



# TECHNO INDIA GROUP PUBLIC SCHOOL

Dt. 20-01-2026

## JEE Mock Test (Series-I) Mock Paper Part-2 (2026)

Time Allowed: **3 hours**

Maximum Marks: **300**

### General Instructions:

1. There are three subjects in the question paper consisting of Physics (Q. no. 1 to 25), Chemistry (Q. no. 26 to 50), and Mathematics (Q. no. 51 to 75).
2. Each subject is divided into two sections. Section A consists of 20 multiple-choice questions & Section B consists of 5 numerical value-type questions.
3. There will be only one correct choice in the given four choices in Section A. For each question for Section A, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.
4. For Section B questions, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.
5. Any textual, printed, or written material, mobile phones, calculator etc. is not allowed for the students appearing for the test.
6. All calculations/written work should be done in the rough sheet, provided with the Question Paper.

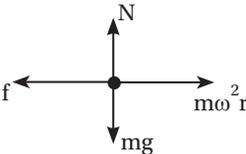
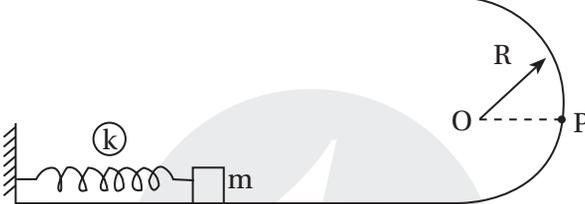
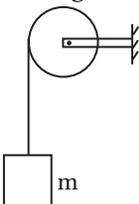


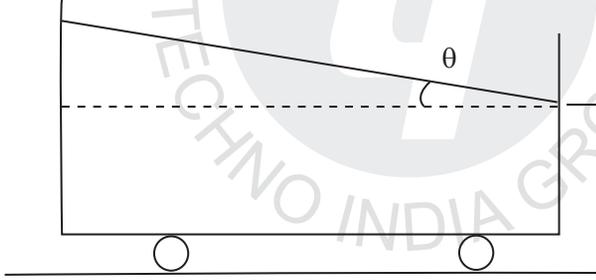
# Physics

## SECTION A

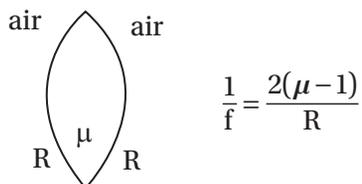
**Section A: consists of 20 questions of 4 marks each.**

1.	The change in volume of the sphere as the radius is increased from 20.0 cm to 20.1 cm. Assume that the rate does not appreciably change between radius = 20.0 cm to radius = 20.1 cm. ① $160 \pi \text{ cm}^3$ ② $1600 \pi \text{ cm}^3$ ③ $16 \pi \text{ cm}^3$ ④ $1.6 \pi \text{ cm}^3$	[4]
2.	Three particles A, B and C are situated at the vertices of an equilateral triangle ABC of side L at $t = 0$ . Each of the particle moves with the constant speed $v$ . A always has its velocity towards particle B, B towards C and C towards A. The time, the particles meet each other is ① $\frac{l}{3v}$ ② $\frac{2l}{3v}$ ③ $\frac{l}{2v}$ ④ $\frac{3l}{2v}$	[4]
3.	A bomb at rest explode into three fragments of masses 1 kg, 2 kg and 3 kg and their velocities are $3 \text{ ms}^{-1}$ , $2 \text{ ms}^{-1}$ and $1 \text{ ms}^{-1}$ respectively. Find momentum is ① zero      ② $8 \text{ kg ms}^{-1}$ ③ $6 \text{ kg ms}^{-1}$ ④ $10 \text{ ms}^{-1}$	[4]
4.	Escape velocity from the surface of earth is $V$ , escape velocity of a body project from centre of earth is ① $\frac{V}{\sqrt{3}}$ ② $2V$ ③ $\frac{V}{2\sqrt{2}}$ ④ $\frac{\sqrt{3}V}{\sqrt{2}}$	[4]
5.	Two resistances $R_1$ and $R_2$ have temperature coefficient of resistance $\alpha_1$ and $\alpha_2$ connected in series. Find the equivalent temperature coefficient of resistance ① $\frac{R_1 + R_2}{\alpha_1 + \alpha_2}$ ② $\frac{R_1\alpha_2 + R_2\alpha_1}{R_1 + R_2}$ ③ $\frac{R_1\alpha_1 + R_2\alpha_2}{R_1 + R_2}$ ④ $\frac{R_1\alpha_2 + R_2\alpha_1}{\alpha_1 + \alpha_2}$	[4]
6.	<div style="text-align: center;"> </div> <p>The floor and the box are rough and the box does not slip on the floor as the cabin spins. The box is at rest with respect to the cabin and hence is rotating with respect to the ground at an angular velocity <math>\omega</math>.</p> <p>① From ground frame : FBD of block <math>m</math> :</p> <div style="text-align: center;"> </div>	[4]

