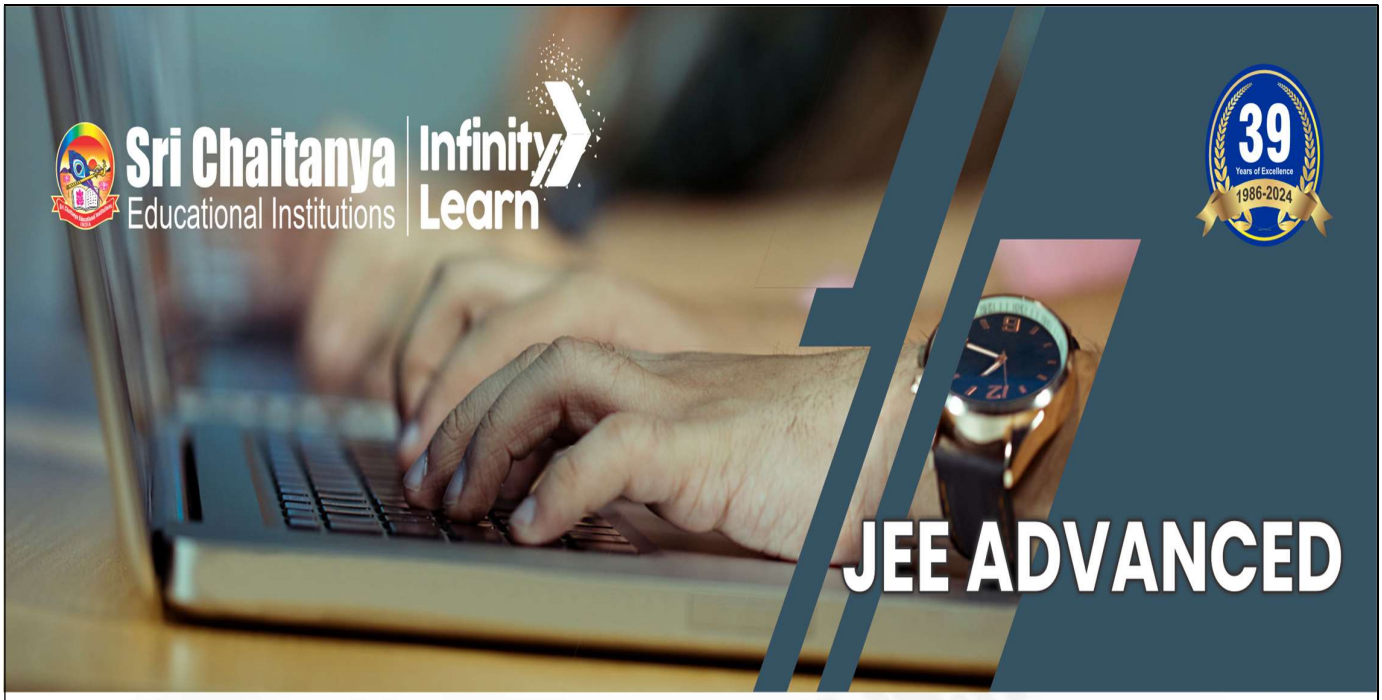


Sri Chaitanya IIT Academy., India.

A.P T.S KARNATAKA TAMILNADU MAHARASTRA DELHI RANCHI

A right Choice for the Real Aspirant

ICON Central Office, Madhapur – Hyderabad

Sec: Sr.Super60(Incoming)_STERLING BT **2022_P1** **Date: 18-05-2025**

Time: 09.00Am to 12.00Pm WTA-32 **Max. Marks:180**

MATHEMATICS : Areas: Drawing of different graphs, Area under plane curve as a definite integral, Finding out the functions from area functions.

PHYSICS : MOTIONAL EMF, Motion of a straight conductor in a magnetic field(Theoretical explanation of electromagnetic induction motional emf), Motion of a loop in a magnetic field, Emf induced across a bar rotating in a magnetic field, AC generator.

CHEMISTRY : GROUP-17: Introduction;Occurrence;atomic and physical properties ;oxidation states;anomalous properties of fluorine;Reactivity towards metals.(General Discussion),preparations,properties and uses (uses as per NCERT) of Cl2, preparations,properties and uses (uses as per NCERT) of HCl, Structures, preparations, properties and uses of Oxides of chlorine, NOTE:[preparations,properties and uses of F2,Br2,I2(not to be tested); NOTE:[preparations,properties and uses of HF,HBr,HI(not to be tested},, Structures, preparations, properties and uses (uses as per NCERT)of oxoacids of chlorine, preparations,properties and uses of Bleaching powder ; Structures, preparations,properties and uses (uses as per NCERT)of interhalogencompounds. Structures of pseudo halides & Polyhalides NOTE ; GROUP-17: General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique behaviour of the first element in each group.(ONLY FOR JEE MAINS), Group-18:Introduction;Occurrence;atomic and physical properties; chemical properties ; compounds of xenon (xenon -fluorine compounds , xenon -oxygen compunds); uses (as per NCERT) of noble gases NOTE: clathrates(not to be tested) NOTE ; GROUP-18: General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique behaviour of the first element in each group.(ONLY FOR JEE MAINS)

