



# 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**

Time: **09.00Am to 12.00Pm**

JEE-MAIN

RPTM-01

Date: **12-07-2025**

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.

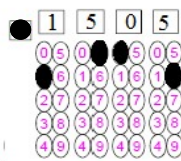
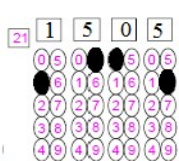
**Marking scheme: +4** for correct answer, **0** if not attempt and **-1** in all other cases.

(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): \_\_\_\_\_

Admission Number:

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

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

12-07-2025 Sr.Super60\_NUCLEUS-BT\_Jee-Main RPTM-01 Test Syllabus

**MATHEMATICS : Functions and Inverse Trigonometric Function**

**PHYSICS** : Thermal physics: Thermometry; Thermal expansion of solids, liquids and gases; Calorimetry, latent heat; Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures, Specific heat of a liquid using calorimeter, Ideal gas laws; Kinetic theory of gases, Maxwells speed distribution, Mean free path, Specific heats ( $C_v$  and  $C_p$  for monoatomic and diatomic gases);

**CHEMISTRY** : Nomenclature, Isomerism: Structural, Stereo, Hybridisation of carbon; bonds, shapes of simple organic molecules, structural and geometrical isomerism; Optical isomerism of compounds containing upto two asymmetric centres, (R,S and E,Z nomenclature excluded) IUPAC nomenclature of simple organic compounds(only hydrocarbons, monofunctional and bi-functional compounds) Conformations of ethane and butane (Newman projections)

**MATHEMATICS****Max Marks: 100****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  $f(n) = \left[ \frac{1}{3} + \frac{3n}{100} \right] n$ , where  $[n]$  denotes the greatest integer less than or equal to  $n$ .  
Then  $\sum_{n=1}^{56} f(n)$  is equal to  
1) 1156                      2) 1289                      3) 1299                      4) 1399
02. If the domain of the function  $f(x) = \log_e \left( \frac{2x-3}{5+4x} \right) + \sin^{-1} \left( \frac{4+3x}{2-x} \right)$  is  $[\alpha, \beta]$  then  $\alpha^2 + 4\beta$  is equal to  
1) 5                      2) 4                      3) 3                      4) 7
03. The value of  $\cot \left( \sum_{n=1}^{50} \tan^{-1} \left( \frac{1}{1+n+n^2} \right) \right)$  is  
1) 25/26                      2) 50/51                      3) 26/25                      4) 52/51
04. If  $f(x) = \begin{cases} 2+2x, & -1 \leq x < 0 \\ 1-\frac{x}{3}, & 0 \leq x \leq 3 \end{cases}$ ;  $g(x) = \begin{cases} -x, & -3 \leq x \leq 0 \\ x, & 0 \leq x \leq 1 \end{cases}$ , then range of  $(f \circ g)(x)$  is  
1) (0,1]                      2) [0,3]                      3) [0,1]                      4) [0,1)
05. The value of  $\tan \left( 2 \tan^{-1} \left( \frac{3}{5} \right) + \sin^{-1} \left( \frac{5}{13} \right) \right)$  is equal to  
1) -181/69                      2) 220/21                      3) -291/76                      4) 151/63
06. Range of the value of the expression  $y = \sin x \cdot \tan x \cdot \cot x$ , is  
1)  $(-1,1) - \{0\}$                       2)  $(-1,1)$                       3)  $[-1,1]$                       4)  $[-1,1] - \{0\}$
07. Given the function,  $f(x) = x^2 + 6x + 7$  what is the smallest possible value of  $f(f(f(f(x))))$  overall real numbers  $x$ ?  
1) 29                      2) 23                      3) 31                      4) 19





