

13.01.2019



Bangalore

SAMPLE PAPERS

JEE ADVANCED

Time: 3 Hours

Maximum Marks: 183

Topics Covered:

Physics : Complete Syllabus

Chemistry : Complete Syllabus

Mathematics : Complete Syllabus

Read the Important Instructions Carefully:

1. You are allowed to take away the Question Paper at the end of the examination.
2. Do not tamper with or mutilate the ORS. Do not use the ORS for rough work.
3. Use a **BLACK BALL POINT PEN** to darken the bubbles on the ORS.
4. The ORS is machine-gradable. Ensure that the bubbles are darkened in the correct way.
5. Darken the bubbles **ONLY IF** you are sure of the answer. There is **NO WAY** to erase or “un-darken” a darkened bubble.

PART-I: PHYSICS

SECTION-1 (MAXIMUM MARKS: 28)

- This section contains **SEVEN** questions
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
- For each question, marks will be awarded in one of the following categories:

Full Marks : +4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened

Partial Marks : +1 For darkening a bubble corresponding to each correct option, provided **NO** incorrect option is darkened

Zero Marks : 0 If none of the bubbles is darkened

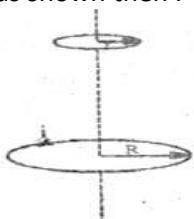
Negative Marks : -2 In all other cases

- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks; darkening only (A) and (D) will result in +2 marks; and darkening (A) and (B) results in -2 marks, as a wrong option is also darkened

1. A single hydrogen atom in ground state is given least energy E_0 so that it can emit H_β – line in the Balmer series, then:

- (a) $E_0 \approx 12.09$ eV
- (b) $E_0 \approx 12.75$ eV
- (c) This atom can give maximum 3 different lines in emission spectrum
- (d) The atom can give maximum 6 different lines in emission spectrum

2. Two coaxial circular loops are shown in figure, smaller loop (radius = r) is at a distance x above the larger one (Radius = R) with $x \gg R$. Now if x is changing at a constant rate $\frac{dx}{dt} = v > 0$ and current is flowing in the larger loop as shown then :



(a) Approximate magnitude of induced EMF generated in smaller loop when $x = NR$ is $\frac{3}{2} \frac{\mu_0 i \pi r^2}{N^4 R^2}$ (where N is a positive constant)

(b) Approximate magnitude of induced EMF generated in smaller loop when $x = NR$ is $\frac{3}{2} \frac{\mu_0 i \pi r^2 v}{N^4 R^2}$ (where N is a positive constant)

(c) Direction of induced current in the smaller loop is same as that larger loop

(d) Direction of induced current in the smaller loop is opposite to that in larger loop.

3. An X-ray tube operating at 84 kV and 10 mA. Only 1% of the electric power supplied is converted into X-rays. If target has a mass of 300 gm and specific heat of 0.04 cal/gm/°C. Then choose the correct statements (use 1 cal = 4.2 J & $hc = 12400$ eV – Å) Assume entire thermal energy is absorbed by the target.

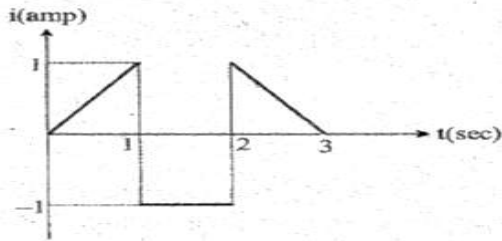
- (a) cut-off wavelength is approximately 0.15 Å
- (b) cut-off wavelength is approximately 6.8 Å
- (c) average rate of temperature rise of target (assuming no heat loss) is 16.5°C/sec

(d) average rate of temperature of temperature rise of target (assuming no heat loss) is $1.7^\circ\text{C}/\text{sec}$.

4. A long straight neutral conductor carries a current I . Assume that all the free electrons in the conductor move with the same velocity v . A is a stationary observer while B is moving same velocity v .

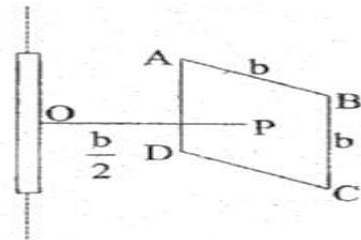
- (a) A and B both observe non- zero magnetic field
- (b) A and B both observe zero electric field
- (c) A and B both observe approximately the same current i .
- (d) A observes zero electric field while the electric field observed by B is non-zero

5. The figure shows current varying with time. The magnitude of constant direct current for a particular time which would produce same heat in identical resistance as produced by given varying current in the seconds.



