

JEE MAIN 2022 · QUESTION PAPER

27 Jul 2022 Shift 1

80 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	15 Q30 to Q44	9 Q45 to Q53
● Mathematics	17 Q54 to Q70	10 Q71 to Q80
In this PDF	80 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.

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Answers follow NTA's final answer keys. Typing errors are possible, so check doubtful answers against the official key. Spotted a mistake? prepwis.in/feedback · Terms: prepwis.in/terms

Q1 Alternating Current

[Step-by-step solution](#) › [prepwisar.in/questions/HQNY6mKvCY](https://www.prepwisar.in/questions/HQNY6mKvCY)

A direct current of 4A and an alternating current of peak value 4A flow through resistance of 3Ω and 2Ω respectively. The ratio of heat produced in the two resistances in same interval of time will be:

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

Q2 Nuclear Physics

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

What is the half-life period of a radioactive material if its activity drops to $1/16^{\text{th}}$ of its initial value in 30 years?

- (A) 9.5 years (B) 8.5 years (C) 7.5 years (D) 10.5 years

Q3 Current Electricity

[Step-by-step solution](#) › [prepwisar.in/questions/y1PxbWjA9A](https://www.prepwisar.in/questions/y1PxbWjA9A)

Two sources of equal emfs are connected in series. This combination is connected to an external resistance R. The internal resistances of the two sources are r_1 and r_2 ($r_1 > r_2$). If the potential difference across the source of internal resistance r_1 is zero, then the value of R will be:

- (A) $r_1 - r_2$ (B) $\frac{r_1 r_2}{r_1 + r_2}$ (C) $\frac{r_1 + r_2}{2}$ (D) $r_2 - r_1$

Q4 Dual Nature of Radiation & Matter

[Step-by-step solution](#) › [prepwisar.in/questions/Ak755w9QO6](https://www.prepwisar.in/questions/Ak755w9QO6)

An electron (mass m) with an initial velocity $\vec{v} = v_0 \hat{i}$ ($v_0 > 0$) is moving in an electric field $\vec{E} = -E_0 \hat{i}$ ($E_0 > 0$) where E_0 is constant. If at $t = 0$ de Broglie wavelength is $\lambda_0 = \frac{h}{mv_0}$, then its de Broglie wavelength after time t is given by

- (A) λ_0 (B) $\lambda_0 \left(1 + \frac{eE_0 t}{mv_0}\right)$ (C) $\lambda_0 t$ (D) $\frac{\lambda_0}{\left(1 + \frac{eE_0 t}{mv_0}\right)}$

Q5 Electromagnetic Waves

[Step-by-step solution](#) › [prepwisar.in/questions/ryrW6Q2L5r](https://www.prepwisar.in/questions/ryrW6Q2L5r)

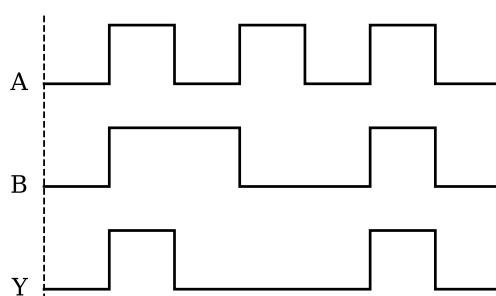
A beam of light travelling along X-axis is described by the electric field $E_y = 900 \sin \omega(t - x/c)$. The ratio of electric force to magnetic force on a charge q moving along Y-axis with a speed of $3 \times 10^7 \text{ms}^{-1}$ will be:

(Given speed of light = $3 \times 10^8 \text{ms}^{-1}$)

- (A) 1 : 1 (B) 1 : 10 (C) 10 : 1 (D) 1 : 2

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A logic gate circuit has two inputs A and B and output Y. The voltage waveforms of A, B and Y are shown below.



The logic gate circuit is:

- (A) AND gate (B) OR gate (C) NOR gate (D) NAND gate

Two identical positive charges Q each are fixed at a distance of ' $2a$ ' apart from each other. Another point charge q_0 with mass ' m ' is placed at midpoint between two fixed charges. For a small displacement along the line joining the fixed charges, the charge q_0 executes SHM. The time period of oscillation of charge q_0 will be:

- (A) $\sqrt{\frac{4\pi^3\epsilon_0 ma^3}{q_0 Q}}$ (B) $\sqrt{\frac{q_0 Q}{4\pi^3\epsilon_0 ma^3}}$ (C) $\sqrt{\frac{2\pi^2\epsilon_0 ma^3}{q_0 Q}}$ (D) $\sqrt{\frac{8\pi^3\epsilon_0 ma^3}{q_0 Q}}$

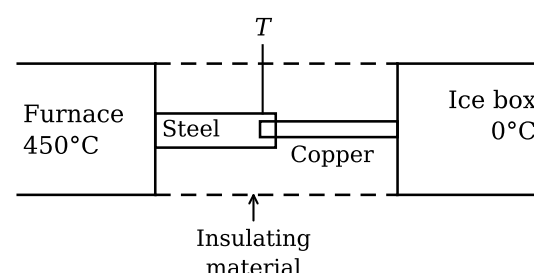
A microscope was initially placed in air (refractive index 1). It is then immersed in oil (refractive index 2). For a light whose wavelength in air is λ , calculate the change of microscope's resolving power due to oil and choose the correct option.