08. If  $f: (-\infty, 2] \rightarrow (-\infty, 4]$ , where  $f(x) = x(4-x)$ , then  $f^{-1}(x)$  is given by
- 1)  $2 - \sqrt{4-x}$       2)  $2 + \sqrt{4-x}$       3)  $-2 + \sqrt{4-x}$       4)  $-2 - \sqrt{4-x}$
09. Let  $f: R - \{0, 1\} \rightarrow R$  be a function such that  $f(x) + f\left(\frac{1}{1-x}\right) = 1 + x \forall x \in R - \{0, 1\}$ .  
Then the value of  $f(2) =$
- 1)  $9/2$       2)  $9/4$       3)  $7/4$       4)  $7/3$
10. If  $f(x) = \sin^2 x + \sin^2(x + \pi/3) + \cos x \cos(x + \pi/3)$  and  $g(5/4) = 1$  then  $(g \circ f)(x) =$
- 1) 1      2) 0      3)  $\sin x$       4)  $-\cos x$
11. If  $f(x) = \frac{9^x}{9^x + 3}$  then  $f\left(\frac{1}{2024}\right) + f\left(\frac{2}{2024}\right) + \dots + f\left(\frac{2023}{2024}\right) =$
- 1) 1011      2) 1011.5      3) 1012      4) 1012.5
12. Let  $f: R \rightarrow R$  be a function such that  $f(x) = x^3 + x^2 + 3x + \sin x$  then
- 1) f is one-one and onto      2) f is one-one and into  
3) f is many one and into      4) f is many one and onto
13. Equation of the image of the line  $x + y = \sin^{-1}(a^6 + 1) + \cos^{-1}(a^4 + 1) - \tan^{-1}(a^2 + 1), a \in R$  about x axis is given by
- 1)  $x - y = 0$       2)  $x - y = \frac{\pi}{2}$       3)  $x - y = \pi$       4)  $x - y = \frac{\pi}{4}$
14.  $f(x) = \left(3\left(1 - \frac{x^{20}}{3}\right)\left(3 + x^{20}\right)\right)^{\frac{1}{40}}, g(x) = f(f(f(x))) + f(f(x))$ , find  $(g(1) - 1)^{40}$
- 1) 3      2) 2      3) 9      4) 8
15. Let  $f(x) = \frac{x-1}{x+1}, x \in R - \{0, -1, 1\}$  If  $f^{n+1}(x) = f(f^n(x))$  for all  $n \in N$ , then  $f^6(6) + f^5(5)$  equal to
- 1)  $1/3$       2)  $1/2$       3)  $1/4$       4)  $1/5$







16. If  $\alpha > \beta > \gamma > 0$ , then the expression

$$\cot^{-1} \left\{ \beta + \frac{(1 + \beta^2)}{(\alpha - \beta)} \right\} + \cot^{-1} \left\{ \gamma + \frac{(1 + \gamma^2)}{(\beta - \gamma)} \right\} + \cot^{-1} \left\{ \alpha + \frac{(1 + \alpha^2)}{(\gamma - \alpha)} \right\} \text{ is equal to}$$

- 1)  $\pi$                       2) 0                      3)  $\frac{\pi}{2} - (\alpha + \beta + \gamma)$                       4)  $3\pi$

17. Let S be the set of all solutions of the equation

$$\cos^{-1}(2x) - 2\cos^{-1}(\sqrt{1-x^2}) = \pi, x \in \left[-\frac{1}{2}, \frac{1}{2}\right]. \text{ Then } \sum_{x \in S} 2\sin^{-1}(x^2 - 1) \text{ is equal to}$$

- 1) 0                      2)  $-\frac{2\pi}{3}$                       3)  $\pi - \sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$                       4)  $\pi - 2\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$

18. column I gives function and column II gives the nature of the function. Then match the item of the column –I with the item of column II

	Column I		Column II
A	$f:[0, \infty) \rightarrow [0, \infty), f(x) = \frac{x}{1+x}$	P	one – one and onto
B	$f:R - \{0\} \rightarrow R, f(x) = x - \frac{1}{x}$	Q	One – one but not onto
C	$f:R - \{0\} \rightarrow R, f(x) = x + \frac{1}{x}$	R	Onto but not one-one
D	$f:R \rightarrow R, f(x) = 2x + \sin x$	S	Neither one one nor onto

The correct match is

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

19. **Statement –I :** Number of solution of the equation  $|\sin^{-1}(\sin x)| = \cos x$ , for  $x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$  is 2

**Statement-II:** If the equation  $|x - 2| - |x + 1| = p$  has exactly one solution, then number of integral value of P is 4

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





20. If  $\tan^{-1}\left(x + \frac{3}{x}\right) - \tan^{-1}\left(x - \frac{3}{x}\right) = \tan^{-1}\frac{6}{x}$ , then the value of  $x^4$  is

1) 3

2) 5

3)  $1/3$ 

4) 9

### 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 ' $f$ ' is a polynomial function satisfying

$$2 + f(x)f(y) = f(x) + f(y) + f(xy) \forall x, y \in \mathbb{R} \text{ and if } f(2) = 5 \text{ then value of } f(7) =$$

22. Let  $f$  be an even function satisfying  $f(x-2) = f\left(x + \left[\frac{6x^2+25}{x^2+4}\right]\right) \forall x \in \mathbb{R}$  and

$$f(x) = \begin{cases} 3x & , 0 \leq x < 1 \\ 4-x & , 1 \leq x \leq 4 \end{cases} \text{ then the value of } f(-2025) \text{ is equal to (where } [.] \text{ denotes}$$

greatest integer function)

