



# 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\_NUCLEUS\_BT**

**Paper -2(Adv-2022-P2-Model)**

**Date: 03-09-2023**

**Time: 02.00Pm to 05.00Pm**

**GTA-01**

**Max. Marks: 180**

03-09-2023\_Sr.Super60\_NUCLEUS\_BT\_Jee-Adv(2022-P2)\_GTA-01\_Syllabus

**PHYSICS : TOTAL SYLLABUS**

**CHEMISTRY : TOTAL SYLLABUS**

**MATHEMATICS : TOTAL SYLLABUS**

**Sri Chaitanya Educational Institutions**  
**INDIA**

**Name of the Student:** \_\_\_\_\_

**H.T. NO:**

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**JEE-ADVANCE-2022-P2-Model**

Time:3Hr's

**IMPORTANT INSTRUCTIONS**

Max Marks: 180

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 8)	Questions with Integer Answer Type	+3	-1	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)	Questions with Single Correct Choice	+3	-1	4	12
<b>Total</b>				<b>18</b>	<b>60</b>

**PHYSICS:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 19 – 26)	Questions with Integer Answer Type	+3	-1	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)	Questions with Single Correct Choice	+3	-1	4	12
<b>Total</b>				<b>18</b>	<b>60</b>

**CHEMISTRY:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 37 – 44)	Questions with Integer Answer Type	+3	-1	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)	Questions with Single Correct Choice	+3	-1	4	12
<b>Total</b>				<b>18</b>	<b>60</b>



**MATHEMATICS****Max. Marks: 60****SECTION-1(Maximum Marks: 24)****SINGLE DIGIT INTEGER**This section contains **EIGHT (08)** questions.The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 TO 9, BOTH INCLUSIVE**.

For each question, enter the correct integer corresponding to the answer using the mouse and the on-screen 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 : +3 If **ONLY** the correct integer is entered;

Zero Marks : 0 If the question is unanswered;

Negative Marks : -1 In all other cases.

1. If  $L = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n^2}\right) \left(1 + \frac{2}{n^2}\right) \left(1 + \frac{3}{n^2}\right) \dots \left(1 + \frac{n}{n^2}\right); n \in N$ , find the greatest integer less than or equal to  $L^4$ .
2. Consider two distinct polynomials  $f(x)$  and  $g(x)$  of degree less than or equal to 3 with integral coefficients such that  $f(1) = g(1), f(-1) = -g(-1), f(2) = g(2), f(-2) = -g(-2), f(3) = g(3), f(-3) = -g(-3)$ . Find the minimum value of  $\frac{f^2(0) + g^2(0)}{6}$ .
3. Let  $A = \left\{ \frac{7462 - 4709i \cos \theta}{277i \sin \theta + 287} : \theta \in R \right\}$ . If  $A$  contains exactly one positive integer  $n$ , then the no. of positive integral divisors of  $n$  is (Here  $i = \sqrt{-1}$ )
4. If  $\int_{-\sqrt{2}}^{\sqrt{2}} \frac{(2x^7 + 3x^6 - 10x^5 - 7x^3 - 12x^2 + x + 1)}{(x^2 + 2)} dx = \frac{\sqrt{2}}{20} (5\pi - k^2)$ , then the value of  $k$  must be ( $k > 0$ )
5. If  $\sum_{k=0}^{100} \left( \frac{k}{k+1} \right)^{100} C_k = \frac{a(2^{100}) + b}{c}$  where  $a, b, c \in N$ , then find the least value of  $\frac{a+b+c}{67}$  is
6. If  $\lim_{x \rightarrow 0^+} \left( \frac{\sin^2 x}{\left[ \frac{x}{\pi} \right] + \frac{x^2}{\pi^2}} \right) \times \frac{\sin(\sin x) - \sin x}{ax^5 + bx^3 + c} = -\frac{\pi^2}{12}$ . Then value of  $b+c$  is (where  $[.]$  denotes greatest integer function)
7. Perpendicular is drawn from a fixed point  $(3,4)$  to a variable line which cuts positive x-axis at one unit distance from origin. Circle  $S(x, y) = 0$  represents the locus of the foot of perpendicular drawn from point  $(3,4)$  to the variable line. If radius of  $S(x, y) = 0$  is  $\sqrt{\lambda_1}$  and length of tangent drawn to  $S(x, y) = 0$  from origin is  $\sqrt{\lambda_2}$ , then find the value of  $\lambda_1 + \lambda_2$ .
8. If volume of the region  $S = \{(x, y, z) \in R^3 : |x+1| + |2y-5| + |3z-1| \leq 6\}$  is  $v$  cubic unit, find  $\frac{v}{6}$





**SECTION-2 (Maximum Marks: 24)****ONE OR MORE THAN**

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

Each Question has Four Options (A), (B), (C), (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; but 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 unanswered;

Negative Marks : -2 In all other cases.

