



TECHNO INDIA GROUP PUBLIC SCHOOL

Dt. 09-05-2025

JEE (ADVANCED) – 2025 Mock Test -II (Paper-1)

Time Allowed: **3 hours**

Maximum Marks: **180**

General Instructions:

1. All questions are of objective type having four answer options for each.
2. Follow the instructions given in each section accordingly.
3. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C or D.
4. Use only **Black/Blue ink ball point pen** to mark the answer by filling up of the respective bubbles completely.
5. Write your name (in block letter), name of examination center and put your signature (as is appeared in Admit Card) in appropriate boxes in the **OMR Sheet**.
6. The OMR Sheet is liable to become invalid if there is any mistake in filling the correct bubbles for Question Booklet number/roll number or if there is any discrepancy in the name/signature of the candidate, name of the examination center. The OMR Sheet may also become invalid due to folding or putting stray marks on it or any damage to it. The consequence of such invalidation due to incorrect marking or careless handling by the candidate will be the sole responsibility of candidate.
7. Candidates are not allowed to carry any written or printed material, calculator, pen, log-table, wristwatch, any communication device like mobile phones, bluetooth device etc. inside the examination hall. Any candidate found with such prohibited items will be **reported against** and his/her candidature will be summarily cancelled.
8. Rough work must be done on the Question Booklet itself. Additional blank pages are given in the Question Booklet for rough work.
9. Hand over the OMR Sheet to the invigilator before leaving the Examination Hall.

MATHEMATICS

Paper-I

SECTION-1 (Maximum Marks: 12)

- This section contains **FOUR (04)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +3 If **ONLY** the correct option is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : -1 In all other cases.

1. A parallelepiped is formed using three non-coplanar unit vectors. Let angles between any of the vector with the normal of the plane, determined by the other two, is α . If function $f(\alpha)$ is defined as the ratio of volume of the parallelepiped to its surface area in relevant domain, then number of solutions of
 - (A) $f(\alpha) = \frac{1}{12}$ is 6 in the interval $\alpha \in (0, 2\pi)$
 - (B) $f(\alpha) = \frac{1}{3}$ is 2 in the interval $\alpha \in (0, 2\pi)$
 - (C) $f(\alpha) = |\sin \alpha|$ is 3 in the interval $\alpha \in (0, 2\pi)$
 - (D) Sum of solutions of $6f(\alpha) = |\sin \alpha|$ is 4π in the interval $\alpha \in (0, 2\pi)$

2. Let $S(t) = \int_1^t \frac{\ln x}{\sqrt{x}}$ then which of the following is incorrect :

<ol style="list-style-type: none"> (A) $S(e^2) < \frac{2(e^2 - 1)}{e}$ (C) $S(e) < \frac{e(e-1)}{2}$ 	<ol style="list-style-type: none"> (B) $S(e^2) < \frac{e-1}{\sqrt{e}} + \frac{2(e^2 - e)}{e}$ (D) $S(e^2) < 2/e$
--	--

3. A function f is defined by $f(x) = \int_0^\pi \cos t \cos(x-t) dt$, $0 \leq x \leq 2\pi$ then which of the following does not hold good.
 - (A) $f(x)$ is continuous and differentiable in $0 < x < 2\pi$
 - (B) Range of $f(x)$ is $\left[\frac{-\pi}{2}, \frac{\pi}{2} \right]$
 - (C) Number of solutions of $f(x) = \cos x$ in $\alpha \in (0, 2\pi)$ is 2
 - (D) $f(x) = \frac{\pi}{2} |\cos x|$ hold good in $x \in (0, 2\pi)$

6. A variable point P in first quadrant moves inside an equilateral $\triangle ABC$ having vertices B (0, 0), C(2, 0) such that its distance from at least one vertex is less than or equal to 1. Let S represents the region traced by P, then
- (A) If area bounded by S is A, then $[A] = 0$
 (B) If area bounded by S is A, then $[A] = 1$
 (C) If area of region inside triangle but outside S is A, then $[A] = 0$
 (D) If area of region inside triangle but outside S is A, then $[A] = 1$ (where $[\cdot]$ represent GIF)
7. Two chess players Vishi and Ritti has same level of expertise, both play a series of n games. The probability that ith game ends in a draw is $\left(\frac{i}{i+1}\right)$ is the probability that Vishi wins off number of games. The value of P when $n = 99$, is
- (A) $\geq .99$ (B) ≥ 0.49 (C) $\geq .65$ (D) $\leq .75$

SECTION-3 (Maximum Marks: 24)

- This section contains **SIX (06)** questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If **ONLY** the correct integer is entered;

Zero Marks : 0 In all other cases.