23. For  $k \in \mathbb{R}$ , let the solutions of the equation

$$\cos\left(\sin^{-1}\left(x \cot\left(\tan^{-1}\left(\cos\left(\sin^{-1}x\right)\right)\right)\right)\right) = k, 0 < |x| < \frac{1}{\sqrt{2}} \text{ be } \alpha \text{ and } \beta, \text{ where the inverse}$$

trigonometric functions take only principal values. If the solutions of the equation

$$x^2 - bx - 5 = 0 \text{ are } \frac{1}{\alpha^2} + \frac{1}{\beta^2} \text{ and } \frac{\alpha}{\beta}, \text{ then } \frac{b}{k^2} \text{ is equal to } \underline{\hspace{2cm}}$$

24. The least integral value of  $k$  for which

$$(k-2)x^2 + 8x + k + 4 > \sin^{-1}(\sin 12) + \cos^{-1}(\cos 12) \text{ for all } x \in \mathbb{R}, \text{ is}$$

25. If  $\cot^{-1}\left(\frac{n}{\pi}\right) > \frac{\pi}{6}$ ,  $n$  being a natural number, then maximum value of  $n$  is \_\_\_\_\_



**PHYSICS****Max Marks: 100****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. Assertion: A glass container of water is filled at  $4^{\circ}\text{C}$ . Water will overflow, if temperature is increased or decreased. (Ignore expansion of glass).  
Reason: Density of water is maximum at  $4^{\circ}\text{C}$ .  
1) If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.  
2) If both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.  
3) If Assertion is true, but the Reason is false.  
4) If Assertion is false, but the Reason is true.
27. Given below are two statements :  
**Statement I:** The average momentum of a molecule in a "sample of an ideal gas independent on temperature.  
**Statement II :** The rms speed of oxygen molecules in a gas is  $v$ . If the temperature is doubled and the oxygen molecules dissociate into oxygen atoms, the rms speed will become  $3v$ .  
In the light of the above statements, choose the correct answer from the options given below:  
1) Both Statement I and Statement II are true  
2) Both Statement I and Statement II are false  
3) Statement I is true but Statement II is false  
4) Statement I is false but Statement II is true
28. Given below are two statement : one is labelled as Assertion A and the other is labelled as Reason R.  
Assertion A: Earth has atmosphere whereas moon doesn't have any atmosphere.  
Reason R: The escape velocity of atmosphere gas on moon is very large as compared to Rms velocity of gas  
In the light of the above statement, choose the correct answer from the options given below:



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

**29.** Given below are two statements:

Statement (I): The mean free path of gas molecules is inversely proportional to cube of molecular diameter.

Statement (II): Average kinetic energy of gas molecules is inversely proportional to absolute temperature of gas.

In the light of the above statements, choose the correct answer from the option 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

**30.** Match the  $C_p / C_v$  ratio for ideal gases with different type of molecules

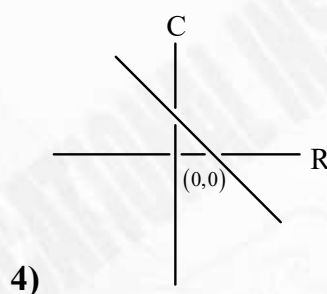
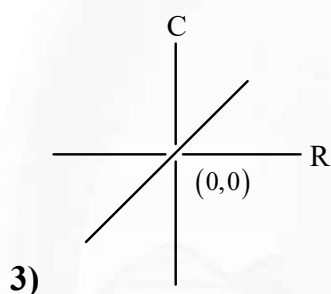
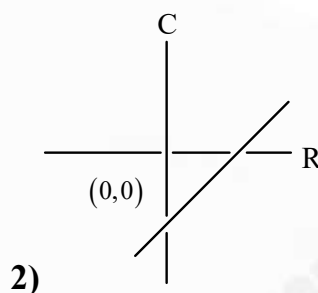
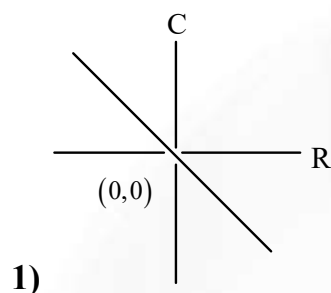
	Column-I		Column-II
	Molecule		$C_p / C_v$
A)	He	I	7/5
B)	H <sub>2</sub>	II	9/7
C)	CO(non rigid)	III	4/3
		IV	5/3

- 1) (A)-(1V), (B) – (II),(C)-(I)      2) (A)-(III), (B)-(IV), (C)-(II)
- 3) (A)- (IV), (B)-(I), (C)-(II)      4) (A)-(II), (B)-(III), (C)-(II)





31. Which of the following figure represents the relation between Celsius ( $0^\circ - 100^\circ C$ ) and Reaumer ( $0^\circ - 80^\circ R$ ) temperatures?