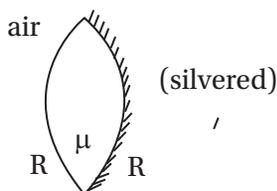
	<p>② From cabin as reference frame : FBD of block <math>m</math> :</p>  <p>③ Both (1) and (2) are correct free body diagram of heavy box of mass <math>m</math>. ④ The radially outward pseudo force <math>m\omega^2 r</math> is called centripetal force.</p>	
7.	<p>Two charged particles P and Q repel each other by a force <math>K_0/x^2</math>, where <math>k</math> is a constant and <math>x</math> is the separation between them. The particle P is clamped to a fixed point in the lab and particle Q which has a mass <math>M</math>, is released from rest with an initial separation <math>a</math> from p. What will be the speed of particle Q at large separation ?</p> <p>① <math>\sqrt{\frac{k_0}{Ma}}</math>      ② <math>\sqrt{\frac{2k_0}{Ma}}</math>      ③ <math>\sqrt{\frac{k_0}{2Ma}}</math>      ④ <math>\sqrt{\frac{Ma}{k}}</math></p>	[4]
8.	 <p>Figure shows a smooth track, a part of which is a circle of radius <math>R</math>. A block of mass <math>m</math> is pushed against a spring of spring constant <math>k</math> fixed at the left and is then released. The initial compression of the spring so that the block presses the track with a force <math>mg</math> when it reaches the point P, where the radius of the track is horizontal.</p> <p>① <math>\sqrt{\frac{mgR}{k}}</math>      ② <math>\sqrt{\frac{2mgR}{k}}</math>      ③ <math>\sqrt{\frac{mgR}{3k}}</math>      ④ <math>\sqrt{\frac{3mgR}{k}}</math></p>	[4]
9.	<p>In case of Elastic collision between a heavy body of mass <math>m_1</math> and a light body of mass <math>m_2</math> (<math>m_1 \gg m_2</math>), the heavy body hits a light body (of mass <math>m_2</math>) from behind then,</p> <p>① <math>\frac{m_1 - m_2}{m_1 + m_2} \approx 1</math>      ② <math>\frac{2m_2}{m_1 + m_2} \approx 0</math>      ③ <math>\frac{2m_1}{m_1 + m_2} \approx 2</math>      ④ All the are correct</p>	[4]
10.	<p>A block of mass <math>m</math> moving at speed <math>v</math> collides with another block of mass <math>2m</math> at rest. The lighter block comes to rest after the collision. The coefficient of restitution is</p> <p>① 1      ② 0      ③ 0.5      ④ 0.2</p>	[4]
11.	<p>A wheel of moment of inertia <math>I</math> and radius <math>r</math> is free to rotate about its centre as shown in figure. A string is wrapped over its rim and a block of mass <math>m</math> is attached to the free end of the string. The system is released from the rest. Then the speed of the block as it descends through a height <math>h</math>.</p>  <p>① <math>\sqrt{\frac{2mgh}{m + \left(\frac{I}{r^2}\right)}}</math>      ② <math>\sqrt{\frac{3mgh}{m + \left(\frac{2I}{r^2}\right)}}</math>      ③ <math>\sqrt{\frac{mgh}{\left(m + \frac{I}{2r^2}\right)}}</math>      ④ <math>\sqrt{2gh}</math></p>	[4]