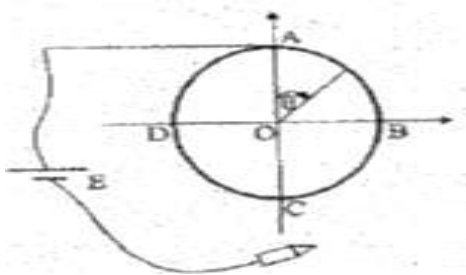
- (a) 1 A when passed for 15 seconds
- (b) $\frac{1}{3}$ A when passed for 15 seconds
- (c) $\frac{\sqrt{5}}{3}$ A when passed for 3 seconds
- (d) $\frac{\sqrt{5}}{9}$ A when passed for 3 seconds

6. There is a square wire frame ABCD of side equal to b and whose centre is at a distance $OP = \frac{b}{2}$ from an infinite line charge (parallel to BC and AD) with linear charge density λ then [plane of the frame is perpendicular to line OP.]



- (a) flux through ABCD is $\frac{\lambda b}{\epsilon_0}$
- (b) flux through ABCD is $\frac{\lambda b}{4\epsilon_0}$
- (c) electric field across AB is uniform
- (d) electric field across BC is uniform

7. The figure shows a circular loop made of a wire of radius R . The resistivity of the material varies as a function of θ such that $\rho = \rho_0 \sin^2 \theta$. The positions of the Jockey such that the magnetic field at the center (O) due to the current in the loop is zero, will be



- (a) $\theta = \frac{\pi}{2}$
- (b) $\theta = \pi$
- (c) $\theta = \frac{3\pi}{2}$
- (d) $\theta = \frac{\pi}{4}$

SECTION-2 (MAXIMUM MARKS: 15)

- This section contains **FIVE** questions
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging 0 to 9, both inclusive
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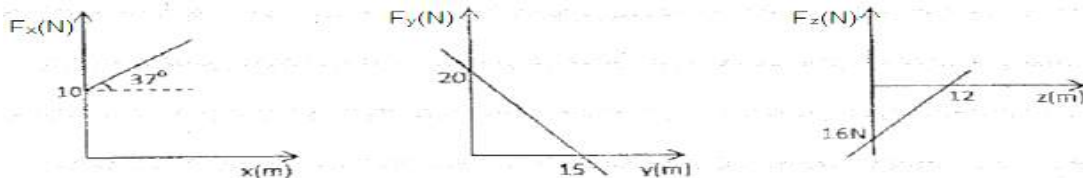
Zero Marks : 0 If all other cases

8. A ring made of superconductor is placed into a homogenous magnetic field whose intensity grows from zero to $B_0 = 25\text{T}$. The plane of the ring is perpendicular to the magnetic field lines. The intensity of the induced current appearing in the ring is (Take the radius of the ring as $r = 1/\sqrt{\pi}\text{ m}$, and its inductance $L = 5\text{H}$)

9. Two identical wires are stretched by the same tension of 100 N, and each emits a note of frequency 200 cycles/sec. The tension in one wire is increased by 1 N. The number of beats heard per second when the wires are plucked is

10. A spherical balloon is filled with an ideal mono-atomic gas. At some instant its pressure was P_0 , volume V_0 and temperature T_0 . If the balloon expanded in such a manner so that the rate of radiation from the balloon remained constant, it was found that the work done by gas inside the balloon was $6P_0V_0 \left[1 - \frac{1}{\sqrt{n}}\right]$ when its volume increased to $8V_0$. The value of n is (assume ambient temperature to be close to 0K)

11. The components of a force acting on a particle are varying according to the graphs shown. When the particle moves from (0, 5, 0) to (4, 20, 12) then the work done by the force is



12. A ring of radius $R = 25\text{ cm}$ made of metal (relative density = 11.3 and breaking stress $\sigma_b = 1.5 \times 10^7\text{ N/m}^2$) rotates about its axis. The rps at which it will rupture is $\frac{46}{x}$ then $x =$

SECTION-3 (MAXIMUM MARKS: 18)

- This section contains **SIX** questions of matching type
- This section contains **TWO** tables (each having 3 columns and 4 rows)
- Based on each table, there are **THREE** questions
- Each question has **FOUR** options (A), (B), (C), and (D). **ONLY ONE** of these four options is correct
- For each question, darken the bubble corresponding to the correct option in the ORS
- For each question, marks will be awarded in one of the following categories:

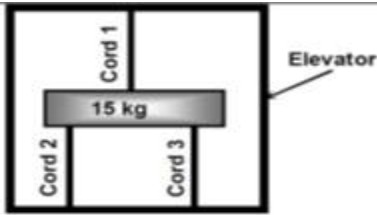
Full Marks : +3 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

Answer questions 13, 14 and 15 by approximately matching the information given in the three columns of the following table.

