric constant $K = 3$ (as shown in figure) will be:

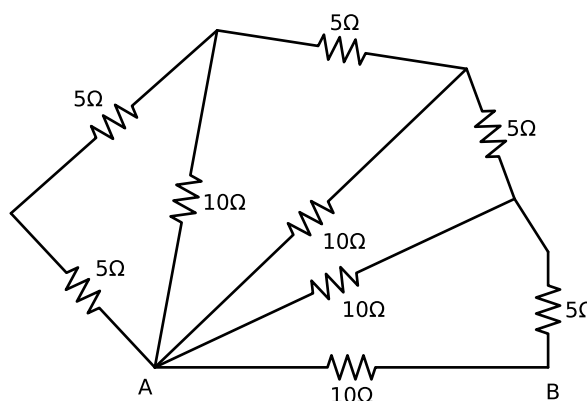


- (A) $2\mu\text{F}$ (B) $32\mu\text{F}$ (C) $6\mu\text{F}$ (D) $8\mu\text{F}$

Q4 Current Electricity

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

The equivalent resistance between points A and B in the given network is:



- (A) 65Ω (B) 20Ω (C) 5Ω (D) 2Ω

Q5 Dual Nature of Radiation & Matter

[Step-by-step solution](#) · [prepwiser.in/questions/XGTJ2NDk2w](https://www.prepwiser.in/questions/XGTJ2NDk2w)

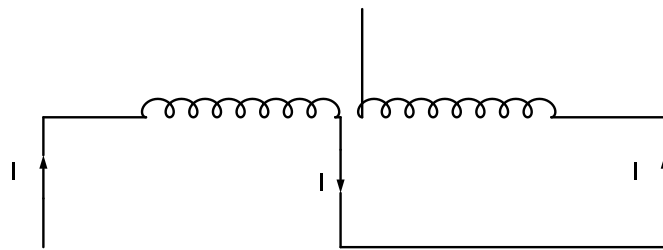
A metal surface is illuminated by a radiation of wavelength $4500\text{ \AA}$. The ejected photo-electron enters a constant magnetic field of 2 mT making an angle of 90° with the magnetic field. If it starts revolving in a circular path of radius 2 mm , the work function of the metal is approximately:

- (A) 1.36 eV (B) 1.69 eV (C) 2.78 eV (D) 2.23 eV

Q6 Electromagnetic Induction[Step-by-step solution > prepwisar.in/questions/mUniR2JT_n](https://www.prepwisar.in/questions/mUniR2JT_n)

Two coils of self inductance L_1 and L_2 are connected in series combination having mutual inductance of the coils as M . The equivalent self inductance of the combination will be:

- (A) $\frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{M}$ (B) $L_1 + L_2 + M$
(C) $L_1 + L_2 + 2M$ (D) $L_1 + L_2 - 2M$

**Q7** Electromagnetic Induction[Step-by-step solution > prepwisar.in/questions/r-iXIBhVWT](https://www.prepwisar.in/questions/r-iXIBhVWT)

A metallic conductor of length 1 m rotates in a vertical plane parallel to east-west direction about one of its end with angular velocity 5 rad s^{-1} . If the horizontal component of earth's magnetic field is $0.2 \times 10^{-4} \text{ T}$, then emf induced between the two ends of the conductor is:

- (A) $5 \mu\text{V}$ (B) $50 \mu\text{V}$ (C) 5 mV (D) 50 mV

Q8 Electromagnetic Waves[Step-by-step solution > prepwisar.in/questions/EIKmZa720](https://www.prepwisar.in/questions/EIKmZa720)

Which is the correct ascending order of wavelengths?

- (A) $\lambda_{\text{visible}} < \lambda_{\text{X-ray}} < \lambda_{\text{gamma-ray}} < \lambda_{\text{microwave}}$ (B) $\lambda_{\text{gamma-ray}} < \lambda_{\text{X-ray}} < \lambda_{\text{visible}} < \lambda_{\text{microwave}}$
(C) $\lambda_{\text{X-ray}} < \lambda_{\text{gamma-ray}} < \lambda_{\text{visible}} < \lambda_{\text{microwave}}$ (D) $\lambda_{\text{microwave}} < \lambda_{\text{visible}} < \lambda_{\text{gamma-ray}} < \lambda_{\text{X-ray}}$

Q9 Semiconductors & Electronic Devices[Step-by-step solution > prepwisar.in/questions/LPWnooreTO](https://www.prepwisar.in/questions/LPWnooreTO)

The positive feedback is required by an amplifier to act an oscillator. The feedback here means:

- (A) External input is necessary to sustain ac signal in output.
(B) A portion of the output power is returned back to the input.
(C) Feedback can be achieved by LR network.
(D) The base-collector junction must be forward biased.