8. Given $|a+b| = \sqrt{3}$. If \vec{c} is a vector such that $\vec{c} = \hat{a} + 2\hat{b} + 3(\hat{a} \times \hat{b})$, then $10 \frac{\hat{a} \cdot \hat{b}}{\vec{c} \cdot \vec{b}}$ is equal to (where \hat{r} represents unit vector of \vec{r}) _____.
9. Let $f(x) = \sqrt[3]{n+1} - \sqrt[3]{n}$, $n \in \mathbb{N}$. If λ is the least value of n for which $f(x) < \frac{1}{12}$, then fractional part of $\left\lfloor \frac{\lambda^{2020}}{5} \right\rfloor$ is _____. ($[\cdot] \rightarrow$ GIF)
10. Let $f(x)$ is a polynomial function such that
- $$\lim_{x \rightarrow a} \frac{\int_a^x f(x) dx - \left(\frac{x-a}{2}\right)(f(x)+f(a))}{(x-a)^3} = -\frac{a}{2} \forall a \in \mathbb{R}$$
- If $f(1)=3$, $f'(1) = 4$, then the minimum value of $f(|x|)$ is _____.
11. Let the function $f: [-4, 4] \rightarrow [-1, 1]$ be defined implicitly by the equation $x + 5y - y^5 = 0$. If a parabola having latus rectum = 2 is drawn with axis along tangent to $f(x)$ at $x = 0$ and origin as vertex, then locus of image of focus in a variable tangent to parabola is straight line $y = 5x + \lambda$, where $2 \left| \frac{\lambda}{\sqrt{26}} \right|$ is equal to _____.
12. A pair of variable straight lines $5x^2 + 3y^2 + \alpha xy = 0$ ($\alpha \in \mathbb{R}$) cut $y^2 = 4x$ at two points P and Q. If the locus of the point of intersection of tangents to the given parabola at P and Q is $x = \lambda$, then $[\lambda]$ is equal to _____.
13. $f: \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function satisfying $2f(x) + f\left(\frac{x}{2} + 2\right) = x^2 + 2x + 3$, then $3 \int_0^3 f(x) dx$ is _____.

SECTION-4 (Maximum Marks: 12)

- This section contains **FOUR (04)** Matching List Sets.
- Each set has **ONE** Multiple Choice Question.
- Each set has **TWO** lists: **List-I** and **List-II**.
- **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +3 **ONLY** if the option corresponding to the correct combination is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : -1 In all other cases.

Matrix Match type Questions :

14. Match the column - I with column - II

	Column - I		Column - II
P.	$\int_0^{\infty} x^9 e^{-x^2} dx$ The value of $\frac{\int_0^{\infty} x^9 e^{-x^2} dx}{\int_0^{\infty} x^7 e^{-x^2} dx}$ is equal to	1.	4
Q.	The maximum value of function $f(x) = x^3 - 3x$ subject to the condition $x^4 + 36 \leq 13x^2$ is	2.	6
R.	A circle passes through the points (2, 2) and (9, 9) and touches the x-axis. The absolute value of the difference of x-coordinates of the possible points of contact is	3.	8
S.	Let $f(x) = \cos^{-1}(3x - 4x^3)$ then $f\left(\frac{\sqrt{3}}{2}\right)$ has the value equal to	4.	12
		5.	18

- (A) P \rightarrow 1; Q \rightarrow 5, R \rightarrow 4, S \rightarrow 2 (B) P \rightarrow 2; Q \rightarrow 4, R \rightarrow 5, S \rightarrow 1
 (C) P \rightarrow 1; Q \rightarrow 4, R \rightarrow 5, S \rightarrow 3 (D) P \rightarrow 1; Q \rightarrow 3, R \rightarrow 4, S \rightarrow 2