9. Let  $z$  be a complex number satisfying  $|z|^3 + 2z^2 + 4\bar{z} - 8 = 0$ , where  $\bar{z}$  denotes the complex conjugate of  $z$ . Let the imaginary part of  $z$  be nonzero. Then choose correct statement(s).  
 A)  $|z|^2 = 8$       B)  $|z|^2 + |z + \bar{z}|^2 = 8$       C)  $|z + 1|^2 = 7$       D)  $|z - \bar{z}|^2 = 12$
10. Let  $l_1$  and  $l_2$  be the lines  $\vec{r}_1 = \lambda(\hat{i} + \hat{j} + \hat{k})$  and  $\vec{r}_2 = (\hat{j} - \hat{k}) + \mu(\hat{i} + \hat{k})$ , respectively. Let  $X$  be the set of all the planes  $H$  that contain the line  $l_1$ . For a plane  $H$ , let  $d(H)$  denote the smallest possible distance between the points of  $l_2$  and  $H$ . Let  $H_0$  be a plane in  $X$  for which  $d(H_0)$  is the maximum value of  $d(H)$  as  $H$  varies over all planes in  $X$ .  
 A)  $d(H_0) = \frac{1}{\sqrt{2}}$   
 B) distance of origin from  $H_0$  is 0  
 C) distance of  $(0, 1, 2)$  from  $H_0$  is  $\sqrt{2}$   
 D) distance of origin from the point of intersection of  $y = z, x = 1$  and  $H_0$  is  $\sqrt{3}$
11. If the graph of the function  $y = 2ax^2 + bx + c$  ( $a > 0; b, c \in R$ ) is intersected by each of the following lines at most once (tangential cases are to be considered as intersection at one point)  $y = ax + b, y = bx + a, y = bx + c, y = cx + b, y = cx + a, y = ax + c$  then  
 A) maximum value of  $\frac{a}{b}$  is 2      B) minimum value of  $\frac{a}{b}$  is 1  
 C) maximum value of  $\frac{c}{a}$  is 9      D) minimum value of  $\frac{c}{a}$  is 1
12. Let  $P$  be a point on the ellipse  $\frac{x^2}{25} + \frac{y^2}{9} = 1$ , in first quadrant with focal distance 7 units w.r.t focus  $S'(-4, 0)$ . Let  $S'P$  and perpendicular from focus  $S$  on the tangent at  $P$  intersect at  $Q$ . Then which of the following is NOT TRUE ?  
 A)  $PQ$  is equal to 3  
 B)  $SQ$  is equal to  $\frac{3\sqrt{3}}{\sqrt{7}}$   
 C) Slope of tangent at  $P$  is equal to  $\frac{\sqrt{3}}{5}$   
 D) Let  $P$  be a variable point then locus of  $Q$  is a circle with radius = 10 units





13. Let  $f: \mathbb{R} - \{1\} \rightarrow \mathbb{R}$ ,  $y = f(x)$  satisfies  $f(x) = 1 + \int_0^x \left( (t + f(t))^2 - 1 \right) dt$ . Then which of the following is/are correct
- A)  $y = f(x)$  is a hyperbola      B)  $y = f(x)$  has local maxima at  $x = 2$   
 C)  $[f(-3)] = 3$  ([.] is G.I.F)      D)  $y = 0$  is a horizontal tangent to  $y = f(x)$
14. If  $P$  is a non null matrix of order  $3 \times 3$  with real entries such that  $P^3 = O$  then (consider  $O$  as  $3 \times 3$  null matrix and  $I$  as  $3 \times 3$  identity matrix)
- A) determinant of  $4P^2 - 2P + I$  is non zero  
 B)  $I - 2P$  is an invertible matrix  
 C) if matrix  $P$  has all integral entries then determinant of  $I - 4P^2$  is zero  
 D) if matrix  $P$  has all integral entries then absolute value of determinant of  $I - 4P^2$  is 1

### SECTION 3 (Maximum marks: 12)

#### SINGLE ANSWER TYPE QUESTION

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.

