GENERAL CHEMISTRY – I

Semester	Subject Code	Category	Lecture hours		Theory hours		Practical hours		Credits
			Per week	Per sem.	Per week	Per sem.	Per week	Per sem.	
II	21CCH2A	Core-II	5	75	5	75	-	-	5

COURSE OBJECTIVES:

- To gain knowledge on preparation, properties and reactions various hydrocarbons.
- To learn the theory behind the volumetric analysis.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To learn about the chemistry of alkanes and alkenes	K2
CO2	To learn about the chemistry of alkynes and cycloalkanes	K2
CO3	To understand various types of chemical bonding	K3
CO4	To gain knowledge about s-block elements, compounds and its complexes	K3
CO5	To learn about thermochemistry and the behavior of ideal gases and can solve the problems regarding molecular velocities.	K3

*CO – course Outcomes

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	M	S
CO2	S	M	M	M	M	S
CO3	S	M	M	S	S	S
CO4	S	M	M	M	M	S
CO5	S	M	M	S	S	S

(S-Strong; M-Medium; L-Low)

UNIT – I: Alkanes and alkenes **15 Hours**

1.1 Alkanes – Methods of preparation of alkanes – Wurtz method, Sabatier-Senderens reduction, Kolbe's electrolytic method and reduction of alkyl halides – physical properties and chemical properties of alkanes – isomerisation, aromatization, oxidation with $KMnO_4$ – cracking – chlorination – mechanism of free radical substitution reaction.

1.2 Alkenes: Preparation from alcohol, haloalkane, dihaloalkanes and alkynes – reactions of alkenes – mechanisms involved in addition of hydrogen, halogen, hydrogen halide, hypohalous acid, water, hydroboration, hydroxylation, ozonolysis, isomerisation and epoxidation – Markonikkof's rule – peroxide effect – allylic substitution by NBS, oxidation by $KMnO_4$ and polymerization – Dienes – classification-conjugated, isolated and cumulated dienes – stability of dienes – synthesis of dienes -- 1,3- butadiene, isoprene and chloroprene – reactions – 1,2 and 1,4 – addition reactions of H_2 and HX, polymerization and Diels-Alder reaction.

UNIT–II: Alkynes and Cycloalkanes **15 Hours**

2.1 Akynes: preparation – reactions – addition of hydrogen, halogen, hydrogen halide, water, HCN, CH_3COOH, hydroboration, alcohols and carboxylic acids, polymerization, ozonolysis, oxidation with chromic acid and alkaline $KMnO_4$ – acidity of terminal alkynes – formation of acetylides.

2.2 Cycloalkanes: Preparation – Wurtz reaction, Dieckmann's condensation and reduction of aromatic hydrocarbons – reactions – cycloaddition, dehalogenation, pyrolysis of calcium salt of dicarboxylic acid – substitution and ring opening reactions – stability of alkanes, alkenes and cycloalkanes – Baeyer's strain theory – theory of strainless rings.

UNIT - III: Chemical bonding **15 Hours**

3.1 Chemical bond – definition – types (ionic, covalent and metallic) – definition - Ionic bond – characteristic of ionic bond – formation of sodium chloride ,calcium oxide and magnesium chloride molecules – factors favoring the ionic compounds – ionization potential – electron affinity – electronegativity – Lattice energy – Born-Haber Cycle – Pauling and Mulliken's scales of electronegativity – Polarizing power and Polarizability – Partial ionic character from electronegativity –Transition from ionic to covalent character and vice versa – Covalent character of ionic compounds – Fajan's rules – Covalent bond.

3.2 Hydrogen bonding – Its nature, types and effect on properties – Intermolecular forces – London forces and Van der Waals forces – ion-dipole-dipole interactions – VSEPR Theory – Principles and hybridization- Shapes of simple inorganic molecules ($BeCl_2$, BF_3, $SiCl_4$, PCl_5, SF_6, H_2O, NH_3) – MO Theory –Bonding and anti-bonding orbitals – Applications of MO theory - H_2, He, N_2, O_2, HF and CO molecules – bond order.

UNIT – IV: s - block elements **15 Hours**

4.1 Position of hydrogen in the periodic table – General characteristics of s- block elements – Compounds of s-block metals – oxides, hydroxides, peroxides, superoxide - preparation and properties – oxo salts – carbonates – bicarbonates – nitrates – halides - Anomalous behavior of Lithium and beryllium.

4.2 Extraction of beryllium – physical and chemical properties of beryllium – Uses – Extraction of Magnesium – physical and chemical properties – Uses - Complexes of s-block metals – complexes with crown ethers – Organometallic compounds of Lithium and Beryllium.

Unit – V: Thermochemistry and Gaseous State **15 Hours**

5.1 Thermochemistry: Heat of reaction – exothermic and endothermic reactions –calculation of ΔH from ΔE and vice versa – Thermochemical equations – bond dissociation energy – calculation from thermochemical data – variation of heat of a reaction with temperature – Kirchoff's equation and its significance.

5.2 Gaseous state – Kinetic gas equation – derivation – Gas laws from the kinetic gas equation – Different kinds of velocities – mean, rms and most probable velocities – Calculation of molecular velocities – Maxwell's distribution of molecular velocities (no derivation) – equipartition of energy – Real gases – Virial equation of state – Boyle temperature (No derivation) – Joule's law – Joule-Thomson effect – Joule-Thomson coefficient and its derivation – inversion temperature and its significance (No derivation).

TEXT BOOKS

S. No.	Authors	Title	Publishers	Year of publication
1.	P. L. Soni	Text Book of Organic Chemistry	Sultan Chand	1986
2.	K. S. Tewari, N. K. Vishnoi, and S. N. Mehrotra	A Text Book of Organic Chemistry	Vikas Publishing	2011

			House, 3rd edition	
3.	B. R. Puri, Sharma and Madan and S. Pathanaia	Principles of Physical chemistry	Vishnoi Publicating Co.,	2013

REFERENCE BOOKS

S. No.	Authors	Title	Publishers	Year of publication
1.	B. R. Puri, L. R. Sharma and K. C. Kallia	Principles of Inorganic chemistry	Milestone Publications	2013
2.	W. U. Malik, G. D. Tuli and R. D. Madan	Selected topics in Inorganic chemistry	S. Chand Publications	2008
4.	Bahl and Arun Bahl	Advanced Organic Chemistry	S. Chand and company Ltd	2010
5.	M. K. Jain and S. C. Sharma	Modern Organic chemistry	Vishnoi Publications	2017
6.	R. T. Morrison and R. N. Boyd	Organic Chemistry	Prentice- Hall of India	2008
7.	P. L. Soni	Text Book of Physical Chemistry	Sultan Chand and Sons	1992
8.	R. D. Madan	Modern Inorganic Chemistry	S. Chand Publications, Reprint	2014

TEACHING METHODOLOGY:

- Power Point Presentations
- Assignments
- Animated videos
- Chalk and Board