

JEE MAIN 2025 (ONLINE) 23RD JANUARY EVENING SHIFT

Question Paper · answer key at the end

Time: 3 Hours

Max. Marks: 300

Questions: 75

General Instructions:

1. The duration of the paper is 3 hours. It has 75 questions: Physics 25, Chemistry 25, Mathematics 25.
2. Each subject has Section A (multiple-choice questions, only one correct answer) and Section B (numerical-value questions).
3. Marking: +4 for each correct answer, -1 for each wrong answer, 0 for a question not answered.
4. The answer key is at the end. Scan the QR code beside any question for its step-by-step solution.
5. Practise this paper as a timed test on the real exam screen, free, at pyqside.com.

Physics: Section A (MCQ)

Q.1 The equation of a transverse wave travelling along a string is

$y(x, t) = 4.0 \sin [20 \times 10^{-3}x + 600t] \text{ mm}$, where x is in mm and t is in second. The velocity of the wave is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) -60 m/s (2) +60 m/s
(3) +30 m/s (4) -30 m/s

Scan or tap for the
full solution



Q.2 A plane electromagnetic wave of frequency 20 MHz travels in free space along the +x direction. At a particular point in space and time, the electric field vector of the wave is $E_y = 9.3 \text{ V m}^{-1}$. Then, the magnetic field vector of the wave at that point is

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $B_z = 1.55 \times 10^{-8} \text{ T}$ (2) $B_z = 6.2 \times 10^{-8} \text{ T}$
(3) $B_z = 3.1 \times 10^{-8} \text{ T}$ (4) $B_z = 9.3 \times 10^{-8} \text{ T}$

Scan or tap for the
full solution



Q.3 If a satellite orbiting the Earth is 9 times closer to the Earth than the Moon, what is the time period of rotation of the satellite? Given rotational time period of Moon = 27 days and gravitational attraction between the satellite and the moon is neglected.

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 3 days (2) 27 days
(3) 81 days (4) 1 day

Scan or tap for the
full solution



Q.4 A massless spring gets elongated by amount x_1 under a tension of 5 N. Its elongation is x_2 under the tension of 7 N. For the elongation of $(5x_1 - 2x_2)$, the tension in the spring will be,

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 20 N (2) 39 N (3) 11 N (4) 15 N

Scan or tap for the
full solution



Q.5 Water of mass m gram is slowly heated to increase the temperature from T_1 to T_2 . The change in entropy of the water, given specific heat of water is $1 \text{ J kg}^{-1} \text{ K}^{-1}$, is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

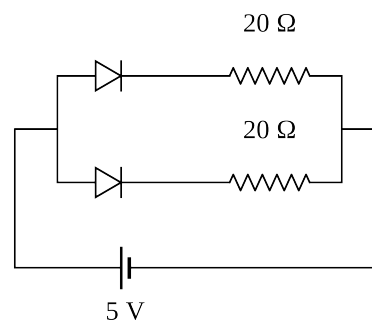
- (1) $m(T_2 - T_1)$ (2) zero
(3) $m \ln \left(\frac{T_1}{T_2} \right)$ (4) $m \ln \left(\frac{T_2}{T_1} \right)$

Scan or tap for the
full solution



Q.6 What is the current through the battery in the circuit shown below?

[JEE Main 2025 (Online) 23rd January Evening Shift]



- (1) 1.5 A (2) 0.25 A (3) 1.0 A (4) 0.5 A

Scan or tap for the
full solution



Q.7 Given below are two statements. One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): The binding energy per nucleon is found to be practically independent of the atomic number A , for nuclei with mass numbers between 30 and 170.

Reason (R): Nuclear force is long range.

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

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) (A) is true but (R) is false
 (2) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (3) (A) is false but (R) is true
 (4) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)

Scan or tap for the full solution



- Q.8** A ball having kinetic energy KE, is projected at an angle of 60° from the horizontal. What will be the kinetic energy of ball at the highest point of its flight?

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\frac{(KE)}{2}$ (2) $\frac{(KE)}{8}$ (3) $\frac{(KE)}{4}$ (4) $\frac{(KE)}{16}$

Scan or tap for the full solution



- Q.9** In photoelectric effect an em-wave is incident on a metal surface and electrons are ejected from the surface. If the work function of the metal is 2.14 eV and stopping potential is 2 V, what is the wavelength of the em-wave? (Given $hc = 1242 \text{ eV nm}$ where h is the Planck's constant and c is the speed of light in vacuum.)