15. Match the Column-I with Column-II

	Column - I		Column - II
P	Number of integral value of k such that all solutions (x, y) to the system of equations $x + 4y = 2k^2$ $x + y = k$ are such that $x, y > 0$ is	1.	0

Q	Number of integers in the domain of the function $g(x) = \ln(\cos^{-1}x)$	2.	1
R	If $x > 0$, then the value of expression $\frac{(1 + \sin^{-1}x)^{2020} + (1 + \cos^{-1}x)^{2021} + (1 + \tan^{-1}x)^{2022}}{(1 + \operatorname{cosec}^{-1}x)^{2020} + (1 + \sec^{-1}x)^{2021} + (1 + \cot^{-1}x)^{2022}}$	3.	2
S	If the function $f: \mathbb{R} - \{-b\} \rightarrow \mathbb{R} - \{1\}$ defined by $f(x) = \frac{x+9}{x+b}$ ($a \neq b$) is self inverse, then $(a+b)$ can be	4.	3
		5.	4

- (A) $P \rightarrow 3; Q \rightarrow 2, R \rightarrow 4, S \rightarrow 1, 2, 3, 4, 5$
 (B) $P \rightarrow 2; Q \rightarrow 3, R \rightarrow 2, S \rightarrow 1, 2, 3, 4, 5$
 (C) $P \rightarrow 4; Q \rightarrow 2, R \rightarrow 1, S \rightarrow 1, 2, 3, 4, 5$
 (D) $P \rightarrow 3; Q \rightarrow 4, R \rightarrow 1, S \rightarrow 1, 2, 3, 4, 5$

16. Match the Column-I with Column-II

	Column - I		Column - II
P	For tetrahedron ABCD, the ratio of sum of squares of length of its edges with sum of square of distances of centroid from its vertices is	1.	27
Q	If ABCD is a regular tetrahedron and length of its side is $2\sqrt{6}$ unit. Now a sphere passes through all the vertices of tetrahedron, then radius of this sphere is	2.	3
R	For tetrahedron ABCD, V_1 is the volume of ABCD and V_2 is the volume of tetrahedron $G_1 G_2 G_3 G_4$ where G_1, G_2, G_3, G_4 are the centroid of faces ABC, BCD, ACD and ABD respectively then $\frac{V_1}{V_2}$ is	3.	2
S	If three edges of tetrahedron are of length 1 unit and angle between each of them is 60° then if volume of tetrahedron is V unit then $12\sqrt{2} V$ is	4.	4
		5.	5

- (A) $P \rightarrow 4; Q \rightarrow 2, R \rightarrow 3, S \rightarrow 1$ (B) $P \rightarrow 2; Q \rightarrow 4, R \rightarrow 1, S \rightarrow 3$
 (C) $P \rightarrow 4; Q \rightarrow 2, R \rightarrow 1, S \rightarrow 3$ (D) $P \rightarrow 4; Q \rightarrow 1, R \rightarrow 2, S \rightarrow 3$

17. Match the Column I to Column II

	Column - I		Column - II
P	If m and n are positive integers satisfying $1 + \cos 2\theta + \cos 4\theta + \cos 6\theta + \cos 8\theta + \cos 10\theta = \frac{\cos m\theta \cdot \sin n\theta}{\sin \theta}$ Then value of $(m+n)$ is equal to	1.	9

Q	The minimum value of the expression $\frac{9x^2 \sin^2 x + 4}{x \sin x}$ for $x \in (0, \pi)$ is	2.	10
R	Let $f(x) = 11 - 8 \sin x - 2 \cos^2 x$. If the maximum and minimum values of $f(x)$ are denoted by M and m respectively then $\frac{M+8}{m}$ has the value equal to	3.	11
S	If $\tan 9\theta = \frac{3}{4}$, $0 < \theta < \frac{\pi}{18}$ then the value of $(3 \operatorname{cosec} 3\theta - 4 \sec 3\theta)$ is equal to	4.	12
		5.	13

- (A) $P \rightarrow 3; Q \rightarrow 4, R \rightarrow 1, S \rightarrow 2$ (B) $P \rightarrow 2; Q \rightarrow 3, R \rightarrow 1, S \rightarrow 4$
 (C) $P \rightarrow 1; Q \rightarrow 2, R \rightarrow 1, S \rightarrow 3$ (D) $P \rightarrow 3; Q \rightarrow 4, R \rightarrow 2, S \rightarrow 1$