Q10 Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution > prepwisar.in/questions/BpRMTk5yBh](https://www.prepwisar.in/questions/BpRMTk5yBh)

Sixty four conducting drops each of radius 0.02 m and each carrying a charge of $5 \mu\text{C}$ are combined to form a bigger drop. The ratio of surface density of bigger drop to the smaller drop will be:

- (A) 1 : 4 (B) 4 : 1 (C) 1 : 8 (D) 8 : 1

Q11 Gravitation[Step-by-step solution > prepwisar.in/questions/uBF4Rj44d4](https://www.prepwisar.in/questions/uBF4Rj44d4)

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

Assertion A : If we move from poles to equator, the direction of acceleration due to gravity of earth always points towards the center of earth without any variation in its magnitude.

Reason R : At equator, the direction of acceleration due to the gravity is towards the center of earth.

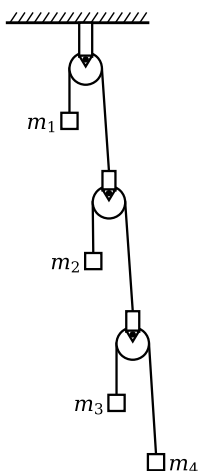
In the light of above statements, choose the correct answer from the options given below:

- (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.

A flask contains argon and oxygen in the ratio of 3 : 2 in mass and the mixture is kept at 27°C. The ratio of their average kinetic energy per molecule respectively will be:

- (A) 3 : 2 (B) 9 : 4 (C) 2 : 3 (D) 1 : 1

In the arrangement shown in figure a_1 , a_2 , a_3 and a_4 are the accelerations of masses m_1 , m_2 , m_3 and m_4 respectively. Which of the following relation is true for this arrangement?



- (A) $4a_1 + 2a_2 + a_3 + a_4 = 0$ (B) $a_1 + 4a_2 + 3a_3 + a_4 = 0$
 (C) $a_1 + 4a_2 + 3a_3 + 2a_4 = 0$ (D) $2a_1 + 2a_2 + 3a_3 + a_4 = 0$

A bar magnet having a magnetic moment of $2.0 \times 10^5 \text{ JT}^{-1}$, is placed along the direction of uniform magnetic field of magnitude $B = 14 \times 10^{-5} \text{ T}$. The work done in rotating the magnet slowly through 60° from the direction of field is:

- (A) 14 J (B) 8.4 J (C) 4 J (D) 1.4 J

If ρ is the density and η is coefficient of viscosity of fluid which flows with a speed v in the pipe of diameter d , the correct formula for Reynolds number R_e is:

- (A) $R_e = \frac{\eta d}{\rho v}$ (B) $R_e = \frac{\rho v}{\eta d}$ (C) $R_e = \frac{\rho v d}{\eta}$ (D) $R_e = \frac{\eta}{\rho v d}$

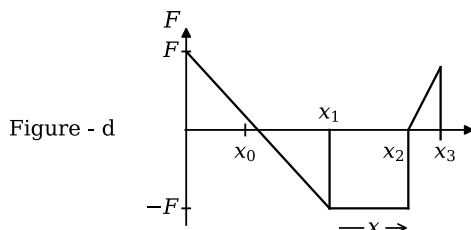
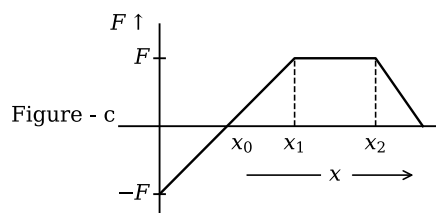
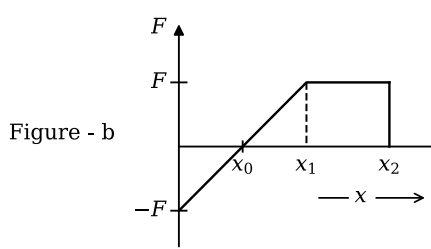
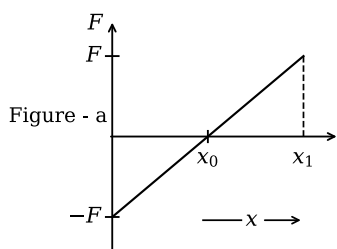
A solid spherical ball is rolling on a frictionless horizontal plane surface about its axis of symmetry. The ratio of rotational kinetic energy of the ball to its total kinetic energy is

