QUESTION PAPER (2025 -26)

Class XI-CHEMISTRY THEORY (043)

M ax. M arks:70   **Time: 3 hours**

General Instructions:

Read the following instructions carefully.

- There are 33 questions in this question paper with internal choice.
- SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
- SECTION B consists of 5 short answer questions carrying 2 marks each.
- SECTION C consists of 7 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case - based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory.
- Use of log tables and calculators is not allowed.

Section A (1 × 16 = 16 Marks)

Q1. The number of significant figures in 0.05060 is: (a) 3 (b) 4 (c) 5 (d) 6

Q2. Which law is the basis of stoichiometry? (a) Law of conservation of mass (b) Law of definite proportion (c) Avogadro's law (d) Law of multiple proportions

Q3. The maximum number of electrons in n = 3 shell is: (a) 9 (b) 18 (c) 32 (d) 8

Q4. Who discovered the neutron? (a) Thomson (b) Rutherford (c) Chadwick (d) Goldstein

Q5. The modern periodic law is based on: (a) Atomic number (b) Atomic mass (c) Neutron number (d) Mass number

Q6. The most electronegative element is: (a) O (b) Cl (c) F (d) N

Q7. Hybridisation of Be in $BeCl_2$ is: (a) sp (b) sp^2 (c) sp^3 (d) sp^3d

Q8. Bond angle in NH_3 is approximately: (a) 90° (b) 107° (c) 120° (d) 180°

Q9. A state function among the following is: (a) Work (b) Heat (c) Internal energy (d) Path

Q10. SI unit of enthalpy is: (a) Joule (b) Calorie (c) erg (d) eV

Q11. Mole fraction of solute in a 1 M solution is always: (a) > 1 (b) < 1 (c) = 1 (d) unpredictable

Q12. The azimuthal quantum number determines: (a) Size of orbital (b) Shape of orbital (c) Orientation of orbital (d) Spin

Q13. Which of the following has the smallest atomic radius? (a) Li (b) Na (c) K (d) Rb

Q14. Which molecule shows hydrogen bonding? (a) HCl (b) CH_4 (c) NH_3 (d) CO_2

Q15. In an isothermal process, ΔU is: (a) Zero (b) Positive (c) Negative (d) Infinite

Q16. The compressibility factor (Z) of an ideal gas is: (a) < 1 (b) > 1 (c) = 1 (d) 0

Section B (2 × 5 = 10 Marks)

Q17. Define the term mole. How many moles are present in 9 g of water?

Q18. State Hund's rule of maximum multiplicity. Illustrate with the configuration of nitrogen atom.

Q19. Write two differences between Mendeleev's periodic law and Modern periodic law.

Q20. Predict the geometry of SO_2 molecule using VSEPR theory.

Q21. Define internal energy. How is it related to heat and work?

Section C (3 × 7 = 21 Marks)

Q22. A sample of NaOH weighing 4 g is dissolved in water to make 250 mL solution. Calculate its molarity and molality.

Q23. Write the electronic configuration of: (a) Cr^{3+} (Z = 24) (b) Cu^{2+} (Z = 29). Explain the reason for anomalous configuration of Cr and Cu.

Q24. Explain the variation of ionisation enthalpy: (a) Across a period (b) Down a group

Q25. Draw Lewis structure of ClF_3. Predict its shape and bond angle using VSEPR theory.

Q26. Derive the relation $\Delta H = \Delta U + \Delta nRT$ for an ideal gas.

Q27. Define enthalpy of formation. Using Hess's law, calculate ΔHf of methane given: ...

Q28. State Heisenberg's Uncertainty Principle. Calculate the uncertainty in velocity of an electron if its position is located within 1×10^{-10} m. (h = 6.626×10^{-34} J·s, mass of electron = 9.1×10^{-31} kg)

Section D (Case-Based, 2 × 4 = 8 Marks)

Q29. Case I – Thermodynamics: During combustion of glucose, $\Delta H = -2800$ kJ/mol. (a) Is the process exothermic or endothermic? (b) Write the balanced chemical equation. (c) Which law is applied in calculating ΔH of reactions? (d) Why is enthalpy a state function?

Q30. Case II – Classification: Successive ionisation enthalpies of an element are given (in kJ/mol): $IE_1 = 738$, $IE_2 = 1450$, $IE_3 = 7730$, $IE_4 = 10500$. (a) Identify the group of element. (b) Justify your answer. (c) Name the element. (d) Write its electronic configuration.

Section E (5 × 3 = 15 Marks)

Q31. (a) State the postulates of Bohr's model of hydrogen atom. (b) Derive the expression for energy of electron in nth orbit.

Q32. (a) Explain sp^3 hybridisation in methane. (b) Compare structures of $BeCl_2$, BCl_3, and NH_3 on the basis of VSEPR theory.

Q33. (a) Explain the first law of thermodynamics with an example. (b) Calculate work done when a gas expands from 5 L to 10 L against constant pressure of 1 atm. (1 L·atm = 101.3 J)