- (A) Resolving power will be $\frac{1}{4}$ in the oil than it was in the air.
 (B) Resolving power will be twice in the oil than it was in the air.
 (C) Resolving power will be four times in the oil than it was in the air.
 (D) Resolving power will be $\frac{1}{2}$ in the oil than it was in the air.

Two satellites A and B, having masses in the ratio 4 : 3, are revolving in circular orbits of radii $3r$ and $4r$ respectively around the earth. The ratio of total mechanical energy of A to B is:

- (A) 9 : 16 (B) 16 : 9 (C) 1 : 1 (D) 4 : 3

If K_1 and K_2 are the thermal conductivities, L_1 and L_2 are the lengths and A_1 and A_2 are the cross sectional areas of steel and copper rods respectively such that $\frac{K_2}{K_1} = 9$, $\frac{A_1}{A_2} = 2$, $\frac{L_1}{L_2} = 2$. Then, for the arrangement as shown in the figure, the value of temperature T of the steel - copper junction in the steady state will be:



- (A) 18°C (B) 14°C (C) 45°C (D) 150°C

Read the following statements:

- A. When small temperature difference between a liquid and its surrounding is doubled, the rate of loss of heat of the liquid becomes twice.
- B. Two bodies P and Q having equal surface areas are maintained at temperature 10°C and 20°C . The thermal radiation emitted in a given time by P and Q are in the ratio $1 : 1.15$.
- C. A Carnot Engine working between 100K and 400K has an efficiency of 75% .
- D. When small temperature difference between a liquid and its surrounding is quadrupled, the rate of loss of heat of the liquid becomes twice.

Choose the correct answer from the options given below:

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

Same gas is filled in two vessels of the same volume at the same temperature. If the ratio of the number of molecules is $1 : 4$, then

- A. The r.m.s. velocity of gas molecules in two vessels will be the same.
- B. The ratio of pressure in these vessels will be $1 : 4$.
- C. The ratio of pressure will be $1 : 1$.
- D. The r.m.s. velocity of gas molecules in two vessels will be in the ratio of $1 : 4$.

Choose the correct answer from the options given below:

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

A bag is gently dropped on a conveyor belt moving at a speed of 2m/s . The coefficient of friction between the conveyor belt and bag is 0.4 . Initially, the bag slips on the belt before it stops due to friction. The distance travelled by the bag on the belt during slipping motion, is : [Take $g = 10\text{m/s}^{-2}$]

- (A) 2 m (B) 0.5 m (C) 3.2 m (D) 0.8 ms

Two bar magnets oscillate in a horizontal plane in earth's magnetic field with time periods of 3s and 4s respectively. If their moments of inertia are in the ratio of $3 : 2$, then the ratio of their magnetic moments will be:

- (A) $2 : 1$ (B) $8 : 3$ (C) $1 : 3$ (D) $27 : 16$

A magnet hung at 45° with magnetic meridian makes an angle of 60° with the horizontal. The actual value of the angle of dip is -

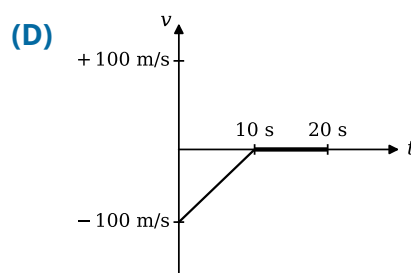
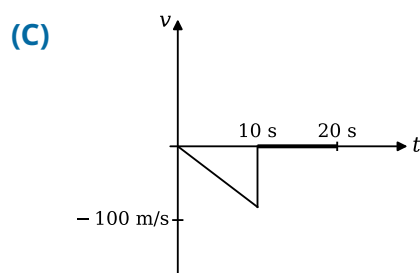
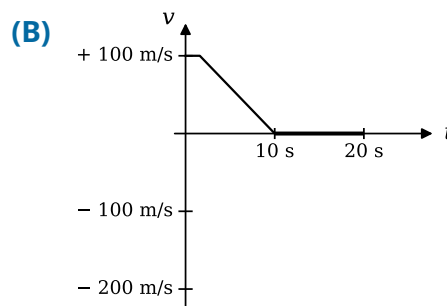
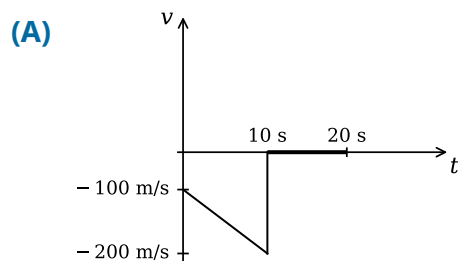
- (A) $\tan^{-1}\left(\sqrt{\frac{3}{2}}\right)$ (B) $\tan^{-1}(\sqrt{6})$ (C) $\tan^{-1}\left(\sqrt{\frac{2}{3}}\right)$ (D) $\tan^{-1}\left(\sqrt{\frac{1}{2}}\right)$