- (A) $\frac{2}{5}$ (B) $\frac{2}{7}$ (C) $\frac{1}{5}$ (D) $\frac{7}{10}$

For a specific wavelength 670 nm of light coming from a galaxy moving with velocity v , the observed wavelength is 670.7 nm. The value of v is:

- (A) $3 \times 10^8 \text{ ms}^{-1}$ (B) $3 \times 10^{10} \text{ ms}^{-1}$ (C) $3.13 \times 10^5 \text{ ms}^{-1}$ (D) $4.48 \times 10^5 \text{ ms}^{-1}$

Arrange the four graphs in descending order of total work done; where W_1 , W_2 , W_3 and W_4 are the work done corresponding to figure a, b, c and d respectively.



- (A) $W_3 > W_2 > W_1 > W_4$ (B) $W_3 > W_2 > W_4 > W_1$ (C) $W_2 > W_3 > W_4 > W_1$ (D) $W_2 > W_3 > W_1 > W_4$

The dimension of mutual inductance is:

- (A) $[ML^2T^{-2}A^{-1}]$ (B) $[ML^2T^{-3}A^{-1}]$ (C) $[ML^2T^{-2}A^{-2}]$ (D) $[ML^2T^{-3}A^{-2}]$

Physics Section B · Numerical value

Q20 to Q29

A batsman hits back a ball of mass 0.4 kg straight in the direction of the bowler without changing its initial speed of 15 ms^{-1} . The impulse imparted to the ball is _____ Ns.

The stopping potential for photoelectrons emitted from a surface illuminated by light of wavelength $6630 \text{ \AA}$ is 0.42 V. If the threshold frequency is $x \times 10^{13} \text{ /s}$, where x is _____ (nearest integer).
(Given, speed light = $3 \times 10^8 \text{ m/s}$, Planck's constant = $6.63 \times 10^{-34} \text{ Js}$)

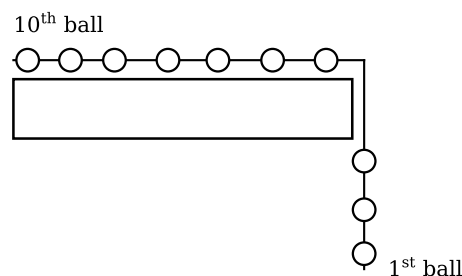
A small bulb is placed at the bottom of a tank containing water to a depth of $\sqrt{7} \text{ m}$. The refractive index of water is $\frac{4}{3}$. The area of the surface of water through which light from the bulb can emerge out is $x\pi \text{ m}^2$. The value of x is _____.

A geyser heats water flowing at a rate of 2.0 kg per minute from 30°C to 70°C . If geyser operates on a gas burner, the rate of combustion of fuel will be _____ g min^{-1} .
[Heat of combustion = $8 \times 10^3 \text{ Jg}^{-1}$, Specific heat of water = $4.2 \text{ Jg}^{-1} \text{ }^\circ\text{C}^{-1}$]

A heat engine operates with the cold reservoir at temperature 324 K. The minimum temperature of the hot reservoir, if the heat engine takes 300 J heat from the hot reservoir and delivers 180 J heat to the cold reservoir per cycle, is _____ K.

Q25 Newton's Laws of Motion **NUMERICAL**[Step-by-step solution > prepwiser.in/questions/J0ilajK87](https://www.prepwiser.in/questions/J0ilajK87)

A system of 10 balls each of mass 2 kg are connected via massless and unstretchable string. The system is allowed to slip over the edge of a smooth table as shown in figure. Tension on the string between the 7th and 8th ball is _____ N when 6th ball just leaves the table.

**Q26** Moving Charges & Magnetism **NUMERICAL**[Step-by-step solution > prepwiser.in/questions/xhF3rMui6v](https://www.prepwiser.in/questions/xhF3rMui6v)

Two 10 cm long, straight wires, each carrying a current of 5A are kept parallel to each other. If each wire experienced a force of 10^{-5} N, then separation between the wires is _____ cm.

Q27 Rectilinear Motion **NUMERICAL**[Step-by-step solution > prepwiser.in/questions/qpV-YObOAc](https://www.prepwiser.in/questions/qpV-YObOAc)

A ball is projected vertically upward with an initial velocity of 50 ms^{-1} at $t = 0\text{s}$. At $t = 2\text{s}$, another ball is projected vertically upward with same velocity. At $t = \text{_____ s}$, second ball will meet the first ball ($g = 10 \text{ ms}^{-2}$).