A block of mass $m = 15\text{ kg}$ is suspended in an elevator with the help of three identical light elastic cords (spring constant $k = 100\text{ N/m}$ each) attached vertically. Cord 1 is tied to the ceiling of the elevator and the other two cords 2 and 3 are tied to the elevator floor as shown in the figure. When the elevator is stationary the tension force in each of the lower cords is $T = 7.5\text{ N}$. Take $g = 10\text{ m/s}^2$. If now the elevator starts moving with given four accelerations shown in column I and Column II gives the displacement of the block with respect to elevator when it is accelerating. Column III gives tension in the cords when elevator is accelerating.



Column 1 (acceleration of the elevator in different cases)		Column 2 (displacement of the block with respect to the elevator upto new equilibrium position)		Column 3 (Tension in the cord)	
(I)	1 m/s^2 upward	(i)	7.5 cm downward	(P)	2.5 N
(II)	1.5 m/s^2 upward	(ii)	2.5 cm downward	(Q)	5 N
(III)	2 m/s^2 upward	(iii)	15 cm downward	(R)	172.5 N
(IV)	33 m/s^2 downward	(iv)	5 cm downward	(S)	0 N

13. Tension in cord – 1.
- (a) (I) (i) (S) (b) (II) (i) (R) (c) (III) (ii) (P) (d) (IV) (iii) (Q)
14. Tension in cord 2.
- (a) (I) (iv) (P) (b) (II) (i) (Q) (c) (III) (iii) (R) (d) (IV) (ii) (S)
15. Tension in cord 3.
- (a) (I) (i) (P) (b) (II) (ii) (P) (c) (III) (iii) (S) (d) (IV) (iii) (R)

II) Answer 16, 17 and 18 questions by appropriately matching the information given in the three columns given below.

A charged particle is projected with a velocity \vec{v} in a region containing both Electric field (\vec{E}) and magnetic field (\vec{B}).

Column I	Column II	Column III
P) $\vec{v} = v_0 \hat{i}$	1) $\vec{E} = E_0 \hat{k}$	i) $\vec{B} = B_0 (\hat{i} + \hat{j})$
Q) $\vec{v} = v_0 (\hat{i} + \hat{j})$	2) $\vec{E} = E_0 \hat{i}$	ii) $\vec{B} = B_0 \hat{k}$
R) $\vec{v} = v_0 \hat{j}$	3) $\vec{E} = 0$	iii) $\vec{B} = 0$
S) $\vec{v} = 0$	4) $\vec{E} = E_0 (\hat{i} + \hat{j})$	iv) $\vec{B} = B_0 \hat{j}$

- 16) Which of the following combinations should be true for the particle to travel along a parabolic path?
- (a) P 2 (ii) (b) R 2 (iv) (c) P 2 (iii) (d) Q 4 (i)
- 17) Which of the following combinations should be true for the particle to travel along a circular path?
- (a) P 3 (ii) (b) R 2 (iv) (c) P 1 (iii) (d) Q 4 (i)
- 18) Which of the following combinations should be true for the particle to travel along a straight line?
- (a) P 3 (ii) (b) R 2 (ii) (c) P 4 (iii) (d) Q 4 (i)

PART – 2 (CHEMISTRY)

SECTION-1 (MAXIMUM MARKS: 28)

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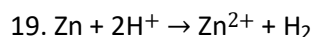
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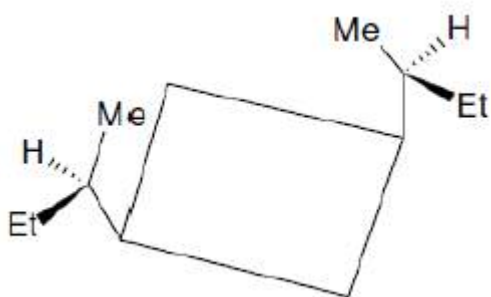
Half – life period is independent of concentration of constant pH. For the constant concentration of Zn, rate becomes 100 times when pH is decreased from 3 to 2. Hence,

(a) $\frac{dx}{dt} = k[\text{Zn}]^0 [\text{H}^+]^2$

(b) $\frac{dx}{dt} = k[\text{Zn}] [\text{H}^+]^2$

- (c) rate is not affected if concentration of zinc is made four times and that of H^+ ion is halved
(d) rate becomes four times if concentration of H^+ ion is doubled at constant Zn concentration.