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Q16 Rectilinear Motion[Step-by-step solution > prepwiser.in/questions/q39Q7hX-zQ](https://www.prepwiser.in/questions/q39Q7hX-zQ)

A bullet is shot vertically downwards with an initial velocity of 100 m/s from a certain height. Within 10 s , the bullet reaches the ground and instantaneously comes to rest due to the perfectly inelastic collision. The velocity-time curve for total time $t = 20\text{ s}$ will be:

(Take $g = 10\text{ m/s}^2$).

**Q17** Work, Energy & Power[Step-by-step solution > prepwiser.in/questions/CHPfPNw3uN](https://www.prepwiser.in/questions/CHPfPNw3uN)

Two cylindrical vessels of equal cross-sectional area 16 cm^2 contain water upto heights 100 cm and 150 cm respectively. The vessels are interconnected so that the water levels in them become equal. The work done by the force of gravity during the process, is [Take, density of water $= 10^3\text{ kg/m}^3$ and $g = 10\text{ ms}^{-2}$]:

- (A) 0.25 J (B) 1 J (C) 8 J (D) 12 J

Q18 Work, Energy & Power[Step-by-step solution > prepwiser.in/questions/gZkyCro3ur](https://www.prepwiser.in/questions/gZkyCro3ur)

Sand is being dropped from a stationary dropper at a rate of 0.5 kgs^{-1} on a conveyor belt moving with a velocity of 5 ms^{-1} . The power needed to keep the belt moving with the same velocity will be:

- (A) 1.25 W (B) 2.5 W (C) 6.25 W (D) 12.5 W

Q19 Units, Dimensions & Errors[Step-by-step solution > prepwiser.in/questions/SaOoY4VUHj](https://www.prepwiser.in/questions/SaOoY4VUHj)

A torque meter is calibrated to reference standards of mass, length and time each with 5% accuracy. After calibration, the measured torque with this torque meter will have net accuracy of:

- (A) 15% (B) 25% (C) 75% (D) 5%

Physics Section B · Numerical value

Q20 to Q29

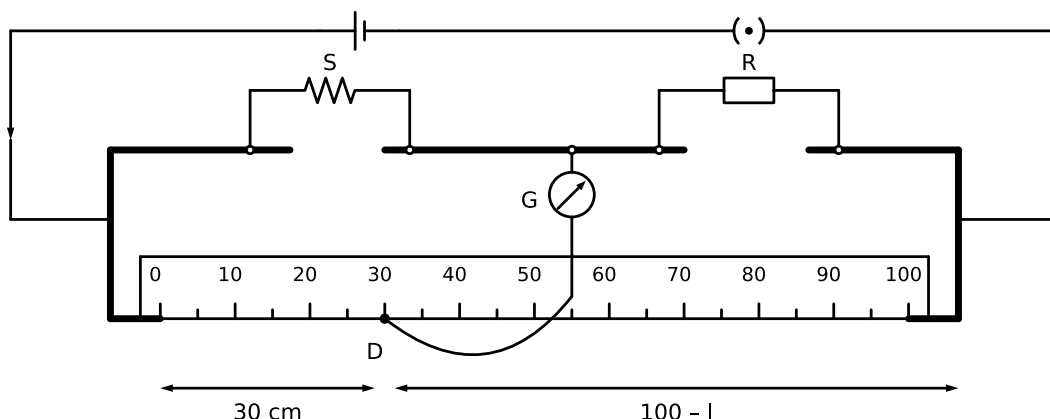
Q20 Alternating Current **NUMERICAL**[Step-by-step solution > prepwiser.in/questions/Wdxklm5Zp1](https://www.prepwiser.in/questions/Wdxklm5Zp1)

To light, a 50 W , 100 V lamp is connected, in series with a capacitor of capacitance $\frac{50}{\pi\sqrt{x}}\mu\text{F}$, with 200 V , 50 Hz AC source. The value of x will be _____.