Q28 Sound Waves **NUMERICAL**[Step-by-step solution > prepwiser.in/questions/kxGp6g8ckX](https://www.prepwiser.in/questions/kxGp6g8ckX)

A set of 20 tuning forks is arranged in a series of increasing frequencies. If each fork gives 4 beats with respect to the preceding fork and the frequency of the last fork is twice the frequency of the first, then the frequency of last fork is _____ Hz.

Q29 Experimental Skills **NUMERICAL**[Step-by-step solution > prepwiser.in/questions/MjNSBDbIHb](https://www.prepwiser.in/questions/MjNSBDbIHb)

A travelling microscope is used to determine the refractive index of a glass slab. If 40 divisions are there in 1 cm on main scale and 50 Vernier scale divisions are equal to 49 main scale divisions, then least count of the travelling microscope is _____ $\times 10^{-6}$ m.

Chemistry Section A · Multiple choice

Q30 to Q46

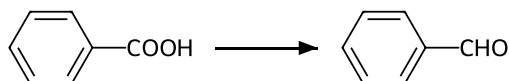
Q30 Aldehydes & Ketones[Step-by-step solution > prepwiser.in/questions/kpqVmTrFD3](https://www.prepwiser.in/questions/kpqVmTrFD3)

Oxidation of toluene to benzaldehyde can be easily carried out with which of the following reagents?

- (A) $\text{CrO}_3/\text{acetic acid}, \text{H}_3\text{O}^+$ (B) $\text{CrO}_3/\text{acetic anhydride}, \text{H}_3\text{O}^+$
(C) $\text{KMnO}_4/\text{HCl}, \text{H}_3\text{O}^+$ (D) $\text{CO}/\text{HCl}, \text{anhydrous AlCl}_3$

Q31 Aldehydes & Ketones[Step-by-step solution > prepwiser.in/questions/gmX5L3V6T4](https://www.prepwiser.in/questions/gmX5L3V6T4)

The reagent, from the following, which converts benzoic acid to benzaldehyde in one step is



- (A) LiAlH_4 (B) KMnO_4 (C) MnO (D) NaBH_4

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Match List-I with List-II

	List - I Enzyme		List - II Conversion of
A.	Invertase	I.	Starch into maltose
B.	Zymase	II.	Maltose into glucose
C.	Diastase	III.	Glucose into ethanol
D.	Maltase	IV.	Cane sugar into glucose

Choose the most appropriate answer from the options given below:

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

Which one of the following is a water soluble vitamin, that is not excreted easily?

- (A) Vitamin B₂ (B) Vitamin B₁ (C) Vitamin B₆ (D) Vitamin B₁₂

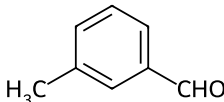
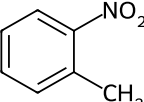
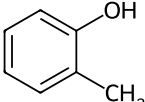
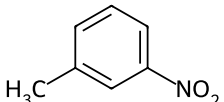
Which of the following is NOT an example of synthetic detergent?

- (A) $\text{CH}_3 - (\text{CH}_2)_{11} - \text{C}_6\text{H}_4 - \text{SO}_3^- \text{Na}^+$
- (B) $\text{CH}_3 - (\text{CH}_2)_{16} - \text{COO}^- \text{Na}^+$
- (C) $\left[\text{CH}_3 - (\text{CH}_2)_{15} - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{N}}} - \text{CH}_3 \right]^+ \text{Br}^-$
- (D) $\text{CH}_3(\text{CH}_2)_{16}\text{COO}(\text{CH}_2\text{CH}_2\text{O})_n\text{CH}_2\text{CH}_2\text{OH}$

The most common oxidation state of Lanthanoid elements is +3. Which of the following is likely to deviate easily from +3 oxidation state?

- (A) Ce (At. No. 58) (B) La (At. No. 57) (C) Lu (At. No. 71) (D) Gd (At. No. 64)

Halogenation of which one of the following will yield m-substituted product with respect to methyl group as a major product?

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

Boiling of hard water is helpful in removing the temporary hardness by converting calcium hydrogen carbonate and magnesium hydrogen carbonate to:

- (A) CaCO_3 and Mg(OH)_2 (B) CaCO_3 and MgCO_3
 (C) Ca(OH)_2 and MgCO_3 (D) Ca(OH)_2 and Mg(OH)_2

The role of depressants in 'Froth Flotation method' is to

- (A) selectively prevent one component of the ore from coming to the froth.
- (B) reduce the consumption of oil for froth formation.
- (C) stabilize the froth.
- (D) enhance non-wettability of the mineral particles.