20. What is/are true about the following compound.



Cis-(1R, 3S)-di-sec-butylcyclobutane

- (a) It has a centre of symmetry (inversion center)
(b) It has a plane of symmetry
(c) It does not have two fold axis (C_2) of symmetry
(d) It is an achiral molecule.

21. Energy diagram of SN^1 and SN^2 reactions. The order of hydrolysis of RX by SN^1 is $3^\circ > 2^\circ > 1^\circ$ RX and SN^2 path is $1^\circ > 2^\circ > 3^\circ$ RX.

Fig. (a)

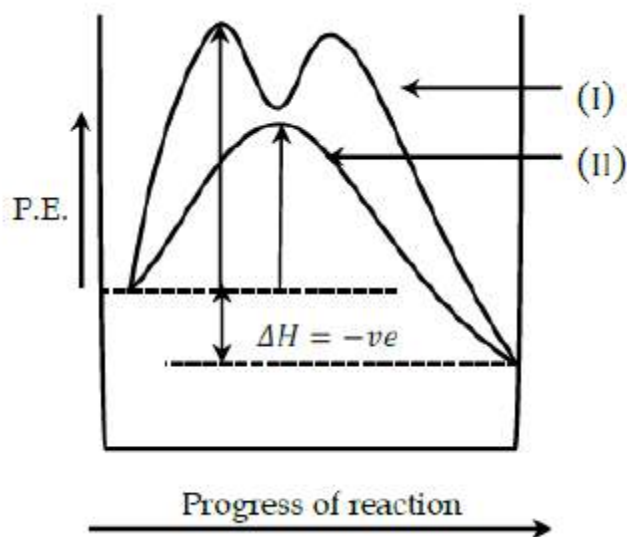
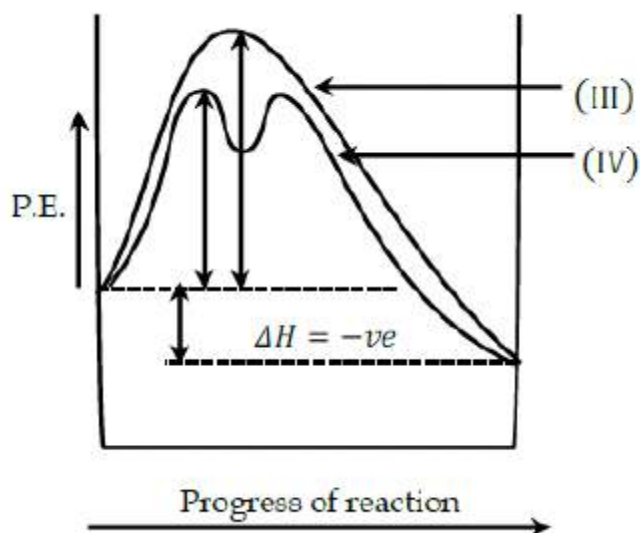


Fig. (b)



Which of the following statements are correct for the above energy diagrams of SN^1 and SN^2 reactions?

- (a) (I) in fig. (a) and (IV) in fig. (b) represent SN^1 reaction.
- (b) (II) in fig. (a) and (III) in fig. (b) represent SN^2 reaction.
- (c) Fig. (a) and fig. (b) are the energy diagrams for 1°RX and 3°RX , respectively.
- (d) Fig. (a) and fig. (b) are the energy diagrams for 3°RX and 1°RX , respectively.