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Q21 Current Electricity **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/YwhORaVDuE](https://www.prepwiser.in/questions/YwhORaVDuE)

In a meter bridge experiment, for measuring unknown resistance 'S', the null point is obtained at a distance 30cm from the left side as shown at point D. If R is $5.6 \text{ k}\Omega$, then the value of unknown resistance 'S' will be _____ Ω .

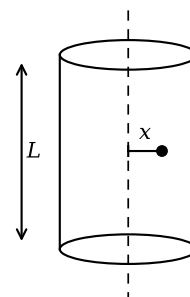
**Q22** Current Electricity **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/yf81b4MEiT](https://www.prepwiser.in/questions/yf81b4MEiT)

A 1m long copper wire carries a current of 1A. If the cross section of the wire is 2.0 mm^2 and the resistivity of copper is $1.7 \times 10^{-8} \Omega \text{ m}$, the force experienced by moving electron in the wire is _____ $\times 10^{-23} \text{ N}$.

(charge on electron = $1.6 \times 10^{-19} \text{ C}$)

Q23 Electrostatics I: Charges, Field & Gauss's Law **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/NF8hP7FbtV](https://www.prepwiser.in/questions/NF8hP7FbtV)

A long cylindrical volume contains a uniformly distributed charge of density $\rho \text{ Cm}^{-3}$. The electric field inside the cylindrical volume at a distance $x = \frac{2\epsilon_0}{\rho} \text{ m}$ from its axis is _____ Vm^{-1} .

**Q24** Projectile Motion & Relative Motion **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/JKv_YIK8i8](https://www.prepwiser.in/questions/JKv_YIK8i8)

A ball of mass m is thrown vertically upward. Another ball of mass 2m is thrown at an angle θ with the vertical. Both the balls stay in air for the same period of time. The ratio of the heights attained by the two balls respectively is $\frac{1}{x}$. The value of x is _____.

Q25 Elasticity **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/hjyMgAjbG0](https://www.prepwiser.in/questions/hjyMgAjbG0)

A square aluminum (shear modulus is $25 \times 10^9 \text{ Nm}^{-2}$) slab of side 60cm and thickness 15cm is subjected to a shearing force (on its narrow face) of $18.0 \times 10^4 \text{ N}$. The lower edge is riveted to the floor. The displacement of the upper edge is _____ $\mu \text{ m}$.

Q26 Rotational Motion **NUMERICAL**[Step-by-step solution](#) > [prepwiser.in/questions/hRcuZ8e-Vm](https://www.prepwiser.in/questions/hRcuZ8e-Vm)

A pulley of radius 1.5m is rotated about its axis by a force $F = (12t - 3t^2) \text{ N}$ applied tangentially (while t is measured in seconds). If moment of inertia of the pulley about its axis of rotation is 4.5 kgm^2 , the number of rotations made by the pulley before its direction of motion is reversed, will be $\frac{K}{\pi}$. The value of K is _____.

Q27 Simple Harmonic Motion **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/8o0fSxZKuW) > prepwisar.in/questions/8o0fSxZKuW

A mass 0.9kg , attached to a horizontal spring, executes SHM with an amplitude A_1 . When this mass passes through its mean position, then a smaller mass of 124g is placed over it and both masses move together with amplitude A_2 . If the ratio $\frac{A_1}{A_2}$ is $\frac{\alpha}{\alpha-1}$, then the value of α will be _____.

Q28 Wave Optics **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/xhlvoeSm0n) > prepwisar.in/questions/xhlvoeSm0n

Two beams of light having intensities I and $4I$ interfere to produce a fringe pattern on a screen. The phase difference between the two beams are $\pi/2$ and $\pi/3$ at points A and B respectively. The difference between the resultant intensities at the two points is xI . The value of x will be _____.

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

The one division of main scale of Vernier callipers reads 1mm and 10 divisions of Vernier scale is equal to the 9 divisions on main scale. When the two jaws of the instrument touch each other, the zero of the Vernier lies to the right of zero of the main scale and its fourth division coincides with a main scale division. When a spherical bob is tightly placed between the two jaws, the zero of the Vernier scale lies in between 4.1cm and 4.2cm and 6^{th} Vernier division coincides scale division. The diameter of the bob will be _____ $\times 10^{-2}\text{cm}$.

Chemistry Section A · Multiple choice

Q30 to Q44

Q30 Carbohydrates & Biomolecules[Step-by-step solution](https://www.prepwisar.in/questions/MbY6Rhi4QG) > prepwisar.in/questions/MbY6Rhi4QG

A sugar 'X' dehydrates very slowly under acidic condition to give furfural which on further reaction with resorcinol gives the coloured product after sometime. Sugar 'X' is

- (A) Aldopentose (B) Aldotetrose (C) Oxalic acid (D) Ketotetrose

Q31 d & f Block Elements[Step-by-step solution](https://www.prepwisar.in/questions/O-2eTnuvMb) > prepwisar.in/questions/O-2eTnuvMb

Given below are two statements.