Which of the following elements is considered as a metalloid?

- (A) Sc
- (B) Pb
- (C) Bi
- (D) Te

The oxide which contains an odd electron at the nitrogen atom is:

- (A) N_2O
- (B) NO_2
- (C) N_2O_3
- (D) N_2O_5

Which one of the following is an example of disproportionation reaction?

- (A) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$
- (B) $MnO_4^- + 4H^+ + 4e^- \rightarrow MnO_2 + 2H_2O$
- (C) $10I^- + 2MnO_4^- + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 5I_2$
- (D) $8MnO_4^- + 3S_2O_3^{2-} + H_2O \rightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$

s-block element which cannot be qualitatively confirmed by the flame test is:

- (A) Li
- (B) Na
- (C) Rb
- (D) Be

The number of radial and angular nodes in 4d orbital are, respectively

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

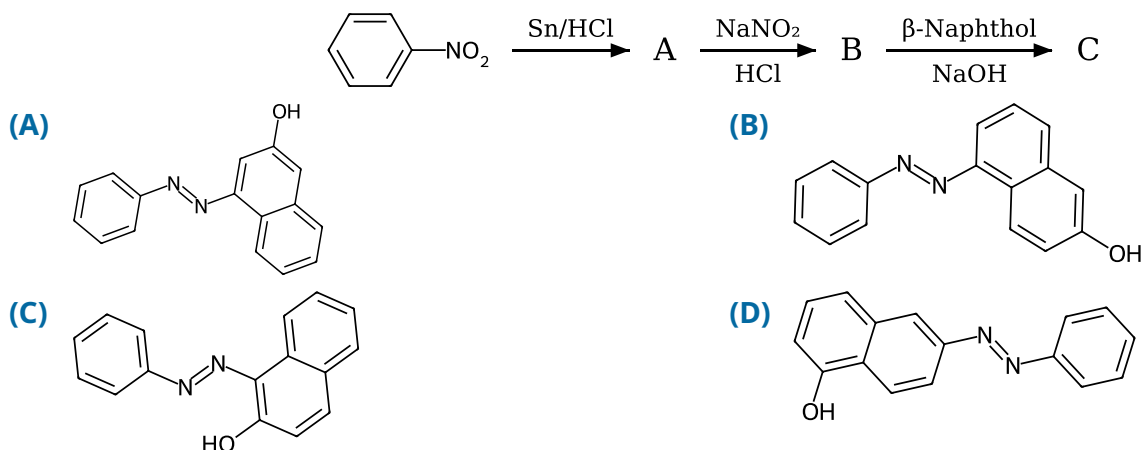
The correct order of nucleophilicity is

- (A) $F^- > OH^-$
- (B) $H_2\ddot{O} > OH^-$
- (C) $R\ddot{O}H > RO^-$
- (D) $NH_2^- > NH_3$

Which statement is NOT correct for p-toluenesulphonyl chloride?

- (A) It is known as Hinsberg's reagent.
- (B) It is used to distinguish primary and secondary amines.
- (C) On treatment with secondary amine, it leads to a product, that is soluble in alkali.
- (D) It doesn't react with tertiary amines.

The final product 'C' in the following series of reactions



Chemistry Section B · Numerical value

Q47 to Q54

Q47 Chemical Kinetics NUMERICAL

[Step-by-step solution](https://www.prepwiser.in/questions/kbljzSFn4B) > prepwiser.in/questions/kbljzSFn4B

Catalyst A reduces the activation energy for a reaction by 10 kJ mol^{-1} at 300 K . The ratio of rate constants, $\frac{k_{T, \text{Catalysed}}}{k_{T, \text{Uncatalysed}}}$ is e^x . The value of x is _____. [nearest integer]

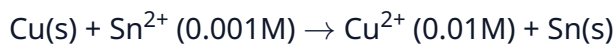
[Assume that the pre-exponential factor is same in both the cases. Given $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$]

Q48 Coordination Compounds NUMERICAL

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

Reaction of $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ with excess ammonia and in the presence of oxygen results into a diamagnetic product. Number of electrons present in t_{2g} -orbitals of the product is _____.