Name of the Student: _____ **H.T. NO:** | | | | | | | |

JEE-ADVANCE-2022-P1-Model

Time:3Hr's **IMPORTANT INSTRUCTIONS** **Max Marks: 180**

MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 8)	Questions with Numerical Value Answer Type%	+3	0	8	24
Sec – II(Q.N : 9 – 14)	Questions with Multiple Correct Choice with partial mark	+4	-2	6	24
Sec – III(Q.N : 15 – 18)	Matching Type	+3	-1	4	12
Total				**18**	**60**

PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 19 – 26)	Questions with Numerical Value Answer Type	+3	0	8	24
Sec – II(Q.N : 27 – 32)	Questions with Multiple Correct Choice with partial mark	+4	-2	6	24
Sec – III(Q.N : 33 – 36)	Matching Type	+3	-1	4	12
Total				**18**	**60**

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 37 – 44	Questions with Numerical Value Answer Type	+3	0	8	24
Sec – II(Q.N : 45 – 50)	Questions with Multiple Correct Choice with partial mark	+4	-2	6	24
Sec – III(Q.N : 51 – 54)	Matching Type	+3	-1	4	12
Total				**18**	**60**

MATHEMATICS **Max Marks: 60**

SECTION – I
(NUMERICAL VALUE TYPE)

This section contains **EIGHT (08)** questions.

- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will bee evaluated according to the following marking scheme :

Full Marks:+3 **ONLY** if the correct numerical value is entered ;
Partial Mark: 0 In all other cases.

1. Let $f(x)$ be a function which satisfy the equation $f(xy)=f(x)+f(y)$ for all $x>0, y>0$ such that $f'(1)=2$. Let A be the area of the region bounded by the curves $y=f(x), y=\left|x^3-6x^2+11x-6\right|$ and $x=0$, then find value of $\frac{28}{17}A$.

2. Area of the region bounded by $[x]^2=[y]^2$, if $x\in[1,5]$, where $[\ ]$ denotes the greatest integer function, is :

3. Let f be a differentiable function satisfying the condition $f\left(\frac{x}{y}\right)=\frac{f(x)}{f(y)}\left(y\neq 0, f(y)\neq 0\right)\forall x,y\in R$ and $f'(1)=2$. If the smaller area enclosed by $y=f(x), x^2+y^2=2$ is A, then find $[A]$, where $[.]$ represents the greatest integer function.

4. Consider $y=x^2$ and $f(x)$ where $f(x)$, is a differentiable function satisfying $f(x+1)+f(z-1)=f(x+z)\forall x,z\in R$ and $f(0)=0;\ f'(0)=4$. If area bounded by curve $y=x^2$ and $y=f(x)$ is Δ, find the value of $\left(\frac{3}{16}\Delta\right)$.

5. The least integer which is greater than or equal to the area of region in $x-y$ plane satisfying $x^6-x^2+y^2\leq 0$ is :

6. The set of points (x,y) in the plane satisfying $x^{2/5}+|y|=1$ form a curve enclosing a region of area $\frac{p}{q}$ square units, where p and q are relatively prime positive integers. Find $p-q$.

7. Let the function $f:[-4,4]\to[-1,1]$ be defined implicitly by the equation $x+5y-y^5=0$. If the area of triangle formed by tangent and normal to $f(x)$ at $x=0$ and the line $y=5$ is A, find $\frac{A}{13}$.

8. If the area bounded by circle $x^2+y^2=4$, the parabola $y=x^2+x+1$ and the curve $y=\left[\sin^2\frac{x}{4}+\cos\frac{x}{4}\right]$, (where [ ] denotes the greats integer function) and $x-$axis is $\left(\sqrt{3}+\frac{2\pi}{3}-\frac{1}{k}\right)$, then the numerical quantity k should be :

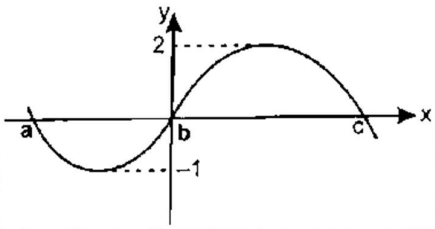
SECTION – II
(ONE OR MORE CORRECT ANSWER TYPE)

This section contains **SIX (06)** 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** two options are 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.

9. Let $f(x)$ be a polynomial function of degree 3 where $a<b<c$ and $f(a)=f(b)=f(c)$. If the graph of $f(x)$ is as shown, which of the following statements are INCORRECT? (Where $c>|a|$)



A) $\int_a^c f(x)dx=\int_b^c f(x)dx+\int_a^b f(x)dx$ B) $\int_a^c f(x)dx<0$

C) $\int_a^b f(x)dx<\int_c^b f(x)dx$ D) $\frac{1}{b-a}\int_a^b f(x)dx>\frac{1}{c-b}\int_b^c f(x)dx$

10. $T_n = \sum_{r=2n}^{3n-1} \frac{r}{r^2+n^2}, S_n = \sum_{r=2n+1}^{3n} \frac{r}{r^2+n^2}$, then $\forall n \in \{1,2.3,....\}$:

A) $T_n > \frac{1}{2}\ln 2$ B) $S_n < \frac{1}{2}\ln 2$ C) $T_n < \frac{1}{2}\ln 2$ D) $S_n > \frac{1}{2}\ln 2$

11. If a curve $y = a\sqrt{x} + bx$ passes through point $(1,2)$ and the area bounded by curve, line $x = 4$ and $x-$axis is 8, then :

A) $a = 3$ B) $b = 3$ C) $a = -1$ D) $b = -1$

12. Area enclosed by the curves $y = x^2 + 1$ and a normal drawn to it with gradient -1; is equal to :

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

13. The triangle formed by the normal to the curve $f(x) = x^2 - ax + 2a$ at the point $(2,4)$ and the coordinate axes lies in second quadrant, if its area is 2 sq units, then α can be

A) 2 B) $\frac{17}{4}$ C) 5 D) $\frac{19}{4}$

14. Let f and g be continuous function on $a \le x \le b$ and set $p(x) = \max\{f(x),\ g(x)\}$ and $q(x) = \min\{f(x), g(x)\}$, then the area bounded by the curves $y = p(x), y = q(x)$ and the ordinates $x = a$ and $x = b$ is given by

A) $\int_a^b |f(x) - g(x)|dx$ B) $\int_a^b |p(x) - q(x)|dx$

C) $\int_a^b \{f(x) - g(x)\}dx$ D) $\int_a^b \{p(x) - q(x)\}dx$

SECTION – III
(MATCHING TYPE)

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 (I), (II), (III) and (IV) and **List-II** has **Five** entries (P), (Q), (R), (S) and (T).
- **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 chosed (i.e. the question is unanswered);
Negative Marks: –1 In all other cases.

15. Match the statements of Column I with values of Column II

Column – I		Column - II	
(A)	The area bounded by the curve $y = x + \sin x$ and its inverse function between the ordinates $x = 0$ to $x = 2\pi$ is $4s$. Then the value of s is	(p)	2
(B)	The area bounded by $y = xe^{\lvert x\rvert}$ and lies $\lvert x\rvert = 1, y = 0$ is	(q)	1
(C)	The area bounded by the curves $y^2 = x^3$ and $\lvert y\rvert = 2x$ is	(r)	$\frac{32}{5}$
(D)	The smaller are included between the curves $\sqrt{\lvert x\rvert} + \sqrt{\lvert y\rvert} = 1$ and $\lvert x\rvert + \lvert y\rvert = 1$ is	(s)	$\frac{4}{3}$
		(t)	1 / 3

A) $A-p, B-p, C-r, D-s$ B) $A-p, B-s, C-p, D-r$
C) $A-p, B-p, C-r, D-t$ D) $A-s, B-q, C-r, D-t$

16. Match the statements of Column I with values of Column II

Column - I		Column - II	
(A)	Area enclosed by $y = \lvert x\rvert, \lvert x\rvert = 2$ and $y = 0$ is	(p)	2
(B)	Area enclosed by the curve $y = \sin x, x = 0, x = \pi$ and $y = 0$ is	(q)	4
(C)	If the area of the region bounded by $x^2 \le y$ and $y \le x + 2$ is $\frac{k}{4}$, then k is equal to	(r)	27
(D)	Area of the quadrilateral formed by tangents at the ends of latusrectum of ellipse $\frac{x^2}{9} + \frac{y^2}{5} = 1$ is	(s)	18

A) $A-r, B-p, C-r, D-s$ B) $A-p, B-p, C-s, D-r$
C) $A-p, B-r, C-s, D-q$ D) $A-p, B-p, C-r, D-r$

17. Match the statements of Column I with values of Column II

Column - I		Column - II	
(A)	Area of region formed by points (x,y) satisfying $[x]^2=[y]^2$ for $0\le x\le 4$ is equal to (where $[\ ]$ denotes greatest integer function)	(p)	48
(B)	The area of region formed by points (x,y) satisfying $x+y\le 6, x^2+y^2\le 6y$ and $y^2\le 8x$ is $\frac{k\pi-2}{12}$, then $k=$	(q)	27
(C)	The area in the first quardant bounded by the curve $y=\sin x$ and the line $\frac{2y-1}{\sqrt{2}-1}=\frac{2}{\pi}(6x-\pi)$ is $\left[\frac{\sqrt{3}-\sqrt{2}}{2}-\frac{(\sqrt{2}+1)\pi}{k}\right]$, then $k=$	(r)	7
(D)	If the area bounded by the graph of $y=xe^{-ax}\ (a>0)$ and the abscissa axis is $\frac{1}{9}$ then the value of 'a' is equal to	(s)	4
		(t)	3

A) $A-r, B-q, C-p, D-p$ B) $A-r, B-q, C-p, D-t$

C) $A-s, B-q, C-p, D-r$ D) $A-s, B-q, C-s, D-t$

18.

