2023
B.A./B.Sc.
Fifth Semester
CORE – 12
CHEMISTRY
Course Code: CHC 5.21
(Physical Chemistry - V)

Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) Discuss the main points of Arrhenius theory of dissociation for strong electrolytes. 3
   (b) Explain in detail the principle of conductometric titration for determination of solubility and solubility products of sparingly soluble salts. 4
   (c) Briefly explain the term electrophoretic effect and relaxation effect 4
   (d) Write a note on liquid junction potential. 3

2. (a) Define concentration cells. Explain the concentration cells with transference. 5
   (b) What is Walden's rule? Establish the relation between ionic mobility, viscosity, and radius of an ions. 5
   (c) Write notes on the following: 2×2=4
      (i) Debye-Falkenhagen effect
      (ii) Wien effect

UNIT–II

3. (a) Discuss the application of EMF measurement for determination of free energy, enthalpy, and entropy of a cell reaction. 6
   (b) Explain the Stern model for electrical double layer. 4
   (c) Illustrate the working of metal-metal ion electrodes. 4

4. (a) Describe how to measure the pH value by quinhydrone method. 6
   (b) State the principle of potentiometric titration and discuss its application for acid-base titration. 5
   (c) Briefly explain electro-catalysis process. 3

UNIT–III

5. (a) Explain the setting up of Schrödinger equation for many electron system. 6
   (b) Explain the application of valence bond theory to the study of H_2 molecule in terms of exchange of electrons and screening effect of electrons. 5
   (c) Write short notes on the physical picture of bonding wave function. 3
6. (a) Derive the wave functions for the treatment of LCAO-MO to H_2^+ ions. 7
   (b) State the variation theorem and discuss how it can be applied for simple system. 5
   (c) Write short notes on the need of approximation technique. 2

UNIT–IV

7. (a) Describe pure rotational Raman spectra of a diatomic molecules. 6
   (b) Discuss the principle and application of ESR spectroscopy. 6
   (c) What are Stokes and anti-Stokes lines? 2
8. (a) State and illustrate with suitable potential energy cures the Franck-Condon principle. 6
   (b) Explain the principle of NMR. State some of its applications in chemistry. 5
   (c) What are fluorescence and phosphorescence? 3

UNIT–V

9. (a) State and explain Lambert-Beer law for light absorption by solutions. What is meant by molar conduction coefficients? 7
   (b) Derive the Stern-Volmer equation for quenching of fluorescence. 5
   (c) Write a note on chemiluminescence. 2

10. (a) Using photosynthesis of HCl as the example, explain the photochemical reaction in which the quantum yield is extremely high. 5

(b) Explain Jablonski diagram depicting the various types of photophysical processes. 5

(c) Distinguish between photo-sensitizers and photo-inhibitors. 4

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