Statement I: O_2 , Cu^{2+} , and Fe^{3+} are weakly attracted by magnetic field and are magnetized in the same direction as magnetic field.

Statement II: NaCl and H_2O are weakly magnetized in opposite direction to magnetic field.

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.

Q32 d & f Block Elements[Step-by-step solution](https://www.prepwisar.in/questions/F8RKZIX2Ry) > prepwisar.in/questions/F8RKZIX2Ry

The total number of $\text{Mn} = \text{O}$ bonds in Mn_2O_7 is _____.

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

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Given below are two statements.

Statement I : Hydrogen peroxide can act as an oxidizing agent in both acidic and basic conditions.

Statement II : Density of hydrogen peroxide at 298K is lower than that of D_2O .

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.

Which of the following methods are not used to refine any metal?

- A. Liquation
B. Calcination
C. Electrolysis
D. Leaching
E. Distillation

Choose the correct answer from the options given below:

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

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

Assertion A : Activated charcoal adsorbs SO_2 more efficiently than CH_4 .

Reason R : Gases with lower critical temperatures are readily adsorbed by activated charcoal.

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

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

Given below are two statements.

Statement I: The chlorides of Be and Al have Cl-bridged structure. Both are soluble in organic solvents and act as Lewis bases.

Statement II: Hydroxides of Be and Al dissolve in excess alkali to give beryllate and aluminate ions.

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.

Which oxoacid of phosphorous has the highest number of oxygen atoms present in its chemical formula?

- (A) Pyrophosphorus acid (B) Hypophosphoric acid
(C) Phosphoric acid (D) Pyrophosphoric acid

The incorrect statement is

- (A) The first ionization enthalpy of K is less than that of Na and Li.
- (B) Xe does not have the lowest first ionization enthalpy in its group.
- (C) The first ionization enthalpy of element with atomic number 37 is lower than that of the element with atomic number 38.
- (D) The first ionization enthalpy of Ga is higher than that of the d-block element with atomic number 30.

Boiling point of a 2% aqueous solution of a non-volatile solute A is equal to the boiling point of 8% aqueous solution of a non-volatile solute B. The relation between molecular weights of A and B is

- (A) $M_A = 4M_B$ (B) $M_B = 4M_A$ (C) $M_A = 8M_B$ (D) $M_B = 8M_A$

250g solution of D-glucose in water contains 10.8% of carbon by weight. The molality of the solution is nearest to

(Given: Atomic Weights are,

H, 1 u; C, 12 u; O, 16 u

)

- (A) 1.03 (B) 2.06 (C) 3.09 (D) 5.40

In Carius method of estimation of halogen, 0.45g of an organic compound gave 0.36g of AgBr. Find out the percentage of bromine in the compound.

(Molar masses:

$\text{AgBr} = 188\text{g mol}^{-1}$; $\text{Br} = 80\text{g mol}^{-1}$

)

- (A) 34.04% (B) 40.04% (C) 36.03% (D) 38.04%

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

Assertion A: Energy of 2s orbital of hydrogen atom is greater than that of 2s orbital of lithium.

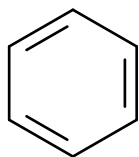
Reason R: Energies of the orbitals in the same subshell decrease with increase in the atomic number.

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

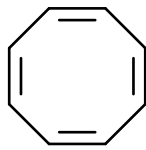
- (A) Both A and R are true and R is the correct explanation of A.
- (B) Both A and R are true but R is NOT the correct explanation of A.
- (C) A is true but R is false.
- (D) A is false but R is true.

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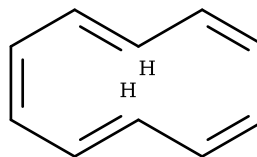
Given below are two statements: one is labelled as Assertion A and, the other is labelled as Reason R.
 Assertion A: [6] Annulene, [8] Annulene and cis-[10] Annulene, are respectively aromatic, not-aromatic and aromatic.



[6] Annulene



[8] Annulene



cis - [10] Annulene

Reason R: Planarity is one of the requirements of aromatic systems.

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

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

Match List I with List II.

	List I		List II
(A)	Benzenesulphonyl chloride	(I)	Test for primary amines
(B)	Hoffmann bromamide reaction	(II)	Anti Saytzeff
(C)	Carbylamine reaction	(III)	Hinsberg reagent
(D)	Hoffmann orientation	(IV)	Known reaction of Isocyanates.