Column - I		Column - II	
I)	Area enclosed by $[x]^2=[y]^2$ for $1\le x\le 4$	(p)	8 sq.units
II)	Area enclosed by $[\lvert x\rvert]+[\lvert y\rvert]=2$	(q)	6 sq.units
III)	Area enclosed by $[\lvert x\rvert][\lvert y\rvert]=2$	(r)	4 sq.units
IV)	Area enclosed by $\frac{[\lvert x\rvert]}{[\lvert y\rvert]}=2, -5\le x\le 5$	(s)	12 sq.units

(Note :- [.] is G.I.F)

A) $I-q, II-s, III-p, IV-p$ B) $I-r, II-q, III-p, IV-s$

C) $I-p, II-q, III-s, IV-r$ D) $I-r, II-p, III-q, IV-r$

PHYSICS **Max Marks: 60**

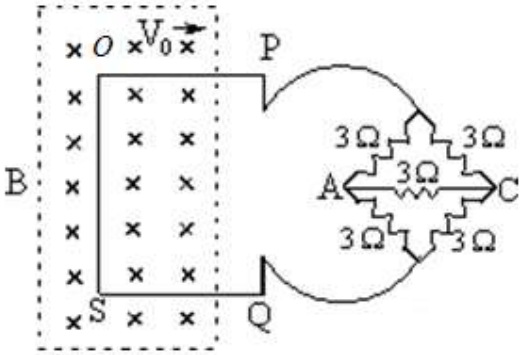
SECTION – I
(NUMERICAL VALUE TYPE)

This section contains **EIGHT (08)** questions.

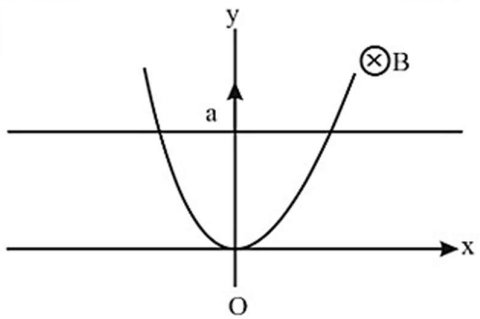
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will bee evaluated according to the following marking scheme :

Full Marks:+3 **ONLY** if the correct numerical value is entered ;
Partial Mark: 0 In all other cases.

19. A square metal wire loop of side 10 cm and resistance 1Ω is moved with a constant velocity v_o in uniform magnetic field of induction B = 2 weber/m^2 as shown in the figure. The magnetic field lines are perpendicular to the plane of the loop (directed into the paper).The loop is connected to a network of resistors each of value 3Ω. The resistance of the lead wires OS and PQ are negligible. the speed of the loop so as to have a steady current of 1 mA in the loop is $n\times10^{-2}\,m/s$ then n is

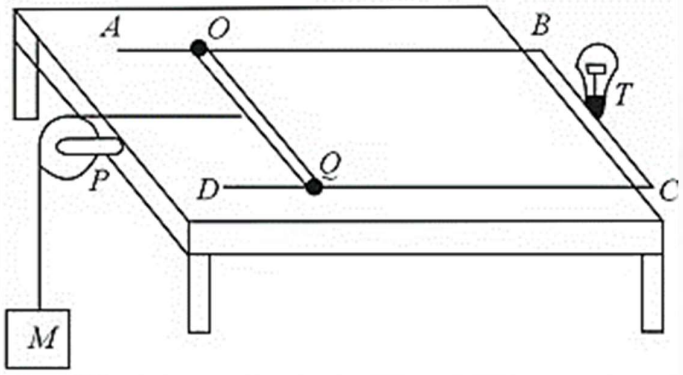


20. A wire is bent as a parabola $y = cx^2$ is located in a uniform magnetic field of magnitude B perpendicular to the xy plane as shown. At the instant t = 0 a long metal rod starts translating from the vertex of the parabola with a constant acceleration along positive y-axis. The induced emf across the points of contact of the rod with the wire is given by $\varepsilon = 2Byv\sqrt{\frac{ka}{c}}$; where k=

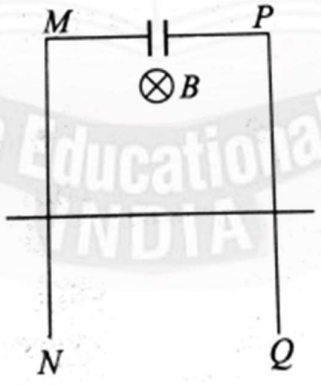


21. Two conducting rings P and Q of radii r and 2r rotate uniformly in opposite directions with centre of mass velocities 2v and v respectively on a conducting surface S. There is a uniform magnetic field of magnitude B perpendicular to the plane of the rings. The potential difference between the highest points of the two rings is $nBrv$. Then $n =$

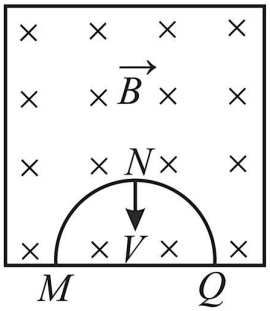
22. In ABCD is a fixed smooth conducting frame in horizontal plane. T is a bulb of power 100W, P is a smooth pulley and OQ is a conducting rod. Neglect the self-inductance of the loop and resistance of any part other than the bulb. The mass M is moving down with constant velocity $10ms^{-1}$. Bulb lights at its rated power due to induced emf in the loop due to earth's magnetic field. Find the mass M (in kg) of the block ($g = 10ms^{-2}$)