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 400 nm (2) 600 nm (3) 300 nm (4) 200 nm

Scan or tap for the full solution



- Q.10** Two point charges $-4 \mu\text{C}$ and $4 \mu\text{C}$, constituting an electric dipole, are placed at $(-9, 0, 0)$ cm and $(9, 0, 0)$ cm in a uniform electric field of strength 10^4 N C^{-1} . The work done on the dipole in rotating it from the equilibrium through 180° is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 18.4 mJ (2) 12.4 mJ
 (3) 16.4 mJ (4) 14.4 mJ

Scan or tap for the full solution



- Q.11** A concave mirror of focal length f in air is dipped in a liquid of refractive index μ . Its focal length in the liquid will be:

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) μf (2) f (3) $\frac{f}{\mu}$ (4) $\frac{f}{(\mu - 1)}$

Scan or tap for the full solution



- Q.12** The width of one of the two slits in Young's double slit experiment is d while that of the other slit is $x d$. If the ratio of the maximum to the minimum intensity in the interference pattern on the screen is 9:4 then what is the value of x ? (Assume that the field strength varies according to the slit width.)

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 2 (2) 3 (3) 4 (4) 5

Scan or tap for the full solution



- Q.13** The refractive index of the material of a glass prism is $\sqrt{3}$. The angle of minimum deviation is equal to the angle of the prism. What is the angle of the prism?

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 60° (2) 50° (3) 58° (4) 48°

Scan or tap for the full solution



- Q.14** Two charges $7 \mu\text{C}$ and $-4 \mu\text{C}$ are placed at $(-7 \text{ cm}, 0, 0)$ and $(7 \text{ cm}, 0, 0)$ respectively. Given, $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$, the electrostatic potential energy of the charge configuration is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) -2.0 J (2) -1.5 J (3) -1.2 J (4) -1.8 J

Scan or tap for the full solution



- Q.15** Water flows in a horizontal pipe whose one end is closed with a valve. The reading of the pressure gauge attached to the pipe is P_1 . The reading of the pressure gauge falls to P_2 when the valve is opened. The speed of water flowing in the pipe is proportional to

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $(P_1 - P_2)^2$ (2) $\sqrt{P_1 - P_2}$
 (3) $P_1 - P_2$ (4) $(P_1 - P_2)^4$

Scan or tap for the full solution



- Q.16** The energy of a system is given as $E(t) = \alpha^3 e^{-\beta t}$, where t is the time and $\beta = 0.3 \text{ s}^{-1}$. The errors in the measurement of α and t are 1.2% and 1.6%, respectively. At $t = 5 \text{ s}$, maximum percentage error in the energy is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 6% (2) 11.6% (3) 4% (4) 8.4%

Scan or tap for the full solution



- Q.17** Match List - I with List - II

List - I		List - II	
A.	Permeability of free space	I.	$[\text{ML}^2 \text{T}^{-2}]$
B.	Magnetic field	II.	$[\text{MT}^{-2} \text{A}^{-1}]$

List - I		List - II	
C.	Magnetic moment	III.	$[MLT^{-2} A^{-2}]$
D.	Torsional constant	IV.	$[L^2 A]$

Choose the correct answer from the options given below :

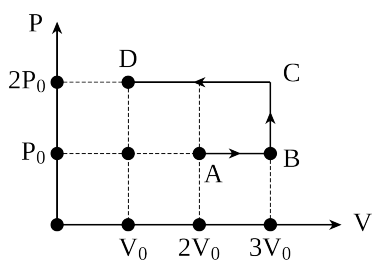
[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) (A)-(III), (B)-(II), (C)-(IV), (D)-(I)
 (2) (A)-(I), (B)-(IV), (C)-(II), (D)-(III)
 (3) (A)-(II), (B)-(I), (C)-(III), (D)-(IV)
 (4) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)

Scan or tap for the full solution



Q.18



Using the given $P - V$ diagram, the work done by an ideal gas along the path ABCD is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $3P_0 V_0$ (2) $-3P_0 V_0$
 (3) $-4P_0 V_0$ (4) $4P_0 V_0$

Scan or tap for the full solution



Q.19 A circular disk of radius R meter and mass M kg is rotating around the axis perpendicular to the disk. An external torque is applied to the disk such that $\theta(t) = 5t^2 - 8t$, where $\theta(t)$ is the angular position of the rotating disc as a function of time t . How much power is delivered by the applied torque, when $t = 2$ s ?

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $60 MR^2$ (2) $72 MR^2$
 (3) $8 MR^2$ (4) $108 MR^2$

Scan or tap for the full solution



Q.20 A galvanometer having a coil of resistance 30Ω need 20 mA of current for full-scale deflection. If a maximum current of 3 A is to be measured using this galvanometer, the resistance of the shunt to be added to the galvanometer should be $\frac{30}{X} \Omega$, where X

is [JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 447 (2) 298 (3) 149 (4) 596

Scan or tap for the full solution



Physics: Section B (Numerical)

Q.21 A time varying potential difference is applied between the plates of a parallel plate capacitor of capacitance $2.5 \mu\text{F}$. The dielectric constant of the medium between the capacitor plates is 1 . It produces an instantaneous displacement current of 0.25 mA in the intervening space between the capacitor plates, the magnitude of the rate of change of the potential difference will be _____ V s^{-1} .

