



# 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**

**JEE-MAIN**

**Date: 02-08-2025**

**Time: 09.00Am to 12.00Pm**

**RPTM-04**

**Max. Marks: 300**

**IMPORTANT INSTRUCTION:**

1. Immediately fill in the Admission number on this page of the Test Booklet with **Blue/Black Ball Point Pen** only.
2. The candidates should not write their Admission Number anywhere (except in the specified space) on the Test Booklet/ Answer Sheet.
3. The test is of **3 hours** duration.
4. The Test Booklet consists of **75 Questions**. The maximum marks are **300**.
5. There are **three** parts in the question paper 1,2,3 consisting of **Mathematics, Physics and Chemistry** having **25 Questions** in each subject and subject having **two sections**.

(I) Section -I contains **20 Multiple Choice Questions** with only one correct option.

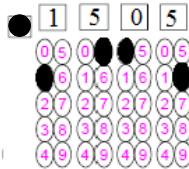
**Marking scheme:** +4 for correct answer, 0 if not attempt and -1 in all other cases.

(II) Section-II contains **05 Numerical Value Type Questions**.

- The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

To cancel any attempted question bubble on the question number box.

For example: To cancel attempted Question 21. Bubble on 21 as shown below



**Question Answered for Marking**

**Question Cancelled for Marking**

**Marking scheme:** +4 for correct answer, 0 if not attempt and -1 in all other cases.

6. Use **Blue / Black Point Pen only** for writing particulars / marking responses on the Answer Sheet. **Use of pencil is strictly prohibited.**
7. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electron device etc, except the Identity Card inside the examination hall.
8. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
9. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Hall. **However, the candidate are allowed to take away this Test Booklet with them.**
10. **Do not fold or make any stray marks on the Answer Sheet**

**Name of the Candidate (in Capital):** \_\_\_\_\_

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**Admission Number:** \_\_\_\_\_

**Candidate's Signature:** \_\_\_\_\_

**Invigilator's Signature:** \_\_\_\_\_

**MATHEMATICS : Total Differential Calculus**

- PHYSICS** : Waves & Sound: Wave motion (plane waves only), longitudinal and transverse waves, superposition of waves; Progressive and stationary waves; Vibration of strings and air columns; Resonance; Beats; Speed of sound in gases; Doppler effect (in sound) (Deleted for MAINS); Measurement of speed of sound using resonance column.
- CHEMISTRY** : Benzene, Alkyl Halides & Aryl Halides:  
Benzene :Reactions of benzene, Structure and aromaticity ; Electrophilic Substitution Reactions; halogenation, nitration, sulphonation, friedel-crafts alkylation and acylation; Effect of directing groups (mono substituted benzenes) in these reactions. Alkyl halides & aryl halides: rearrangement reactions of alkyl carbocation, Grignard reactions, nucleophilic substitution reactions; Haloarenes :Fittig, Wurtz-Fittig, nucleophilic aromatic substitution in haloarenes and substituted haloarenes (excluding Benzyne mechanism and Cine substitution).



**SECTION-I  
(SINGLE CORRECT ANSWER TYPE)**

This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

**Marking scheme:** +4 for correct answer, 0 if not attempted and -1 in all other cases.

1. Let  $f(x) = \frac{\sin \pi x}{x^2}$ ,  $x > 0$

Let  $x_1 < x_2 < x_3 < \dots < x_n < \dots$  be all the points of local maximum of  $f$  and

$y_1 < y_2 < y_3 < \dots < y_n < \dots$  be all the points of local minimum of  $f$ . Then which of the following options is **NOT** correct?

1)  $|x_n - y_n| > 1$  for every  $n$

2)  $x_1 < y_1$

3)  $x_n \in \left(2n, 2n + \frac{1}{2}\right)$  for every  $n$

4)  $x_{n+1} - x_n > 2$  for every  $n$

2. If  $f(x)$  be an identity function in  $\mathbb{R}$  and  $g(x) = \sum_{k=1}^3 \{f(x) - (2016+k)\}^{-1}$ , then which of the

following is correct?

1)  $g(x)$  is strictly increasing in  $(2018, 2019)$

2)  $\lim_{x \rightarrow -\infty} g(x) = 1$

3)  $g(x)$  has no real roots

4) Slope of tangent to the curve  $g(x)$  at  $x = f(2016)$  is  $-\frac{49}{36}$

3. Let  $f(x)$  be a twice differentiable function in  $[a, b]$ , given that  $f(x)$  and  $f''(x)$  are either both positive or both negative (i.e both are of same sign and never equal to zero) in  $[a, b]$

Statement-I:  $f'(x) = 0$  has atleast one real root in  $[a, b]$ .

Statement-II: A Strictly decreasing function or a strictly increasing function can intersect the X-axis atmost once.

1) Statement-I is true, Statement-II is also true.

2) Statement-I is true, Statement-II is false.

3) Statement-I is false, Statement-II is also false.

4) Statement-I is false, Statement-II is true.



4.  $e^{\lim_{n \rightarrow \infty} \left( \sqrt{n^2+n+1} - \left[ \sqrt{n^2+n+1} \right] \right)}$ , ( $n \in \mathbb{N}$ ), where  $[.]$  denotes the greatest integer function is:

- 1) 1      2)  $\sqrt{e}$       3)  $\sqrt[3]{e}$       4)  $\sqrt[4]{e}$

5.  $\left| \lim_{n \rightarrow \infty} \left( \frac{\sqrt[n]{p} + \sqrt[n]{q}}{2} \right)^n \right|$ ,  $p, q > 0$  equals:

- 1) 1      2)  $\sqrt{pq}$       3)  $pq$       4)  $\frac{pq}{2}$

6.  $f(x) = \frac{\left[ \frac{1}{2} + x \right] - \left[ \frac{1}{2} \right]}{x}$ ,  $-1 \leq x \leq 2$  ( $[.]$  denote greatest integer function)

- 1) is continuous at  $x=0$       2) is continuous  $x=\frac{1}{2}$   
 3) is continuous at  $x=1$       4) is continuous  $x=\frac{3}{2}$

7. Let  $g(x)$  be a polynomial of degree one and  $f(x)$  be defined by  $f(x) = \begin{cases} g(x), & x \leq 0 \\ |x|^{\sin x}, & x > 0 \end{cases}$ . If

$f(x)$  is continuous satisfying  $f'(1)=f(-1)$ , then  $g(x)$  is

- 1)  $(1+\sin 1)x+1$       2)  $(1-\sin 1)x+1$       3)  $(1-\sin 1)x-1$       4)  $(1+\sin 1)x-1$

8. If  $y = \tan^{-1} \sqrt{\frac{1-\sin x}{1+\sin x}}$ , then the value of  $\frac{dy}{dx}$  at  $x=\frac{\pi}{6}$  is

- 1)  $-\frac{1}{2}$       2)  $\frac{1}{2}$       3) 1      4) does not exist

9. Let  $F(x) = (f(x))^2 + (f'(x))^2$ ,  $F(0) = 6$  where  $f(x)$  is a thrice differentiable function such that  $|f(x)| \leq 1$ ,  $\forall x \in [-1, 2]$ , then choose the correct statement(s)

- 1) There must be a point of local maximum for  $F(x)$  in  $(-1, 1)$   
 2)  $f'(x) > 2 \forall x \in (-1, 1)$   
 3)  $F(x) > 5 \forall x \in (-1, 1)$   
 4)  $F(x)$  has no point of extremum in  $(-1, 1)$

10. The displacement of the particle moving in a straight line from a fixed point on the line is ' $s$ '. Where  $s^2 = at^2 + 2bt + c$ , then acceleration is proportional to

- 1)  $s^{-2}$       2)  $s^{-3}$       3)  $s^{-1/2}$       4)  $s^{-4}$

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

JEE MAIN 2023	RANK
SINGARAJI VENKAT KOUNDINYA HSC-2022 Sri Chaitanya 6th-12th Class 300 MARKS	1

JEE Advanced 2023	RANK
VAVILALA CHIVILAS REDDY HSC-2022 Sri Chaitanya 6th-12th Class 341 360 MARKS	1

