UNIVERSITY OF MADRAS

B.Sc. DEGREE COURSE IN CHEMISTRY

SYLLABUS WITH EFFECT FROM 2020-2021

BCY-DSC04

CORE-IV: GENERAL CHEMISTRY – III

Learning Outcomes

1. To understand the general characteristics of Nitrogen and Oxygen families.
2. To know about the chemistry of Halogens and noble gases.
3. To learn the mechanism of Nucleophillic substitution and Elimination reactions.
4. To know about the reaction mechanisms of aromatic and heterocyclic compounds.
5. To understand the basic concepts of Thermodynamics and Thermochemistry.

SEMESTER	Subject Title	Total Hours	Credit
III	General Chemistry – III	75	4

UNIT-I: CHEMISTRY OF NITROGEN ANDOXYGENFAMILIES (15hrs)

1.1 Group VA elements: General characteristics of Group VA elements; chemistry of H_2N-NH_2, NH_2OH, HN_3 and HNO_3. Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$,P_2O_5 and oxyacids of phosphorous (H_3PO_3 and H_3PO_4).

1.2 Group VIA elements: General properties of group VIA elements - Structure and allotropy of elements-chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium - Oxyacids of sulphur (Caro's and Marshall'sacids).

UNITII: CHEMITRY OF HALOGENS AND NOBLEGASES (15hrs)

2.1 Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxyacids ($HClO_4$). Inter-halogen compounds (ICl, ClF_3, BrF_5 and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of Iodine.

2.2 Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases- clathrate compounds.

UNIT III: NUCLEOPHILIC SUBSTITUTION AND ELIMINATION REACTIONS (10hrs)

3.1 Nucleophilicsubstitution : S_N1, S_N2 and S_Ni reactions-mechanisms-stereochemistry - effect of solvent, structure of substrate, nucleophilicity of the reagent [nucleophile] and nature of the leaving group.

3.2 Elimination reactions: E1, E2 and E1CB reactions and mechanisms: Hofmann and Saytzeff rules. Elimination vs Substitution.

UNIT IV: BENZENE AND POLYNUCLEARAROMATICHYDROCARBONS **(15hrs)**

Aromaticity - conditions for aromaticity - resonance stabilization energy - Hückel rule with respect to benzene, naphthalene, anthracene andphenanthrene; Electrophilic substitution in benzene-general mechanism; nitration, sulphonation, halogenations, Friedel-Crafts alkylation and acylation. Orientation [directive influence] and reactivity in mono substituted benzenes. Polynuclear hydrocarbons-naphthalene, anthracene and phenanthrene-preparation, properties and uses.

UNIT V: THERMODYNAMICS-I **(20 hrs)**

5.1 Terminology of thermodynamics-Thermodynamic equilibrium-nature of work and heat-First law of Thermodynamics-statement-definition of Internal Energy (E), Enthalpy (H) and Heat capacity. Relation between Cp and Cv. Calculation of W, q, dE and dH for expansion of ideal and real gases under isothermal and adiabatic condition of reversible and irreversible processes. Joule- Thompson effect and Coefficient (μ_{JT})-Calculation of μ_{JT} for ideal and real gases - Inversion temperature.

5.2 Thermochemistry - Relation between enthalpy of reaction at constant volume (q_v) and at constant pressure (q_p) - Temperature dependence of heat of reaction - Kirchoff equation-Derivation and application-Enthalpy of formation and combustion - Bond energy and its calculation from thermochemicaldata.

Textbooks :

1. Puri B.R., Sharma L.R. and Pathania M.S., Principles of Physical Chemistry, 47th ed., New Delhi, Vishal Publishing Co.,2016.
2. Puri B.R., Sharma L.R. and Kalia K.C., Principles of Inorganic Chemistry, 33th ed., New Delhi, Milestone Publishers and Distributors,2016.
3. Soni P.L., and Chawla H.M., Textbook of Organic Chemistry, 29th ed., New Delhi, Sultan Chand & Sons, 2007.
4. Jain M K and Sharma S C, Modern Organic Chemistry, Vishal Publications,2018.

Reference Books

1. Lee J.D. Concise Inorganic Chemistry, 5th ed., Blackwell Science,2005.
2. Soni, P.L. and Mohan Katyal. Textbook of Inorganic Chemistry, 20th ed., Sultan Chand & Sons, 2006.
3. Glasstone Samuel. Textbook of Physical Chemistry, 2nd ed., Macmillan India Ltd.,1990.
4. Soni P.L., Dharmarha O.P. and Dash U.N Textbook of Physical Chemistry, 23rd ed., New Delhi, Sultan Chand & Sons,2011.
5. Graham Solomons T.W. Organic Chemistry, 3rd ed., John Wiley &Sons.
6. Morrison R.T. and Boyd R.N., Organic Chemistry, 6th ed., Pearson Education, Asia,2002.