15. Let  $I_n = \int_0^1 \frac{dx}{(2+x)(1+x)^n}$  and  $|9I_{10} + I_9 - 8I_8| = \frac{1}{M}$ , then  $M =$
- A) 2048      B) 256      C) 1024      D) 512
16. Given that  $a, b, c$  are integers such that  $abc = 60$  and  $\omega$  is a non real cube root of unity. Then the minimum possible value of  $|a + b\omega + c\omega^2|$  is
- A) 3      B)  $\sqrt{3}$       C) 2      D) 1
17. A polynomial equation  $x^4 + px^2 + qx + r = 0$ ; ( $p, q, r \in \mathbb{R} - \{0\}$ ) has 3 repeated real roots. If all possible points having coordinates  $(p, r)$  in 2D plane lie on a part of conic, then the length of its semi latus rectum is
- A) 2      B) 3      C) 6      D) 12
18. Let  $P_1$  and  $P_2$  be the feet of perpendiculars from foci of ellipse  $\frac{x^2}{25} + \frac{y^2}{16} = 1$  upon any tangent at  $P$  on the ellipse. Now tangents at  $P_1$  and  $P_2$  to the auxilliary circle meets at  $Q$ . Then eccentricity of the locus of the point  $Q$  is
- A) 1      B) 0.8      C)  $\sqrt{2}$       D) 0.6



## PHYSICS

Max. Marks: 60

SECTION-1(Maximum Marks: 24)  
SINGLE DIGIT INTEGERThis section contains **EIGHT (08)** questions.The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 TO 9, BOTH INCLUSIVE.

For each question, enter the correct integer corresponding to the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

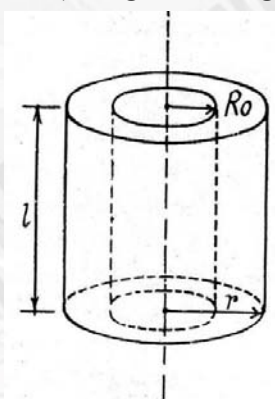
Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +3 If **ONLY** the correct integer is entered;

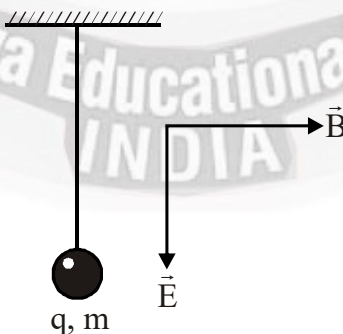
Zero Marks : 0 If the question is unanswered;

Negative Marks : -1 In all other cases.

19. A straight infinitely long cylinder of radius  $R_0 = 10\text{ cm}$  is uniformly charged with a surface charge density  $\sigma = +10^{-12}\text{ C/m}^2$ . The cylinder serves as a source of electrons, with the velocity of the emitted electrons perpendicular to its surface. The electron velocity be to ensure that electrons can move away, from the axis of the cylinder to a distance greater than  $r = 10^3\text{ m}$  is  $100n\text{ km/s}$ . Find  $n$  (using rounding off, do not truncate)



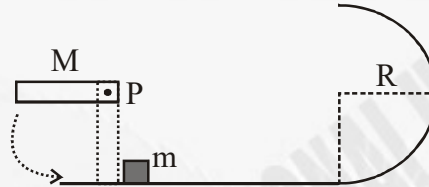
20. In the region having mutually perpendicular electric and magnetic fields, a dielectric ball is attached to a thread of length  $l$  (see figure). Mass of the ball is  $m$ , charge  $q$ , the electric field  $E$ , magnetic field  $B$ . Find the period of small oscillations of the pendulum in a plane perpendicular to the magnetic field.

(Take  $l = 1\text{ m}$ ,  $q = -1\mu\text{C}$ ,  $E = 7.5\text{ V/m}$ ,  $m = 1\text{ mg}$ ,  $B = 0.5\text{ T}$ )

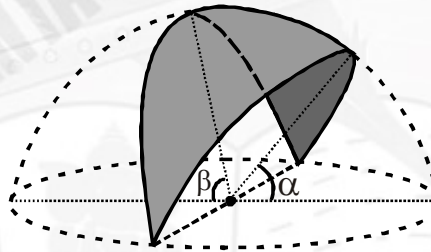




21. The principal section of glass prism is an isosceles  $\Delta PQR$  with  $PQ = PR$ . The face  $PR$  is silvered. A ray is incident perpendicularly on face  $PQ$  and after two reflections it emerges from base  $QR$ , normal to it. If the angle of the prism is  $\frac{\pi}{n}$ , find  $n$ .
22. A rod of length  $R$  and mass  $M$  is free to rotate about a horizontal axis passing through hinge  $P$  as shown in the figure. First it is taken aside such that it becomes horizontal and then released. At the lowest point the rod hits the block  $B$  of mass  $m$  and stops. If mass of rod is  $\sqrt{60} \text{ kg}$ , find mass of the block if it just complete the circle.