NEET 2023	RANK
BORA VARUN CHAKRABARTHI HSC-2022 Sri Chaitanya 6th-12th Class 720 720 MARKS	1

JEE MAIN 2023	RANK
SINGARAJI VENKAT KOUNDINYA HSC-2022 Sri Chaitanya 6th-12th Class 300 MARKS	1





## 20. Match the following

	<b>List-I</b>		<b>List-II</b>
(p)	$f(x) = \begin{cases} e^{-1/x^2}, & x \neq 0 \\ 0, & x = 0 \end{cases}$	(1)	$f(x)$ is continuous in $\mathbb{R}$
(q)	$f(x) = x x $	(2)	$f(x)$ is differentiable in $\mathbb{R}$
(r)	$f(x) = \sin^{-1} \sin x$	(3)	First derivative is continuous in $\mathbb{R}$
(s)	$f(x) = \begin{cases} x^2 \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$	(4)	$\lim_{x \rightarrow 0} f(x)$ exists

Codes:

- 1) p-4,q-1,r-1,s-2      2) p-1,q-2,r-3,s-4  
 3) p-2,q-1,r-3,s-4      4) p-3,q-4,r-2,s-1

**SECTION-II****(NUMERICAL VALUE TYPE)**

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

**Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.**

21. If  $\beta = \lim_{x \rightarrow 0} \frac{e^{x^3} - (1-x^3)^{1/3} + ((1-x^2)^{1/2} - 1) \sin x}{x \sin^2 x}$ , then the value of  $\frac{6\beta}{5}$  is
22. Let  $f(x) = [\lfloor x \rfloor] + |1-x|$ ,  $-1 \leq x < 3$ , (here  $[\cdot]$  denotes greatest integer function). The number of points, where  $f(x)$  is non-differentiable is
23. Let  $f(x) = \begin{cases} \max \{ |x|, x^2 \} & |x| \leq 2 \\ 8 - 2|x| & 2 < |x| \leq 4 \end{cases}$ . Let S be the set of points in the interval  $(-4, 4)$  at which  $f$  is not differentiable. Then  $n(S) =$
24. The tangent to the curve  $y = x^2 - 5x + 5$ , parallel to the line  $y = 2x + 3$ , also passes through the point  $\left(\frac{1}{8}, k\right)$  where  $|k| =$
25. If the acute angles between the curves  $y = |x^2 - 1|$  and  $y = |x^2 - 3|$  at their points of intersection be  $\theta$  such that  $\tan \theta = \frac{m}{7}$ , then number of positive integral factors of  $m^2$  is equal to

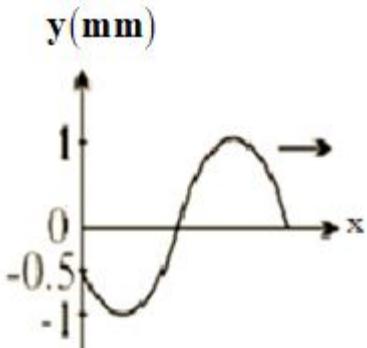


**SECTION-I  
(SINGLE CORRECT ANSWER TYPE)**

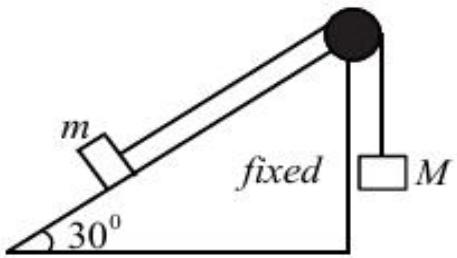
This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme:** +4 for correct answer, 0 if not attempted and -1 in all other cases.

26. Find the equation of a wave travelling along the positive x-axis, whose snapshot at  $t = 0$  as shown in figure



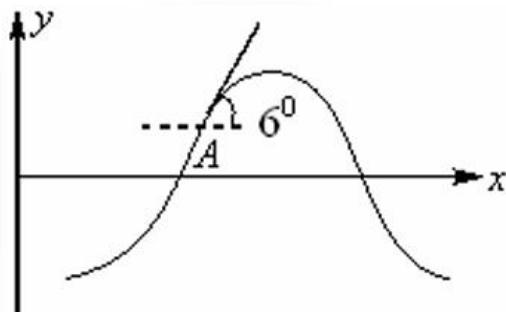
- 1)  $y = \sin\left(kx - \omega t + \frac{\pi}{6}\right)$       2)  $y = \sin\left(kx - \omega t - \frac{\pi}{6}\right)$   
 3)  $y = \sin\left(\omega t - kx + \frac{\pi}{6}\right)$       4)  $y = \sin\left(\omega t - kx - \frac{\pi}{6}\right)$
27. A wire of linear mass density  $10^{-2} \text{ kg m}^{-1}$  passes over a frictionless light pulley fixed on the top of a frictionless fixed inclined plane which makes an angle of  $30^\circ$  with the horizontal. Masses  $m$  and  $M$  are tied at two ends of wire such that  $m$  rests on the inclined plane and  $M$  hangs freely vertically downwards as shown in the figure. The entire system is in equilibrium and a transverse wave propagates along the wire with a velocity of  $100 \text{ ms}^{-1}$ . ( $g = 10 \text{ m/sec}^2$ ). Then choose the correct option



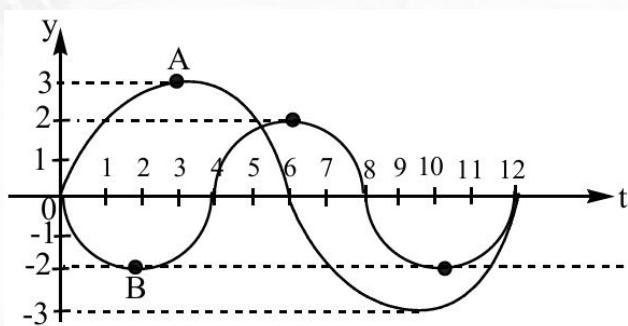
- 1)  $M = 5 \text{ kg}$       2)  $\frac{m}{M} = \frac{1}{4}$       3)  $m = 20 \text{ kg}$       4)  $\frac{m}{M} = 4$



28.  $y$ - $x$  curve at an instant for a transverse wave travelling along  $x$  axis on a string is shown. Angle made by tangent with horizontal at the point A on the curve is  $6^0$ , as shown



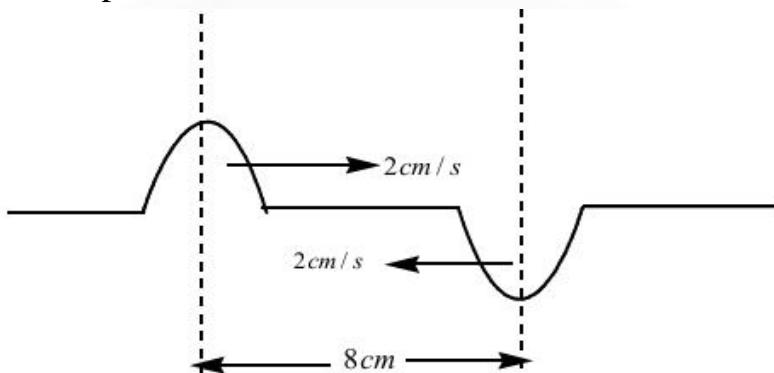
- A) Transverse velocity of the particle at a point A is parallel to positive  $y$ - direction if the wave is travelling along positive  $x$  axis.  
 B) Transverse velocity of the particle at point A is parallel to positive  $y$  direction if the wave is travelling along negative  $x$  axis  
 C) Magnitude of transverse velocity of the particle at point A is greater than wave speed  
 D) Magnitude of transverse velocity of the particle at point A is lesser than wave speed  
 1) Only A, C are correct                    2) Only B, D are correct  
 3) Only A, D are correct                    4) Only B, C are correct
29. The transverse displacement versus time graph for two waves A and B which travel along two identical strings having same tension are as shown in the figure. Their average intensity ratio  $I_A / I_B$  is



