

CHEMISTRY

CBSE Class XI | Vacation Assignment | Set 1

Time Allowed: 3 Hours	Maximum Marks: 70
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General Instructions

1. Attempt all questions. Show calculations clearly and include units.
2. Use appropriate significant figures in numerical answers.
3. Atomic masses may be taken from the periodic table unless specified.

Section A — Objective / Very Short Answer (16 marks)

Q1–Q8. Choose the correct answer. ($8 \times 1 = 8$)

1. The number of significant figures in 0.00450 is: (a) 2 (b) 3 (c) 4 (d) 5
2. One mole contains approximately: (a) 6.022×10^{23} entities (b) 3.011×10^{23} entities (c) 1.66×10^{23} entities (d) 22.4 entities
3. The maximum number of electrons in the $n = 3$ shell is: (a) 8 (b) 18 (c) 32 (d) 9
4. Across a period, atomic radius generally: (a) increases (b) decreases (c) remains constant (d) doubles
5. The bond in NaCl is primarily: (a) covalent (b) metallic (c) ionic (d) hydrogen
6. The oxidation number of oxygen in most compounds is: (a) +2 (b) –2 (c) –1 (d) 0
7. For an exothermic reaction, ΔH is: (a) positive (b) negative (c) zero always (d) undefined
8. The hybridisation of carbon in CH_4 is: (a) sp (b) sp^2 (c) sp^3 (d) dsp^2

Q9–Q12. Answer briefly. ($4 \times 2 = 8$)

9. Define empirical formula and molecular formula.
10. State Heisenberg's uncertainty principle.
11. What is electronegativity? How does it generally vary across a period?
12. Define a buffer solution and give one example.

Section B — Short Answer (18 marks)

- Q13. Calculate the number of moles in 11 g of CO_2 . (Molar mass = 44 g mol^{-1}). (3)
- Q14. Write the electronic configurations of Na ($Z = 11$) and Cl ($Z = 17$), and identify their valence electrons. (3)
- Q15. Explain the difference between ionic and covalent bonding with one example of each. (3)
- Q16. Balance the equation in acidic medium: $\text{MnO}_4^- + \text{Fe}^{2+} \rightarrow \text{Mn}^{2+} + \text{Fe}^{3+}$. (3)
- Q17. Explain the significance of the four quantum numbers. (3)
- Q18. Define enthalpy of formation and Hess's law. (3)

Section C — Long Answer / Numerical (24 marks)

- Q19. A compound contains 40.0% carbon, 6.7% hydrogen and 53.3% oxygen by mass. Determine its empirical formula. (4)
- Q20. Explain the trends in ionisation enthalpy across a period and down a group. Mention two factors affecting it. (4)
- Q21. Draw Lewis structures for CO_2 , NH_3 and H_2O . Predict their shapes using VSEPR theory. (4)
- Q22. For a reaction, $\Delta H = -92 \text{ kJ mol}^{-1}$. Explain the meaning of the sign and distinguish exothermic from endothermic reactions with energy-profile sketches. (4)

Q23. Explain the inductive effect and resonance effect with suitable organic examples. (4)

Q24. A gaseous mixture contains 2 mol N_2 and 3 mol H_2 in a 10 L vessel at 300 K. Calculate total pressure using $PV = nRT$. Take $R = 0.0821 \text{ L atm mol}^{-1} \text{ K}^{-1}$. (4)

Section D — Application / Case-based (12 marks)

Q25. A student dissolves 5.85 g NaCl in water and makes the volume up to 500 mL. (a) Calculate moles of NaCl. (2)
(b) Calculate molarity. (2)

Q26. Elements X and Y have atomic numbers 12 and 17. (a) Write their electronic configurations. (2) (b) Predict the formula and type of compound formed. (2)

Q27. In a reaction vessel, increasing temperature increases the rate of reaction. (a) Explain this using collision theory. (2) (b) Why does a catalyst increase rate without being consumed overall? (2)