23. The electric field intensity at the centre of a uniformly charged hemispherical shell is  $E_0$ . Now two portions of the hemisphere are cut from either side and remaining portion is shown in figure. If  $\alpha = \beta = \frac{\pi}{3}$ , then electric field intensity at centre due to remaining portion is  $\frac{E_0}{n}$ , find  $n$ .

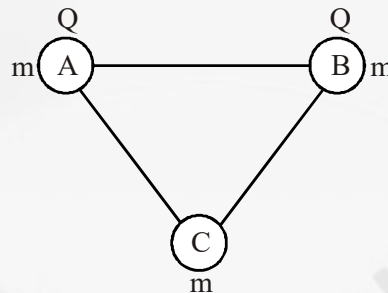


24. A cylindrical pot is slowly filled with water. The centre of mass of the empty pot is at a height of  $10 \text{ cm}$ , the mass of the pot is  $1 \text{ kg}$ , and its inner area is  $0.4 \text{ m}^2$ . What is the height (in  $\text{cm}$ ) of the water in it, if the centre of mass of the system is at the lowest position? (Take density of water  $1000 \text{ kg/m}^3$ )
25. A particle is uncharged and is thrown vertically upward from ground level with a speed of  $5\sqrt{5} \text{ m/s}$ . As a result, it attains a maximum height  $h$ . The particle is then given a positive charge  $+q$  and reaches the same maximum height  $h$  when thrown vertically upward with a speed of  $13 \text{ m/s}$ . Finally, the particle is given a negative charge  $-q$ . Ignoring air resistance, determine the speed (in  $\text{m/s}$ ) with which the negatively charged particle must be thrown vertically upward, so that it attains exactly the same maximum height  $h$ .





26. Three balls of equal mass  $m$  are connected by light insulating inextensible threads of length  $l$  each and kept on a level smooth non conducting ground. The balls A and B are given charge  $Q$  each. The strings are all taut. The string connecting A and B suddenly snaps. What is the maximum speed (in m/s) of C during the resulting motion ?  
 $Q = 1 \mu C, l = 1.5 m, \text{mass } m = 1 \text{ gm}.$



**SECTION-2 (Maximum Marks: 24)**  
**ONE OR MORE THAN**

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

Each Question has Four Options (A), (B), (C), (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).

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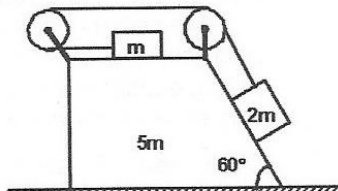
Partial Marks : +2 If three or more options are correct but **ONLY** two options are chosen; but of which are correct;

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 unanswered;

Negative Marks : -2 In all other cases.

27. A system is shown in the figure. Which is released from rest. There is no friction between ground and mass  $5m$ . The coefficient of friction between mass  $5m$  and mass  $2m$  is  $\mu$ . The coefficient of friction between mass  $5m$  and mass  $m$  is also  $\mu$ . Choose the correct option(s).



- A) The acceleration of centre of mass of system is zero.  
 B) The magnitude of acceleration of mass  $5m$  is zero if  $\mu = 0$   
 C) The tension in the string is  $\frac{4mg}{3\sqrt{3}}$  if  $\mu = \frac{1}{\sqrt{3}}$   
 D) The magnitude of acceleration of mass  $5m$  is zero if  $\mu = \frac{1}{\sqrt{3}}$



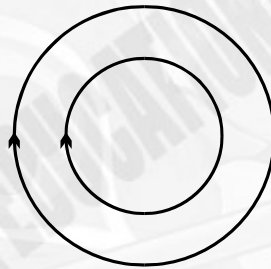




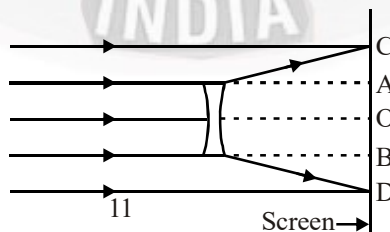
28. At a point on the screen in YDSE experiment 3<sup>rd</sup> maxima is observed at  $t = 0$ . Now screen is slowly moved with constant speed away from the slits in such a way that the centre of slits and centre of screen lie on same line always and at  $t = 1$  sec the intensity at that point is observed  $(3/4)^{\text{th}}$  of maximum intensity in between 2<sup>nd</sup> and 3<sup>rd</sup> maxima. The speed of screen will be ( $D =$  separation between the screen and slits  $d =$  separation between the slits,  $d \ll D$   $\lambda = 5000 \text{ \AA}$ ).

A)  $\frac{5D}{13}$       B)  $\frac{13D}{5}$       C)  $\frac{17D}{5}$       D)  $\frac{D}{17}$

29. Two concentric, coplanar, circular loop of wire, with different diameter carry current in the same sense as shown in the figure. Which of the following statement(s) is/are correct?