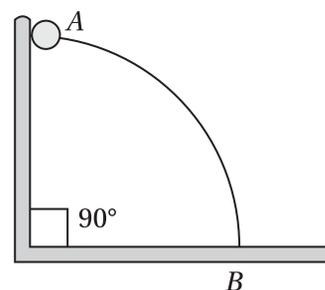
Physics

Paper-I

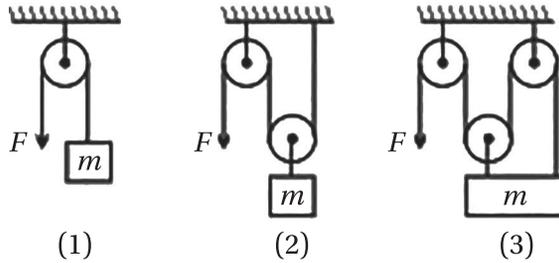
SECTION-1 (Maximum Marks: 12)

- This section contains **FOUR (04)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +3 If **ONLY** the correct option is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : -1 In all other cases.

- 18.** A wire, which passes through the hole in a small bead, is bent in the form of quarter of a circle. The wire is fixed vertically on ground as shown in the figure. The bead is released from near the top of the wire and it slides along the wire without friction. As the bead moves from A to B , the force it applies on the wire is



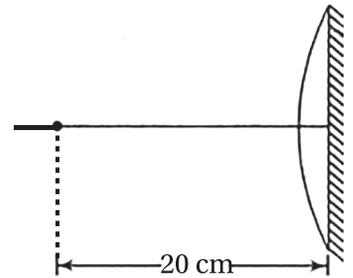
- (A) always radially outwards
 (B) always radially inwards
 (C) radially outwards initially and radially inwards later
 (D) radially inwards initially and radially outwards later
- 19.** Equal force $F (> mg)$ is applied to string in all the three cases. In which case the block has maximum acceleration?



- (1) (2) (3)
- (A) 1 (B) 2
 (C) 3 (D) Equal in all the 3 cases

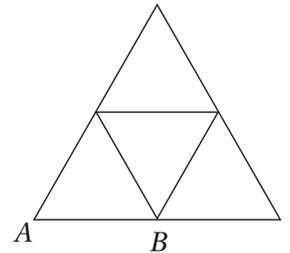
20. A point object is placed at a distance of 20 cm from a thin plano-convex lens of focal length 15 cm. The plane surface of the lens is now silvered. The image created by the system is at

- (A) 60 cm to the left of the system
 (B) 60 cm to the right of the system
 (C) 12 cm to the left of the system
 (D) 12 cm to the right of the system



21. In the diagram resistance between any two junctions is R . Equivalent resistance across terminals A and B is

- (A) $\frac{11R}{7}$ (B) $\frac{18R}{11}$
 (C) $\frac{7R}{11}$ (D) $\frac{11R}{18}$



SECTION-2 (Maximum Marks: 12)

- This section contains three (03) questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 **ONLY** if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but **ONLY** three options are chosen;

Partial Marks : +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct;

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option;

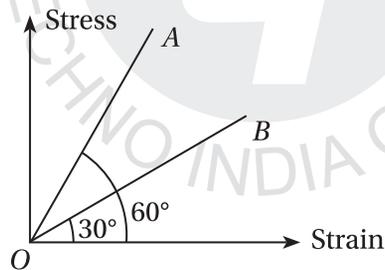
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -2 In all other cases.

SECTION-3 (Maximum Marks: 24)

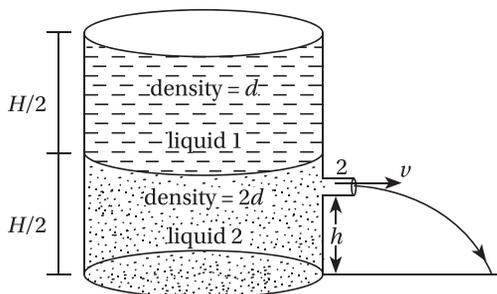
- This section contains **SIX (06)** questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +4 If **ONLY** the correct integer is entered;
Zero Marks : 0 In all other cases.