12.	<p>The density inside a solid sphere of radius <math>a</math> is given by</p> $\rho = \rho_0 \frac{a}{r}$ <p>Where <math>\rho_0</math> is the density at the surface and <math>r</math> denotes the distance from the centre. The gravitational field due to this sphere at a distance <math>2a</math> from its centre is .</p> <p>① <math>\pi G\rho_0 a</math>                      ② <math>2\pi G\rho_0 a</math>                      ③ <math>4\pi G\rho_0 a</math>                      ④ <math>\frac{1}{2}\pi G\rho_0 a</math></p>	[4]
13.	<p>In damped harmonic motion of a particle of mass <math>m</math></p> <p>① The damping force may be written as <math>F = -bv</math> where <math>b</math> is damping constant, <math>v</math> is speed of particle.</p> <p>② The equation of motion is <math>m\frac{dv}{dt} = -kx - bv</math></p> <p>③ For small damping</p> $x = A_0 \cdot e^{-(bt/2m)} \sin(\omega't + \delta)$ <p>where <math>\omega' = \sqrt{\left(\frac{k}{m}\right) - \left(\frac{b}{2m}\right)^2} = \sqrt{(\omega_0)^2 - \left(\frac{b}{2m}\right)^2}</math></p> <p>④ All the above are correct.</p>	[4]
14.	<p>Consider a liquid placed in a beaker which is accelerating horizontally with an acceleration <math>a_0</math> as shown in the figure below. Then <math>\tan \theta =</math></p>  <p>① <math>\frac{a_0}{g}</math>                                      ② <math>\frac{g}{a_0}</math></p> <p>③ <math>\frac{a_0}{2g}</math>                                      ④ <math>\frac{a_0}{3g}</math></p>	[4]
15.	<p>A 0.002 cm liquid column balances the excess pressure inside a soap bubble of radius 7.5 mm. The density of liquid is (given surface tension of soap bubble is <math>0.03 \text{ Nm}^{-1}</math>)</p> <p>① <math>8.2 \times 10^3 \text{ kg/m}^3</math>                      ② <math>4.1 \times 10^3 \text{ kg/m}^3</math></p> <p>③ <math>2.0 \times 10^3 \text{ kg/m}^3</math>                      ④ <math>3.2 \times 10^3 \text{ kg/m}^3</math></p>	[4]
16.	<p>A sound wave of wavelength 40 cm travels in air. If the difference between the maximum and minimum pressures at a given point is <math>1.0 \times 10^{-3} \text{ N/m}^2</math> then the amplitude of vibration of the particles of the medium. The bulk modulus of air is <math>1.4 \times 10^5 \text{ N.m}^2</math></p> <p>① 2.2 Å                                      ② 1.2 Å</p> <p>③ 3 Å    ④ 4 Å</p>	[4]

17. If the focal length of equiconvex lens be  $f$  (of radius of curvature  $R$ ) : figure 1



then the equivalent focal length  $F$  of the system for the figure



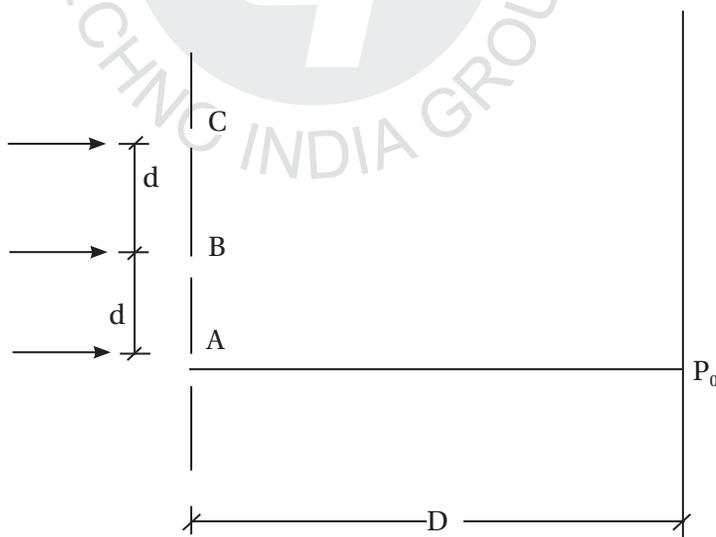
①  $\frac{fR}{2(R+f)}$

②  $\frac{2fR}{R+f}$

③  $\frac{2fR}{R-f}$

④  $\frac{fR}{2(R-f)}$

18. In YDSE experiment; figure shows three equidistant slits being illuminated by a monochromatic parallel beam of light. Let  $BP_0 - AP_0 = \lambda$  and  $D \gg \lambda$ . The ratio between the intensity at  $P_0$  to the intensity due to any of the slits individually.



① 1

② 2

③ 3

④ 4

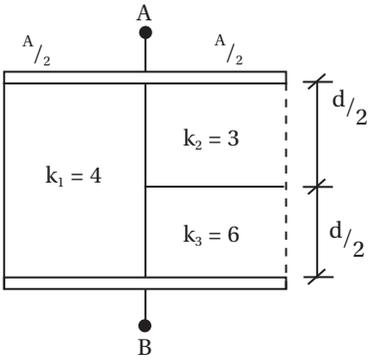
19. The speed of electromagnetic wave in a medium of dielectric constant 2.25 and relative permeability 4 is