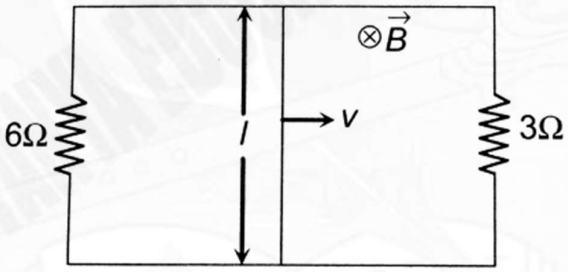
23. A conducting rod of length l, resistance R and mass m moving vertically downward due to gravity. Other parts are kept fixed. Magnetic field is B. MN and PQ are vertical, smooth conducting rails. The capacitance of the capacitor is C. The rod is released from rest. The maximum current induced in the circuit is $i_{\max} = \dfrac{mgBlc}{m + B^n l^2 c}$ then n



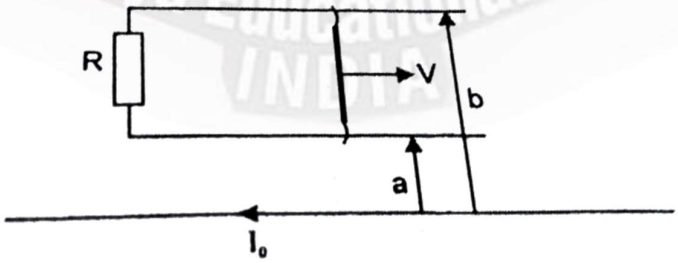
24. A thin semicircular conducting ring of radius R is falling with its plane vertical in horizontal magnetic induction $\vec{B}$. At the position MNQ, the speed of the ring is V, and the potential difference developed across the ring is $\frac{BnR\vartheta}{4}$ then n is



25. A rectangular loop with a sliding connector of length $l = 1.0m$ is situated in a uniform magnetic field B = 2T perpendicular to the plane of loop. Resistance of connector is $r = 2\Omega$. Two resistance of 6Ω and 3Ω are connected The external force required to keep the connector moving with a constant velocity $v = 2ms^{-1}$ is in _____N



26. A long straight wire carries a current I_o *at* distances a and b from it there are two other wires, parallel to the former one, which are interconnected by a resistance R. A connector slides without friction along the wires with a constant velocity. Assuming the resistance of the wires, the connector, the sliding contacts, and the self-inductance of the frame to be negligible, the force required to maintain the connector's velocity constant is $F = \frac{\vartheta}{R}\left(\frac{\mu_o}{2\pi} i_o \ln\left(\frac{b}{a}\right)\right)^n$ then n is

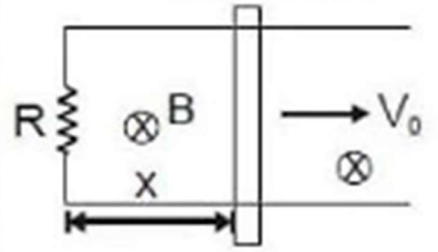


SECTION – II
(ONE OR MORE CORRECT ANSWER TYPE)

This section contains **SIX (06)** 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** two options are 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.

27. A conducting rod of length l is moved at constant velocity v_o on two parallel conducting, smooth fixed rails, that are placed in a uniform constant magnetic field B perpendicular to the plane of the rails as shown in figure. A resistance R is connected between the two ends of the rail. Then which of the following is/are correct?



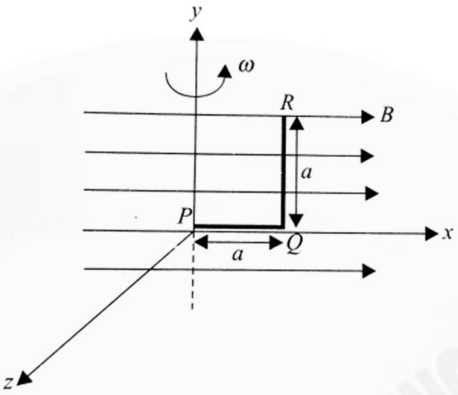
A) The thermal power dissipated in the resistor is equal to rate of work done by external person pulling the rod.

B) If applied external force is doubled then a part of external power increases the velocity of rod

C) Lenz's law is not satisfied for direction of current in Loop

D) If resistance R is doubled then power required to maintain the constant velocity V_o become half

28. In a region there exist a magnetic field B_o along positive x-axis. A metallic wire of length 2a and one side along x-axis and one side parallel of y-axis is rotating about y-axis with an angular velocity w. Then at the instant shown.