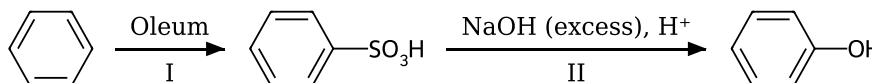
Choose the correct answer from the options given below:

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

Chemistry Section B · Numerical value

Q45 to Q53

In the following reaction



The % yield for reaction I is 60% and that of reaction II is 50%. The overall yield of the complete reaction is _____. [nearest integer]

Amongst the following, the number of oxide(s) which are paramagnetic in nature is



According to MO theory, number of species/ions from the following having identical bond order is _____.





The above reaction has been studied at 800°C. The related data are given in the table below

Reaction serial number	Initial Pressure of H_2/kPa	Initial Pressure of NO/kPa	Initial rate $\left(\frac{-dp}{dt}\right)/(kPa/s)$
1	65.6	40.0	0.135
2	65.6	20.1	0.033
3	38.6	65.6	0.214
4	19.2	65.6	0.106

The order of the reaction with respect to NO is _____.

The conductivity of a solution of complex with formula $\text{CoCl}_3(\text{NH}_3)_4$ corresponds to 1 : 1 electrolyte, then the primary valency of central metal ion is _____.

In the titration of KMnO_4 and oxalic acid in acidic medium, the change in oxidation number of carbon at the end point is _____.

20mL of 0.02 M $\text{K}_2\text{Cr}_2\text{O}_7$ solution is used for the titration of 10mL of Fe^{2+} solution in the acidic medium.

The molarity of Fe^{2+} solution is _____ $\times 10^{-2}$ M. (Nearest Integer)

The molar heat capacity for an ideal gas at constant pressure is $20.785\text{JK}^{-1}\text{mol}^{-1}$. The change in internal energy is 5000J upon heating it from 300K to 500K. The number of moles of the gas at constant volume is _____. [Nearest integer] (Given: $R = 8.314\text{JK}^{-1}\text{mol}^{-1}$)

Optical activity of an enantiomeric mixture is $+12.6^\circ$ and the specific rotation of (+) isomer is $+30^\circ$. The optical purity is _____%.

Mathematics Section A · Multiple choice

Q54 to Q70

If the plane P passes through the intersection of two mutually perpendicular planes $2x + ky - 5z = 1$ and $3kx - ky + z = 5$, $k < 3$ and intercepts a unit length on positive x -axis, then the intercept made by the plane P on the y -axis is:

- (A) $\frac{1}{11}$ (B) $\frac{5}{11}$ (C) 6 (D) 7

The remainder when $(2021)^{2022} + (2022)^{2021}$ is divided by 7 is

- (A) 0 (B) 1 (C) 2 (D) 6

Q56 Circles[Step-by-step solution](https://www.prepwiser.in/questions/8lwgt_TZam)

If the circle $x^2 + y^2 - 2gx + 6y - 19c = 0$, $g, c \in \mathbb{R}$ passes through the point $(6, 1)$ and its centre lies on the line $x - 2cy = 8$, then the length of intercept made by the circle on x -axis is:

- (A) $\sqrt{11}$ (B) 4 (C) 3 (D) $2\sqrt{23}$

Q57 Complex Numbers[Step-by-step solution](https://www.prepwiser.in/questions/H-CsuyYOE0)

Let the minimum value v_0 of $v = |z|^2 + |z - 3|^2 + |z - 6i|^2$, $z \in \mathbb{C}$ is attained at $z = z_0$. Then $|2z_0^2 - \bar{z}_0^3 + 3|^2 + v_0^2$ is equal to:

- (A) 1000 (B) 1024 (C) 1105 (D) 1196

Q58 Definite Integration[Step-by-step solution](https://www.prepwiser.in/questions/bs6n9udyD_)

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function defined as

$f(x) = a \sin\left(\frac{\pi[x]}{2}\right) + [2 - x]$, $a \in \mathbb{R}$ where $[t]$ is the greatest integer less than or equal to t . If

$\lim_{x \rightarrow -1} f(x)$ exists, then the value of $\int_0^4 f(x) dx$ is equal to

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

Q59 Continuity & Differentiability[Step-by-step solution](https://www.prepwiser.in/questions/hAxEX9Fgju)

Let a function $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined as:

$$f(x) = \begin{cases} \int_0^x (5 - |t - 3|) dt, & x > 4 \\ x^2 + bx & , x \leq 4 \end{cases}$$

where $b \in \mathbb{R}$. If f is continuous at $x = 4$, then which of the following statements is NOT true?