32. Two rods of lengths  $l_1$  and  $l_2$  are made of materials whose coefficients of linear expansion are  $\alpha_1$  and  $\alpha_2$  respectively. If the difference between the two lengths is independent of temperature, then :
- 1)  $\frac{l_1}{l_2} = \frac{\alpha_2}{\alpha_1}$       2)  $l_1^2 \alpha_2 = l_2^2 \alpha_1$       3)  $\frac{l_1}{l_2} = \frac{\alpha_1}{\alpha_2}$       4)  $\alpha_2^2 l_1 = \alpha_1^2 l_2$
33. Two liquids are at temperature  $20^\circ C$  and  $40^\circ C$ . When same mass of both of them is mixed, the temperature of the mixture is  $32^\circ C$ . What is the ratio of their specific heats?
- 1)  $1/3$       2)  $2/3$       3)  $1/5$       4)  $2/5$
34. A glass flask of volume  $1000 \text{ cm}^3$  is completely filled with mercury at  $0^\circ C$ . The coefficient of cubical expansion of mercury is  $182 \times 10^{-6} / ^\circ C$  and that of glass is  $30 \times 10^{-6} / ^\circ C$ , how much mercury will over flow? "When heated to  $100^\circ C$ ."
- 1)  $30 \text{ cm}^3$       2)  $18.2 \text{ cm}^3$       3)  $15.2 \text{ cm}^3$       4)  $3 \text{ cm}^3$





35. The temperature of equal masses of three different liquids A, B and C are  $12^{\circ}\text{C}$ ,  $19^{\circ}\text{C}$  and  $28^{\circ}\text{C}$  respectively. The temperature when A and B are mixed is  $16^{\circ}\text{C}$  and when B and C are mixed is  $23^{\circ}\text{C}$ . The temperature when A and C are mixed is:
- 1)  $18.2^{\circ}\text{C}$       2)  $22.2^{\circ}\text{C}$       3)  $20.3^{\circ}\text{C}$       4)  $24.2^{\circ}\text{C}$
36. A hailstone at  $0^{\circ}\text{C}$  falls from a height of 1 km on an insulating surface converting whole of its kinetic energy into heat. What part of it will melt? (Given:  $g = 10\text{ms}^{-2}$ ):
- 1)  $\frac{1}{33}$       2)  $\frac{1}{8}$       3)  $\frac{1}{33} \times 10^{-4}$       4) All of it will melt
37. On Celsius scale the temperature of the body increases by  $30^{\circ}\text{C}$ . The increase in temperature on Fahrenheit scale is
- 1)  $70^{\circ}$       2)  $72^{\circ}$       3)  $54^{\circ}$       4)  $75^{\circ}$
38. The lower and upper fixed points of a faulty thermometer are  $5^{\circ}$  and  $99^{\circ}$  respectively. If the reading of the thermometer is  $52^{\circ}$ , the temperature on the Fahrenheit scale is:
- 1)  $132^{\circ}\text{F}$       2)  $122^{\circ}\text{F}$       3)  $154^{\circ}\text{F}$       4)  $15^{\circ}\text{F}$
39. An ideal gas is expanding such that  $PT^1 = \text{constant}$ . The coefficient volume expansion of the gas is
- 1)  $\frac{1}{T}$       2)  $\frac{2}{T}$       3)  $\frac{4}{T}$       4)  $\frac{3}{T}$
40. A certain amount of an ideal gas is contained in a closed vessel. The vessel is moving with a constant velocity  $v$ . The molecular mass of gas is  $M$ . The rise in temperature of the gas when the vessel is suddenly stopped is ( $\gamma = C_p / C_v$ )
- 1)  $\frac{Mv^2(\gamma - 1)}{2R(\gamma + 1)}$       2)  $\frac{Mv^2(\gamma - 1)}{2R}$
- 3)  $\frac{Mv^2}{2R(\gamma + 1)}$       4)  $\frac{Mv^2}{2R(\gamma - 1)}$