A) Potential difference across PQ is zero

B) Potential difference across PQ is $\frac{1}{2}B_o\omega a^2$

C) Potential difference across QR is $\frac{1}{2}B_o\omega a^2$

D) Potential difference across QR is $B_o\omega a^2$

29. A flexible wire loop in the shape of a circle has a radius that grows linearly with time, as $r = r_o t$. There exists a time varying magnetic field in the region as $B = B_o t$, where B_o and r_o are positive constants with appropriate dimensions

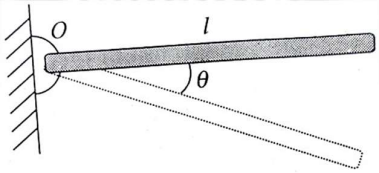
A) The rate of change of induced emf varies linearly with time

B) The induced emf varies parabolically with time

C) The dimensional formula of $\frac{B_o}{ro}$ is $M^1L^{-1}T^{-2}A^{-1}$

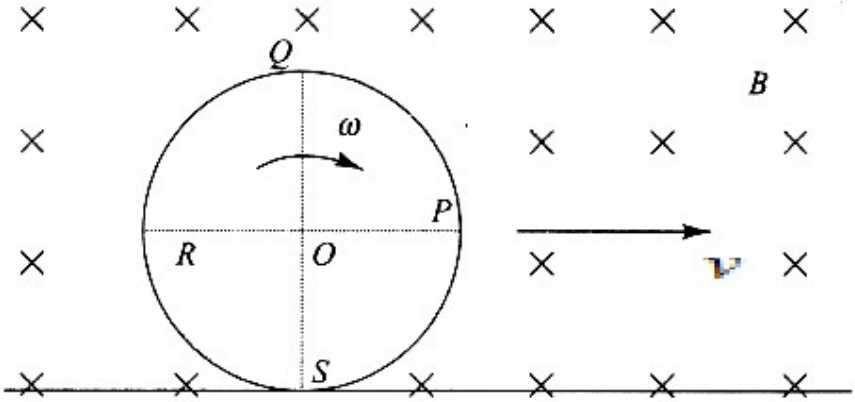
D) The dimensions of $\frac{B_o}{r_o}$ is independent of the physical quantity length

30. A conducting rod of length l is hinged at point O. It is free to rotate in a vertical plane. There exists a uniform magnetic field $\overline{B}$ in horizontal direction. The rod is released from the position as shown in fig. Potential difference between the two ends of the rod after rotating an angle θ is proportional to



A) $l^{3/2}$ B) l^2 C) B D) $(\sin\theta)^{1/2}$

31. A disc of radius r is rolling without sliding on a horizontal surface with a velocity of center of mass v and angular velocity ω in a uniform magnetic field B which is perpendicular to the plane of the disc as shown. O is the center of the disc and P,Q,R and S are the four points on the disc. Which of the following statements is true?



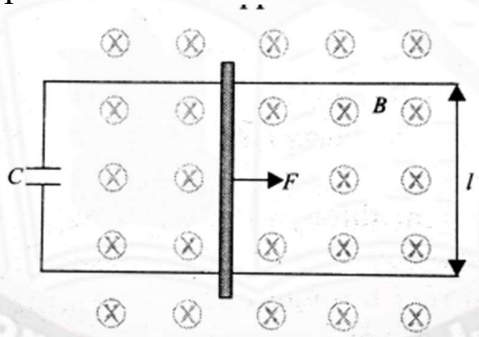
A) Due to translation, induced emf across PS = Bvr

B) Due to rotation, induced emf across QS=0

C) Due to translation, induced emf across RO=0

D) Due to rotation, induced emf across OQ = Bvr

32. A conducting wire of length l and mass m can slide without friction on two parallel rails and is connected to capacitance C. The whole system lies in a magnetic field B and a constant force F is applied to the rod. Then



A) The rod moves with constant velocity

B) The rod moves with an acceleration of $\frac{(F)}{\left(m+B^2l^2C\right)}$

C) There is constant charge on the capacitor

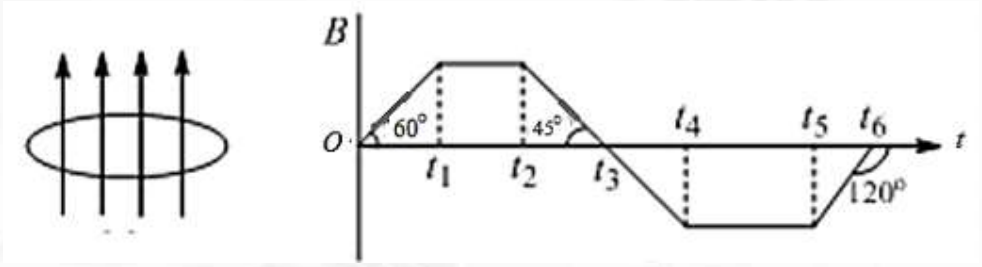
D) Charge on the capacitor increases with time

SECTION – III
(MATCHING TYPE)

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 (I), (II), (III) and (IV) and **List-II** has **Five** entries (P), (Q), (R), (S) and (T).
- **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 chosed (i.e. the question is unanswered);
Negative Marks: –1 In all other cases.