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the full solution



Q.22 In a series LCR circuit, a resistor of 300Ω , a capacitor of 25 nF and an inductor of 100 mH are used. For maximum current in the circuit, the angular frequency of the ac source is _____ $\times 10^4$ radians s^{-1}

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the full solution



Q.23 An air bubble of radius 1.0 mm is observed at a depth 20 cm below the free surface of a liquid having surface tension 0.095 J/m² and density 10^3 kg/m³. The difference between pressure inside the bubble and atmospheric pressure is _____ N/m². (Take $g = 10$ m/s²)

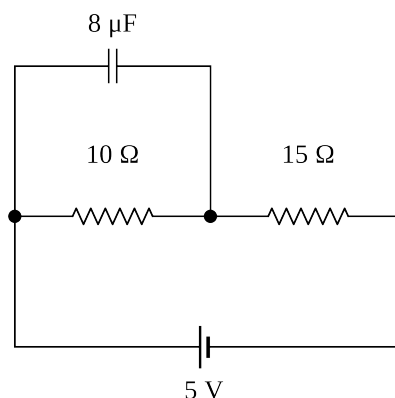
[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the full solution



Q.24 At steady state the charge on the capacitor, as shown in the circuit below, is _____ μC .

[JEE Main 2025 (Online) 23rd January Evening Shift]



Scan or tap for the full solution



- Q.25** A satellite of mass $\frac{M}{2}$ is revolving around earth in a circular orbit at a height of $\frac{R}{3}$ from earth surface. The angular momentum of the satellite is $M\sqrt{\frac{GMR}{x}}$. The value of x is _____, where M and R are the mass and radius of earth, respectively. (G is the gravitational constant)

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the full solution

**Chemistry: Section A (MCQ)**

- Q.26** pH of water is 7 at 25°C. If water is heated to 80°C, it's pH will :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) Decrease
(2) Remains the same
(3) Increase
(4) H^+ concentration increases, OH^- concentration decreases

Scan or tap for the full solution



- Q.27** When a non-volatile solute is added to the solvent, the vapour pressure of the solvent decreases by 10 mm of Hg. The mole fraction of the solute in the solution is 0.2. What would be the mole fraction of the solvent if decrease in vapour pressure is 20 mm of Hg ?

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 0.2 (2) 0.4 (3) 0.8 (4) 0.6

Scan or tap for the full solution



- Q.28** Match List - I with List - II

List - I		List - II	
A.	Bronze	I.	Cu, Ni
B.	Brass	II.	Fe, Cr, Ni, C
C.	UK silver coin	III.	Cu, Zn
D.	Stainless steel	IV.	Cu, Sn

Choose the correct answer from the options given below :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) A-IV, B-II, C-III, D-I
(2) A-IV, B-III, C-I, D-II
(3) A-III, B-I, C-IV, D-II
(4) A-III, B-IV, C-II, D-I



Solution

- Q.29** Consider a binary solution of two volatile liquid components 1 and 2. x_1 and y_1 are the mole fractions of component 1 in liquid and vapour phase, respectively. The slope and intercept of the linear plot of $\frac{1}{x_1}$ vs $\frac{1}{y_1}$ are given respectively as :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\frac{P_1^0}{P_2^0}, \frac{P_1^0 - P_2^0}{P_2^0}$ (2) $\frac{P_2^0}{P_1^0}, \frac{P_2^0 - P_1^0}{P_1^0}$
(3) $\frac{P_2^0}{P_1^0}, \frac{P_1^0 - P_2^0}{P_2^0}$ (4) $\frac{P_1^0}{P_2^0}, \frac{P_2^0 - P_1^0}{P_2^0}$

Scan or tap for the full solution



- Q.30** Given below are the atomic numbers of some group 14 elements. The atomic number of the element with lowest melting point is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 14 (2) 50 (3) 6 (4) 82

Scan or tap for the full solution



- Q.31** Given below are two statements :

Statement-I: The boiling points of alcohols and phenols increase with increase in the number of C-atoms.

Statement-II: The boiling points of alcohols and phenols are higher in comparison to other class of compounds such as ethers, haloalkanes.