Q49 Electrochemistry NUMERICAL

[Step-by-step solution](https://www.prepwiser.in/questions/NK5UfouXAf) > prepwiser.in/questions/NK5UfouXAf

The Gibbs free energy change for the above reaction at 298 K is $x \times 10^{-1} \text{ kJ mol}^{-1}$. The value of x is _____. [nearest integer]

[Given: $E_{\text{Cu}^{2+}/\text{Cu}}^\ominus = 0.34 \text{ V}$; $E_{\text{Sn}^{2+}/\text{Sn}}^\ominus = -0.14 \text{ V}$; $F = 96500 \text{ C mol}^{-1}$]

Q50 Solid State NUMERICAL

[Step-by-step solution](https://www.prepwiser.in/questions/WOycdS3ujr) > prepwiser.in/questions/WOycdS3ujr

In a solid AB , A atoms are in ccp arrangement and B atoms occupy all the octahedral sites. If two atoms from the opposite faces are removed, then the resultant stoichiometry of the compound is A_xB_y . The value of x is _____. [nearest integer]

Q51 Solutions & Colligative Properties NUMERICAL

[Step-by-step solution](https://www.prepwiser.in/questions/M8RI5376y7) > prepwiser.in/questions/M8RI5376y7

The osmotic pressure exerted by a solution prepared by dissolving 2.0 g of protein of molar mass 60 kg mol^{-1} in 200 mL of water at 27°C is _____ Pa. [integer value]

(use $R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$)

Q52 Mole Concept & Stoichiometry NUMERICAL

[Step-by-step solution](https://www.prepwiser.in/questions/5DTLvr_29I) > prepwiser.in/questions/5DTLvr_29I

CNG is an important transportation fuel. When 100 g CNG is mixed with 208 g oxygen in vehicles, it leads to the formation of CO_2 and H_2O and produces large quantity of heat during this combustion, then the amount of carbon dioxide, produced in grams is _____. [nearest integer]

[Assume CNG to be methane]

The moles of methane required to produce 81 g of water after complete combustion is _____ $\times 10^{-2}$ mol. [nearest integer]

A fish swimming in water body when taken out from the water body is covered with a film of water of weight 36 g. When it is subjected to cooking at 100°C , then the internal energy for vaporization in kJ mol^{-1} is _____. [nearest integer]

[Assume steam to be an ideal gas. Given $\Delta_{\text{vap}}H^\ominus$ for water at 373 K and 1 bar is 41.1 kJ mol^{-1} ; $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$]

Mathematics Section A · Multiple choice

Q55 to Q73

If the plane $2x + y - 5z = 0$ is rotated about its line of intersection with the plane $3x - y + 4z - 7 = 0$ by an angle of $\frac{\pi}{2}$, then the plane after the rotation passes through the point:

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

If the lines

$$\vec{r} = (\hat{i} - \hat{j} + \hat{k}) + \lambda (3\hat{j} - \hat{k})$$

and

$$\vec{r} = (\alpha\hat{i} - \hat{j}) + \mu (2\hat{i} - 3\hat{k})$$

are co-planar, then the distance of the plane containing these two lines from the point $(\alpha, 0, 0)$ is:

- (A) $\frac{2}{9}$ (B) $\frac{2}{11}$ (C) $\frac{4}{11}$ (D) 2

Let $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$, $\vec{b} = 2\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - \hat{j} + \hat{k}$ be three given vectors. Let $\vec{v}$ be a vector in the plane of $\vec{a}$ and $\vec{b}$ whose projection on $\vec{c}$ is $\frac{2}{\sqrt{3}}$. If $\vec{v} \cdot \hat{j} = 7$, then $\vec{v} \cdot (\hat{i} + \hat{k})$ is equal to:

- (A) 6 (B) 7 (C) 8 (D) 9

Consider a cuboid of sides $2x$, $4x$ and $5x$ and a closed hemisphere of radius r . If the sum of their surface areas is a constant k , then the ratio $x : r$, for which the sum of their volumes is maximum, is:

- (A) 2 : 5 (B) 19 : 45 (C) 3 : 8 (D) 19 : 15

If $y = y(x)$ is the solution of the differential equation $x \frac{dy}{dx} + 2y = x e^x$, $y(1) = 0$ then the local maximum value of the function $z(x) = x^2 y(x) - e^x$, $x \in R$ is:

- (A) $1 - e$ (B) 0 (C) $\frac{1}{2}$ (D) $\frac{4}{e} - e$

If the solution of the differential equation

$$\frac{dy}{dx} + e^x (x^2 - 2) y = (x^2 - 2x) (x^2 - 2) e^{2x}$$

satisfies $y(0) = 0$, then the value of $y(2)$ is _____.