22. From the following data, mark the option(s) where ΔH is correctly written for the given reaction.

Given : $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\ell)$; $\Delta H = -57.3 \text{ kJ}$

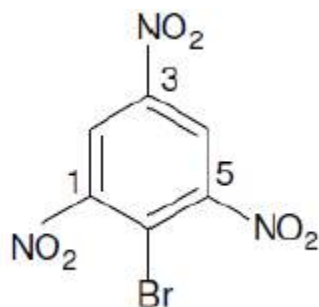
$\Delta H_{\text{solution}}$ of $\text{HA}(\text{g}) = -70.7 \text{ kJ/mol}$

$\Delta H_{\text{solution}}$ of $\text{BOH}(\text{g}) = +20 \text{ kJ/mol}$

$\Delta H_{\text{ionization}}$ of $\text{HA} = 15 \text{ kJ/mol}$ and BOH is a strong base.

Reaction	$\Delta H_r \text{ (kJ/mol)}$
(a) $\text{HA}(\text{aq}) + \text{BOH}(\text{aq}) \rightarrow \text{BA}(\text{aq}) + \text{H}_2\text{O}$	-42.3
(b) $\text{HA}(\text{g}) + \text{BOH}(\text{g}) \rightarrow \text{BA}(\text{aq}) + \text{H}_2\text{O}$	-93
(c) $\text{HA}(\text{g}) \rightarrow \text{H}^+(\text{aq}) + \text{A}^-(\text{aq})$	-55.7
(d) $\text{B}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{BOH}(\text{aq})$	-20

23. Which of the following statements would be INCORRECT about this compounds?



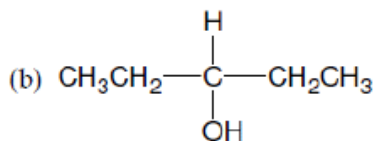
- (a) All three C – N bond are of same length
 (b) $C_1 - N$ and $C_3 - N$ bonds are of same length but shorter than $C_5 - N$ bond
 (c) $C_1 - N$ and $C_5 - N$ bonds are of different length but longer than $C_3 - N$ bond
 (d) $C_1 - N$ and $C_5 - N$ bonds are of same length but both are longer than $C_3 - N$ bond.

24. Which of the following statements are correct?

- (a) Nitrogen sesquioxide reacts with concentrated acids forming nitrosyl salts
 (b) Nitrogen sesquioxide exists in two different forms-symmetrical and asymmetrical forms
 (c) The N – N bond in dinitrogen oxide is weak in nature
 (d) Heating dry lead nitrate produces NO_2 and O_2 . On cooling, NO_2 crystallizes out

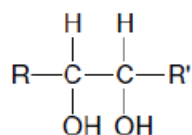
25. Which of the following statements are not correct?

- (a) Tertiary butyl alcohol gives positive iodoform test



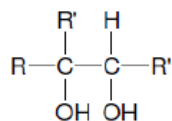
gives positive iodoform test

- (c) The carbon-carbon bond in



can be broken by the use of periodic acid giving two aldehydes.

- (d) The carbon-carbon bond in



can be broken by the use of periodic acid giving two aldehydes.

SECTION-2 (MAXIMUM MARKS: 15)

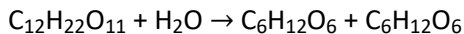
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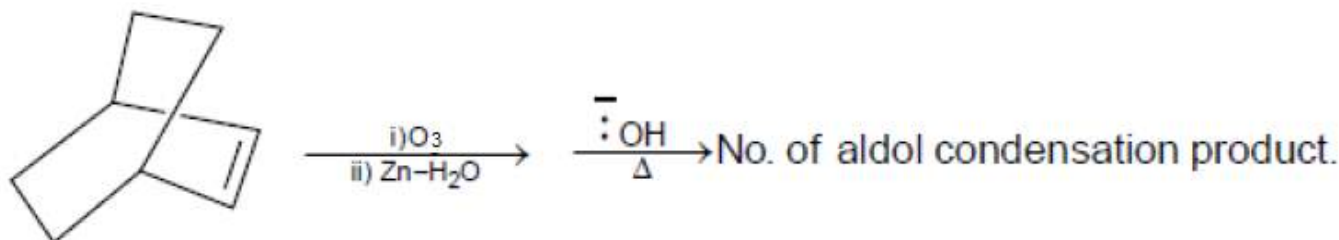
26. 1^{st} excitation Potential of a hydrogen like $\begin{array}{c} \text{H} \\ | \\ \text{CH}_3 - \text{C} - \text{OH} \\ | \end{array}$ sample is 15 volt. If all the atoms of the sample are in eV of the electron ejected if a photon of energy $\frac{65}{9}$ eV is supplied to this sample.