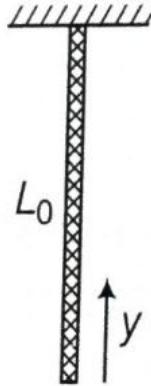
- 1)  $\frac{9}{4}$                     2) 1                    3)  $\frac{81}{16}$                     4)  $\frac{3}{2}$
30. A Circular loop of a string of mass per unit length  $\mu$  and radius  $R$  is rotated about an axis passing through its center and perpendicular to the plane with an angular velocity  $\omega$ . A small disturbance is created in the loop in the same sense of rotation. The linear speed of the disturbance for a stationary observer is:  
 1)  $\omega R$                     2)  $2\omega R$                     3)  $3\omega R$                     4) Zero



31. Two identical pulses in a stretched string whose centres are initially 8 cm apart are moving towards each other as shown in figure. The speed of each pulse is 2cm/s After 2s the total energy of the pulses will be

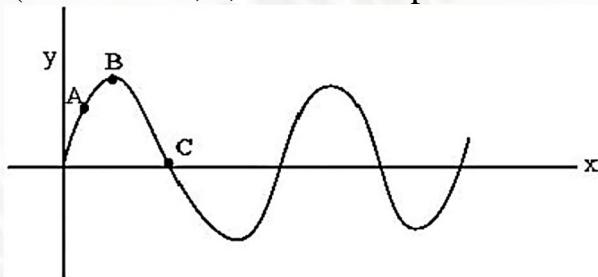


- 1) zero
  - 2) purely potential
  - 3) purely kinetic
  - 4) Partly kinetic and partly potential
32. The equation of a transverse wave travelling along a string is  
 $y(x,t) = 4.0 \sin(40 \times 10^{-3}x + 600t)$  mm, where x is in the mm and t is in second. The velocity of the wave is:
- 1) +15m/s
  - 2) -15m/s
  - 3) +30m/s
  - 4) -30m/s
33. The transverse displacement  $y(x,t)$  of a wave on a string is given by  
 $y(x,t) = e^{-\left(ax^2 + bt^2 + 2\sqrt{ab}xt\right)}$ . This represents a
- 1) Wave moving in +ve x direction with speed  $\sqrt{\frac{a}{b}}$
  - 2) Wave moving in -ve x direction with speed  $\sqrt{\frac{b}{a}}$
  - 3) Standing wave of frequency  $\sqrt{b}$
  - 4) Standing wave of frequency  $\sqrt{\frac{1}{b}}$
34. A wire of variable mass per unit length  $\mu = \mu_0 y$ , is hanging from the ceiling as shown in the figure. The length of the wire is  $L_0$ . A small transverse disturbance is produced at its lower end. The time after which the disturbance will reach the other end is



- 1)  $\sqrt{\frac{2L_0}{g}}$       2)  $\sqrt{\frac{8L_0}{g}}$       3)  $2\sqrt{\frac{L_0}{g}}$       4)  $\sqrt{\frac{12L_0}{g}}$

35. A plane progressive transverse wave is passing through medium along the positive x-axis at the given instant of time. The nature of the displacement-position (y vs x) graph of particles of medium at that instant is as shown in figure. Which of the following statement are correct. (Consider A,B,C are three particles of the vibrating string)



A) Elastic potential energy per unit length of the string at the point B is more than that at points A and C

B) Elastic potential energy per unit length of the string at the point C is more than that at points A and B

C) Velocity of the particle at A is along negative y-axis.

D) Velocity of the particle at C is along positive y-axis.

1) Only B,C,D are correct

2) Only A,C,D are correct

3) Only A,C are correct

4) Only A,D are correct

36. An open organ pipe is vibrating in its fifth overtone. The distance between two

consecutive points where pressure amplitude is  $\frac{1}{\sqrt{2}}$  time pressure amplitude at pressure

antinodes, is 40 cm. Then the length of open organ pipe is (neglect end correction)

1) 3m

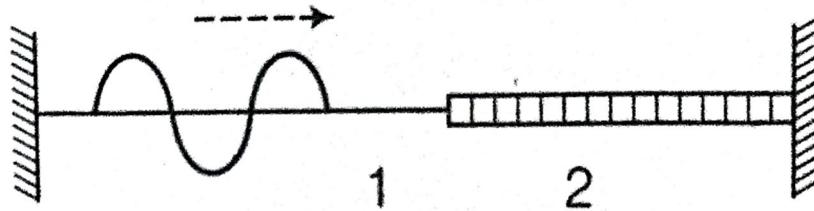
2) 3.6 m

3) 4.2 m

4) 4.8 m



37. In the figure are shown, two strings. Linear mass density of string 2 is nine times that of string 1. Tension in both the strings is same. A transverse wave in string 1 is incident at the boundary. Part of waves is reflected in to medium 1 (i.e. string 1) and part is transmitted in medium 2(i.e string 2). If  $A, v, I$  and  $P$  represent amplitude, speed of wave, intensity and power, ,Match the Column I with Column II and mark the correct option ( $A_1, V_1, I_1, P_1$  are the respective parameters for reflected wave and  $A_2, V_2, I_2, P_2$  are the respective parameters for the transmitted wave)



	COLUMN-I		COLUMN-II
I)	$ A_1 / A_2 $	P)	9
II)	$V_1 / V_2$	Q)	1
III)	$I_1 / I_2$	R)	3
IV)	$P_2 / P_1$	S)	Data insufficient
		T)	1/3

- 1)  $I \rightarrow Q, II \rightarrow R, III \rightarrow S, IV \rightarrow R$       2)  $I \rightarrow S, II \rightarrow T, III \rightarrow P, IV \rightarrow R$   
 3)  $I \rightarrow Q, II \rightarrow R, III \rightarrow S, IV \rightarrow T$       4)  $I \rightarrow P, II \rightarrow R, III \rightarrow Q, IV \rightarrow T$

38. A string is clamped at both the ends and it is vibrating in its 4<sup>th</sup> harmonic. The equation of the stationary wave is  $Y = 0.3\sin(0.314x)\cos(200\pi t)$ . The length of the string is (All quantities are in SI units)

- 1) 20 m      2) 80 m      3) 40 m      4) 60 m

39. A sound source is situated in a medium of bulk modulus  $1.6 \times 10^5 N/m^2$ . The equation for the wave emitted from it is given by  $y = A_0 \sin(7.5\pi x - 3000\pi t)$ ; (where x is in m and t is in s). Then velocity of wave is  $v$  and the displacement amplitude of the waves received by the observer standing at a distance 5 m from the source is A. The density of medium is  $\rho$ . The maximum pressure amplitude as observed by the observers ear is 30 Pa. The intensity of wave received by the observer is I. Then choose the incorrect option

- 1)  $\rho = 1 kg/m^3$       2)  $v = 400 m/s$       3)  $A = \frac{10^{-4}}{4\pi} m$       4)  $I = \frac{8}{9} W/m^2$



- 40.** A closed organ and an open organ tube filled by two different gases having same bulk modulus but different densities  $\rho_1$  and  $\rho_2$  respectively. The frequency of 9<sup>th</sup> harmonic of closed tube is identical with 4<sup>th</sup> harmonic of open tube. If the length of the closed tube is 10 cm and the density ratio of the gases is  $\rho_1 : \rho_2 = 1:16$ , then the length of the open tube is:
- 1)  $\frac{20}{7} \text{ cm}$       2)  $\frac{15}{7} \text{ cm}$       3)  $\frac{20}{9} \text{ cm}$       4)  $\frac{15}{9} \text{ cm}$
- 41.** Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R  
**Assertion A:** A sound wave has higher speed in solids than gases  
**Reason R:** Gases have higher value of Bulk Modulus than solids.  
 In the light of the above statements, choose the correct answer from the options given below
- 1) Both A and R are true and R is the correct explanation of A  
 2) A is false but R is true  
 3) Both A and R are true but R is NOT the correct explanation of A  
 4) A is true but R is false.
- 42.** Statement-1: If oil of density higher than of water is used in place of water in a resonance tube experiment, the frequency of vibrating air Column decreases.
- Statement-2: The Frequency of vibrating air Column in the resonance tube experiment is independent of nature of the liquid taken in the tube.
- 1) Both Statement-1 and statement-2 are true  
 2) Both Statement-1 and statement-2 are false  
 3) Statement-1 is true and statement-2 is false  
 4) Statement-1 is false but statement-2 is true.
- 43.** Assertion A: Sound waves cannot be polarised.  
 Reason R: Only transverse waves can be polarised.
- 1) Both A and R are true and R is the correct explanation of A  
 2) Both A and R are true but R is NOT the correct explanation of A  
 3) A is false but R is true  
 4) A is true but R is false.