①  $2 \times 10^8 \text{ ms}^{-1}$

②  $1 \times 10^8 \text{ ms}^{-1}$

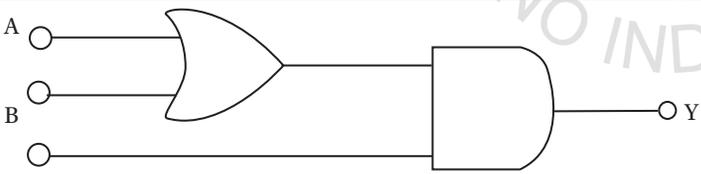
③  $3 \times 10^8 \text{ ms}^{-1}$

④  $2.5 \times 10^8 \text{ ms}^{-1}$

20.	<p>The equivalent capacitance between A and B is (A : area of each plate, d = separation between the plates).</p> 	[4]
<p>① <math>2 A\epsilon_0/d</math>      ② <math>3 A\epsilon_0/d</math>      ③ <math>6 A\epsilon_0/d</math>      ④ <math>4 A\epsilon_0/d</math></p>		

### SECTION B

**Section B consists of 5 questions of 4 marks each**

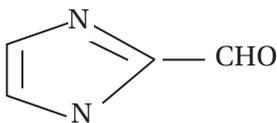
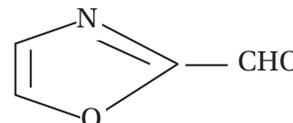
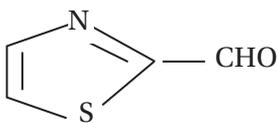
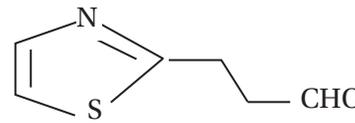
21.	<p>The charge flowing through a resistance R varies with time t as <math>Q = at - bt^2</math>, where a and b are positive constants. The total heat produced in <math>R \times \frac{12b}{a^3R}</math> is equal to _____ .</p>	[4]
22.	<p>A long solenoid has 1000 turns. When a current of 4A flows through it, the magnetic flux linked with each turn of solenoid is <math>4 \times 10^{-3}</math> wb. The self inductance of the solenoid is _____ .</p>	[4]
23.	<p>An electron of mass m and a photon have same energy E. The ratio of de-Broglie wavelength associated with them is <math>\frac{1}{C} \left( \frac{E}{xm} \right)^{\frac{1}{2}}</math>, then x is _____ .</p>	[4]
24.	 <p>If <math>A = 1, B = 0, C = 1</math>, then Y is _____ .</p>	[4]
25.	<p>Given the value of Rydberg constant is <math>10^7 \text{ m}^{-1}</math>, the wave number of the last line of the Balmer series in hydrogen spectrum is <math>\frac{10^7}{n} \text{ m}^{-1}</math>. Then n is equal to _____ .</p>	[4]

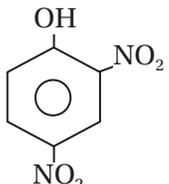
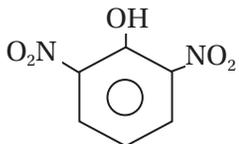
## Chemistry

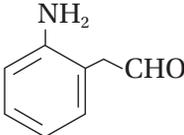
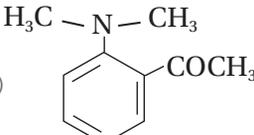
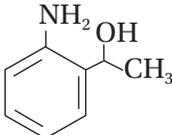
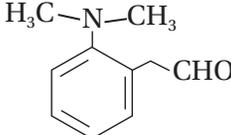
### SECTION A

**Section A: consists of 20 questions of 4 marks each.**

26.	<p>Caffeine has a molecular weight of 194. If it contains 28.9% by mass of Nitrogen, number of atoms of Nitrogen in one molecule of caffeine is :</p>	[4]
<p>① 4      ② 6      ③ 2      ④ 3</p>		