- A) the magnetic force exerted by the outer loop on a short portion of the inner loop is radially outward
- B) the magnetic force exerted by the outer loop on a short portion of the inner loop is radially inward
- C) the net magnetic force exerted by the outer loop on a whole inner loop is non zero and is radially outward
- D) the net magnetic force exerted by the outer loop on a whole inner loop is zero
30. A concave lens is placed in the path of a uniform parallel beam of light falling on a screen as shown. Then



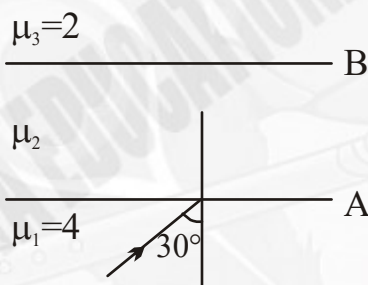


- A) intensity of light will be the same everywhere on the screen  
 B) intensity in region AB will be smaller than what it would be in the absence of the lens  
 C) in the region AC and BD, the intensity will be smaller than what it would be in the absence of the lens  
 D) in the region AC and BD, the intensity will be greater than what it would be in the absence of the lens

31. A hydrogen atom and a doubly ionized lithium atom are both in the second excited state. If  $L_H$  and  $L_{Li}$  respectively represent their electronic angular momenta and  $E_H$  and  $E_{Li}$  their energies, then :

- A)  $L_H > L_{Li}$  and  $|E_H| > |E_{Li}|$       B)  $L_H = L_{Li}$  and  $|E_H| < |E_{Li}|$   
 C)  $L_H = L_{Li}$  and  $|E_H| > |E_{Li}|$       D)  $L_H < L_{Li}$  and  $|E_H| < |E_{Li}|$

32. A light ray is incident on lower medium boundary at an angle  $30^\circ$  with the normal. Which of following statement is/are true?



- A) If  $\mu_2 > 2$  then total deviation is  $60^\circ$     B) If  $\mu_2 < 2$  then total deviation is  $60^\circ$   
 C) If  $\mu_2 > 2$  then total deviation is  $120^\circ$     D) If  $\mu_2 < 2$  then total deviation is  $120^\circ$

### SECTION 3 (Maximum marks: 12)

#### SINGLE ANSWER TYPE QUESTION

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:

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

Negative Marks : -1 In all other cases.

33. If the surface of a metal is successfully exposed to radiation of  $\lambda_1 = 350\text{ nm}$  and  $\lambda_2 = 450\text{ nm}$  the maximum velocity of photoelectrons will differ by a factor 2. The work function of this metal is

- A)  $2.84 \times 10^{-19}\text{ J}$     B)  $1.6 \times 10^{-19}\text{ J}$     C)  $3.9 \times 10^{-19}\text{ J}$     D)  $2.4 \times 10^{-19}\text{ J}$





34. Three successive resonant frequencies of a string are 90, 150 and 210 Hz. If the length of the string is 80 cm, the speed of the transverse wave in the string is.....
- A) 96 m/s      B) 48 m/s      C) 24 m/s      D) 32 m/s
35. The shape of a wave propagating in the positive  $x$  or negative  $x$  - direction is given  $y = \frac{1}{\sqrt{1+x^2}}$  at  $t=0$  and  $y = \frac{1}{\sqrt{2-2x+x^2}}$  at  $t=1s$  where  $x$  and  $y$  are in meters. The shape the wave disturbance does not change during propagation. Find the velocity of the wave.
- A)  $1m/s$  in positive  $x$  direction  
B)  $1m/s$  in negative  $x$  direction  
C)  $\frac{1}{2}m/s$  in positive  $x$  direction  
D)  $\frac{1}{2}m/s$  in negative  $x$  direction
36. In older times, people used to think that the Earth was flat. Imagine that the Earth is indeed not a sphere of radius  $R$ , but an infinite plate of thickness  $H$ . What value of  $H$  is needed to allow the same gravitational acceleration to be experienced as on the surface of the actual Earth ? (Assume that the Earth's density is uniform and equal in the two models.)
- A)  $\frac{2R}{3}$       B)  $\frac{4R}{3}$       C)  $\frac{8R}{3}$       D)  $\frac{R}{3}$





## CHEMISTRY

Max. Marks: 60

SECTION-1(Maximum Marks: 24)  
SINGLE DIGIT INTEGERThis section contains **EIGHT (08)** questions.The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 TO 9, BOTH INCLUSIVE.