27. 0.0125 mol of sucrose is dissolved in 100 gm of water and it undergo partial inversion according to following equation



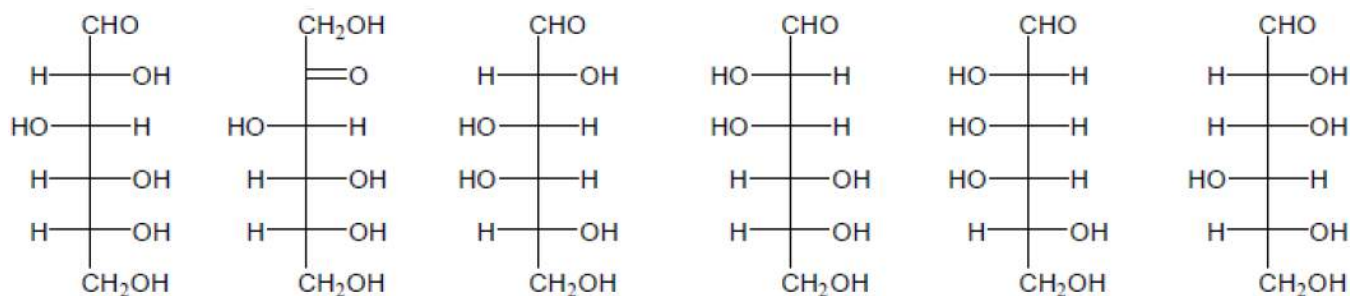
If elevation in boiling point of solution is 0.104°C . Calculate $\frac{1}{10}$ mol percentage of sugar inverted ($K_{b'H_2O} = 0.52$)

28.



29. How many of these gives coupling reaction :

30. How many of these gives same osazone with PhNHNH_2 :



SECTION-3 (MAXIMUM MARKS: 18)

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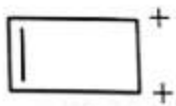
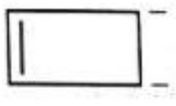

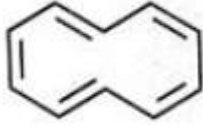
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Match the Column (I), Column (II) and Column (III), (Matrix)

Column I	Column II	Column III
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(a)		(p)	Aromatic	(w)	$(4n + 2)\pi$ electron. $n = 0, 1, 2, 3$
(b)		(q)	Non-aromatic	(x)	$4\pi n$ electron $n = 1, 2, 3$
(c)		(r)	Anti-aromatic	(y)	Non-planar compound
(d)		(s)	Planar compound	(z)	Readily reacts with active metal

31. which of the following is correct?

- (a) a-p-x (b) a-q-y (c) a-p-w (d) a-s-x

32. which of the following is correct?

- (a) c-r-x (b) c-q-z (c) c-p-y (d) c-s-w

33. which of the following is correct?

- (a) d-p-w (b) d-q-w (c) d-r-x (d) d-s-z

List A		List B		List C	
A.	Rate of reaction	1.	$-\frac{\Delta[A]}{\Delta t} = -\frac{\Delta[A]}{dt}$	a.	$\Delta H = +ve$ or $-ve$
B.	Rate constant of a reaction	2.	$V_t = V_0$	b.	$\Delta H = -ve$
C.	Equilibrium constant	3.	$V_t \neq V_0$	c.	$t \rightarrow 0$
D.	$V_t = \frac{V_0 \cdot t}{273}$	4.	Increases	d.	$\Delta H \rightarrow 0$
E.	$V_t = V_0 + \frac{V_0 \cdot t}{273}$	5.	Decreases	e.	$T \rightarrow 0$

34. which of the following is correct?

- (a) A-4-e (b) A-5-c (c) A-4-c (d) A-1-d

35. which of the following is correct?

- (a) E-5-c (b) E-4-b (c) E-3-e (d) E-2-c

36. select the correct relation

- (a) C-4-a (b) C-3-c (c) C-4-d (d) C-5-b

PART – C (MATHEMATICS)

SECTION-1 (MAXIMUM MARKS: 28)

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Negative Marks : -2 In all other cases

- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks; darkening only (A) and (D) will result in +2 marks; and darkening (A) and (B) results in -2 marks, as a wrong option is also darkened

37. Let S be the area bounded by $y = e^{|\cos 4x|}$, $x = 0$, $y = 0$ and $x = \pi$, Then

- (a) $S = 2 \int_0^{\pi/2} e^{\sin t} dt$ (b) $S > \frac{\pi}{2}$ (c) $S < 2 \left(e^{\frac{\pi}{2}} - 1 \right)$ (d) $S \leq 1$

38. Let from the point with abscissa 25, two tangents are drawn to the ellipse $24x^2 + 2y^2 = 600$ with foci at S_1 and S_2 . The points of contact of tangents are A and B. If the distance of A from S_1 is $\frac{60}{13}$ units, then

- (a) The distance of A from S_2 is $\frac{80}{13}$ units
 (b) The distance of B from S_1 is 5 units
 (c) The distance of B from S_2 is 5 units
 (d) The distance of A from the directrix corresponding to S_2 is $\frac{350}{13}$ units.