27.	A photon of light of wavelength $6000\text{\AA}$ has energy E. What will be the wavelength of photon of a light which has energy of photon $4E$ ? ① $1500\text{\AA}$ ② $600\text{\AA}$ ③ $2000\text{\AA}$ ④ $750\text{\AA}$	[4]
28.	Energy of H-atom in the ground state is $-13.6\text{ eV}$ , hence energy in the second excited state is : ① $-6.8\text{ eV}$ ② $-3.4\text{ eV}$ ③ $-1.51\text{ eV}$ ④ $-4.53\text{ eV}$	[4]
29.	Find the bond order of Ozone ( $\text{O}_3$ ) and carbonate ion ( $\text{CO}_3^{2-}$ ) are respectively. ① 1 & 2                      ② 1.5 & 1.5                      ③ 1.5 & 1.3                      ④ 1.33 & 1	[4]
30.	Bond energy of H - H, F - F and H - F bonds are $104$ , $38$ and $135\text{ Kcal(mole)}^{-1}$ respectively. The resonance energy in the H - F molecule will be : ① $142\text{ Kcal(mole)}^{-1}$ ② $66\text{ Kcal(mole)}^{-1}$ ③ $72.14\text{ Kcal(mole)}^{-1}$ ④ $79.26\text{ Kcal(mole)}^{-1}$	[4]
31.	For a spontaneous reaction the $\Delta G$ , equilibrium constant (K) and E cell will be respectively : ① $-ve, > 1, -ve$ ② $-ve, < 1, -ve$ ③ $+ve, > 1, -ve$ ④ $-ve, > 1, +ve$	[4]
32.	Standard entropies of $X_2$ , $Y_2$ and $XY_3$ are $60$ , $40$ and $50\text{ J K}^{-1}(\text{mol})^{-1}$ respectively. for the reaction. $\frac{1}{2}X_2 + \frac{3}{2}Y_2 \rightleftharpoons XY_3$ ; $\Delta H = -30\text{ kJ}$ to be at equilibrium, the temperature should be : ① $750\text{ k}$ ② $1000\text{ k}$ ③ $1250\text{ k}$ ④ $500\text{ k}$	[4]
33.	In the wet tests for detection of various cations by precipitation, $\text{Ba}^{2+}$ cations are detected by obtaining precipitate of : ① Barium oxalate                      ② $\text{BaCO}_3$ ③ $\text{Ba(OAc)}_2$ ④ $\text{BaSO}_4$	[4]
34.	An organic compound gives blood red colour after being treated with Lassaignes filtrate and then with ferric chloride. The possible element can be : ① N                      ② S                      ③ N and S                      ④ Cl and N	[4]
35.	$25\text{ mL}$ of silver nitrate solution, $1\text{M}$ is added dropwise to $25\text{ mL}$ of potassium iodide, $1.05\text{ M}$ solution. The ion(s) present in very small quantity in the solution is/are ① $\text{NO}_3^-$ only                      ② $\text{K}^+$ only ③ $\text{Ag}^+$ and $\text{I}^-$ both                      ④ $\text{I}^-$ only	[4]
36.	Element not present in Nessler's reagent is : ① Hg                      ② I                      ③ K                      ④ N	
37.	Which of the following compounds would give the following set of qualitative analysis ? (i) Fehlings's Test positive (ii) Na fusion extract upon treatment with sodium nitroprusside gives a blood red colour. ①  ②  ③  ④ 	[4]