33. A conducting loop is held in a magnetic field such that the field is oriented perpendicular to the area of the loop as shown. At any instant, magnetic flux density over the entire area has the same value but it varies with time



Column I		Column II	
i.	Induced current in the coil is in the clockwise sense	a.	For $t_2 < t < t_3$
ii	Induced current in the coil is in the anticlockwise sense	b.	For $t_3 < t < t_4$
iii	Induced current is zero	c.	For $t_5 < t < t_6$
iv	Induced current is maximum	d.	For $t_4 < t < t_5$

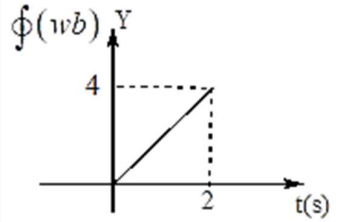
A) $i-a, ii-b, iii-d, iv-c$ B) $i-b, ii-a, iii-c, iv-c$
C) $i-c, ii-d, iii-b, iv-a$ D) $i-c, ii-a, b, iii-d, iv-c$

34. Match the dimensional formulae with the corresponding units

Column I		Column II	
A.	$ML^2T^{-2}A^{-1}$	p.	Farad
B.	$M^{-1}L^{-2}T^4A^2$	q.	Weber
C.	$ML^2T^{-3}A^{-1}$	r.	Ohm
D	$ML^2T^{-3}A^{-2}$	s	emf (volt)

A) $A \to q; B \to P; C \to s; D \to r$ B) $A \to c; B \to q; C \to r; D \to s$
C) $A \to q; B \to s; C \to p; D \to r$ D) $A \to r; B \to s; C \to p; D \to q$

35. The variation of magnetic flux associated with a coil of resistance 2Ω varies with time t as shown match the quantities in column I with their respective values in SI units, in column II



Column I		Column II	
A.	Induced emf produced	p.	4
B.	Induced current	q.	1
C.	Charge flows in 2 sec	r.	8
D	Heat generated in 2sec	s	2

A) $A \to s; B \to q; C \to s; D \to p$ B) $A \to s; B \to q; C \to p; D \to s$

C) $A \to s; B \to p; C \to q; D \to s$ D) $A \to q; B \to p; C \to s; D \to p$

36. A uniform circular disc of mass M, radius R, having uniformly distributed charge Q is placed on a horizontal rough floor of coefficient of friction μ A uniform vertically downward magnetic field, varying with time t as $B = B_o t^2$ is confined in a cylindrical region of radius $r(> R_o)$ coaxial with the disc assuming B_o to be a positive constant, match quantities in column-I (given as a multiple of k) with their respective k values in Column-II

Column I		Column II	
A.	Rotation of disc begins at time $t_o = k\left(\frac{\mu Mg}{QB_oR}\right)$	p.	$\frac{2}{3}$
B.	Torque due to friction at $t = 2s$ is $\tau_f = k(\mu MgR)$	q.	$\frac{8}{9}$
C.	Torque due to magnetic field at time values $t = 0, t = t_o$ and $t = 3t_o$ are $k(\mu MgR)$, with multiple respective values of k to be selected from Column-II	r.	Zero
D	Angular velocity of disc at $t = 2t_0$ is ω. $\omega = k\left(\frac{M\mu^2 g^2}{QB_oR^2}\right)$	s	$\frac{4}{3}$
		t	2

A) $A \to p; B \to q; C \to t; D \to r$ B) $A \to s; B \to p; C \to p, r, t; D \to q$

C) $A \to s; B \to p; C \to r, p, t; D \to q$ D) $A \to r, t; B \to s; C \to p; D \to q$

CHEMISTRY **Max Marks: 60**

SECTION – I
(NUMERICAL VALUE TYPE)

This section contains **EIGHT (08)** questions.

- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will bee evaluated according to the following marking scheme :

Full Marks:+3 **ONLY** if the correct numerical value is entered ;
Partial Mark: 0 In all other cases.

37. In the following reaction,

$XeF_6 + H_2O(1mole) \longrightarrow (X) + 2HF$

X has 'P' $\sigma-$bonds, 'Q' $\pi-$bonds and 'R' lone pairs on Xe atom, then the value of $\left(\frac{P+Q+R}{4}\right)$ is _____

38. In case of oxides of chlorine

X = oxidation no.of 'Cl' in Cl_2O_6 compound and

Y = the number of oxygen atoms surrounding each 'Cl' atom in Cl_2O_7 compound, then the value of $\left(\frac{x+y}{3}\right)$ is _____

39. For oxyacid $HClO_x$, if $x = y = z\,(x, y, z\ are\ natural\ numbers)$ where

x = Total no.of lone pairs at central atom

y = No.of oxygen atoms

z = Total no.of π electrons in the oxyacid, the value of $\left(\frac{2x+y+z}{5}\right)$ is _____

40. Consider the following compounds A to E

A) XeF_n B) $XeF^{\oplus}_{(n+1)}$ C) XeF^{Θ}_{n+1} D) XeF_{n+2} E) XeF^{2-}_{n+4}

If n = 4, P = total n.of bond pairs and

Q = Total no.of lone pairs on central atom of compounds A to E

Then, the value of $\left(\frac{P+Q}{4}\right)$ *is* _____

41. Xenon(Xe) on reaction with O_2F_2 gives is Xe compound 'P'.Three moles of Compound 'P' on complete hydrolysis gives 'x' moles of XeO_3 and 'y' moles of HF. Then the value of $\left(\frac{x+y}{2}\right)$ is _____

42. Ozonolysis of ClO_2 produces an oxide of chlorine then if A = No.of $\pi-$bonds in (P) B) = Average oxidation state of chlorine in (P), then value of $\left(\frac{2B-A}{3}\right)$ is _____

43. When Cl_2 reacts with hot conc. NaOH solution gives corresponding products, then
If x = the difference in oxidation state of 'Cl' in the products
Y = no.of moles of 'NaCl' produced during reaction.
Then the value of (x/y) is _____

44. When 3.55g of bleaching powder is treated with acetic acid and excess of KI liberated iodine, which required 5ml of 0.25N hypo solution. What is the percentage of available Cl_2?