39. Let AB be a focal chord (not the latus rectum) of the parabola $y^2 = 4px$ where p is a prime number ($p > 0$), such that the lengths SA and SB are integers (S being focus of the parabola). If the tangents to the parabola at A and B meet at point P, then

- (a) $\frac{PA + PB - |PA - PB|}{2} = (p + 1) \sqrt{p + 1}$ (b) $\frac{PA + PB + |PA - PB|}{2} = (p + 1) \sqrt{(p + 1)p}$
 (c) $SP = (p + 1)\sqrt{p}$ (d) $AB = (p + 1)^2$

40. Let P be any point on the curve $\frac{x^2}{16} - \frac{y^2}{9} = \sin 2018^\circ$ whose foci are S_1 and S_2 , then

- (a) The value of $|PS_1 - PS_2|$ is $8\sqrt{|\sin 2018^\circ|}$
 (b) The equation of auxiliary circle of the curve is $x^2 + y^2 = 9 |\sin 2018^\circ|$
 (c) The equation of director circle of the curve is $x^2 + y^2 = 7 |\sin 2018^\circ|$
 (d) Director circle of the curve does not exist

41. Let the angle between vectors \vec{a} and \vec{b} is $\frac{\pi}{6}$, between vectors \vec{b} and \vec{c} is $\frac{\pi}{4}$ and between vectors \vec{c} and \vec{a} is $\frac{\pi}{3}$.

The angle, the vector \vec{a} makes with the plane containing vectors \vec{b} and \vec{c} , is

- (a) $\cos^{-1} \sqrt{1 - \sqrt{\frac{2}{3}}}$ (b) $\cos^{-1} \sqrt{2 - \sqrt{\frac{3}{2}}}$ (c) $\sin^{-1} \sqrt{\sqrt{\frac{2}{3}} - 1}$ (d) $\sin^{-1} \sqrt{\sqrt{\frac{2}{3}}}$

42. Let for $n > 1, n \in \mathbb{I}$, $\lim_{n \rightarrow \infty} \int_0^{(n+1)\frac{\pi}{2}} \left(\frac{\cos x + x \sin x}{x^2 + \cos^2 x} \right) dx = \ell$ and $\lim_{x \rightarrow \infty} (x^2 \ln(x \cot^{-1} x)) = m$, then
 (a) $\ell \in \mathbb{Q}, m \notin \mathbb{Q}$ (b) $\ell \notin \mathbb{Q}, m \in \mathbb{Q}$ (c) $[\ell] + [m] = 0$; $[\cdot]$ denotes G.I.F.) (d) $\ell < 0 < m$

43. Consider a cube of side length 9 units. Let (x, y, z) be coordinates of points on or inside the cube such that $x, y, z \in \mathbb{I}$ and $0 \leq x, y, z \leq 9$. If total number of ways of selecting two distinct points among these such that their mid-point is also having integral coordinates is N , then
 (a) N is divisible by 30 (b) N is divisible by 31
 (c) N is divisible by 32 (d) Number of factors of N is 40

SECTION-2 (MAXIMUM MARKS: 15)

- This section contains **FIVE** questions
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging 0 to 9, both inclusive
- For each question, darken the bubble corresponding to the correct integer in the ORS
- For each question, marks will be awarded in one of the following categories:
Full Marks : +3 If only the bubble corresponding to the correct answer is darkened
Zero Marks : 0 If all other cases

44. If $\int \frac{dx}{1 + \sqrt{x+2} + \sqrt{x+1}} = ax + b\sqrt{x+1} + c \int \sqrt{\frac{x+2}{x+1}} dx$ then $\sum_{\frac{1}{a}}^{\frac{1}{c}} 1$ is equal to