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

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) Statement-I is false but Statement-II is true
(2) Both Statement-I and Statement-II are true
(3) Statement-I is true but Statement-II is false
(4) Both Statement-I and Statement-II are false

Scan or tap for the full solution



- Q.32** The α -Helix and β - Pleated sheet structures of protein are associated with its :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) tertiary structure (2) quaternary structure
(3) primary structure (4) secondary structure

Scan or tap for the full solution



- Q.33** The effect of temperature on spontaneity of reactions are represented as :

	ΔH	ΔS	Temperature	Spontaneity
(A)	+	-	any T	Non spontaneous
(B)	+	+	low T	spontaneous
(C)	-	-	low T	Non spontaneous
(D)	-	+	any T	spontaneous

The incorrect combinations are :

[JEE Main 2025 (Online) 23rd January Evening Shift]

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

Scan or tap for the full solution



Q.34 Match List - I with List - II

List - I (Isomers of $\text{C}_{10}\text{H}_{14}$)	
A.	
B.	
C.	
D.	
List - II (Ozonolysis product)	
I.	
II.	
III.	
IV.	

Choose the correct answer from the options given below :

[JEE Main 2025 (Online) 23rd January Evening Shift]

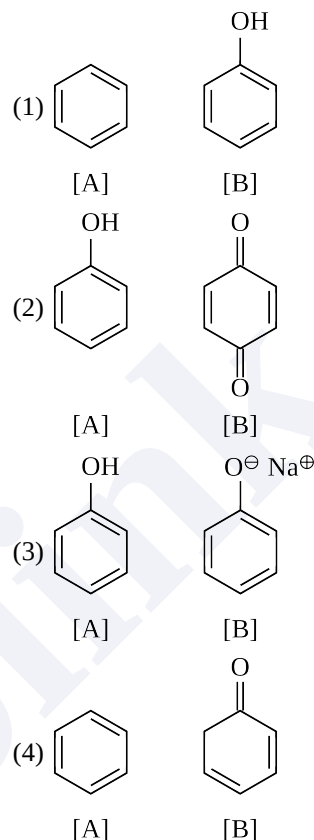
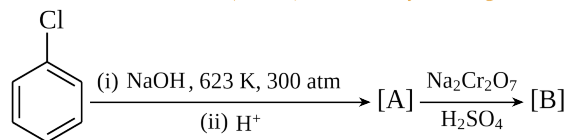
- (1) A-III, B-IV, C-I, D-II
(2) A-I, B-IV, C-III, D-II
(3) A-III, B-II, C-I, D-IV
(4) A-II, B-II, C-I, D-IV



Solution

Q.35 Identify the products [A] and [B], respectively in the following reaction:

[JEE Main 2025 (Online) 23rd January Evening Shift]

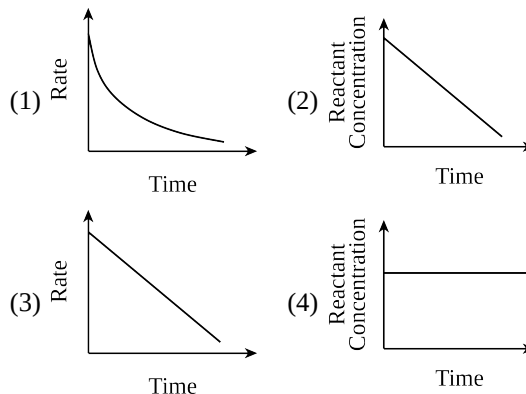


Scan or tap for the full solution



Q.36 Which of the following graphs most appropriately represents a zero order reaction?

[JEE Main 2025 (Online) 23rd January Evening Shift]

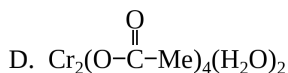


Scan or tap for the full solution



Q.37 Identify the coordination complexes in which the central metal ion has d^4 configuration.

- A. $[\text{FeO}_4]^{2-}$
B. $[\text{Mn}(\text{CN})_6]^{3-}$
C. $[\text{Fe}(\text{CN})_6]^{3-}$



Choose the correct answer from the options given below :

[JEE Main 2025 (Online) 23rd January Evening Shift]

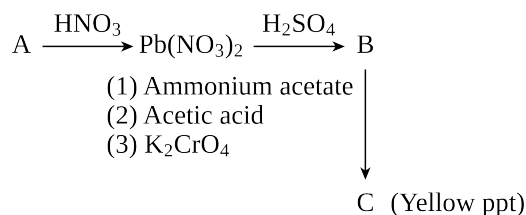
- (1) B, C and D only (2) C and E only
 (3) A, B and E only (4) B and D only

Scan or tap for the full solution



Q.38 Identify A, B and C in the given below reaction sequence

[JEE Main 2025 (Online) 23rd January Evening Shift]



- (1) PbCl_2 , PbSO_4 , PbCrO_4
 (2) PbS , PbSO_4 , $\text{Pb}(\text{CH}_3\text{COO})_2$
 (3) PbS , PbSO_4 , PbCrO_4
 (4) PbCl_2 , $\text{Pb}(\text{SO}_4)_2$, PbCrO_4



Solution

Q.39 Standard electrode potentials for a few half cells are mentioned below :

$$E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V}, E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$$

$$E^\circ_{\text{Ag}^+/\text{Ag}} = 0.80 \text{ V}, E^\circ_{\text{Mg}^{2+}/\text{Mg}} = -2.37 \text{ V}$$

Which one of the following cells gives the most negative value of ΔG° ?

