Answer any 4 questions from 1 to 5. Each carries 1 score. **(4 × 1 = 4)**

1. The number of moles of solute in one litre of the solution is _____.

   (a) Molarity (b) Molality

   (c) Normality (d) Mole fraction

2. The element with outer electronic configuration $3s^2 3p^3$ belong to which block of the periodic table ?

3. The hybridisation of carbon in Ethyne molecule is _____.

4. Which among the following is a Lewis acid ?

   (a) CH_4 (b) BF_3

   (c) PCl_5 (d) NH_3

5. Which among the following is a group showing + R effect ?

   (a) –CN (b) –OH

   (c) $-NO_2$ (d) –COOH

Answer any 8 questions from 6 to 15. Each carries 2 scores. **(8 × 2 = 16)**

6. Hydrogen combines with oxygen to form two different compounds, H_2O and H_2O_2.

   (i) Which law is obeyed by this combination ? **(1)**

   (ii) State the law mentioned above. **(1)**

7. Dual nature of matter was proposed by Louis de Broglie. Calculate the de Broglie wavelength associated with an electron with velocity 1.6×10^6 m/s. **(2)**

8. Heisenberg's uncertainty principle rules out the existence of definite path for electrons. State Heisenberg's uncertainty principle with equation. (2)

9. NF_3 and NH_3 are polar molecules. The Dipole moment of NF_3 is less than that of NH_3. Why ? (2)

10. The spontaneity of a process is expressed in terms of Gibb's energy.

(i) Define Gibb's energy. (1)

(ii) Write Gibb's equation. (1)

11. (i) Le-chatelier principle helps to maximise the conversion of reactants to products. State Le-chatelier's principle. (1)

(ii) Explain common ion effect. (1)

12. (i) Find the oxidation number of chlorine in $HClO_4$. (1)

(ii) Explain oxidation and reduction in terms of oxidation number. (1)

13. Give the structures of the following compounds :

(i) 3-Ethyl-2, 2-dimethyl pentane (1)

(ii) Pent-4-en-2-ol (1)

14. Draw the cis and trans isomers of But-2-ene. (2)

15. Complete the following :

(i) $3CH \equiv CH \xrightarrow[873\ k]{\text{Red Hot Iron Tube}} \_\_\_\_$ (1)

(ii) How alkanes are prepared by Wurtz reaction ? (1)

Answer any 8 questions from 16 to 26. Each carries 3 scores. $(8 \times 3 = 24$

16. (i) Classify the following as homogeneous mixture, heterogeneous mixture, element and compound :

(a) Silver (b) Air (c) Muddy water (d) Water

(ii) Define Limiting Reagent of a reaction.

17. (i) Write the names of four quantum numbers.

(ii) State Pauli's exclusion principle.

18. (i) Write the IUPAC name of the element with atomic number 105.

(ii) Define electronegativity.

(iii) Chlorine atom has high electron gain enthalpy than fluorine atom.

19. (i) Write the general outer electronic configuration of transition metals.

(ii) Mention two properties of transition metals.

20. Give three salient features of molecular orbital theory.

21. (i) State first law of thermodynamics. Write its mathematical expression.

(ii) Which of the following is a process taking place with increase in entropy ?

(a) Freezing of water

(b) Condensation of steam

(c) Evaporation of water

(1)

22. (i) Define pH scale.

(ii) The pKa of acetic acid and pKb of ammonium hydroxide are 4.76 and 4.75 respectively. Calculate the pH of ammonium acetate solution. (2)

(2)

23. (i) Describe disproportionation reaction with an example. (1)

(ii) Write the stock notation of the compound CuO.

(1)

24. (i) What is Heterolytic fission ? (1)

(ii) Write any one type of adsorption chromatography.

(iii) Name the purification method used to separate the components of crude petroleum. (1)

25. (i) Draw the Newman's projections for the staggered and eclipsed conformation of ethane. (2)

(ii) Which conformation of ethane is more stable ? (1)

26. (i) $CH_3CH = CH_2 + HBr \longrightarrow$

$CH_3 - \underset{\underset{Br}{|}}{CH} - CH_3$ (I)

$CH_3 - CH_2 - CH_2Br$ (II)

Classify I and II as major and minor product. (2)

(ii) Name the rule that decides the formation of major product. (1)

Answer any 4 questions from 27 to 31. Each carries 4 scores. **(4 × 4 = 16)**

27. (i) Explain Bohr model of Hydrogen atom. (2)

(ii) Write any two drawbacks of Rutherford model of atom. (1)

(iii) What is photoelectric effect ? (1)

28. (i) Match the molecules in Column-I with their shape in Column-II.

	Column-I		Column-II
(1)	PCl_5	(A)	Trigonal Pyramidal
(2)	SF_6	(B)	Trigonal bipyramidal
(3)	CH_4	(C)	Octahedral
(4)	NH_3	(D)	Tetrahedral

(2)

(ii) Define Bond order of a molecule. (1)

(iii) Mention the two types of Hydrogen Bonding. (1)

29. (i) Define Lattice enthalpy. (1)

(ii) Construct an enthalpy diagram for the determination of lattice enthalpy of sodium chloride. (3)

30. (i) What are Buffer Solutions ? Give an example for Buffer solution. (2)

(ii) Explain Bronsted-Lowry concept of acids and bases. (1)

(iii) Write the relation between K_p and K_c ? (1)

31. (i) Differentiate Electrophile and Nucleophile. Give one example for each. (2)

(ii) Explain the following :

(a) Functional group isomerism

(b) Metamerism (2)
