

UNIVERSITY OF NORTH BENGAL



Accredited by NAAC with grade A

Raja Rammohunpur, Dist: Darjeeling, Pin: 734013.

CHOICE BASED CREDIT SYSTEM

B.Sc. Program Course with CHEMISTRY

Truncated Syllabus

(First Semester)

B.Sc. Program Course in CHEMISTRY

SCHEME for B.Sc. Program Course 1st SEMESTER

Year	Semester	DISCIPLINE SPECIFIC COURSE
1 st	1 st	DSC-I Paper-I Section-A: Inorganic Chemistry Section-B: Organic Chemistry

SEMESTER I

DISCIPLINE SPECIFIC CORE COURSE

DISCIPLINE SPECIFIC CORE COURSE [DSC -I, Paper -1]

Chemistry (Credit: 06 each)

THEORY

DSC-1: PAPER-I ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS (Credits: Theory-04, Practicals-02)

Section A: Inorganic Chemistry-1

Atomic Structure:

Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it.

Significance of Quantum numbers.

(7 Lectures)

Chemical Bonding and Molecular Structure:

Ionic Bonding:

General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent Bonding:

VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds.

MO Approach: MO treatment of Homonuclear molecules

(8 Lectures)

Section B: Organic Chemistry-1

Fundamentals of Organic Chemistry:

Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.

Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles.

Reactive Intermediates: Carbocations, Carbanions and free radicals.

(4 Lectures)

Stereochemistry:

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis - trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

(7 Lectures)

Aliphatic Hydrocarbons:

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent.

Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule). Addition of HX (Markownikoff's and anti-Markownikoff's addition).

(4 lectures)

Reference Books:

- Lee, J.D. Concise Inorganic Chemistry ELBS, 1991
 - Cotton, F.A., Wilkinson, G & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
 - Douglas, B.E., McDaniel, D.H & Alexander, J.J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
 - Huheey, J.E., Keiter, E.A., Keiter, R.L & Medhi, O.K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
 - Graham Solomon, T.W., Fryhle, C.B & Snyder, S.A. Organic Chemistry, John Wiley & Sons (2014). McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
 - Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
 - Eliel, E.L. Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000
 - Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
 - Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
 - Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
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DSC LAB: DSC -I PAPER -I

ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS

[A theoretical background is required for the following experiments]

Section A: Inorganic Chemistry - Volumetric Analysis (ANY ONE)

1. Estimation of oxalic acid by titrating it with KMnO_4 .
2. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .

Section B: Organic Chemistry (ANY ONE)

1. Detection of extra elements (N, S, Cl, Br) in organic compounds (containing upto two extra elements)
2. Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given)

Reference Books:

- Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012
 - Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009
 - Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J & Smith, P.W.G.,
 - Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
 - Mann, F.G & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.
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