- 44.** Statement-1: The change in air pressure at constant temperature effects the speed of sound.  
 Statement-2: The speed of sound in gases is proportional to the square root of absolute temperature.  
 1) Statement-1 and Statement-2 are TRUE and STATEMENT 2 is the correct explanation of Statement-1  
 2) Statement-1 and Statement-2 are TRUE and STATEMENT 2 is not the correct explanation of Statement-1  
 3) Statement-1 is TRUE and Statement-2 is FALSE  
 4) Statement-1 is FALSE but STATEMENT-2 is TRUE.
- 45.** The amplitude and phase of a wave that is formed by the superposition of two harmonic travelling waves,  $y_1(x,t) = 4 \sin(kx - \omega t)$  and  $y_2(x,t) = 2 \sin\left(kx - \omega t + \frac{2\pi}{3}\right)$ , are:

(Take the angular frequency of initial waves same as  $\omega$ )

- 1)  $\left[6, \frac{2\pi}{3}\right]$       2)  $\left[6, \frac{\pi}{3}\right]$       3)  $\left[\sqrt{3}, \frac{\pi}{6}\right]$       4)  $\left[2\sqrt{3}, \frac{\pi}{6}\right]$

## SECTION-II

### (NUMERICAL VALUE TYPE)

This section contains 5 Numerical Value Type Questions. The Answer should be within 0 to 9999. If the Answer is in Decimal then round off to the Nearest Integer value (Example i.e. If answer is above 10 and less than 10.5 round off is 10 and If answer is from 10.5 and less than 11 round off is 11).

**Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases**

- 46.** A sample of oxygen at NTP has volume V and a sample of hydrogen at NTP has the volume 4V Both the gases are mixed and the mixture is maintained at NTP. If the speed of sound in hydrogen at NTP is 1270 m/s, the speed of sound in the mixture is  $x$  m / sec then  $x$  is \_\_\_\_\_
- 47.** In the resonance experiment, two air columns (closed at one end) of 100 cm and 120 cm long, give 15 beats per second when each one is sounding in the respective fundamental modes. The velocity of sound in the air column is  $x$  m / sec then  $x$  is \_\_\_\_\_
- 48.** Two harmonic waves moving in the same direction superimpose to form a wave  $x = a \cos(1.5t) \cos(50.5t)$  where  $t$  is in seconds. The period with which they beat is \_\_\_\_\_

$$\frac{(x)\pi}{3} \text{ sec then } x \text{ is }$$

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

JEE MAIN 2023	RANK
SINGARA-JU VENKAT KOUNDINYA HSC-2022 Sri Chaitanya 6 <sup>th</sup> -12 <sup>th</sup> Class 300 300 MARKS	1

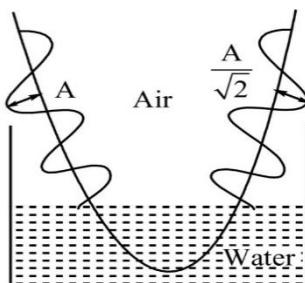
JEE Advanced 2023	RANK
VAVILALA CHIVILAS REDDY HSC-2022 Sri Chaitanya 6 <sup>th</sup> -12 <sup>th</sup> Class 341 360 MARKS	1

NEET 2023	RANK
BORA VARUN CHAKRAVARTHI HSC-2022 Sri Chaitanya 6 <sup>th</sup> -12 <sup>th</sup> Class 720 720 MARKS	1

RANK
1



49. A thin string of density  $0.1 \text{ kg/m}$  is held at one end and the other end is oscillated according to the equation  $y(l=0,t) = 20(\text{cm})\sin(40t)$  where  $t$  is in seconds and  $l$  in cm is the coordinate along the length of the string. The string is under a uniform tension of  $10\text{N}$ . The string passes through a bath filled with  $\frac{40}{21} \text{ kg}$  of water. Due to wet friction, heat is transferred through the bath and a snapshot at sometime is given in figure. After  $\alpha$  second the temperature of the bath rises by one kelvin. Then find the value of  $\alpha$  [specific heat capacity of water =  $4.2\text{kJ/kg-K}$ ]
- (where  $A$  is the amplitude of the wave on the string before entering the tub and  $\frac{A}{\sqrt{2}}$  is the amplitude of the wave on the string after coming from the tub)



50. Two sound waves of frequencies  $100 \text{ Hz}$  and  $102 \text{ Hz}$  and having same amplitude 'A' are interfering. A detector which can detect waves of amplitude greater than or equal to  $A$  is kept at rest. In a time interval of  $12 \text{ seconds}$ , find the total duration (in sec) in which detector is active.



**SECTION-I  
(SINGLE CORRECT ANSWER TYPE)**

This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

**Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.**

- 51.** The set of meta directing functional groups from the following sets is

- 1)  $-CN, -NH_2, -NHR, -OCH_3, -CH_3$       2)  $-CN, -CHO, -NHCOCH_3, -COOR, -CH_3$   
 3)  $-NO_2, -NH_2, -COOH, -COOR, -CH_3$       4)  $-NO_2, -CHO, -SO_3H, -COR, -COOH, -COOR$

- 52.** Arrange the following in increasing order of reactivity towards nitration

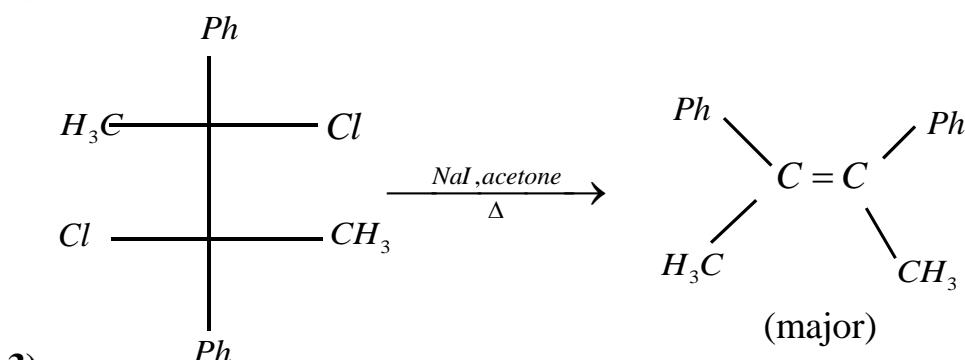
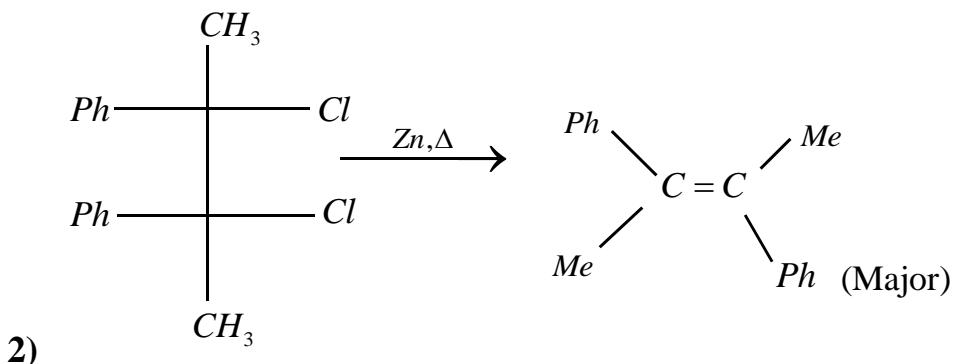
- A) p-xylene      B) Bromobenzene      C) mesitylene      D) nitrobenzene      E) benzene  
 F) Cyano Benzene

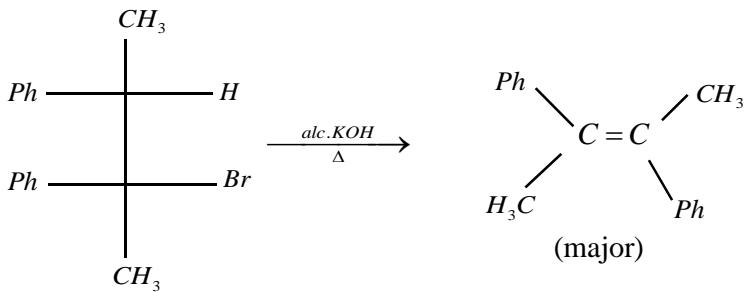
Choose the correct answer from the options given below:

- 1)  $F < C < D < E < A < B$       2)  $D < F < B < E < A < C$   
 3)  $F < D < C < E < A < B$       4)  $C < D < E < B < A < F$

- 53.** Which of the following is incorrect?