For each question, enter the correct integer corresponding to the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

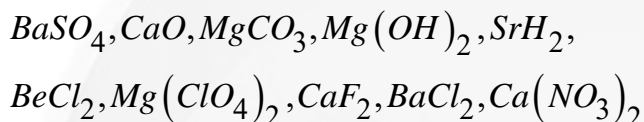
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37. How many of the following compounds are sparingly soluble in water?



38. Boric acid consists of layered lattice structure in which each layer is formed by combining several boric acid molecules through hydrogen bonds. In this process in each layer there are two types of rings

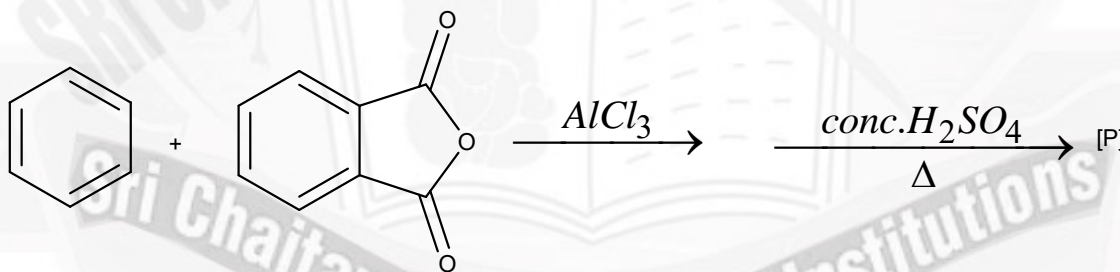
(1) which contain B, H and O atoms and the other

(2) Which contain H and O only.

The number of hydrogen bonds in the ring formed by H and O only is

39. The value of  $n$  in  $[P_nO_{18}]^{6-}$  is \_\_\_\_\_

40. The number of oxygen atoms in product [P] is



41. The number of pi bonds in compound [Z] is



42. The sum of the number of bromine atoms and oxygen atoms in the final product [X] of the following reaction is

Sec: Sr.Super60\_NUCLEUS\_BT

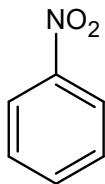
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Page 12

**Sri Chaitanya Educational Institutions**

**THE PERFECT HAT-TRICK WITH ALL-INDIA RANK 1 IN JEE MAIN 2023 JEE ADVANCED 2023 AND NEET 2023**

JEE MAIN 2023	RANK	JEE Advanced 2023	RANK	NEET 2023	RANK
SINGARAJU VENKAT KUMARDHINIA	1	VADILALA CHIRUVILAS REDDY	1	BORLA VARUN CHAKRAVARTHI	1
300		341		720	
300		360		720	



1. Sn/Con.HCl

2. Br<sub>2</sub>/CS<sub>2</sub>3. NaNO<sub>2</sub>/Con.HCl4. H<sub>3</sub>PO<sub>2</sub>5. HCOF/BF<sub>3</sub>/244 K

→ [X]

43.  $pK_a$  of HA is 5. The  $pH$  of 0.1M NaA is \_\_\_\_\_.
44. A solution containing 15.168 g of  $Se_x$  in 200 g of benzene showed a depression in freezing point of 0.6 °C. If the molal depression constant of benzene is  $5 K kg mol^{-1}$  and atomic weight of selenium is 79u, the value of  $\frac{x}{2}$  is

**SECTION-2 (Maximum Marks: 24)****ONE OR MORE THAN**This section contains **SIX (06)** questions.Each Question has Four Options (A), (B), (C), (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; but 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 unanswered;

Negative Marks : -2 In all other cases.

45. The correct statements among the following is/are
- A) Most five-coordinate compounds adopt either the Trigonal bipyramidal (TBP) or square pyramidal(SP structures).
- B) When the central atom is a main group element, the axial bonds are longer than the equatorial bonds in TBP structure but reverse is the case for the SP structure
- C) When the central atom is a transition element in TBP(ex.  $CuCl_5^{3-}$ ) the axial  $Cu-Cl$  bonds are shorter than equatorial ones but on the other hand in  $sp$  (ex.  $Ni(CN)_5^{3-}$ ) the axial  $Ni-C$  bonds are longer than the equatorial ones.
- D) In  $BrF_5$  the bromine atom is below the basal plane of square pyramid but in  $Ni(CN)_5^{3-}$  the  $Ni$  atom is above the basal plane
46. Until the discovery of Alfred werner, people thought that all optically active compounds should contain carbon. The compound prepared by Werner.



