

PART-II

- NOTE:** (i) Part-II is to be attempted on the separate Answer Book.
 (ii) Attempt **ONLY FOUR** questions from **PART-II** by selecting **TWO** questions from **EACH SECTION**. **ALL** questions carry **EQUAL** marks.
 (iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.
 (iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
 (v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
 (vi) Extra attempt of any question or any part of the question will not be considered.
 (vii) **Use of Calculator is allowed.**

- Q. 2. (a) What is the de Broglie hypothesis and how was this proved experimentally? (10)
 Explain in detail.
 (b) How do you compare the Gibb's and Helmholtz free energies? (05)
 (c) Explain occurrence and oxidation states of Lanthanides. (05) (20)
- Q. 3. (a) Explain in detail the Nernst equation. (10)
 (b) Justify that half life period of third order reaction is inversely proportional to square of the initial concentration of reactants. (05)
 (c) What are Eigen function and Eigen values? Explain with examples. (05) (20)
- Q. 4. (a) Discuss in detail the Hess's law with the help of suitable examples. (10)
 (b) Discuss the Hamiltonian operator in detail. (05)
 (c) Explain the phase diagram by applying the Gibb's phase rule for a two component system with the help of a suitable example. (05) (20)
- Q. 5. (a) Derive the equation for rate constant of a third order reaction with same initial concentrations. Give its half life and examples as well. (10)
 (b) What is solvent extraction? Discuss its theory and uses for the extraction of metals. (05)
 (c) What is theory of buffer solutions? Explain. (05) (20)
- Q. 6. (a) Explain the kinetics of the enzymes catalysis (10)
 (b) Give postulates of Werner's theory of co-ordination compounds. How does it justify the formulae of $\text{CoCl}_3 \cdot 6\text{NH}_3$, $\text{CoCl}_3 \cdot 5\text{NH}_3$, $\text{CoCl}_3 \cdot 4\text{NH}_3$, and $\text{CoCl}_3 \cdot 3\text{NH}_3$? (05)
 (c) How the electrochemical series will help us, that whether a particular metal will react with an acid or not? (05) (20)
- Q. 7. (a) Discuss in detail the soft and hard acid and base (SHAB) concept with suitable examples. (10)
 (b) Derive relationship between equilibrium constant and Gibb's free energy. (05)
 (c) What are different statistical tests in chemical analysis? Explain. (05) (20)
- Q. 8. (a) Discuss the nomenclature and structure of coordination complexes with coordination number 2-10. (10)
 (b) How do you calculate the degree of dissociation (α) of a weak electrolyte by Kohlrausch law? (05)
 (c) The hydrolysis of $\text{CH}_3\text{COO}^-\text{C}_2\text{H}_5$ with NaOH is a second order reaction. How do you follow the progress of this reaction in the laboratory? (05) (20)