45. If the function $y = g(x)$ satisfies $g'(x) + (\cot x) \cdot g(x) - 2\cos x = 0$, $g\left(\frac{\pi}{2}\right) = 1$, then $\frac{2}{\sqrt{3}} g\left(\frac{\pi}{3}\right)$ is equal to –

46. Let ' α^k ' where $k = 0, 1, 2, \dots, 2013$ are 2014^{th} roots of unity. If z_1 and z_2 be any two complex number such that $|z_1| = |z_2| = \frac{1}{\sqrt{2014}}$, then the value of $\sum_{k=0}^{2013} |z_1 + \alpha^k z_2|^2$, is equal to

47. If $a + b + c = 0$, $a^3 + b^3 + c^3 = 3$, $a^5 + b^5 + c^5 = 10$, then find the value of $a^4 + b^4 + c^4 = \dots$

48. From a point, in XY -plane, perpendicular tangents are drawn to ellipse $x^2 + 2y^2 = 2$. The chord of contact, with respect to the point, touches a circle which is concentric with given ellipse. Then $\frac{\text{Maximum area of the circle}}{9(\text{Minimum area of the circle})} = \dots$

SECTION-3 (MAXIMUM MARKS: 18)

- This section contains **SIX** questions of matching type
- This section contains **TWO** tables (each having 3 columns and 4 rows)
- Based on each table, there are **THREE** questions
- Each question has **FOUR** options (A), (B), (C), and (D). **ONLY ONE** of these four options is correct
- For each question, darken the bubble corresponding to the correct option in the ORS
- For each question, marks will be awarded in one of the following categories:

Full Marks : +3 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : -1 In all other cases

Note $y' = \frac{dy}{dx}$

Column – I		Column – II		Column – III	
(I)	$y \cdot (y')^2 - xy'(1+y) + x^2 = 0, y(\sqrt{3}) = 2$	(i)	$[y] = 1$ where $[.]$ is greatest integer function	(P)	Curve is bounded with area π .
(II)	$y' = \frac{y^2 - x^2}{2xy}, y(1) = 1$	(ii)	Maximum value of y is 3	(Q)	Area bounded by curve in first quadrant with co-ordinate axes is $\frac{3\pi}{4}$
(III)	$y' = \frac{-9x}{y}, y(1) = 0$	(iii)	Maximum value of y is not defined	(R)	Curve is conic with eccentricity $\frac{1}{2}$
(IV)	$y' = \frac{x}{y}, y(2) = 0$	(iv)	Maximum value of y is 1	(S)	Curve is conic with eccentricity $\sqrt{2}$

49. The correct combination is

- (a) (I) (ii) (Q) (b) (II) (iv) (P) (c) (III) (i) (R) (d) (IV) (iv) (Q)

50. The correct combination is

- (a) (I) (iii) (R) (b) (II) (ii) (Q) (c) (III) (ii) (Q) (d) (IV) (i) (P)

51. The correct combination is

- (a) (I) (iii) (S) (b) (II) (ii) (R) (c) (III) (iv) (Q) (d) (IV) (iv) (S)

From $P(-4, 0)$ tangents PA, PA' are drawn to circle $x^2 + y^2 = 4$. Where A and A' is point of contact and A lies above x -axis. Rhombus $PAP'A'$ is completed.

Column – I		Column – II		Column – III	
(I)	$A \equiv (-1, \sqrt{3})$	(i)	$PA = 2\sqrt{3}$	(P)	P' lies on given circle $x^2 + y^2 = 4$
(II)	$A' \equiv (-1, -\sqrt{3})$	(ii)	Area of $\Delta PAA' = 3\sqrt{3}$ sq. units	(Q)	$\Delta PAA'$ is equilateral
(III)	$P' = (4, 0)$	(iii)	$PP' = 6$	(R)	P' lies outside circle $x^2 + y^2 = 4$
(IV)	$P' = (2, 0)$	(iv)	Area of $\Delta PAA' = 4\sqrt{3}$ sq. units	(S)	P' lies inside circle $x^2 + y^2 = 4$

52. Which of the following is correct :

- (a) (I) (ii) R (b) (I) (iii) Q (c) (IV) (ii) (S) (d) (I) (iii) R

53. Which of the following is incorrect :

- (a) (I) (iii) P (b) (I) (ii) Q (c) (IV) (i) P (d) (IV) (iii) R

54. Which of the following is correct :

- (a) (IV) (iii) S (b) (IV) (ii) R (c) (IV) (iii) P (d) None of these