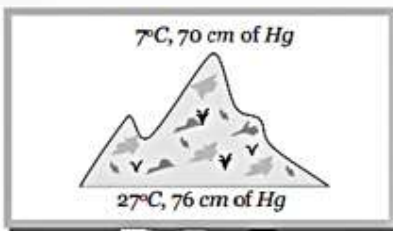


41. If pressure of a gas contained in a closed vessel is increased by 0.4% when heated by  $10^{\circ}\text{C}$ , the initial temperature must be
- 1) 250 K                      2)  $250^{\circ}\text{C}$                       3) 2500 K                      4)  $25^{\circ}\text{C}$
42. The molecules of a given mass of a gas have root mean square speeds of  $100\text{ ms}^{-1}$  at  $27^{\circ}\text{C}$  and 1.00 atmospheric pressure. What will be the root mean square speeds of the molecules of the gas at  $127^{\circ}\text{C}$  and 2.0 atmospheric pressure?
- 1)  $\frac{150}{\sqrt{3}}\text{ m/s}$                       2)  $\frac{125}{\sqrt{3}}\text{ m/s}$                       3)  $\frac{200}{\sqrt{3}}\text{ m/s}$                       4)  $100\sqrt{3}\text{ m/s}$
43. Following statements are given :
- A) The average kinetic energy of a gas molecule decreases when the temperature is reduced
- B) The average kinetic energy of a gas molecule decreases with increase in pressure at constant temperature.
- C) The average kinetic energy of a gas molecule decreases with increase in volume.
- D) volume of a gas increases with increase in temperature at constant pressure.
- E) The volume of gas decreases with increase in temperature.
- Choose the correct answer from the options given below.
- 1) (A) and (D) only.                      2) (A), (B) and (D) only.
- 3) (B) and (D) only.                      4) (A), (B) and (E) only.
44. N molecules of a gas, each of mass m, strike per second a fixed wall of a container of area A at an angle  $\theta$  to the perpendicular to the wall and rebound with a speed V. The collisions are assumed to be elastic.
- 1) The magnitude of change in momentum is  $|\Delta p| = 2mv\sin\theta$
- 2)  $|\Delta p| = 2mv\cos\theta$
- 3) The pressure exerted on the wall is  $p = \frac{N|\Delta p|}{2A}$
- 4)  $p = \frac{|\Delta p|}{2NA}$





45. At the top of a mountain a thermometer reads  $7^{\circ}\text{C}$  and a barometer reads 70 cm of Hg. At the bottom of the mountain these read  $27^{\circ}\text{C}$  and 76 cm of Hg, respectively. Ratio of density of air at the top with that of bottom is



- 1) 75/76      2) 70/76      3) 76/75      4) 76/70

### 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 block of ice of mass 120 g at temperature  $0^{\circ}\text{C}$  is put in 300g of water at  $24^{\circ}\text{C}$ . x gm of ice melts as the temperature of the water reaches  $0^{\circ}\text{C}$ . The value of X is \_\_\_\_\_  
(L of ice = 80 cal/gm  $S_w = 1$  cal/gm C)
47. 1 kg of diatomic gas is at a pressure of  $8 \times 10^4 \text{ N/m}^2$ . Density of gas is  $4 \text{ kg/m}^3$ . Energy of gas \_\_\_\_\_  $\times 10^4 \text{ J}$
48. A gun fires a lead bullet of temperature  $27^{\circ}\text{C}$  into a wooden block. The bullet having melting temperature of  $327^{\circ}\text{C}$  penetrates into the block and melts down. If the total heat required for the process is 625 J, then the mass of the bullet is \_\_\_\_\_ grams.  
Latent heat of fusion of lead =  $2.5 \times 10^4 \text{ JKg}^{-1}$  and specific heat capacity of lead =  $125 \text{ JKg}^{-1} \text{ K}^{-1}$ )
49. Nitrogen gas is at 573 K temperature. The temperature (in K) at which the rms speed of a  $\text{H}_2$  molecule would be equal to the rms speed of a nitrogen molecule, is  
(Molar mass of  $\text{N}_2$  gas 28 g);
50. The average translational kinetic energy of  $\text{N}_2$  gas molecules at \_\_\_\_\_ K becomes equal to the K.E. of an electron accelerated from rest through a potential difference of 0.1 volt.



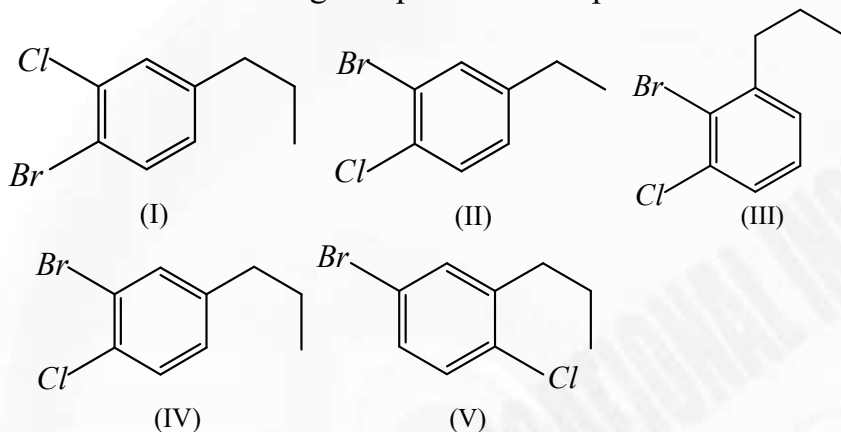


**CHEMISTRY****Max Marks: 100****SECTION-I  
(SINGLE CORRECT ANSWER TYPE)**

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.

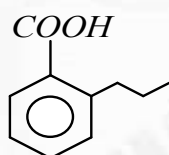
**Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.**

51. Which of the following compounds corresponds of 2-Bromo-1-chloro-4-propyl benzene?

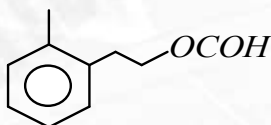


- 1) (II) and (V)      2) (II) and (IV)      3) (IV) only      4) (I) and (IV) only

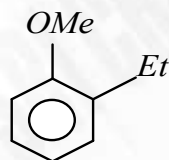
52.