- (A) f is not differentiable at $x = 4$ (B) $f'(3) + f'(5) = \frac{35}{4}$
(C) f is increasing in $(-\infty, \frac{1}{8}) \cup (8, \infty)$ (D) f has a local minima at $x = \frac{1}{8}$

Q60 Differential Equations[Step-by-step solution](https://www.prepwiser.in/questions/SNoGZzZj_c)

Let $y = y_1(x)$ and $y = y_2(x)$ be two distinct solutions of the differential equation $\frac{dy}{dx} = x + y$, with $y_1(0) = 0$ and $y_2(0) = 1$ respectively. Then, the number of points of intersection of $y = y_1(x)$ and $y = y_2(x)$ is

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

Q61 Relations & Functions (Basic)[Step-by-step solution](https://www.prepwiser.in/questions/REOm5Y9nYQ)

Let $f, g : \mathbb{N} - \{1\} \rightarrow \mathbb{N}$ be functions defined by $f(a) = \alpha$, where α is the maximum of the powers of those primes p such that p^α divides a , and $g(a) = a + 1$, for all $a \in \mathbb{N} - \{1\}$. Then, the function $f + g$ 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

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Let

$$A = \begin{pmatrix} 1 & 2 \\ -2 & -5 \end{pmatrix}$$

. Let $\alpha, \beta \in \mathbb{R}$ be such that $\alpha A^2 + \beta A = 2I$. Then $\alpha + \beta$ is equal to

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

Let $P(a, b)$ be a point on the parabola $y^2 = 8x$ such that the tangent at P passes through the centre of the circle $x^2 + y^2 - 10x - 14y + 65 = 0$. Let A be the product of all possible values of a and B be the product of all possible values of b . Then the value of $A + B$ is equal to:

- (A) 0 (B) 25 (C) 40 (D) 65

Let S be the sample space of all five digit numbers. If p is the probability that a randomly selected number from S , is a multiple of 7 but not divisible by 5, then $9p$ is equal to:

- (A) 1.0146 (B) 1.2085 (C) 1.0285 (D) 1.1521

Suppose $a_1, a_2, \dots, a_n, \dots$ be an arithmetic progression of natural numbers. If the ratio of the sum of first five terms to the sum of first nine terms of the progression is $5 : 17$ and, $110 < a_{15} < 120$, then the sum of the first ten terms of the progression is equal to

- (A) 290 (B) 380 (C) 460 (D) 510

Let R_1 and R_2 be two relations defined on $\mathbb{R}$ by

$$a R_1 b \Leftrightarrow ab \geq 0 \text{ and } a R_2 b \Leftrightarrow a \geq b$$

Then,

- (A) R_1 is an equivalence relation but not R_2 (B) R_2 is an equivalence relation but not R_1
 (C) both R_1 and R_2 are equivalence relations (D) neither R_1 nor R_2 is an equivalence relation

Let $\vec{a} = \alpha\hat{i} + \hat{j} + \beta\hat{k}$ and $\vec{b} = 3\hat{i} - 5\hat{j} + 4\hat{k}$ be two vectors, such that $\vec{a} \times \vec{b} = -\hat{i} + 9\hat{j} + 12\hat{k}$. Then the projection of $\vec{b} - 2\vec{a}$ on $\vec{b} + \vec{a}$ is equal to:

- (A) 2 (B) $\frac{39}{5}$ (C) 9 (D) $\frac{46}{5}$

Let $\vec{a} = 2\hat{i} - \hat{j} + 5\hat{k}$ and $\vec{b} = \alpha\hat{i} + \beta\hat{j} + 2\hat{k}$. If $((\vec{a} \times \vec{b}) \times \hat{i}) \cdot \hat{k} = \frac{23}{2}$, then $|\vec{b} \times 2\hat{j}|$

is equal to:

- (A) 4 (B) 5 (C) $\sqrt{21}$ (D) $\sqrt{17}$

Q69 Area Under Curves[Step-by-step solution](#) › [prepwiser.in/questions/7aZELLPe8T](#)

The area of the smaller region enclosed by the curves $y^2 = 8x + 4$ and $x^2 + y^2 + 4\sqrt{3}x - 4 = 0$ is equal to

- (A) $\frac{1}{3}(2 - 12\sqrt{3} + 8\pi)$ (B) $\frac{1}{3}(2 - 12\sqrt{3} + 6\pi)$ (C) $\frac{1}{3}(4 - 12\sqrt{3} + 8\pi)$ (D) $\frac{1}{3}(4 - 12\sqrt{3} + 6\pi)$

Q70 Straight Lines[Step-by-step solution](#) › [prepwiser.in/questions/Tf9JAHnhb3](#)