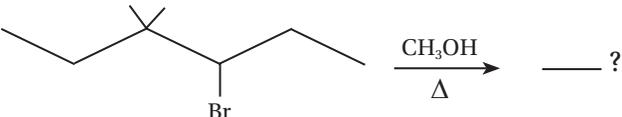
38.	<p>Which of the following does not give effervescences of <math>\text{CO}_2</math> with aq. <math>\text{NaHCO}_3</math> solution ?</p> <p>① <math>\text{H}_2\text{CO}_3</math></p> <p>② </p> <p>③ </p> <p>④ None of these</p>	[4]										
39.	<p>An organic compound is treated with <math>\text{NaNO}_2</math> and dil. <math>\text{HCl}</math> at <math>0^\circ\text{C}</math>. The resulting solution is added to an alkaline solution of <math>\beta</math>-naphthol where by brilliant red dye is produced. It shows the presence of :</p> <p>① <math>-\text{NO}_2</math> group</p> <p>② aromatic <math>-\text{NH}_2</math> group</p> <p>③ <math>-\text{CONH}_2</math> group</p> <p>④ aliphatic <math>-\text{NH}_2</math> group</p>	[4]										
40.	<p>Match column-I, with column-II</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Column-I</th> <th style="text-align: center;">Column-II</th> </tr> </thead> <tbody> <tr> <td>(A) Xanthate test</td> <td>(p) Aldehyde</td> </tr> <tr> <td>(B) Schiff's reagent</td> <td>(q) Methyl ketone</td> </tr> <tr> <td>(C) Azo-dye test</td> <td>(r) <math>1^\circ</math> amine</td> </tr> <tr> <td>(D) Iodofirm test</td> <td>(s) Alcohol.</td> </tr> </tbody> </table> <p>① A - (s), B - (r), C - (p), D - (q)</p> <p>② A - (p), B - (q), C - (r), D - (s)</p> <p>③ A - (p), B - (r), C - (s), D - (q)</p> <p>④ A - (s), B - (p), C - (r), D - (q)</p>	Column-I	Column-II	(A) Xanthate test	(p) Aldehyde	(B) Schiff's reagent	(q) Methyl ketone	(C) Azo-dye test	(r) $1^\circ$ amine	(D) Iodofirm test	(s) Alcohol.	[4]
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(D) Iodofirm test	(s) Alcohol.											
41.	<p><b>Statement I :</b> Tollen's reagent gives positive result with all aldehydes :</p> <p><b>Statement II :</b> Tollen's reagent gives negative result with all ketones</p> <p>① Both statement I and II are correct</p> <p>② Both statement I and II are incorrect</p> <p>③ Statement I is correct but statement II is incorrect</p> <p>④ Statement II is correct but statement I is incorrect.</p>	[4]										
42.	<p>Consider the following structure <math>\text{H}_3\text{C} - \text{C} = \text{N} \cdot \text{OH}</math></p> $\begin{array}{c}   \\ \text{H}_3\text{C} - \text{C} = \text{N} - \text{OH} \end{array}$ <p>The name and the colour of the complex it form with Ni are respectively.</p> <p>① Dimethyl glycine, red</p> <p>② Dimethyl glyoxime, red</p> <p>③ Dimethyl glycol, yellow</p> <p>④ Dimethyl formide, blue</p>	[4]										
43.	<p>A gas 'X' is passed through water to form saturated solution. The aqueous solution on treatment with <math>\text{AgNO}_3</math> gives a white precipitate. The saturated aqueous solution also dissolves magnesium ribbon with evolution of a colourless gas 'Y'. Identify 'X' and 'Y'.</p> <p>① <math>\text{X} = \text{CO}_2</math>, <math>\text{Y} = \text{Cl}_2</math></p> <p>② <math>\text{X} = \text{Cl}_2</math>, <math>\text{Y} = \text{CO}_2</math></p> <p>③ <math>\text{X} = \text{Cl}_2</math>, <math>\text{Y} = \text{H}_2</math></p> <p>④ <math>\text{X} = \text{H}_2</math>, <math>\text{Y} = \text{Cl}_2</math></p>	[4]										
44.	<p>The outer electron configuration of Gd (At. No. = 64) is :</p> <p>① <math>4f^3, 5d^5, 6s^2</math></p> <p>② <math>4f^3, d^0, 6s^2</math></p> <p>③ <math>4f^4, 5d^4, 6s^2</math></p> <p>④ <math>4f^7, 5d^1, 6s^2</math></p>	[4]										

45.	The tests performed the Compound 'X' and their inferences are _		[4]	
	<b>Test</b>	<b>Inference</b>		
	A. 2, 4 -DNP test	coloured precipitate		
	B. Iodoform Test	Yellow precipitate		
	C. Atodye test	No dye formation		
	Compound 'X' is :			
①		② 	③ 	④ 

### SECTION B

#### Integer type Questions.

**Section B consists of 5 questions of 4 marks each.**

46.	For $[\text{CrCl}_3 \cdot x\text{NH}_3]$ , elevation in boiling point of one molal solution is double of one molal urea solution. Hence, the value of x (assuming complete dissociation) is _____ .	[4]
47.	An organic compound undergoes first order decomposition. The time taken to its decomposition to $\frac{1}{8}$ and $\frac{1}{10}$ of its initial concentration are $t_{1/8}$ and $t_{1/10}$ respectively. What is the value of $\frac{[t_{1/8}]}{[t_{1/10}]} \times 10$ ? [Given $\log_{10} 2 = 0.3$ ]	[4]
48.	The ratio of $\left(\frac{\Delta m}{\Delta c}\right)$ for $\text{Ca}_3(\text{PO}_4)_2$ will be equal to _____ .	[4]
49.	Total number of stereoisomer possible for the compound : $\text{H}_3\text{C} - \text{CH} = \text{CH} - \text{CH} = \text{CH} - \text{CH} = \text{CH} - \text{Ph}$ is _____ .	[4]
50.	Find out the total numbers of possible $\text{E}_1$ products from the following reaction : 	[4]

## Mathematics

### SECTION A

**Section A: consists of 20 questions of 4 marks each.**

51.	If $A = \{x : \cos x \geq -\frac{1}{2}, 0 \leq x \leq \pi\}$ and $B = \{x : \sin x \geq \frac{1}{2}; \frac{\pi}{3} \leq x \leq \pi\}$ , then	[4]		
①	$A \cap B = \left[\frac{\pi}{3}, \frac{2\pi}{3}\right]$	② $A \cap B = \left[-\frac{\pi}{3}, \frac{2\pi}{3}\right]$	③ $A \cup B = \left[-\frac{5\pi}{6}, \frac{5\pi}{6}\right]$	④ $A \cap B = \left[0, \frac{2\pi}{3}\right]$