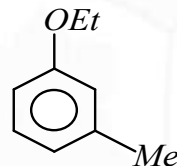
and



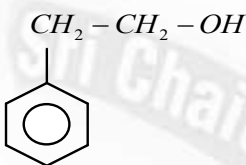
Functional isomers



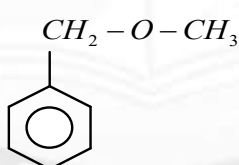
and



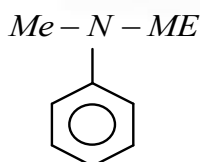
Metamers



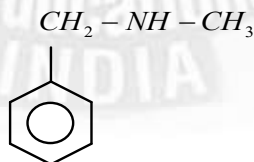
and



Metamers



and



Functional isomers

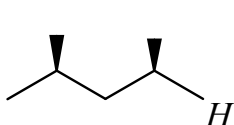
Which of the following is correct for above matching

- 1) TFTF      2) FTTF      3) TTFT      4) TFFT

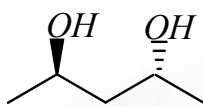




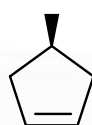
53. How many compounds shown below are chiral?



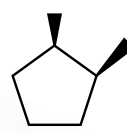
(I)



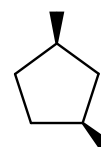
(II)



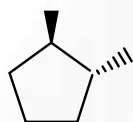
(III)



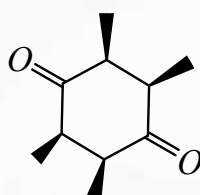
(IV)



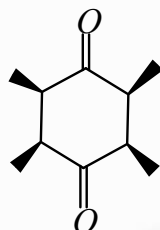
(V)



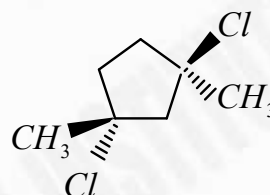
(VI)



(VII)



(VIII)



(IX)

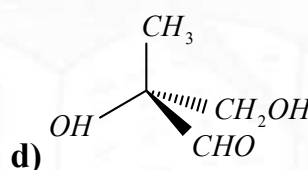
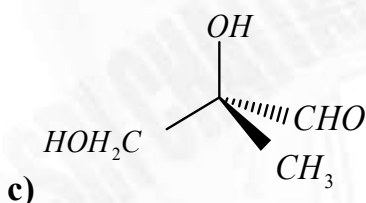
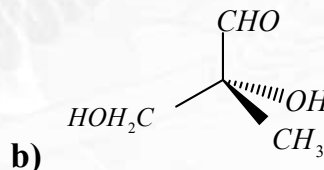
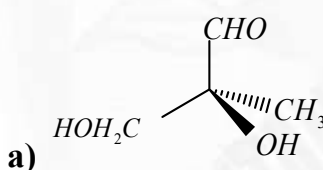
1) 3

2) 5

3) 6

4) 8

54. Which of the following statement(s) regarding the following molecules is incorrect?



1) a &amp; d are enantiomers

2) b &amp; d are identical

3) b &amp; c are diastereomers

4) c &amp; d are enantiomers

55. The enantiomeric excess and observed specific rotation of a mixture containing 6 g of (+)-2-Butanol and 4 (g) of (-)-2-Butanol are respectively (If the specific rotation of enantiomerically pure (+)-2-butanol is +13.5 units)

1) 80%, +2.7-unit

2) 20%, -27 unit

3) 20%, +2.7-unit

4) 80%, -27 unit

56. **ASSERTION:** The energy difference between staggered and Eclipsed conformations of ethylene dichloride is less than in ethylene dibromide.

**REASON:** The bond moment of  $C - Cl$  is greater than that of  $C - Br$ .





- 1) If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.
- 2) If both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
- 3) If Assertion is true, but the Reason is false.
- 4) If Assertion is false, but the Reason is true.

57. **ASSERTION:** Hybridisation influences the bond length and bond enthalpy (strength) in compound

**REASON:** If S- character in hybridisation increases then bond becomes shorter and stronger

- 1) If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.
- 2) If both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
- 3) If Assertion is true, but the Reason is false.
- 4) If Assertion is false, but the Reason is true.