- 1) *dipole moment ( $\mu$ )*:  $CH_3F > CH_3Cl > CH_3Br > CH_3I$





- 54.** Given below are two statements:

Statement I: Generally in  $S_N2$  reaction inversion of configuration takes place.

Statement II:  $S_N1$  reactions generally result in formation of intermediate as carbocation  
In the light of the above statements, choose the correct answer from the options given below.

- 1) Statement I is false but Statement II is true.
- 2) statement I is true but Statement II is false.
- 3) Both Statement I and Statement II are false.
- 4) Both Statement I and Statement II are true.

- 55.** Given below are two statements: one is labelled as

Assertion (A) and the other is labelled as reason (R).

Assertion (A): Haloalkanes react with KCN to form alkyl cyanides as a main product while with AgCN form isocyanide as the main product.

Reason (R): KCN and AgCN both are highly covalent compounds.

In the light of the above statements, choose the most appropriate answer from the options given below.

- 1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- 2) (A) is not correct but (R) is correct.
- 3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- 4) (A) is correct but (R) is not correct

- 56.** Assertion A: Hydrolysis of an alkyl chloride is slow reaction but in the presence of NaI, the rate of the hydrolysis increases.

Reason R: leaving group ability order:  $F^- > Cl^- > Br^- > I^-$ .

In the light of the above statements, choose the correct answer from the options given below.

- 1) A is false but R is true
- 2) A is true but R is false
- 3) Both A and R are true but R is not the correct explanation of A
- 4) Both A and R are true and R is the correct explanation of A.



57. Given below are two statements:

Statement –I: High concentration of strong nucleophilic reagent with secondary alkyl halides which do not have bulky substituents will follow  $S_N2$  mechanism.

Statement –II: A Tertiary alkyl halide when treated with a large excess of ethanol follows  $S_N1$  mechanism.

In the light of the above statements, choose the most appropriate from the options given below.

1) Both Statement I and Statement II are false.

2) Both statement I and Statement II are true.

3) Statement I is false but Statement II is true.

4) Statement I is true but Statement II is false.

58. Match List I with List II.

	<b>List I (Reaction)</b>		<b>List II (Name of the reaction)</b>
A.	$\text{C}_6\text{H}_6 + \text{C}_2\text{H}_5\text{Cl} \xrightarrow[\text{Dry Ether}]{\text{Na}} \text{C}_6\text{H}_5\text{CH}_2\text{C}_2\text{H}_5$	I.	Fittig reaction
B.	$\text{C}_6\text{H}_5\text{Cl} \xrightarrow[\text{Dry Ether}]{\text{Na}} \text{C}_6\text{H}_5-\text{C}_6\text{H}_5$	II.	Wurtz-fittig reaction
C.	$\text{C}_6\text{H}_6 + \text{N}_2^+\text{Cl}^- \xrightarrow{\text{Cu}_2\text{Br}_2} \text{C}_6\text{H}_5\text{Br} + \text{N}_2$	III.	Swart's reaction
D.	$\text{CH}_3\text{-Br} + \text{AgF} \rightarrow \text{CH}_3\text{F} + \text{AgBr}$	IV.	Sandmeyer reaction

Choose the correct answer from the options given below:

1) A- III, B- II, C- IV, D- I

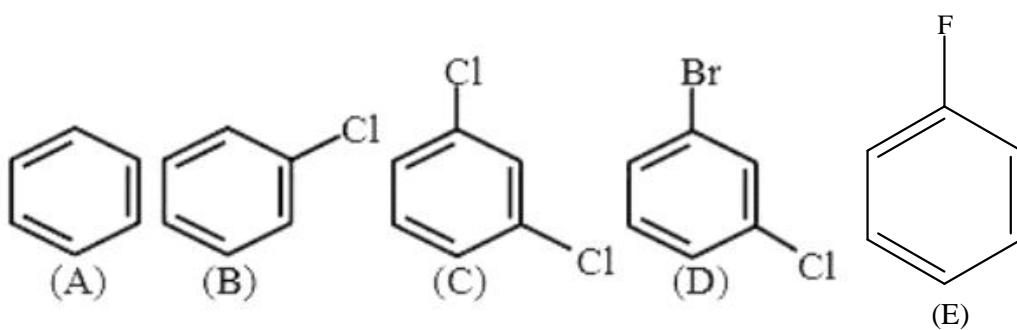
2) A- II, B- I, C- IV, D- III

3) A- IV, B- II, C- III, D- I

4) A- II, B- I, C- III, D- IV

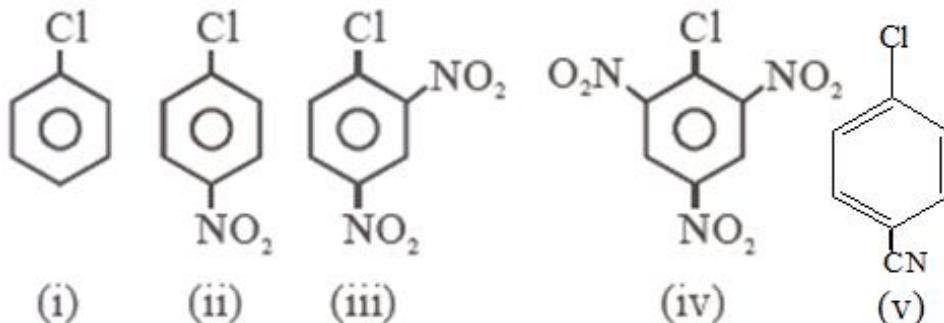


59. The correct decreasing order of densities of the following compounds is



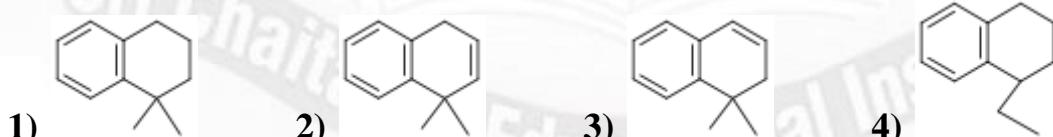
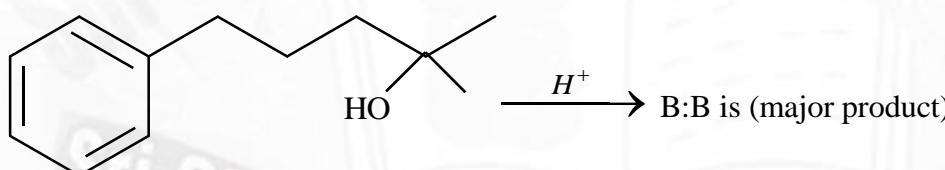
- 1)  $D > E > C > B > A$   
 2)  $D > C > E > B > A$   
 3)  $E > D > C > B > A$   
 4)  $D > C > B > E > A$

60. The correct order of the following compounds showing increasing tendency towards nucleophilic substitution reactions is



- 1)  $(v) < (iv) < (iii) < (ii) < (i)$   
 2)  $(iv) < (i) < (ii) < (iii) < (v)$   
 3)  $(i) < (v) < (ii) < (iii) < (iv)$   
 4)  $(iv) < (i) < (iii) < (ii) < (v)$

61.