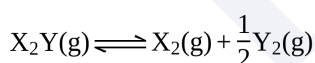
[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\text{Zn} | \text{Zn}^{2+}(1\text{M}) || \text{Ag}^+(1\text{M}) | \text{Ag}$
 (2) $\text{Ag} | \text{Ag}^+(1\text{M}) || \text{Mg}^{2+}(1\text{M}) | \text{Mg}$
 (3) $\text{Zn} | \text{Zn}^{2+}(1\text{M}) || \text{Mg}^{2+}(1\text{M}) | \text{Mg}$
 (4) $\text{Cu} | \text{Cu}^{2+}(1\text{M}) || \text{Ag}^+(1\text{M}) | \text{Ag}$



Solution

Q.40 Consider the reaction



The equation representing correct relationship between the degree of dissociation (x) of $\text{X}_2\text{Y}(\text{g})$ with its equilibrium constant K_p is _____. Assume x to be very very small.

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $x = \sqrt[3]{\frac{K_p}{P}}$ (2) $x = \sqrt{\frac{K_p}{2P}}$
 (3) $x = \sqrt{\frac{2K_p^2}{P}}$ (4) $x = \sqrt{\frac{2K_p}{P}}$

Scan or tap for the full solution



Q.41 Given below are two statements :

Statement-I: For a given shell, the total number of allowed orbitals is given by n^2 .

Statement-II: For any subshell, the spatial orientation of the orbitals is given by $-l$ to $+l$ values including zero.

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

[JEE Main 2025 (Online) 23rd January Evening Shift]

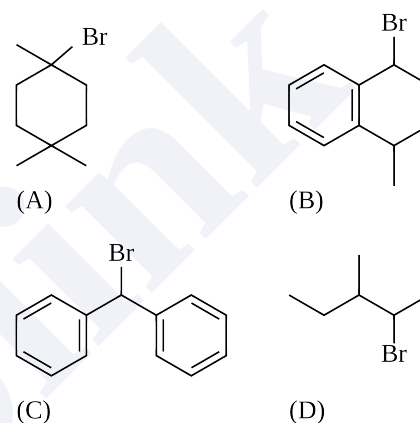
- (1) Both Statement-I and Statement-II are true
 (2) Both Statement-I and Statement-II are false
 (3) Statement-I is false but Statement-II is true
 (4) Statement-I is true but Statement-II is false

Scan or tap for the full solution



Q.42 The ascending order of relative rate of solvolysis of following compounds is :

[JEE Main 2025 (Online) 23rd January Evening Shift]



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



Solution

Q.43 Given below are two statements about X-ray spectra of elements :

Statement-I: A plot of $\sqrt{\nu}$ (ν = frequency of X-rays emitted) vs atomic mass is a straight line.

Statement-II: A plot of ν (ν = frequency of X-rays emitted) vs atomic number is a straight line.

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

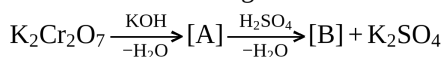
[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) Statement-I is false but Statement-II is true
 (2) Both Statement-I and Statement-II are true
 (3) Statement-I is true but Statement-II is false
 (4) Both Statement-I and Statement-II are false

Scan or tap for the full solution



Q.44 Consider the following reactions



The products [A] and [B], respectively are :

[JEE Main 2025 (Online) 23rd January Evening Shift]

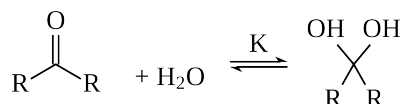
- (1) $\text{K}_2\text{Cr}(\text{OH})_6$ and Cr_2O_3
- (2) K_2CrO_4 and Cr_2O_3
- (3) K_2CrO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$
- (4) K_2CrO_4 and CrO



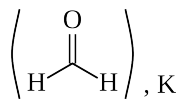
Solution

Q.45 Given below are two statements:

Consider the following reaction

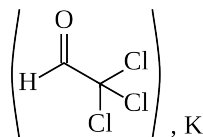


Statement-I: In the case of formaldehyde



is about 2280, due to small substituents, hydration is faster.

Statement-II: In the case of trichloro acetaldehyde



is about 2000 due to -I effect of -Cl.