SECTION – II
(ONE OR MORE CORRECT ANSWER TYPE)

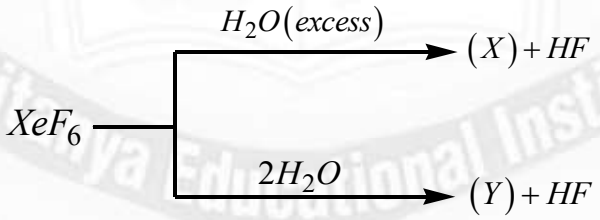
This section contains **SIX (06)** questions.

- 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** two options are 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.

45. The correct order of the following is / are;
A) $HF < HCl < HBr < HI$: Acidic strength
B) $HF > HCl > HBr > HI$: thermal stability
C) $HF > HCl > HBr > HI$: Boiling point
D) $HF < HCl < HBr < HI$: Bond dissociation enthalpy

46. Which of the following is/are correct statement regarding the following reaction is



A) XeF_6 can undergo partial hydrolysis
B) 'Y' is an oxy-acid of xenon
C) 'X' is an explosive
D) Both are examples of non-redox reactions

47. Which of the following reactions of Xe compounds are feasible?

A) $XeF_2 + HF \longrightarrow H(XeF_3)$ B) $XeF_4 + PF_5 \longrightarrow [XeF_3]^+[PF_6]^-$

C) $XeF_6 + RbF \longrightarrow [XeF_5]^+[RbF_2]^-$ D) $3XeF_4 + 6H_2O \longrightarrow 2Xe + XeO_3 + 12HF + \frac{3}{2}O_2$

48. The species which are not formed on fluorination of phosphorous pentachloride in polar organic solvent are

A) PF_3 *and* PCl_3 B) PF_5 *and* PCl_3

C) $[PCl_4]^+[PCl_4F_2]^{\Theta}$ *and* $[PCl_4]^+[PF_6]^{\Theta}$ D) $[PF_4]^{\oplus}[PF_6]^{\Theta}$ *and* $[PCl_4]^{\oplus}[PF_6]^{\Theta}$

49. With respect to hypochlorite, chlorate and perchlorate ions choose the correct statements

A) The molecular shape of only chlorate ions are influenced by the lone pair of electrons of 'Cl'

B) The hypochlorite is the weakest conjugate base

C) The hypochlorite ion oxidizes the sulphite ion

D) The hypochlorite and chlorate ions disproportionate to give rise to identical set of ions

50. Partial hydrolysis XeF_6 gives

A) XeO_2F_2 B) $XeOF_2$ C) $XeOF_4$ D) XeO_3

SECTION – III
(MATCHING TYPE)

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- Each set has **TWO** lists : **List-I** and **List-II.**
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Negative Marks: –1 In all other cases.

51. Match the xenon compounds given in List-I with corresponding geometrices and number of lone pairs on Xe given is list-II based on VSEPR model and choose the correct option

List-I		List-II	
P)	XeF_4	1)	Tetrahedral and one lone pair of electrons
Q)	XeO_3F_2	2)	Trigonal bipyramidal and 2 lone pair of electrons
R)	XeF_2	3)	Octahedral and 2 lone pair electrons
S)	XeO_3	4)	Trigonal bipyramidal and no lone pair of electrons
		5)	Trigonal bipyramidal and 3 lone pair of electrons

A) $P-4, Q-3, R-5, S-1$ B) $P-4, Q-2, R-1, S-3$

C) $P-3, Q-4, R-5, S-1$ D) $P-3, Q-4, R-2, S-1$

52. Match the following sets related to compounds and number of lone pairs at central atoms

List-I		List-II	
A)	$HClO_4$	p)	1
B)	$HClO_3$	q)	2
C)	$HClO_2$	r)	0
D)	$HClO$	s)	3

A) $A-s, B-r, C-q, D-p$ B) $A-s, B-q, C-p, D-r$

C) $A-r, B-p, C-s, D-q$ D) $A-r, B-p, C-q, D-s$

53. Match the following

List-I		List-II	
A)	XeF_5^{Θ}	p)	Octahedral
B)	$HXeO_4^{\Theta}$	q)	Pentagonal planar
C)	XeO_2F_4	r)	See-saw
D)	$XeF_5^{\oplus}$	s)	Square pyramidal

A) $A-q, B-p, C-r, D-s$ B) $A-q, B-r, C-p, D-s$

C) $A-r, B-p, C-s, D-q$ D) $A-q, B-r, C-s, D-p$

54. Match the following halogens with their properties

List-I		List-II	
A)	F_2	p)	Maximum enthalpy of dissociation
B)	Cl_2	q)	Corrosive liquid
C)	Br_2	r)	Maximum solubility in water
D)	I_2	s)	Minimum standard reduction potential

A) $A-s, B-p, C-q, D-r$ B) $A-r, B-p, C-s, D-q$

C) $A-r, B-p, C-q, D-s$ D) $A-s, B-q, C-p, D-r$

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