

MINOR COURSE

Paper Code: UCHEMIN11001

Paper Description: INTRODUCTORY CHEMISTRY

Paper Type: TH + PLB

Credits: Theory-03, Practical-01

Total Marks: 75 [Theory (ESE – 40); Practical (ESE – 20); CE – 10; Attendance – 05]

Theory: 45 Lectures [Each Lecture is one hour in duration]

INTRODUCTORY CHEMISTRY

UNIT I: Basics of Organic Chemistry

Organic Compounds: Classification and Nomenclature, Hybridization. Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation; Organic acids and bases: their relative strength. Huckel's rule of aromaticity.

Homolytic and Heterolytic fission; Electrophiles and Nucleophiles: Types, shape, and the relative stability of Carbocations, Carbanions, and Free radicals.

Introduction to types of organic reactions and their mechanism: Addition, Elimination (formation of alkenes and alkynes), and Substitution reactions. **(15 Lectures)**

UNIT II: Atomic Structure

Bohr's theory, its limitations, and the atomic spectrum of hydrogen atoms. Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle and its significance, Schrödinger's wave equation, the significance of ψ and ψ^2 . Quantum numbers and their significance.

Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations, Variation of orbital energy with atomic number. **(15 Lectures)**



UNIT III: Gaseous State

Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path and viscosity of gases, including their temperature and pressure dependence, the relation between mean free path and coefficient of viscosity. calculation of σ from η .

The behavior of real gases: Deviations from ideal behavior, compressibility factor, Z , and its variation with pressure for different gases. Causes of deviation from ideal behavior, Van der Waals equation of state, its derivation and application in explaining real gas behavior and calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, the relation between critical constants and van der Waals constants, and the law of corresponding states.

(15 Lectures)

Reference Books:

- Claiden, J.; Warren, S. & Greeves, N. *Organic Chemistry*, 2nd Ed., Oxford University Press, 2012.
- Carruthers, W. *Some Modern Methods of Organic Synthesis*, 4th Ed., Cambridge University Press, 2004.
- Loudon, M. *Organic Chemistry*, Oxford University Press, 2002.
- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Douglas, B.E. and McDaniel, D.H. *Concepts & Models of Inorganic Chemistry*, Oxford, 1970.
- Day, M.C. and Selbin, J. *Theoretical Inorganic Chemistry*, ACS Publications, 1962.
- Atkins, P. W. & Paula, J. de *Atkin's Physical Chemistry*, 10th Ed., Oxford University Press, 2014.
- Ball, D. W. *Physical Chemistry*, Thomson Press, India, 2007.
- Castellan, G. W. *Physical Chemistry*, 4th Ed., Narosa, 2004.



PRACTICAL

End Semester Examination (ESE):

At the end of the semester, a practical examination will be conducted as per the following guidelines:

Marks distribution

Experiment	15 marks
Practical record notebook	03 marks
Viva-voce	02 marks

Unit I

10 HOURS

1. Purification of organic compounds by crystallization using the following solvents:
(a) Water, (b) Alcohol
2. Determination of the melting points of organic compounds.

Reference Books:

- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry*, Pearson Education, 2009.
- Vogel, A. *Vogel's Textbook of Practical Organic Chemistry*, 5th Ed., Pearson India, 2003.

Unit II

20 HOURS

1. Qualitative analysis of **water-soluble** mixtures - **three ionic species** (two cations and one anion or one cation and two anions) out of the following:

Cations: Pb^{2+} , Cu^{2+} , Fe^{3+} , Ni^{2+} , Ba^{2+} , NH_4^+

Anions: SO_4^{2-} , NO_3^- , Cl^-

Cations are to be confirmed by special tests /spot tests wherever feasible

(Group analysis not to be performed)

Reference Books:

- Mendham, J., A. I. Vogel's *Quantitative Chemical Analysis*, 6th Ed., Pearson, 2009.
- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.