25. Gravitational potential due to a uniform solid sphere of mass M and radius R , at the centre of sphere is $-n\left(\frac{GM}{2R}\right)$, then n is _____.
26. The moment of inertia of a door of mass m , length $2l$ and width l about its longer side is $\frac{ml^2}{x}$. Then x is _____.
27. Two points of a rod moves with velocities $3v$ and v perpendicular to the rod and in the same direction, separated by a distance r . Then the angular velocity of rod is $y \cdot \left(\frac{v}{r}\right)$, y is equal to _____.
28. The stress-strain graphs for two wires of two materials A and B are shown in the figure, where Y_A and Y_B are the Young's modulus of the materials.



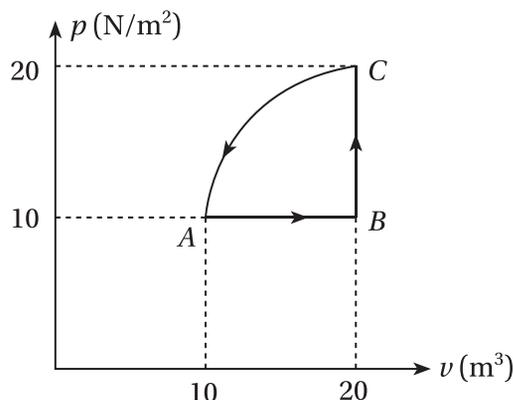
Then for same strain, ratio of their energy densities is _____.

29.



Here v is speed of efflux at 2, which is $\sqrt{(nH - 4h)\frac{g}{2}}$, then $n =$ _____.

30.



The p - v diagram for a cyclic process performed on an ideal monoatomic gas is shown in the figure. The curve AC is one fourth of a circle.

Heat absorbed by gas in cyclic process is $-n\pi$ J. Then n is _____.

SECTION-4 (Maximum Marks: 12)

- This section contains **FOUR (04)** Matching List Sets.
- Each set has **ONE** Multiple Choice Question.
- Each set has **TWO** lists: **List-I** and **List-II**.
- **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +3 **ONLY** if the option corresponding to the correct combination is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : -1 In all other cases.

31.

List-I		List-II	
P	Nuclear fusion	1.	Converts some matter into energy
Q	Nuclear fission	2.	Generally possible for nuclei with low atomic number
R	β -decay	3.	Generally possible for nuclei with higher atomic number
S	Exothermic nuclear reaction	4.	Generally possible for weak nuclear forces
		5.	Binding energy is negative

- (A) $P \rightarrow 1, 2$ $Q \rightarrow 1, 3$ $R \rightarrow 1, 4$ $S \rightarrow 1, 2, 3$ (B) $P \rightarrow 1, 3$ $Q \rightarrow 1, 2$ $R \rightarrow 1, 2, 3$ $S \rightarrow 1, 4$
 (C) $P \rightarrow 1, 4$ $Q \rightarrow 1, 2, 3$ $R \rightarrow 1, 2$ $S \rightarrow 1, 3$ (D) $P \rightarrow 1, 2, 3$ $Q \rightarrow 1, 4$ $R \rightarrow 1, 3$ $S \rightarrow 1, 2$

32.

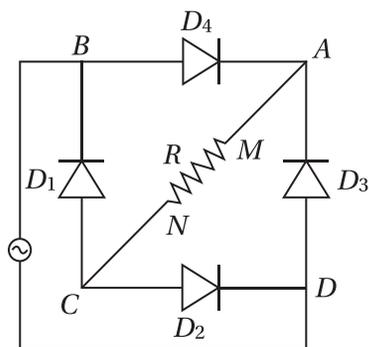


Figure (1)

P	In figure (1), in one half cycle B is at higher potential	1.	D_3, D_1 are forward biased
Q.	In figure (1), if D is at higher potential	2.	D_4, D_2 are forward biased
R	Current flows through resistor R	3.	Full wave rectifier
S	The given circuit is rectifier circuit	4.	M to N
		5.	Half wave rectifier