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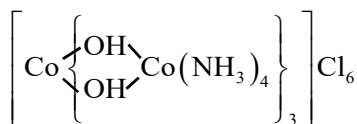
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720

RANK

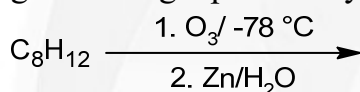
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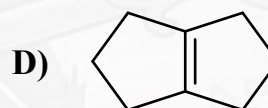
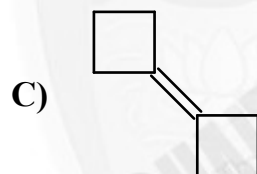
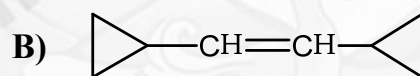
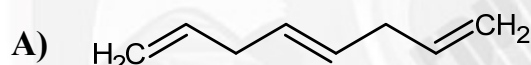
is optically active and proved that the earlier theory is wrong. The correct statements about this compound is/are

- A) All the cobalt atoms are in same oxidation state
- B) It cannot exhibit geometrical isomerism.
- C) In this complex there are four octahedral centres sharing the 3 edges of central cobalt octahedron by the 3 other octahedrons of cobalt ions.
- D) It is a diamagnetic complex

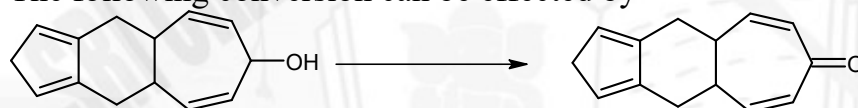
47. An organic compound of molecular formula  $\text{C}_8\text{H}_{12}$  incapable of showing stereoisomerism gives a single product by the following reaction



The compound may be



48. The following conversion can be effected by



- A) Pyridium chlorochromate
- B)  $\text{Cu} / 573 \text{ K}$
- C) cold alkaline  $\text{KMnO}_4$
- D)  $[\text{Ag}(\text{NH}_3)_2]\text{OH}$

49.  $\text{C}(s) + \text{CO}_2(g) \longrightarrow 2\text{CO}(g); \Delta H = 40 \text{ kcal mol}^{-1}$

In a suitable reaction vessel, pieces of graphite are mixed with carbon dioxide gas at  $1.00 \text{ atm}$  and  $1000 \text{ K}$ . Which of the following changes will result in an increase in reaction rate?

- A) decrease in size of the graphite pieces
- B) increase in temperature
- C) decrease in partial pressure of  $\text{CO}(g)$
- D) increase in partial pressure of  $\text{CO}_2(g)$





50. INCORRECT statement(s) among the following is/are
- A) Energy of activation of a spontaneous process must be zero.
  - B) The entropy of every system increases during a spontaneous change.
  - C) As a reversible reaction moves towards equilibrium, Gibbs energy change of the reaction keeps on increasing and reaches a maximum at equilibrium.
  - D) Higher amount of mechanical work can be gotten out of a system that undergoes an irreversible process, as compared to a reversible process.

**SECTION 3 (Maximum marks: 12)**  
**SINGLE ANSWER TYPE QUESTION**

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.

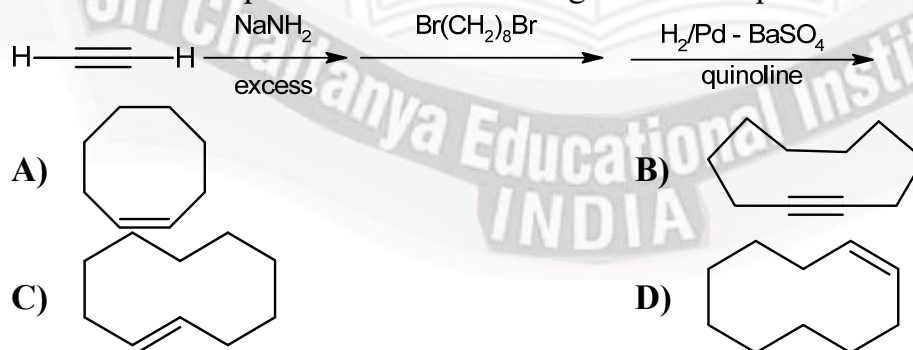
Answer to each question will be evaluated according to the following marking scheme:

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.

51. Part of the Bayer process involves the digestion of crushed ore in concentrated aqueous sodium hydroxide. This process is carried out at high pressure
- A) Increase the boiling temperature of the solution
  - B) To increase the solubility of sodium aluminate in water
  - C) To increase the rate of formation of sodium aluminate
  - D) To decrease the boiling temperature of the mixture
52. A solution contains  $0.1M$   $Sr^{2+}$  ions and  $0.1M$   $Ag^+$  ions. Addition of an equal volume of a  $0.5M$  solution of which reagent which cause precipitation of strontium salt but not a silver salt ?
- A)  $NaNO_3$
  - B)  $NaF$
  - C)  $NaOH$
  - D)  $NOCl$
53. Predict the final product of the following reaction sequence.