58. **Statement –I :** Symmetrical cis isomer has high B.P than trans isomer because of high polarity of cis compound

**Statement –II :** Symmetrical trans Isomer has high M.P than cis isomer because of symmetrical packing of trans compound in its crystal lattice

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

59. **Statement –I :** The number of methyl group present in Isooctane is one

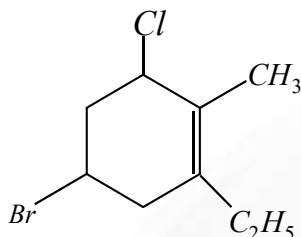
**Statement –II :** The number of tertiary carbons in Isooctane is one

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





60. IUPAC name of



- 1) 4-Bromo -6-chloro -2-ethyl-1-methylcyclohex-1-ene
- 2) 5-Bromo-1-chloro-3-ethyl-2-methylcyclohex-2-ene
- 3) 5-Bromo-3-chloro-1-ethyl-2-methylcyclohex-1-ene
- 4) 1-Bromo-5-chloro-3-ethyl-4-methylcyclohex-3-ene

61. Match the structure given in Column-I with the names in column-II.

	Column- I (Compound)		Column- II (Correct IUPAC name)
A)		P)	4-Bromopent-2-ene
B)		Q)	4-Bromo-3-methylpent-2-ene
C)		R)	1- Bromo-2-methylbut-2-ene
D)		S)	1-Bromo-2-methylpent-2-ene

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

62. Which of the following compounds can be resolved?

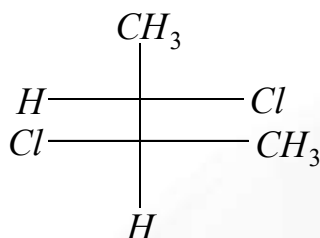
- 1) cis-1, 3-dimethylcyclohexane
- 2) 1, 1- dimethyl cyclohexane
- 3) cis-1,4- dimethyl cyclohexane
- 4) Cis-1-Ethyl-3- methyl cyclohexane





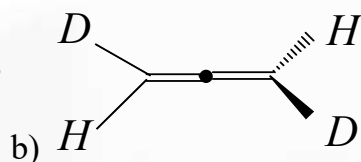


63. The chiral molecules are:



a)

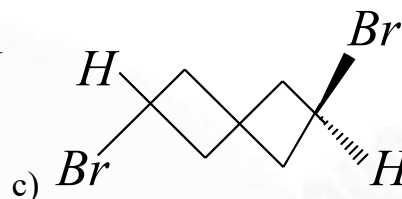
1) a,b



b)

2) b,c

3) a,c



c)

4) a,b,c

64. IUPAC Name of phorone

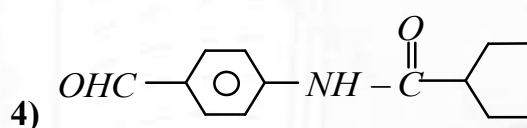
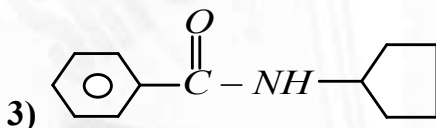
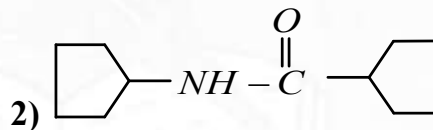
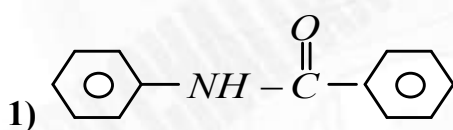
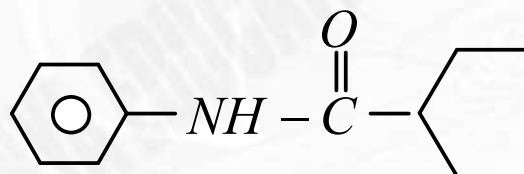
1) 2, 6-Dimethyl hepta – 2, 5- dien-4-one

2) 2, 5 -Dimethyl hepta – 2, 6-dien-4-one

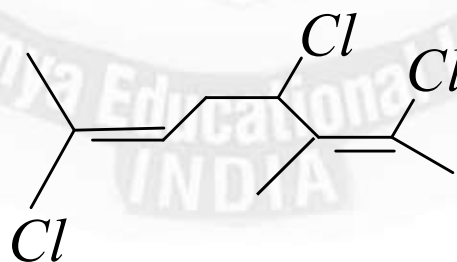
3) 4 – Methyl pent -3-en-2-one

4) 2- Methyl pent -2-en-4-one

65. Which of the following is metamer of the given compound?



66. Total number of stereoisomers possible for the given structure.



1) 8

2) 2

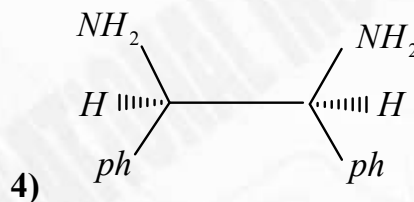
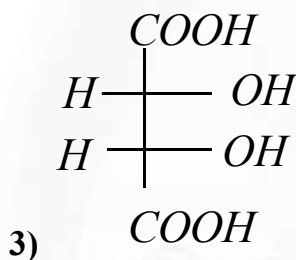
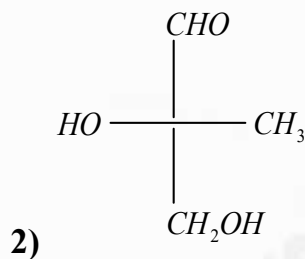
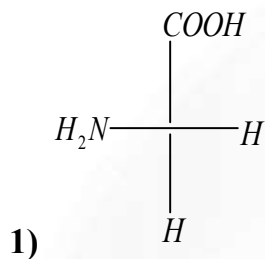
3) 4