Let $A(1, 1)$, $B(-4, 3)$, $C(-2, -5)$ be vertices of a triangle ABC , P be a point on side BC , and Δ_1 and Δ_2 be the areas of triangles APB and ABC , respectively. If $\Delta_1 : \Delta_2 = 4 : 7$, then the area enclosed by the lines AP , AC and the x -axis is:

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

Mathematics Section B · Numerical value

Q71 to Q80

Q71 Three Dimensional Geometry **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/Qcn3IOch4F](#)

Let the line $\frac{x-3}{7} = \frac{y-2}{-1} = \frac{z-3}{-4}$ intersect the plane containing the lines $\frac{x-4}{1} = \frac{y+1}{-2} = \frac{z}{1}$ and $4ax - y + 5z - 7a = 0 = 2x - 5y - z - 3$, $a \in \mathbb{R}$ at the point $P(\alpha, \beta, \gamma)$. Then the value of $\alpha + \beta + \gamma$ equals _____.

Q72 Applications of Derivatives **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/vj_T81ouId](#)

Let M and N be the number of points on the curve $y^5 - 9xy + 2x = 0$, where the tangents to the curve are parallel to x -axis and y -axis, respectively. Then the value of $M + N$ equals _____.

Q73 Complex Numbers **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/hMH-bH8kVx](#)

Let $S = \{z \in \mathbb{C} : z^2 + \bar{z} = 0\}$. Then $\sum_{z \in S} (\operatorname{Re}(z) + \operatorname{Im}(z))$ is equal to _____.

Q74 Differential Equations **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/ymEAzSYhFN](#)

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

$$\sin(2x^2) \log_e(\tan x^2) dy + \left(4xy - 4\sqrt{2}x \sin\left(x^2 - \frac{\pi}{4}\right)\right) dx = 0$$

, $0 < x < \sqrt{\frac{\pi}{2}}$, which passes through the point $(\sqrt{\frac{\pi}{6}}, 1)$. Then $|y(\sqrt{\frac{\pi}{3}})|$ is equal to _____.

Q75 Ellipse **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/APuTVGZkwV](#)

If the length of the latus rectum of the ellipse $x^2 + 4y^2 + 2x + 8y - \lambda = 0$ is 4, and l is the length of its major axis, then $\lambda + l$ is equal to _____.

Q76 Quadratic Equations & Polynomial Inequalities **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/9xRgwK1KTP](#)

Let $f(x) = 2x^2 - x - 1$ and $S = \{n \in \mathbb{Z} : |f(n)| \leq 800\}$. Then, the value of $\sum_{n \in S} f(n)$ is equal to _____.

Q77 Ellipse **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/UQSu9nx9If](#)

An ellipse $E : \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ passes through the vertices of the hyperbola $H : \frac{x^2}{49} - \frac{y^2}{64} = -1$. Let the major and minor axes of the ellipse E coincide with the transverse and conjugate axes of the hyperbola H , respectively. Let the product of the eccentricities of E and H be $\frac{1}{2}$. If l is the length of the latus rectum of the ellipse E , then the value of $113l$ is equal to _____.

For $k \in \mathbb{R}$, let the solutions of the equation

$$\cos(\sin^{-1}(x \cot(\tan^{-1}(\cos(\sin^{-1}x)))) = k, 0 < |x| < \frac{1}{\sqrt{2}}$$

be α and β , where the inverse trigonometric functions take only principal values. If the solutions of the equation $x^2 - bx - 5 = 0$ are $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$ and $\frac{\alpha}{\beta}$, then $\frac{b}{k^2}$ is equal to _____.

Let S be the set containing all 3×3 matrices with entries from $\{-1, 0, 1\}$. The total number of matrices $A \in S$ such that the sum of all the diagonal elements of $A^T A$ is 6 is _____.

The mean and variance of 10 observations were calculated as 15 and 15 respectively by a student who took by mistake 25 instead of 15 for one observation. Then, the correct standard deviation is _____.

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

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Physics

1. B	2. C	3. A	4. D	5. C	6. A	7. A	8. B
9. B	10. C	11. A	12. C	13. B	14. B	15. A	16. A
17. B	18. D	19. B	20. 3	21. 2400	22. 136	23. 1	24. 1
25. 48	26. 18	27. 16	28. 2	29. 412			

Chemistry

30. A	31. A	32. C	33. C	34. A	35. C	36. D	37. D
38. D	39. B	40. B	41. A	42. A	43. D	44. C	45. 30
46. 4	47. 3	48. 2	49. 3	50. 1	51. 24	52. 2	53. 42

Mathematics

54. D	55. A	56. D	57. A	58. B	59. C	60. A	61. D
62. D	63. D	64. C	65. B	66. D	67. D	68. B	69. C
70. C	71. 12	72. 2	73. 0	74. 1	75. 75	76. 10620	77. 1552
78. 12	79. 5376	80. 2					

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