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

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) Statement-I is true but Statement-II is false
- (2) Both Statement-I and Statement-II are true
- (3) Statement-I is false but Statement-II is true
- (4) Both Statement-I and Statement-II are false

Scan or tap for the full solution



Chemistry: Section B (Numerical)

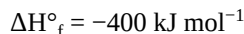
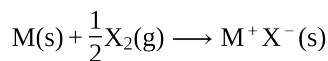
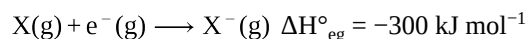
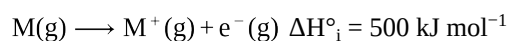
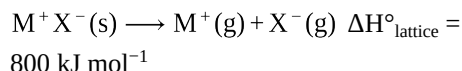
Q.46 0.01 mole of an organic compound (X) containing 10% hydrogen, on complete combustion produced 0.9 g H_2O . Molar mass of (X) is _____ g mol^{-1} .

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the full solution



Q.47 The bond dissociation enthalpy of X_2 $\Delta H^\circ_{\text{bond}}$ calculated from the given data is _____ kJ mol^{-1} . (Nearest integer)



[Given : M^+X^- is a pure ionic compound and X forms a diatomic molecule X_2 in gaseous state]

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the full solution



Q.48 When 81.0 g of aluminium is allowed to react with 128.0 g of oxygen gas, the mass of aluminium oxide produced in grams is _____. (Nearest integer)

Given :

Molar mass of Al is 27.0 g mol^{-1}

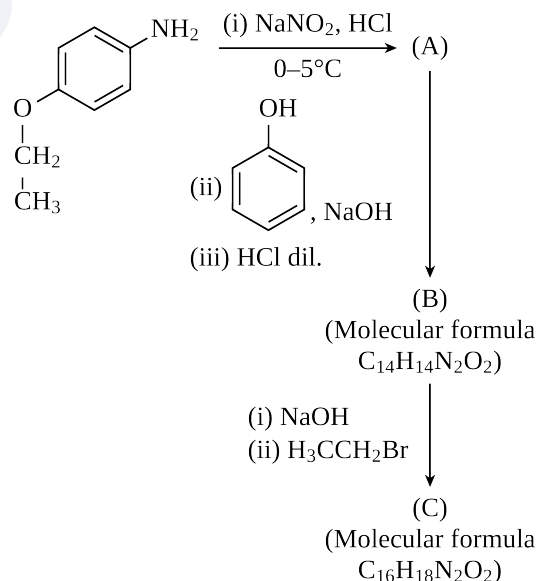
Molar mass of O is 16.0 g mol^{-1}

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the full solution



Q.49 Consider the following sequence of reactions.



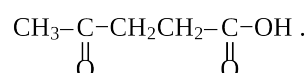
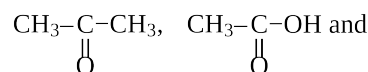
Total number of sp^3 hybridised carbon atoms in the major product C formed is _____.

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the full solution



Q.50 A compound 'X' absorbs 2 moles of hydrogen and 'X' upon oxidation with KMnO_4/H^+ gives



The total number of σ bonds present in the compound 'X' is _____.

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the full solution



Mathematics: Section A (MCQ)

Q.51 If $I = \int_0^{\frac{\pi}{2}} \frac{\sin^3 x}{\sin^2 x + \cos^2 x} dx$, then $\int_0^{2I} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x} dx$ equals :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\frac{\pi^2}{12}$ (2) $\frac{\pi^2}{4}$ (3) $\frac{\pi^2}{16}$ (4) $\frac{\pi^2}{8}$

Scan or tap for the full solution



Q.52 The number of complex numbers z , satisfying $|z| = 1$ and $\left| \frac{z}{\bar{z}} + \frac{\bar{z}}{z} \right| = 1$, is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 8 (2) 10 (3) 4 (4) 6

Scan or tap for the full solution



Q.53 The length of the chord of the ellipse $\frac{x^2}{4} + \frac{y^2}{2} = 1$, whose mid-point is $\left(1, \frac{1}{2}\right)$, is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\frac{2}{3}\sqrt{15}$ (2) $\frac{1}{3}\sqrt{15}$
(3) $\sqrt{15}$ (4) $\frac{5}{3}\sqrt{15}$

Scan or tap for the full solution



Q.54 Let the point A divide the line segment joining the points $P(-1, -1, 2)$ and $Q(5, 5, 10)$ internally in the ratio $r:1$ ($r > 0$). If O is the origin and $(\vec{OQ} \cdot \vec{OA}) - \frac{1}{5} |\vec{OP} \times \vec{OA}|^2 = 10$, then the value of r is :

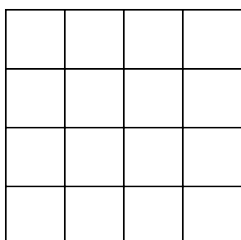
[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\sqrt{7}$ (2) 14 (3) 7 (4) 3

Scan or tap for the full solution



Q.55 A board has 16 squares as shown in the figure :



Out of these 16 squares, two squares are chosen at random. The probability that they have no side in

common is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\frac{3}{5}$ (2) $\frac{4}{5}$ (3) $\frac{23}{30}$ (4) $\frac{7}{10}$

Scan or tap for the full solution



Q.56 If the square of the shortest distance between the lines $\frac{x-2}{1} = \frac{y-1}{2} = \frac{z+3}{-3}$ and $\frac{x+1}{2} = \frac{y+3}{4} = \frac{z+5}{-5}$ is $\frac{m}{n}$, where m, n are coprime numbers, then $m+n$ is equal to :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 14 (2) 6 (3) 21 (4) 9

Scan or tap for the full solution



Q.57 Let $X = \mathbb{R} \times \mathbb{R}$. Define a relation R on X as : $(a_1, b_1)R(a_2, b_2) \Leftrightarrow b_1 = b_2$

Statement-I: R is an equivalence relation.