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

If m is the slope of a common tangent to the curves $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and $x^2 + y^2 = 12$, then $12m^2$ is equal to:

- (A) 6 (B) 9 (C) 10 (D) 12

The locus of the mid point of the line segment joining the point $(4, 3)$ and the points on the ellipse $x^2 + 2y^2 = 4$ is an ellipse with eccentricity:

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

Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined as $f(x) = x - 1$ and $g: \mathbb{R} - \{1, -1\} \rightarrow \mathbb{R}$ be defined as $g(x) = \frac{x^2}{x^2 - 1}$.

Then the function fog is:

- (A) one-one but not onto (B) onto but not one-one
(C) both one-one and onto (D) neither one-one nor onto

The normal to the hyperbola

$\frac{x^2}{a^2} - \frac{y^2}{9} = 1$ at the point $(8, 3\sqrt{3})$ on it passes through the point:

- (A) $(15, -2\sqrt{3})$ (B) $(9, 2\sqrt{3})$ (C) $(-1, 9\sqrt{3})$ (D) $(-1, 6\sqrt{3})$

If the inverse trigonometric functions take principal values then

$$\cos^{-1} \left(\frac{3}{10} \cos \left(\tan^{-1} \left(\frac{4}{3} \right) \right) + \frac{2}{5} \sin \left(\tan^{-1} \left(\frac{4}{3} \right) \right) \right)$$

is equal to:

- (A) 0 (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{6}$

$\lim_{x \rightarrow 0} \frac{\cos(\sin x) - \cos x}{x^4}$ is equal to:

- (A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{1}{6}$ (D) $\frac{1}{12}$

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Q67 Continuity & Differentiability[Step-by-step solution](https://www.prepwiser.in/questions/kglawHu-xB)

Let $f(x) = \min \{1, 1 + x \sin x\}$, $0 \leq x \leq 2\pi$. If m is the number of points, where f is not differentiable and n is the number of points, where f is not continuous, then the ordered pair (m, n) is equal to

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

Q68 Determinants[Step-by-step solution](https://www.prepwiser.in/questions/s5JLcqmuCL)

If the system of equations

$$\alpha x + y + z = 5, x + 2y + 3z = 4, x + 3y + 5z = \beta$$

has infinitely many solutions, then the ordered pair (α, β) is equal to:

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

Q69 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/I9hXgqPCp3)

If

$$A = \sum_{n=1}^{\infty} \frac{1}{(3 + (-1)^n)^n}$$

and

$$B = \sum_{n=1}^{\infty} \frac{(-1)^n}{(3 + (-1)^n)^n}$$

, then $\frac{A}{B}$ is equal to:

- (A) $\frac{11}{9}$ (B) 1 (C) $-\frac{11}{9}$ (D) $-\frac{11}{3}$

Q70 Statistics[Step-by-step solution](https://www.prepwiser.in/questions/_1_bSAlbvC)

The mean and standard deviation of 50 observations are 15 and 2 respectively. It was found that one incorrect observation was taken such that the sum of correct and incorrect observations is 70. If the correct mean is 16, then the correct variance is equal to:

- (A) 10 (B) 36 (C) 43 (D) 60

Q71 Area Under Curves[Step-by-step solution](https://www.prepwiser.in/questions/3LJ5G1xWW_)

The area of the region bounded by $y^2 = 8x$ and $y^2 = 16(3 - x)$ is equal to:

- (A) $\frac{32}{3}$ (B) $\frac{40}{3}$ (C) 16 (D) 19

Q72 Indefinite Integration[Step-by-step solution](https://www.prepwiser.in/questions/gVLI5hCcRj)

If $\int \frac{1}{x} \sqrt{\frac{1-x}{1+x}} dx = g(x) + c$, $g(1) = 0$, then $g\left(\frac{1}{2}\right)$ is equal to:

- (A) $\log_e \left(\frac{\sqrt{3}-1}{\sqrt{3}+1} \right) + \frac{\pi}{3}$ (B) $\log_e \left(\frac{\sqrt{3}+1}{\sqrt{3}-1} \right) + \frac{\pi}{3}$
(C) $\log_e \left(\frac{\sqrt{3}+1}{\sqrt{3}-1} \right) - \frac{\pi}{3}$ (D) $\frac{1}{2} \log_e \left(\frac{\sqrt{3}-1}{\sqrt{3}+1} \right) - \frac{\pi}{6}$

Q73 Trigonometric Ratios & Identities[Step-by-step solution](https://www.prepwiser.in/questions/BZZNnaiqS_)

$16 \sin(20^\circ) \sin(40^\circ) \sin(80^\circ)$ is equal to:

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

Q74 Binomial Theorem **NUMERICAL**

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

If

$$({}^{40}C_0) + ({}^{41}C_1) + ({}^{42}C_2) + \dots + ({}^{60}C_{20}) = \frac{m}{n} {}^{60}C_{20}$$

m and n are coprime, then m + n is equal to _____.