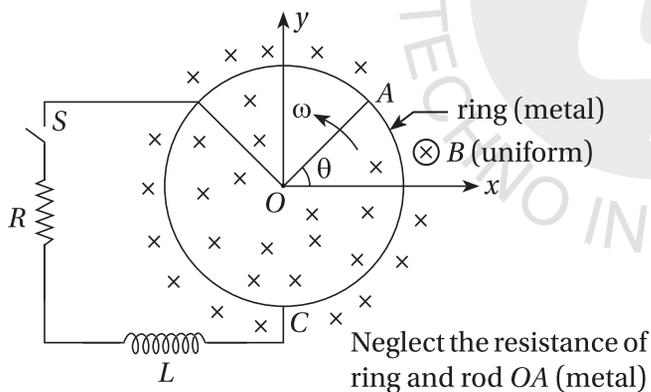
(A) $P \rightarrow 1$ $Q \rightarrow 2$ $R \rightarrow 4$ $S \rightarrow 3$

(B) $P \rightarrow 2$ $Q \rightarrow 1$ $R \rightarrow 4$ $S \rightarrow 3$

(C) $P \rightarrow 1$ $Q \rightarrow 4$ $R \rightarrow 2$ $S \rightarrow 5$

(D) $P \rightarrow 5$ $Q \rightarrow 2$ $R \rightarrow 3$ $S \rightarrow 4$

33.



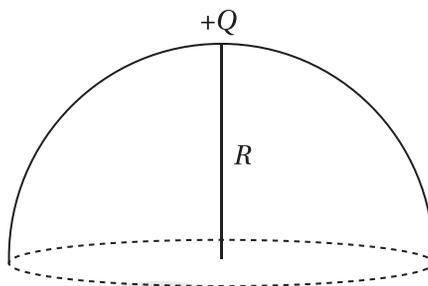
OA is a metal rod and mass m and length r kept rotating with a constant angular speed ω .

	List I		List II
P	Equivalent circuit when S is closed	1.	L/R
Q	Time constant (τ)	2.	
R	Maximum current i_0	3.	$\frac{B\omega r^2}{2}$

S	emf induced e	4.	$\frac{B\omega r^2}{2R}$
		5.	A.C. circuit

- (A) P → 1 Q → 2 R → 3 S → 4 (B) P → 5 Q → 1 R → 4 S → 1
 (C) P → 2 Q → 1 R → 4 S → 3 (D) P → 4 Q → 5 R → 1 S → 2

34. A point charge +Q is placed just outside an imaginary hemispherical surface of radius R as shown in figure.



P	The electric flux passing through the curved surface of the hemisphere is ϕ_{curve}	1.	$\frac{Q}{\epsilon_0}$
Q	Total flux ϕ_{due} to charge Q	2.	$-\frac{Q}{2\epsilon_0} \left(1 - \frac{1}{\sqrt{2}}\right)$
R	E_{\perp} = normal component of the electric field to the flat surface	3.	equipotential
S	Potential of the circumference of flat surface	4.	decreasing as we move away from centre of flat surface
		5.	Net flux through the surfaces is zero

- (A) P → 2 Q → 1 R → 4 S → 3 (B) P → 1 Q → 2 R → 3 S → 4
 (C) P → 3 Q → 4 R → 2 S → 1 (D) P → 4 Q → 3 R → 1 S → 2

CHEMISTRY

Paper-I

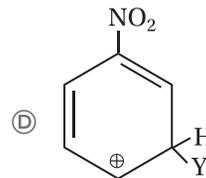
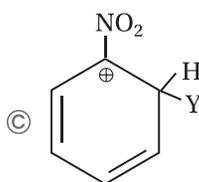
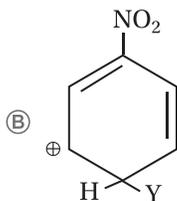
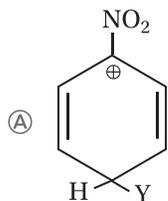
SECTION-1 (Maximum Marks: 12)

- This section contains **FOUR (04)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +3 If **ONLY** the correct option is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : -1 In all other cases.

35. Nitrobenzene can be prepared from benzene by using a mixture of concentrated HNO_3 and concentrated H_2SO_4 . In the nitrating mixture, HNO_3 acts as:

- (A) base (B) acid (C) reducing agent (D) catalyst

36. Which of the following carbocations is expected to be most stable?



37. One litre of sample of hard water ($d = 1 \text{ g/ml}$) contains 136 mg of CaSO_4 and 190 mg of MgCl_2 . What is the hardness of water interm of CaCO_3 ?