Statement-II: For some $(a, b) \in X$, the set $S = \{(x, y) \in X : (x, y)R(a, b)\}$ represents a line parallel to $y = x$.

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

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) Both Statement-I and Statement-II are true
(2) Statement-I is true but Statement-II is false
(3) Both Statement-I and Statement-II are false
(4) Statement-I is false but Statement-II is true

Scan or tap for the full solution



Q.58 If the area of the region $\{(x, y) : -1 \leq x \leq 1, 0 \leq y \leq a + e^{|x|} - e^{-x}, a > 0\}$ is $\frac{e^2 + 8e + 1}{e}$, then the value of a is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 7 (2) 5 (3) 6 (4) 8

Scan or tap for the full solution



Q.59 Let the range of the function $f(x) = 6 + 16\cos x \cdot \cos\left(\frac{\pi}{3} - x\right) \cdot \cos\left(\frac{\pi}{3} + x\right) \cdot \sin 3x \cdot \cos 6x$, $x \in \mathbb{R}$ be $[\alpha, \beta]$. Then the distance of the point (α, β) from the line $3x + 4y + 12 = 0$ is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 11 (2) 10 (3) 8 (4) 9

Scan or tap for the full solution



Q.60 The system of equations

$$\begin{aligned}x + y + z &= 6, \\x + 2y + 5z &= 9, \\x + 5y + \lambda z &= \mu,\end{aligned}$$

has no solution if

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\lambda = 17, \mu = 18$ (2) $\lambda = 17, \mu \neq 18$
(3) $\lambda = 15, \mu \neq 17$ (4) $\lambda \neq 17, \mu \neq 18$

Scan or tap for the full solution



Q.61 The distance of the line $\frac{x-2}{2} = \frac{y-6}{3} = \frac{z-3}{4}$ from the point $(1, 4, 0)$ along the line $\frac{x}{1} = \frac{y-2}{2} = \frac{z+3}{3}$ is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\sqrt{17}$ (2) $\sqrt{13}$ (3) $\sqrt{15}$ (4) $\sqrt{14}$

Scan or tap for the full solution



Q.62 $\lim_{x \rightarrow \infty} \frac{(2x^2 - 3x + 5)(3x - 1)^{\frac{x}{2}}}{(3x^2 + 5x + 4)\sqrt{(3x + 2)^x}}$ is equal to :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $\frac{2e}{3}$ (2) $\frac{2}{3\sqrt{e}}$ (3) $\frac{2e}{\sqrt{3}}$ (4) $\frac{2}{\sqrt{3e}}$

Scan or tap for the full solution



Q.63 Let $A = [a_{ij}]$ be a 3×3 matrix such that $A \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$, $A \begin{bmatrix} 4 \\ 1 \\ 3 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$ and $A \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, then a_{23} equals :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 2 (2) -1 (3) 1 (4) 0

Scan or tap for the full solution



Q.64 Let $A = \{(x, y) \in \mathbf{R} \times \mathbf{R} : |x + y| \geq 3\}$ and

$$B = \{(x, y) \in \mathbf{R} \times \mathbf{R} : |x| + |y| \leq 3\}.$$

$C = \{(x, y) \in A \cap B : x = 0 \text{ or } y = 0\}$, then

$$\sum_{(x, y) \in C} |x + y| \text{ is :}$$

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 18 (2) 24 (3) 15 (4) 12

Scan or tap for the full solution



Q.65 If in the expansion of $(1 + x)^p(1 - x)^q$, the coefficients of x and x^2 are 1 and -2, respectively, then $p^2 + q^2$ is equal to :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 8 (2) 20 (3) 13 (4) 18

Scan or tap for the full solution



Q.66 A rod of length eight units moves such that its ends A and B always lie on the lines $x - y + 2 = 0$ and $y + 2 = 0$, respectively. If the locus of the point P, that divides the rod AB internally in the ratio 2:1 is $9(x^2 + \alpha y^2 + \beta xy + \gamma x + 28y) - 76 = 0$, then $\alpha - \beta - \gamma$ is equal to :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 24 (2) 22 (3) 21 (4) 23