54. The reaction below can be used as a laboratory method for preparing small quantities of  $Cl_2(g)$ . If a 49 g sample that is 96%  $K_2Cr_2O_7$  by mass is allowed to react with 325 mL of  $HCl(aq)$  with a density of 1.15 g / ml and 30.1%  $HCl$  by mass, how many grams of  $Cl_2(g)$  are produced?



(Atomic weights: K = 39, Cr = 52, Cl = 35.5)

A) 68.16 g

B) 45.64 g

C) 34.08 g

D) 53 g

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Sri Chaitanya  
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All India Category Ranks Count

**89**

BELOW 1000  
All India Category Ranks Count

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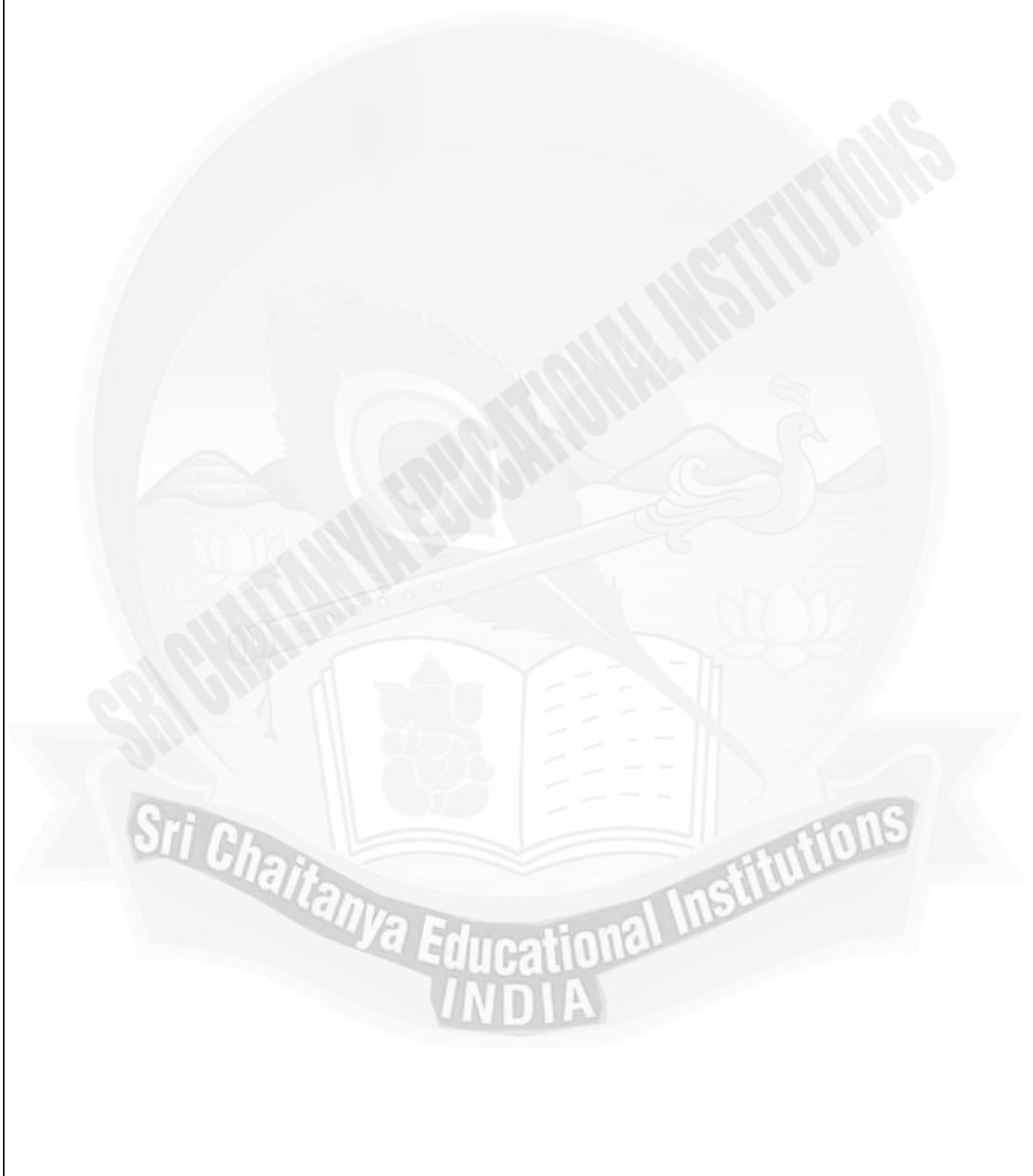
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