



Code	Subject Title	Cr. Hrs	Semester
CHEM-203	Chemistry-IV (General Chemistry)	3	IV
Year	Discipline		
2	Botany, Zoology, Chemistry-I, II		

Quantum Mechanics and Atomic Structure:

Elementary treatment of Compton effect and photoelectric effect; Brief discussion of result of Bohr's Model and its defects; Somerfield's modification and evolution of azimuthal quantum number; Dual nature of matter; Verification of dual nature by Davisson and Germer's experiment; Detail of Heisenberg's uncertainty principle; Postulates of quantum mechanics; Brief introduction of operators; Derivation of time independent Schrodinger wave equation in terms of polar coordinates and derivation of principle quantum number; Energy equation for free motion of particle in one-dimensional box; Eigen values and Eigen functions; normalization of wave function; Probability functions; radial distribution, probability density functions.

Electrochemistry:

Electrolytic conduction and its measurement; Specific, equivalent and molar conductance, Determination of resistance; Cell content, conductance ratio, conduction of strong and weak electrolytes; Ionic motilities and their determination; Kohlrausch's law and its applications; Faraday's law (first and second) and their significance; Transport number; Hittort's rule; Determination of transference number by Hittort's method. Applications of conductance measurement; EMF of the chemical cells; Electrode potential and its measurement with reference to Weston standard, glass electrode, calomel electrode and quinhydrone electrode; Nerst equation; Thermodynamics of cells; Concentration of cells with liquid junction and without liquid junction.

Evaluation of Analytical Data and Essentials of Chemical Analysis:

Some fundamental concepts like mole, activity and activity co-efficient; Concepts of mean, median, accuracy, precision, significant figures; Various types of errors, their detection and elimination; Standard deviation; Relative standard deviation; Confidence limits; Rounding off the analytical data. Law of mass action and its applications; precipitation and solubility product; common ion effect; Co-precipitation, fractional precipitation, concept of pH, buffers, working of indicators.

Spectroscopy:

Electromagnetic radiation and its interaction with matter; Nature of different transitions possible in atoms and molecules; Electronic, vibrational, rotational and other possible transitions by absorption of radiation by molecules and atoms. Development of spectroscopic analytical techniques employing various transitions. Classification of spectroscopic techniques on the basis of type of radiation, phenomenon occurring and the nature of the matter. Basic introduction to atomic and molecular spectroscopic techniques including flame emission, spectrophotometry, UV, IR spectroscopy.

Chemistry of Carbonyl Compounds:

Preparation of aldehydes and ketones by pyrolysis of calcium salts of acids, acylation of alkenes and arenas, reduction of acid halides and nitriles. Physical properties of aldehydes and ketones; Structure and reactivity of carbonyl group; Comparison of the reactivity of aldehydes and ketones; Nucleophilic additions of water, alcohols, ammonia and its derivatives, hydrogen cyanide, bisulfite, reduction and oxidation reactions; Aldol condensation and related reaction; Cannizzaro's reaction; Wittig reaction; Oxidation reactions, Chemical tests of aldehydes and ketones.



Chemistry of Carboxylic Acids and Their Derivatives:

Physical properties of carboxylic acids; Effects of different parameters on the acid strengths of aliphatic and aromatic carboxylic acids. Chemical properties like salt formation nucleophilic acyl substitution, reduction of carboxylic acids, decarbonylation, Hunsdicker reaction, Kochi reaction, substitution at α -carbon. Preparations, properties and reactions of acids chlorides, acids anhydrides, amides, cyanides, and esters; Malonic and acetoacetic esters syntheses.

Recommended Books:

1. Adamson A. W. "Understanding Physical Chemistry" 3rd Ed. Benjamin Cummings publishing company Inc.
 2. Akhtar M.N. & Ghulam Nabi, "Textbook of Physical Chemistry" ilmi kutab khana, Lahore.
 3. Bhatti H.N. and K. Hussain, "Principles of Physical Chemistry"; Carwan Book House, Lahore.
 4. Shriver, D.F., P.W. Atkins and C.H. Langford, "Inorganic Chemistry"; Oxford, 2nd Ed. (1996).
 5. Snarp, A.G. "Inorganic Chemistry", Longman, 3rd Edition (1992).
 6. Rayner Canham, Gelof, "Descriptive Inorganic Chemistry" & Co. (1995).
 7. Daniel R. Paller, "Experimental Organic Chemistry, John Willey & Sons" Inc., 2009.
 8. James A. Moore, "Experimental methods in Organic Chemistry" Holt-Saunders Int. 1983.
 9. R.L. Shriner, R.C. Fuson, D.IV. Curtin and T.C. Morrill "The systematic Identification of organic compounds, 6th ed. John Willey & sons, 1979.
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