Scan or tap for the full solution



Q.67 Let $\int x^3 \sin x \, dx = g(x) + C$, where C is the constant of integration. If $8\left(g\left(\frac{\pi}{2}\right) + g'\left(\frac{\pi}{2}\right)\right) = \alpha\pi^3 + \beta\pi^2 + \gamma$, $\alpha, \beta, \gamma \in \mathbf{Z}$, then $\alpha + \beta - \gamma$ equals :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 47 (2) 55 (3) 62 (4) 48

Scan or tap for the full solution



Q.68 A spherical chocolate ball has a layer of ice-cream of uniform thickness around it. When the thickness of the ice-cream layer is 1 cm, the ice-cream melts at the rate of $81 \text{ cm}^3/\text{min}$ and the thickness of the ice-cream layer decreases at the rate of $\frac{1}{4\pi} \text{ cm/min}$. The surface area (in cm^2) of the chocolate ball (without the ice-cream layer) is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 128π (2) 196π (3) 225π (4) 256π

Scan or tap for the full solution



Q.69 Let the shortest distance from $(a, 0)$, $a > 0$, to the parabola $y^2 = 4x$ be 4. Then the equation of the circle passing through the point $(a, 0)$ and the focus of the parabola, and having its centre on the axis of the parabola is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $x^2 + y^2 - 8x + 7 = 0$ (2) $x^2 + y^2 - 6x + 5 = 0$
(3) $x^2 + y^2 - 4x + 3 = 0$ (4) $x^2 + y^2 - 10x + 9 = 0$

Scan or tap for the full solution



Q.70 Let $x = x(y)$ be the solution of the differential equation $y = \left(x - y \frac{dx}{dy}\right) \sin\left(\frac{x}{y}\right)$, $y > 0$ and $x(1) = \frac{\pi}{2}$. Then $\cos(x(2))$ is equal to :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $2(\log_e 2) - 1$ (2) $1 - 2(\log_e 2)^2$
 (3) $1 - 2(\log_e 2)$ (4) $2(\log_e 2)^2 - 1$

Scan or tap for the
full solution



Mathematics: Section B (Numerical)

- Q.71** The number of ways, 5 boys and 4 girls can sit in a row so that either all the boys sit together or no two boys sit together, is _____.

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the
full solution



- Q.72** Let α, β be the roots of the equation $x^2 - ax - b = 0$ with $\text{Im}(\alpha) < \text{Im}(\beta)$. Let $P_n = \alpha^n - \beta^n$. If $P_3 = -5\sqrt{7}i$, $P_4 = -3\sqrt{7}i$, $P_5 = 11\sqrt{7}i$ and $P_6 = 45\sqrt{7}i$, then $|\alpha^4 + \beta^4|$ is equal to _____.

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the
full solution



- Q.73** The focus of the parabola $y^2 = 4x + 16$ is the centre of the circle C of radius 5. If the values of λ , for which C passes through the point of intersection of the lines $3x - y = 0$ and $x + \lambda y = 4$, are λ_1 and λ_2 , $\lambda_1 < \lambda_2$, then $12\lambda_1 + 29\lambda_2$ is equal to _____.

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the
full solution



- Q.74** The roots of the quadratic equation $3x^2 - px + q = 0$ are 10^{th} and 11^{th} terms of an arithmetic progression with common difference $\frac{3}{2}$. If the sum of the first 11 terms of this arithmetic progression is 88, then $q - 2p$ is equal to _____.

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the
full solution



- Q.75** The variance of the numbers 8, 21, 34, 47, ..., 320 is _____.

[JEE Main 2025 (Online) 23rd January Evening Shift]

Scan or tap for the
full solution



ANSWER KEY

Physics: Section A (MCQ)

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	4	3	4	3	4	4	1	3	3	4	2
Ques.	12	13	14	15	16	17	18	19	20		
Ans.	4	1	4	2	1	1	2	1	3		

Physics: Section B (Numerical)

Ques.	21	22	23	24	25		
Ans.	100	2	2190	16	3		

Chemistry: Section A (MCQ)

Ques.	26	27	28	29	30	31	32	33	34	35	36
Ans.	1	4	2	4	2	2	4	4	1	2	2
Ques.	37	38	39	40	41	42	43	44	45		
Ans.	4	3	1	3	1	2	4	3	2		

Chemistry: Section B (Numerical)

Ques.	46	47	48	49	50		
Ans.	100	200	153	4	27		

Mathematics: Section A (MCQ)

Ques.	51	52	53	54	55	56	57	58	59	60	61
Ans.	3	1	1	3	2	4	2	2	1	2	4
Ques.	62	63	64	65	66	67	68	69	70		
Ans.	2	2	4	3	4	2	4	2	4		

Mathematics: Section B (Numerical)

Ques.	71	72	73	74	75		
Ans.	17280	31	15	474	8788		