4) 3

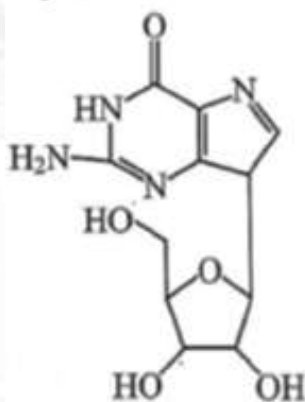




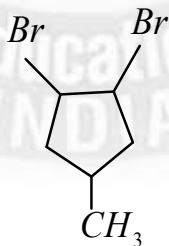
67. The optically inactive compound from the following is
- 1) 2 – bromopropanol
  - 2) 2 – bromobutane
  - 3) 2 – bromopentane
  - 4) 2 – bromo-2- methyl butane
68. Which of the following molecule is expected to rotate the plane polarised light?



69. How many Amides functional groups are present in the molecule of Guanosine shown below?



- 1) 1      2) 2      3) 3      4) 4
70. How many geometrical isomers possible for given structure



- 1) 8      2) 6      3) 3      4) 4





## SECTION-II

### (NUMERICAL VALUE TYPE)

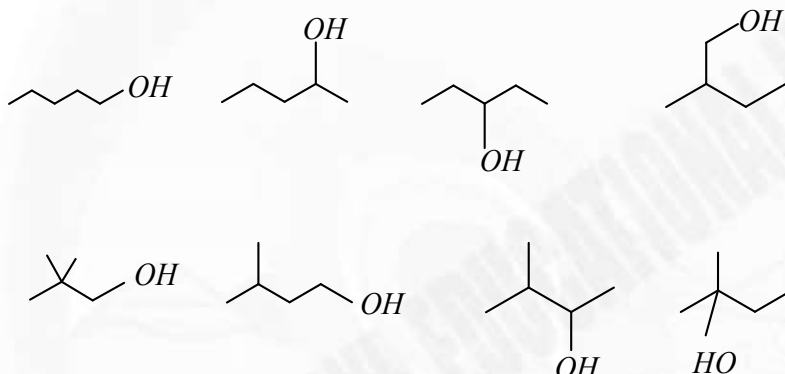
This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and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

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

71. How many compounds are homocyclic Compounds?

- |                |             |                 |                |
|----------------|-------------|-----------------|----------------|
| i) Toluene     | ii) Aniline | iii) Anisole    | iv) Benzene    |
| v) Naphthalene | vi) Phenol  | vii) Azolene    | viii) Pyrrole  |
| ix) Xylene     | x) Styrene  | xi) Furan       | xii) Thiophene |
|                |             | xiii) Imidazole |                |

72. How many number of compounds, amongst following have same IUPAC name?

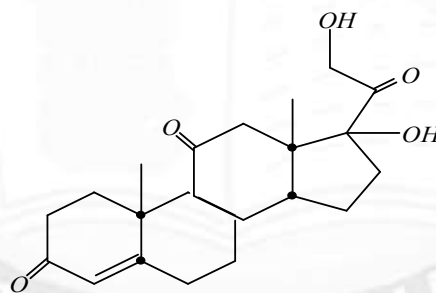


73. The sum of Locants (Substituents) in Vanillin as per IUPAC?

74. X = Number of alcohols (structurally different) possible for  $C_4H_{10}O$

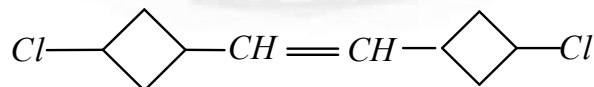
Y = number of ketones (structurally different) possible for  $C_5H_{10}O$

Z = Number of different functional groups present in the below compound:



Find the value of  $\left(\frac{X + Y + Z}{2}\right)$ ?

75. Consider the following molecules.



How many stereoisomers exist for this molecule?







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**31**

BELOW  
**500**  
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CATEGORY RANKS

**95**

BELOW  
**10**  
ALL INDIA CATEGORY  
RANKS COUNT

**10**

BELOW  
**100**  
ALL INDIA CATEGORY  
RANKS COUNT

**98**

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