- (A) 100 ppm (B) 200 ppm (C) 300 ppm (D) 400 ppm

38. The ratio of slopes of K_{max} versus frequency (ν) and V_0 (stopping - potential) versus frequency (ν) curves in the photoelectric effect gives:

- (A) charge of electron (B) planck's constant (C) work function (D) mass of electron

SECTION-2 (Maximum Marks: 12)

- This section contains three (03) questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 **ONLY** if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but **ONLY** three options are chosen;

Partial Marks : +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct;

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -2 In all other cases.

- For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then

choosing **ONLY** (A), (B) and (D) will get +4 marks;

choosing **ONLY** (A) and (B) will get +2 marks;

choosing **ONLY** (A) and (D) will get +2 marks;

choosing **ONLY** (B) and (D) will get +2 marks;

choosing **ONLY** (A) will get +1 mark;

choosing **ONLY** (B) will get +1 mark

choosing **ONLY** (D) will get +1 mark;

choosing no option (i.e the question is unanswered) will get 0 marks; and

choosing any other combination of options will get -2 marks.

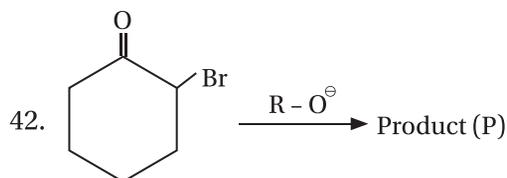
39. In the following reaction the intermediates and final product will be: $\text{RCONH}_2 \xrightarrow[\Delta]{\text{Br}_2/\text{KOH}} ?$
- (A) $\text{RCH}_2\text{CONH}_2\text{Br}$, RNH_2 (B) RNCO
 (C) RCONHBr (D) $\text{RCON} \ddot{\text{N}} : , \text{RNH}_2$
40. 50 ml $\frac{\text{M}}{10}$ is mixed with 10 ml $\frac{\text{M}}{10}$ NaOH solution. Then find out correct option/options for the mixture.
 [Given $\text{p}K_a$ for $\text{CH}_3\text{COOH} = 4.8$]
- (A) Mixture is acidic buffer (B) Mixture is basic buffer, $\text{pH} = 9.8$
 (C) $\text{pH} = 4.2$ (D) Salt hydrolysis takes place
41. A hypothetical reaction $\text{X}_2 + \text{Y}_2 \rightarrow 2\text{XY}$, follows the mechanism as given below:
- $$\text{X}_2 \rightleftharpoons \text{X} + \text{X} \text{ (Fast)} \quad \text{X} + \text{Y}_2 \longrightarrow \text{XY} + \text{Y} \text{ (Slow)} \quad \text{X} + \text{Y} \longrightarrow \text{XY} \text{ (Fast)}$$
- The order of the overall reaction and rate of reaction depends upon:
- (A) $r = K[\text{X}][\text{Y}_2]$ (B) $r = K[\text{X}_2]^{1/2}[\text{Y}_2]$
 (C) order of reaction is 1.5 (D) order of reaction is 2

SECTION-3 (Maximum Marks: 24)

- This section contains **SIX (06)** questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If **ONLY** the correct integer is entered;

Zero Marks : 0 In all other cases.



How many carbon atoms are present in cycle in product 'P' ? _____

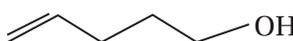
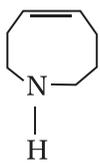
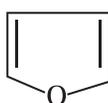
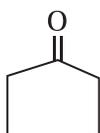
43. Find the total number of moles of phenyl hydrazine used during glucosazone formation from glucose.

44. How many Faraday of electricity is required to deposit 3 moles of Ca from molten CaCl_2 ? _____
45. Total number of achiral isomers obtained from monochlorination of methylcyclohexane. _____
46. In absence of any nucleophile, benzyne dimerizes to give a structure having unsaturation index. _____
47. Not considering the electronic spin, the degeneracy of the second excited state ($n = 3$) of H atom is 9, while the degeneracy of the second excited state of H^\ominus is _____.

SECTION-4 (Maximum Marks: 12)

- This section contains **FOUR (04)** Matching List Sets.
- Each set has **ONE** Multiple Choice Question.
- Each set has **TWO** lists: **List-I** and **List-II**.
- **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +3 **ONLY** if the option corresponding to the correct combination is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : -1 In all other cases.