Q75 Complex Numbers **NUMERICAL**

[Step-by-step solution](#) › [prepwiser.in/questions/WSFnTXYa5R](https://www.prepwiser.in/questions/WSFnTXYa5R)

If $z^2 + z + 1 = 0$, $z \in C$, then

$$\left| \sum_{n=1}^{15} \left(z^n + (-1)^n \frac{1}{z^n} \right)^2 \right|$$

is equal to _____.

Q76 Definite Integration **NUMERICAL**

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

The integral

$$\frac{24}{\pi} \int_0^{\sqrt{2}} \frac{(2-x^2)dx}{(2+x^2)\sqrt{4+x^4}}$$

is equal to _____.

Q77 Functions (Advanced) **NUMERICAL**

[Step-by-step solution](#) › [prepwiser.in/questions/0SCfrIxYOs](https://www.prepwiser.in/questions/0SCfrIxYOs)

Let $f: \mathbb{R} \rightarrow \mathbb{R}$ satisfy $f(x+y) = 2^x f(y) + 4^y f(x)$, $\forall x, y \in \mathbb{R}$. If $f(2) = 3$, then $14 \cdot \frac{f'(4)}{f'(2)}$ is equal to _____.

Q78 Hyperbola **NUMERICAL**

[Step-by-step solution](#) › [prepwiser.in/questions/qKgZnd0pCk](https://www.prepwiser.in/questions/qKgZnd0pCk)

Let a line L_1 be tangent to the hyperbola $\frac{x^2}{16} - \frac{y^2}{4} = 1$ and let L_2 be the line passing through the origin and perpendicular to L_1 . If the locus of the point of intersection of L_1 and L_2 is $(x^2 + y^2)^2 = \alpha x^2 + \beta y^2$, then $\alpha + \beta$ is equal to _____.

Q79 Matrices **NUMERICAL**

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

Let

$$X = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}, Y = \alpha I + \beta X + \gamma X^2$$

and $Z = \alpha^2 I - \alpha \beta X + (\beta^2 - \alpha \gamma) X^2$, $\alpha, \beta, \gamma \in \mathbb{R}$. If

$$Y^{-1} = \begin{bmatrix} \frac{1}{5} & \frac{-2}{5} & \frac{1}{5} \\ 0 & \frac{1}{5} & \frac{-2}{5} \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$$

, then $(\alpha - \beta + \gamma)^2$ is equal to _____.

Q80 Permutations & Combinations **NUMERICAL**

[Step-by-step solution](#) › [prepwiser.in/questions/cizSxc2TIz](https://www.prepwiser.in/questions/cizSxc2TIz)

The total number of 3-digit numbers, whose greatest common divisor with 36 is 2, is _____.

Q81 Probability: Basic **NUMERICAL**

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

If the probability that a randomly chosen 6-digit number formed by using digits 1 and 8 only is a multiple of 21 is p, then 96 p is equal to _____.

Let p and q be two real numbers such that $p + q = 3$ and $p^4 + q^4 = 369$. Then $\left(\frac{1}{p} + \frac{1}{q}\right)^{-2}$ is equal to _____.

If $a_1 (> 0)$, a_2, a_3, a_4, a_5 are in a G.P., $a_2 + a_4 = 2a_3 + 1$ and $3a_2 + a_3 = 2a_4$, then $a_2 + a_4 + 2a_5$ is equal to _____.

Answer key: JEE Main 2022 · 26 Jun · Shift 2

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Physics

1. D	2. A	3. C	4. C	5. A	6. D	7. B	8. B	9. B	10. B
11. D	12. D	13. A	14. A	15. C	16. B	17. C	18. A	19. C	20. 12
21. 35	22. 9	23. 42	24. 540	25. 36	26. 5	27. 6	28. 152	29. 5	

Chemistry

30. B	31. C	32. C	33. D	34. B	35. A	36. C	37. A	38. A	39. D
40. B	41. A	42. D	43. A	44. D	45. C	46. C	47. 4	48. 6	49. 983
50. 3	51. 415	52. 143	53. 225	54. 38					

Mathematics

55. C	56. B	57. D	58. B	59. D	60. C	61. B	62. C	63. D	64. C
65. C	66. C	67. B	68. C	69. C	70. C	71. C	72. A	73. B	74. 102
75. 2	76. 3	77. 248	78. 12	79. 100	80. 150	81. 33	82. 4	83. 40	

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