



CLUSTER UNIVERSITY SRINAGAR

SYLLABUS (FYUP UNDER NEP 2020)

Offered By Department Of CHEMISTRY

Semester 2nd (Major Course)

Course Title: Chemistry-II

Course Code: UGCHM22J201

Credits: 4 (Theory: 3, Practical: 1)

Contact Hrs: 75 (Theory: 45, Practical: 30)

Max. Marks 100

Theory External: 60; Min Marks: 24

Theory Internal (Continuous Assessment): 15 Marks, Min Marks: 06

Practical Experimental Basis= 15, Min. Marks: 06

Practical Experimental (Continuous assessment) = 10, Min. Marks: 04

Course Objectives:

- To introduce students to basic concepts of periodic properties and chemistry of s-block elements.
- To understand the stereo chemical dispositions of hydrocarbons.
- To introduce and to understand concepts of thermodynamics.

Course Outcomes:

On completion of the course, the student should be able to:

- Understand the trends of periodic properties and chemistry of s-block elements.
- Predict stereo-chemical outcomes of organic compounds in general and hydrocarbons in particular.
- Define and describe the basic principles of thermodynamics.
- Relate and apply various thermodynamic laws to real systems.

Unit I: Periodic properties and s-Block Elements

(15 Hrs)

Effective nuclear charge and its calculation by Slater rules. Trends in periodic properties: Atomic Size, Ionic Size, Ionization Energy, Electron Affinity and Electronegativity. Scales of Electronegativity. Anomalous behavior and diagonal relationships (Lithium, Beryllium, Magnesium and Aluminum). Chemical Reactivity of s-block elements towards Water, Oxygen, Hydrogen, Nitrogen and Halogens. Chemical characteristics of the compounds of alkali and alkaline earth metals (Oxides and Hydroxides). Hydrides: Classification and general properties.

Unit II: Hydrocarbons-I

(15 Hrs)

Stereochemistry Stereoisomerism: Conformations of ethane, butane and cyclohexane (Newmann, Sawhorse and Fischer representations). Concept of chirality (upto two carbon atoms). Optical isomerism: enantiomers, diastereomers, meso compounds and racemization. Relative and absolute configuration: D/ L, threo / erythro and R/ S nomenclature (for upto 2 chiral carbon atoms) as per CIP rules.

Geometrical isomerism: *cis-trans* and *E/Z* Nomenclature.

Alkanes: Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, Grignard reagent. Reactions: Free radical substitution- Halogenation.

UNIT III: Thermodynamics-I

(15 Hrs)

Introduction: System, surroundings, intensive and extensive properties, types of systems; thermodynamic processes, state and path functions. Exact and inexact differentials.

First law of thermodynamics: Concept of heat, work, internal energy, statement of first law, calculations of work and internal energy for reversible, irreversible and free expansion of gases (ideal and nonideal) under isothermal and adiabatic conditions. Joule Thomson coefficient and inversion temperature.

Exothermic and endothermic reactions, Heats of reactions, standard states, relation between heat of reaction at constant volume (q_v) and at constant pressure (q_p), Heat capacity, relation between C_p and C_v , laws of thermochemistry, enthalpy of formation, heat of solution and dilution, heat of neutralization, bond dissociation energy, bond energy and its calculation, concept of lattice energy, effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions.

UNIT-IV: PRACTICALS (Lab Work)

(30 Hrs)

1. Determination of acetic acid concentrations in commercial vinegar using NaOH.
2. Determination of ferrous ions by dichromate method.
3. Tests for unsaturation
4. Identification of functional groups containing oxygen- alcohols, phenols, carbonyl compounds and carboxylic acids.
5. Identification of functional groups containing nitrogen- amines, amides, nitro compounds.
6. Determination of heat capacity of calorimeter for different volumes.
7. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
8. Field trip.

Books Recommended:

1. Concise Inorganic Chemistry; J.D. Lee; 5thEdn., OUP/Wiley India Pvt. Limited, 2008.
2. Principles of Inorganic Chemistry; B.R. Puri, L.R. Sharma and K.C. Kalia; 33rdEdn., Milestone Publishers & Distributors/ Vishal Publishing Co., 2017
3. Advanced General Organic Chemistry: A Modern Approach; S.K. Ghosh; 3rd Revised Edn., New Central, 2010.
4. Organic Chemistry; R.T. Morrison, R.N. Boyd, S. K. Bhattacharjee; 7th Edn., Pearson India, 2011.
5. Advanced Organic Chemistry; Dr. Jagdamba Singh and LDS Yadav; Pragati edition, 2017.
6. Principles of Physical Chemistry; B.R. Puri, L.R. Sharma and L.S. Pathania; 47th Edn., Vishal Pubs & Co, 2017.
7. An Introduction to Chemical Thermodynamics by R P Rastogi and R R Mishra; Vishal Pubs
8. Vogel's; text book of Quantitative Inorganic Analysis (revised); Bassett, J.; Denney, R.C.; Jeffery, G. H and Mendham, J.; 6th ed.; ELBS; 2007.
9. Comprehensive Practical Organic Chemistry: Qualitative analysis Ahluwalia, V.K. & Sunita Dhingra; Universities Press, India, 2004.
10. Advanced Practical Organic Chemistry; N. K. Vishnoi; 3rdEdn; Vikas Publishing, 2009.
11. Advanced Practical Physical Chemistry; J.B. Yadav; Krishna Prakashan Media (P)Limited, 2015.
12. Experiments in Physical Chemistry; Das, R. C, and Behra, B.; Tata McGraw Hill.
13. Stereochemistry of Organic Compounds 2nd Ed., D. Nasipuri. (New Age Inter.- 2008)
14. Stereochemistry of Organic Compounds 7th Ed. - P.S. Kalsi. (New Age Inter.- 2012).