52.	If $f(x) = \prod_{n=1}^{100} (x-n)^{n(101-n)}$ , then find $\frac{f(101)}{f'(101)}$ .	[4]
	① 5025                      ② $\frac{1}{5050}$ ③ 2550                      ④ 5050	
53.	The equations of the sides AB, BC and CA of a triangle ABC are $2x + y = 0$ , $x + py = 39$ and $x - y = 3$ respectively and $P(2, 3)$ is its circumcentre. Then which of the following is not true?	[4]
	① $(AC)^2 = 9p$ ② $(AC)^2 + p^2 = 36$ ③ $32 < \text{area}(\Delta ABC) < 36$ ④ $34 < \text{area}(\Delta ABC) < 38$	
54.	Consider the locus of the complex number $Z$ in the argand plane given by $\text{Re}(Z) - 2 =  Z - 7 + 2i $ . Let $P(Z_1)$ and $Q(Z_2)$ be two complex numbers satisfying the given locus and also satisfying $\arg\left[\frac{Z_1 - (2 + \alpha i)}{Z_2 - (2 + \alpha i)}\right] = \frac{\pi}{2}$ ( $\alpha \in \mathbb{R}$ ). Find the minimum value of $PQ$ .	[4]
	① 8                      ② 10                      ③ 5                      ④ 2	
55.	If $x_i \in [0, 1] \forall i = 1, 2, 3, \dots, 28$ , then the maximum value of $\sqrt{\sin^{-1} x_1} \sqrt{\cos^{-1} x_2} + \sqrt{\sin^{-1} x_2} \sqrt{\cos^{-1} x_3} + \sqrt{\sin^{-1} x_3} \sqrt{\cos^{-1} x_4} + \dots + \sqrt{\sin^{-1} x_{28}} \sqrt{\cos^{-1} x_1}$ is	[4]
	① $14\pi$ ② $7\pi$ ③ $28\pi$ ④ $15\pi$	
56.	A dice is thrown $(2n + 1)$ times. Find the probability that faces with even numbers appear odd number of times.	[4]
	① $\frac{3}{4}$ ② $\frac{3}{5}$ ③ $\frac{1}{2}$ ④ $\frac{1}{4}$	
57.	$1013 \sum_{r=1}^{1012} \left[ \frac{\sum_{p=1}^r p}{\sum_{p=1}^r p^3} \right]$ is equal to	[4]
	① 2023                      ② 2024                      ③ 2025                      ④ 2026	
58.	The direction ratios of a line are $(\lambda + 1, 1 - \lambda, 2)$ and the line makes an angle $60^\circ$ with the $y$ -axis. If values of $\lambda$ are roots of an equation, then the equation is	[4]
	① $x^2 - 2x - 2 = 0$ ② $x^2 - 4x + 1 = 0$ ③ $x^2 - 4x - 1 = 0$ ④ $x^2 - 6x + 4 = 0$	
59.	If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + 5x^3 - 6x^2 + 8x - 10 = 0$ , then the value of $(1 + \alpha^2)(1 + \beta^2)(1 + \gamma^2)(1 + \delta^2)$ is	[4]
	① 18                      ② 17                      ③ 16                      ④ 15	