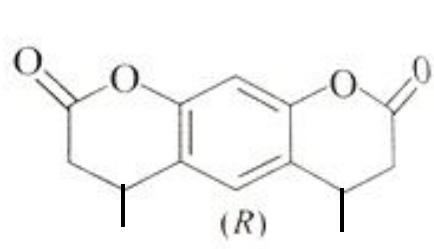
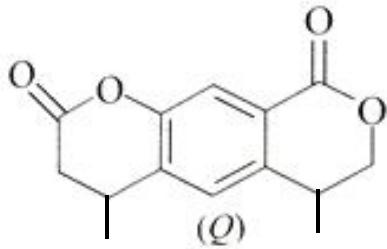
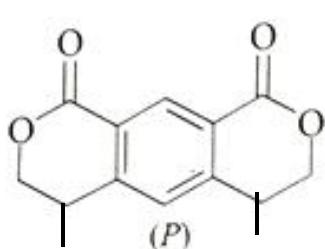


62. In sulphonation, acylation, nitration and alkylation of benzene the group of effective electrophiles would be:

- 1)  $SO_3^{\oplus}, CH_3 - C \equiv O, NO_2^{\oplus}, R^{\oplus}$   
 2)  $SO_3, CH_3 CO, NO_2^{\oplus}, R^{\oplus}$   
 3)  $SO_3, CH_3 - COCl, NO_2^{\oplus}, R^{\oplus}$   
 4)  $SO_3, CH_3 CHO, NO_2^{\oplus}, R^{\oplus}$

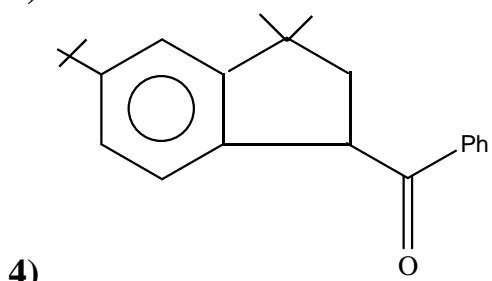
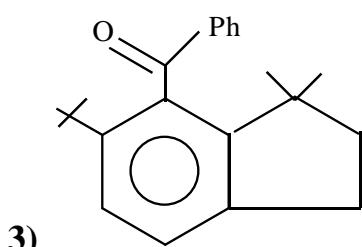
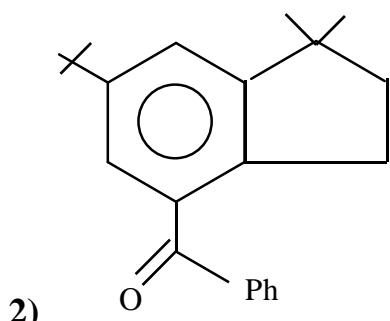
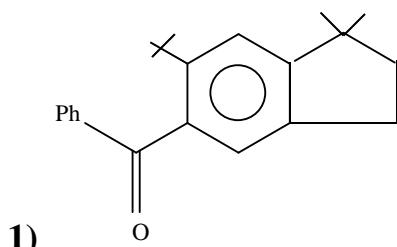
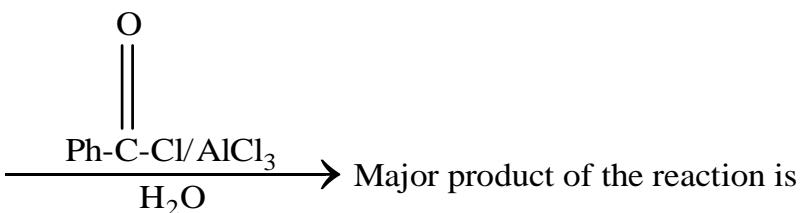
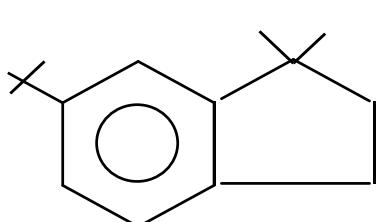


63. Arrange the following in decreasing order of reaction with  $Cl_2 / AlCl_3$ :

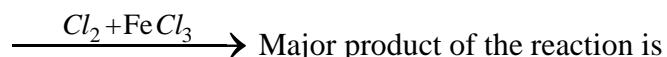
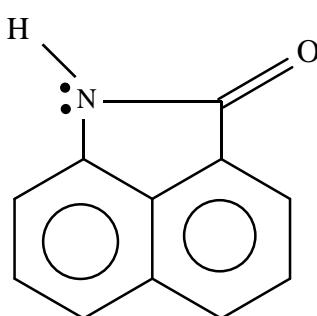


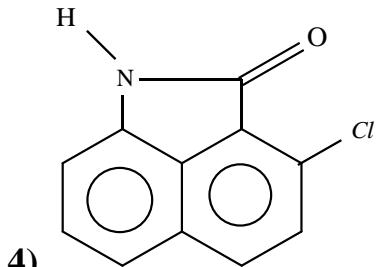
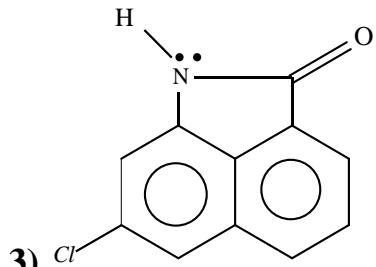
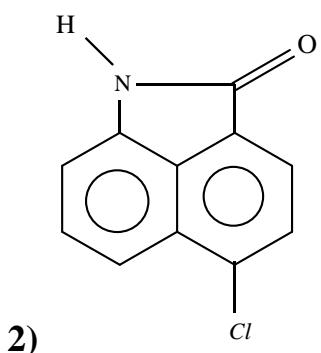
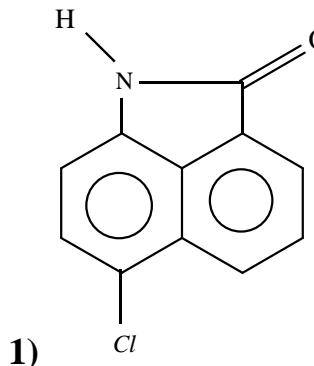
- 1)  $Q > R > P$       2)  $P > Q > R$       3)  $R > Q > P$       4)  $R > P > Q$

64.

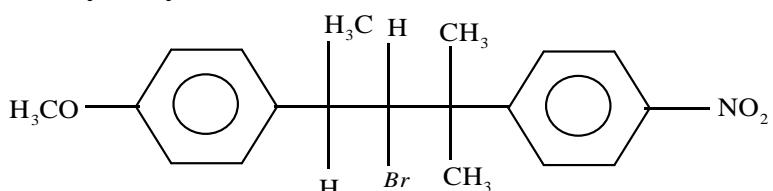


65.



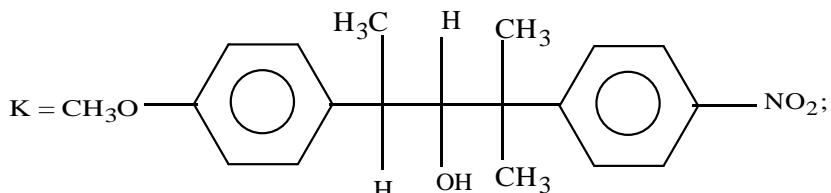


66. The hydrolysis of

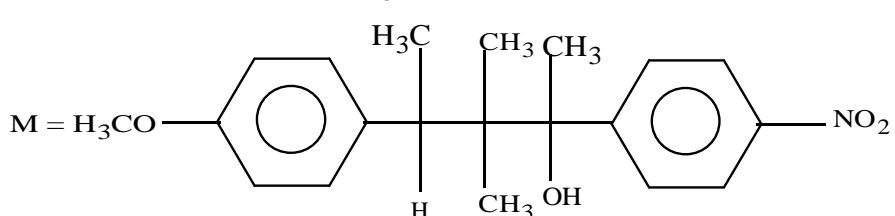
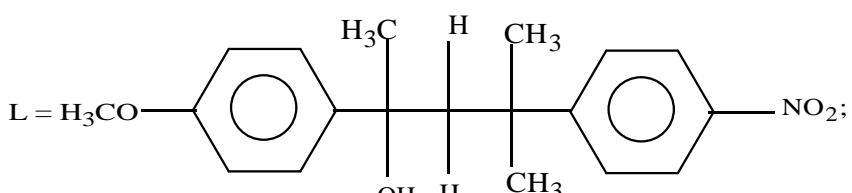