48. Match the column

Column-I		Column-II (Correct regarding reaction mechanism and product)	
P	 $\xrightarrow[2. \text{Br}_2/\text{CCl}_4]{1. \text{Na}}$ 'P'	1.	Syn addition on double bond
Q	 $\xrightarrow{\text{Br}_2/\text{CCl}_4}$ 'P'	2.	Anti-addition on double bond
R	 $\xrightarrow{\text{Br}_2/\text{CCl}_4}$ 'P'	3.	Formation of new cycle in compound
S	 $\xrightarrow[2. \text{Br}_2, \text{CCl}_4]{1. \text{CH}_2=\text{P}(\text{Ph})_3}$ 'P'	4.	Cyclic transition state
		5.	Formation of vicinal dihalide

- (A) P → 2,4,5 Q → 2,3,4 R → 1,2,4,5 S → 2,3,4
 (B) P → 2,3,4 Q → 2,3,4 R → 1,2,4,5 S → 2,4,5
 (C) P → 1,2,4,5 Q → 2,4,5 R → 2,3,4 S → 2,3,4
 (D) P → 2,4,5 Q → 1,2,4,5 R → 2,3,4 S → 2,3,4

49. Match the column

Column-I		Column-II	
P	Fe(NO ₃) ₂ (aq)	1.	Hydrolysis of cation
Q	NH ₄ HCO ₃	2.	Hydrolysis of anion
R	HCOONa(aq)	3.	Aqueous solution is acidic

S	$\text{NH}_4\text{CN}(\text{aq})$	4.	Amphiprotic ion in electrolyte
		5.	pH value of solution is independent on concentration of salt

- Ⓐ P → 1,2,3,4,5 Q → 2 R → 1,2,5 S → 1,3 Ⓑ P → 2 Q → 1,2,5 R → 1,3 S → 1,2,3,4,5
 Ⓒ P → 1,2,5 Q → 1,3 R → 1,2,3,4,5 S → 2 Ⓓ P → 1,3 Q → 1,2,3,4,5 R → 2 S → 1,2,5

50. Match the column I with column II

Column-I (Pair of Species)		Column-II (Identical property in pairs of species)	
P	$\text{PCl}_3\text{F}_2, \text{PCl}_2\text{F}_3$	1.	Hybridisation of central atom
Q	$\text{BF}_3, \text{BCl}_3$	2.	Shape of molecule/ion
R	$\text{CO}_2, \text{CN}_2^{2-}$	3.	μ (dipole moment)
S	$\text{C}_6\text{H}_6, \text{B}_3\text{N}_3\text{H}_6$	4.	Total number of electrons
		5.	Back bonding

- Ⓐ P → 1,2 Q → 1,2,3,5 R → 1,2,3,4 S → 1,2,3,4 Ⓑ P → 1,2,3,5 Q → 1,2 R → 1,2,3,4 S → 1,2,3,4
 Ⓒ P → 1,2,3,4 Q → 1,2,3,5 R → 1,2 S → 1,2,3,4 Ⓓ P → 1,2,3,4 Q → 1,2 R → 1,2,3,4 S → 1,2,3,5

51. List-I contains compounds and List-II contains reactions:

List-I		List-II	
P	H_2O_2	1.	$\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{OH})_2 \rightarrow$
Q	$\text{Mg}(\text{OH})_2$	2.	$\text{BaO}_2 + \text{H}_2\text{SO}_4 \rightarrow$
R	BaCl_2	3.	$\text{Ca}(\text{OH})_2 + \text{MgCl}_2 \rightarrow$
S	CaCO_3	4.	$\text{BaO}_2 + \text{HCl} \rightarrow$
		5.	$\text{Ca}(\text{HCO}_3)_2 + \text{Ca}(\text{OH})_2 \rightarrow$

Match each compound in List -1, with its formation reaction(s) in List-II and choose the correct options.

- Ⓐ P → 2 Q → 1 R → 4 S → 3 Ⓑ P → 5 Q → 1 R → 2 S → 3
 Ⓒ P → 5 Q → 3 R → 2 S → 1 Ⓓ P → 2 Q → 3 R → 4 S → 1