60.	Let $a = \min \{x^2 + 2x + 4; x \in \mathbb{R}\}$ and $b = \lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$ . Then $\sum_{r=0}^n a^r b^{n-r}$ is	[4]
	① $\frac{3^{n+1} - 1}{3 \cdot 2^n}$ ② $\frac{6^{n+1} - 1}{5 \cdot 2^n}$ ③ $\frac{3^{n+1} + 1}{3 \cdot 2^n}$ ④ $\frac{6^{n+1} + 1}{5 \cdot 2^n}$	
61.	Words of length 12 are formed using the letters A, B, C, D, E, F, G, H, I, J, K, L. Let $x$ be the number of such words where no letter is repeated and let $y$ be the number of such words where exactly one letter is repeated twice and no other letter is repeated. Then, the value of $\frac{y}{6x}$ is	[4]
	① 6                      ② 5                      ③ 11                      ④ 66	
62.	If the solution curve $f(x, y) = 0$ of the differential equation $(1 + \log_e x) \frac{dx}{dy} - x \log_e x = e^y$ , $x > 0$ , passes through the points $(1, 0)$ and $(\alpha, 2)$ , then $\alpha^\alpha$ is equal to	[4]
	① $e^{e^2}$ ② $e^{\sqrt{2}e^2}$ ③ $e^{2e^{\sqrt{2}}}$ ④ $e^{2e^2}$	
63.	If the tangents at the point P and Q on the circle $x^2 + y^2 - 2x + y = 5$ meet at the point $R\left(\frac{9}{4}, 2\right)$ , then the area of the triangle PQR is	[4]
	① $\frac{5}{4}$ ② $\frac{5}{8}$ ③ $\frac{13}{4}$ ④ $\frac{13}{6}$	
64.	Let $P_1$ be a parabola with vertex $(3, 2)$ and focus $(4, 4)$ and $P_2$ be its mirror image with respect to the line $x + 2y = 6$ . If the directrix of $P_2$ is $x + 2y = 3\lambda$ , then the value of $15\lambda$ is	[4]
	① 30                      ② 40                      ③ $\frac{10}{3}$ ④ 50	
65.	The value of $\int_0^1 2x^3 \{f''(x)\} dx$ where $f(x) = (1 - x^2)^4$ is	[4]
	① $\frac{6}{5}$ ② $\frac{5}{6}$ ③ $\frac{7}{5}$ ④ $\frac{5}{7}$	
66.	Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \frac{x^2 - x + 4}{x^2 + x + 4}$ , then the maximum value of $f(x)$ is	[4]
	① $\frac{7}{5}$ ② $\frac{3}{5}$ ③ $\frac{5}{3}$ ④ 2	
67.	Let $A = \{x : x = 4^n - 3n - 1 \text{ and } n \in \mathbb{N}\}$ Then $B = \{y : y = 9(n - 1) \text{ and } n \in \mathbb{N}\}$ .	[4]
	① $A = B$ ② $A \subset B$ ③ $A \supset B$ ④ $A \subseteq B$	
68.	Find the smaller of the two areas enclosed by the curves $x^2 + y^2 = 4$ and $y^2 = 3(2x - 1)$ .	[4]
	① $(4\pi - \sqrt{3})$ sq. units                      ② $\frac{1}{2}(2\pi + \sqrt{3})$ sq. units ③ $\frac{1}{3}(4\pi - \sqrt{3})$ sq. units                      ④ None of these	

69.	Let $E_1, E_2, E_3$ be three mutually exclusive events such that $P(E_1) = \frac{2+3p}{6}, P(E_2) = \frac{3-p}{8}$ and $P(E_3) = \frac{2-p}{2}$ . If the maximum and minimum values of $p$ are $p_1$ and $p_2$ , then $ p_1 - p_2 $ is equal to	[4]					
①	$\frac{3}{11}$	②	$\frac{11}{2}$	③	$\frac{2}{11}$	④	$\frac{11}{3}$
70.	Let a circle of radius 4 be concentric to the ellipse $15x^2 + 19y^2 = 285$ . Then the common tangents are inclined to the minor axis of the ellipse at the angle	[4]					
①	$\frac{\pi}{12}$	②	$\frac{\pi}{4}$	③	$\frac{\pi}{3}$	④	$\frac{\pi}{6}$

[4]

### SECTION B

**Section B consists of 5 questions of 4 marks each.**

71.	If area enclosed by the curve $ x  +  y  \leq K$ is $f(K+1)$ sq. units, then the value of $5f(10)$ is _____.	[4]
72.	If $\frac{1}{\sqrt{3x+1}} \left[ \left( \frac{1+\sqrt{3x+1}}{2} \right)^n - \left( \frac{1-\sqrt{3x+1}}{2} \right)^n \right]$ is a fifth degree polynomial, then the value of $100n$ is _____.	[4]
73.	Let $a_p = p^8 C_p$ and $b_p = (8-p)^8 C_p$ . Also $A_p = \begin{pmatrix} a_p & 0 \\ 0 & b_p \end{pmatrix}$ and $A = \sum_{p=0}^8 A_p = \begin{pmatrix} x & 0 \\ 0 & y \end{pmatrix}$ , then $x+y$ equals _____.	[4]
74.	If the shortest distance between the lines $x = y + 2 = 6z - 6$ and $x + 1 = 2y = -12z$ is $\lambda$ , then the value of $(4 - \lambda)^{10}$ is _____.	[4]
75.	Let $\vec{a}, \vec{b}, \vec{c}$ be three non-coplanar unit vectors such that the angle between every pair of them is $\frac{\pi}{3}$ . If $\vec{a} \times \vec{b} + \vec{b} \times \vec{c} = p\vec{a} + q\vec{b} + r\vec{c}$ , where $p, q$ and $r$ are scalars, then the value of $\left( \frac{p^2 + 2q^2 + r^2}{q^2} \right)^4$ is _____.	[4]