In aqueous acetone gives:

Where



Where



1) K and L

2) Only K

3) L and M

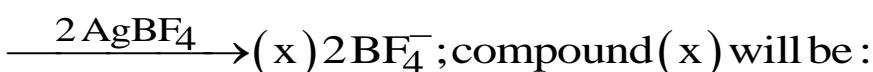
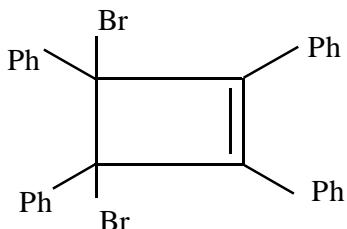
4) Only M



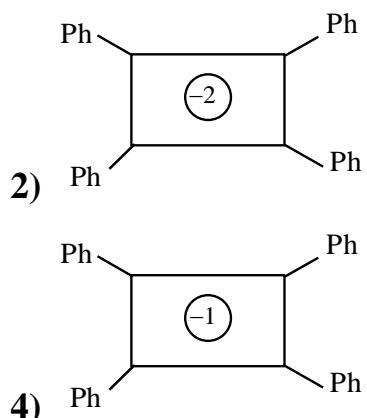
67. In nitration of benzene by mixed acid (conc.  $H_2SO_4 + conc. HNO_3$ ) the rate of reaction will be:

- 1)  $C_6H_6 = C_6D_6 = C_6T_6$   
 2)  $C_6H_6 > C_6D_6 > C_6T_6$   
 3)  $C_6H_6 = C_6D_6 > C_6T_6$   
 4)  $C_6H_6 < C_6D_6 < C_6T_6$

68.



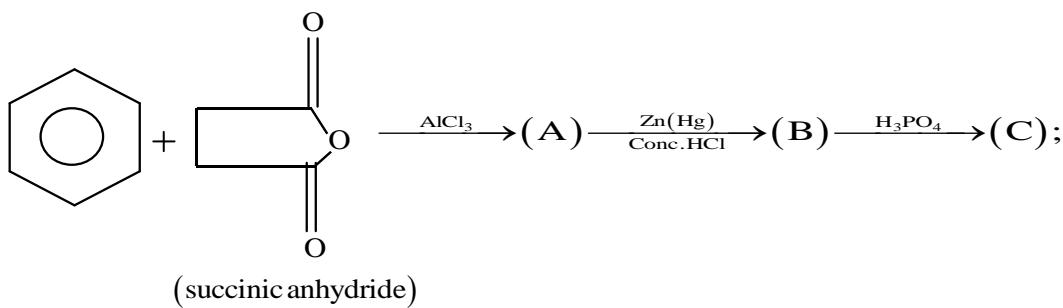
- 1)   
 2)   
 3)   
 4)



69. Which of the following molecules is expected to have the greatest resonance stabilization?

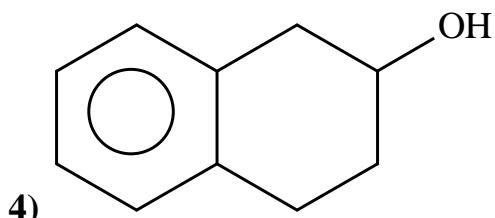
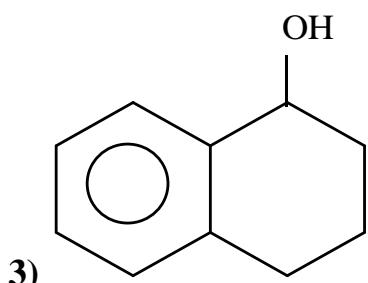
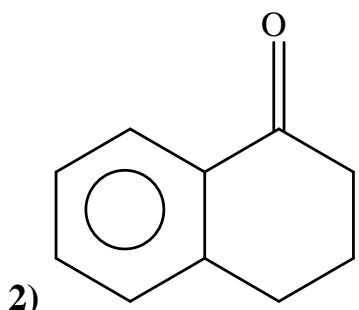
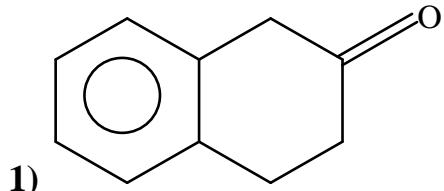
- 1)   
 2)   
 3)   
 4)

70.





Product (C) of the above reaction is:

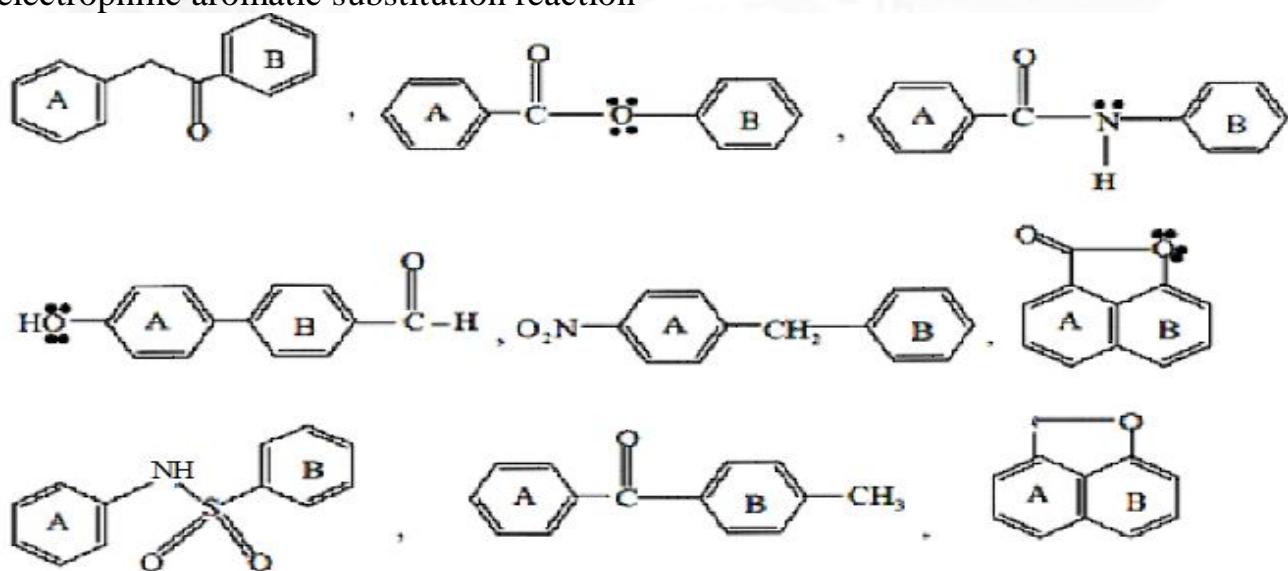


## SECTION-II (NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

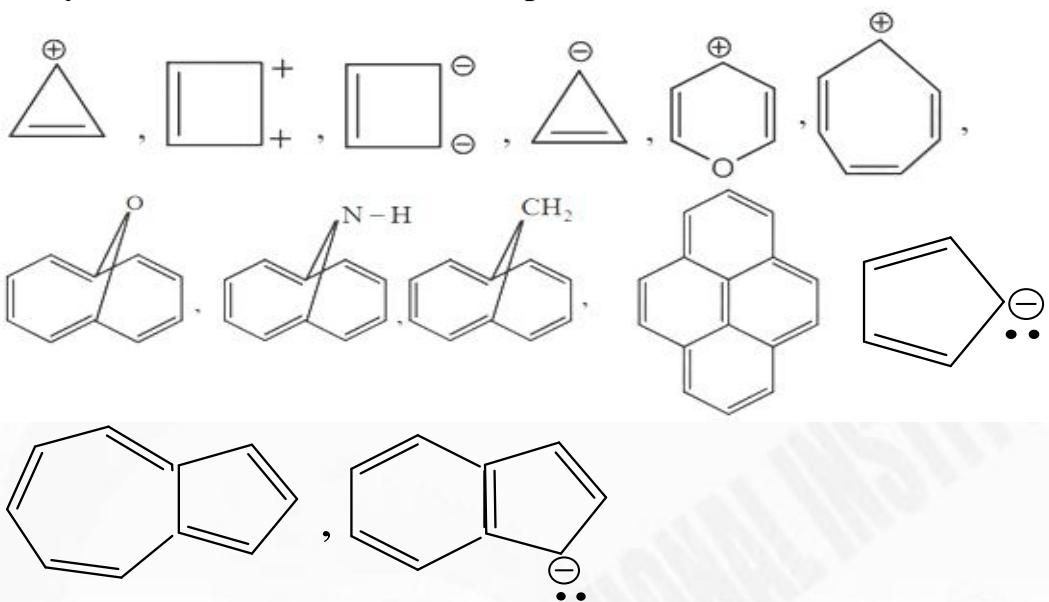
**Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases**

71. Each of the compounds shown below has two aromatic rings, labelled as A and B. Identify number of compounds in which ring B is more active than ring A for electrophilic aromatic substitution reaction

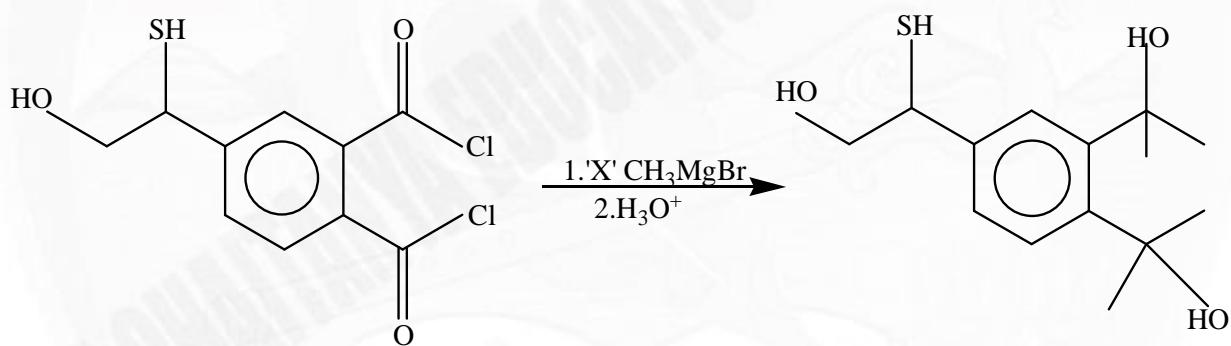




72. Identify the number of Aromatic compounds or ions

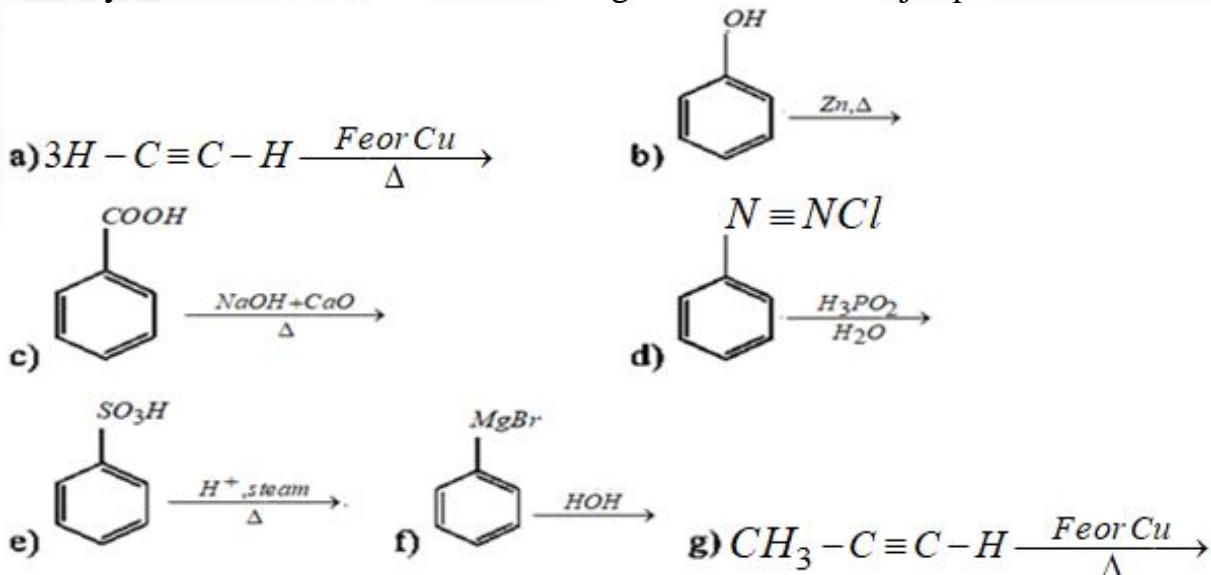


73.



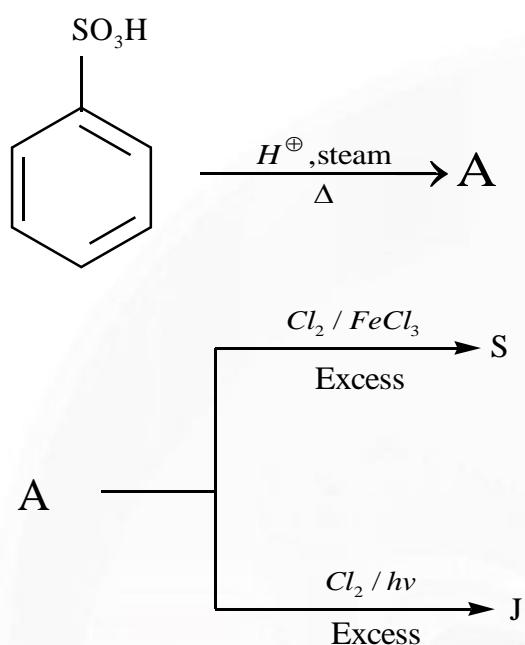
Find out the value of 'X'

74. Identify number of reactions that can be give benzene as major product.





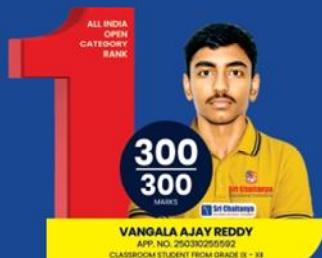
75.



The molecular weight difference between J and S is x. Then the value of x is?

## JEE MAIN 2025

# 31 STUDENTS BELOW 100 AIR



BELOW  
100  
ALL INDIA OPEN  
CATEGORY RANKS

**31**

BELOW  
500  
ALL INDIA OPEN  
CATEGORY RANKS

**95**

BELOW  
10  
ALL INDIA CATEGORY  
RANKS COUNT

**10**

BELOW  
100  
ALL INDIA CATEGORY  
RANKS COUNT

**98**

BELOW  
1000  
ALL INDIA CATEGORY  
RANKS COUNT

**579**

TOTAL QUALIFIED RANKS  
FOR JEE ADVANCED-2025

**22,094**

\*DLP/AITS

## JEE 2025 STARS SHINE BRIGHT

### Sri Chaitanya Tops JEE ADVANCED

#### ALL INDIA OPEN CATEGORY RANKS



BELOW  
100  
ALL INDIA OPEN  
CATEGORY RANKS

**29**

BELOW  
500  
ALL INDIA OPEN  
CATEGORY RANKS

**113**

BELOW  
1000  
ALL INDIA OPEN  
CATEGORY RANKS

**205**

BELOW  
1000  
ALL INDIA CATEGORY  
RANKS COUNT

**745**

NUMBER OF  
QUALIFIED RANKS  
**4,212**

\*DLP/AITS