

REDUCED SYLLABUS FOR 6TH SEMESTER HONOURS

Subject: Chemistry

Paper - H7

Marks: 100 (80+20)

Time: 3 hours

Physical Chemistry

(Marks: 40)

60 Lectures

Unit-1:

(Marks: 20)

30 Lectures

A. ELECTROCHEMISTRY-II

(8 Lectures)

Electromotive force: Measurement of e.m.f., Weston-Cadmium cell, types of reversible electrodes, e.m.f. of reversible cells, Nernst equation, single electrode potentials, sign convention of e.m.f. a cell. reference electrode - Hydrogen electrode, calomel electrode, quinhydrone electrodes, standard electrode potential, electrochemical series, setting up of simple cells, cell reaction, elementary ideas of polarization and over voltage- Tafel equation (no derivation), successive anodic and cathodic processes. Concentration cells: Cell without transference.

B. SURFACE PROPERTIES

(8 Lectures)

Colloids: Definition, classification, preparation and purification of colloids, properties of colloids - physical, mechanical (Brownian motion), optical (Tyndal effect), electrical (Zeta potential) properties, stability and protective action of colloids - Gold number; Hurdy - Schulze rule, coagulation, peptisation, salting out, mechanism of functioning of soap and detergents, micelle formation; critical micelles concentration (CMC), emulsions.

C. MACROMOLECULES:

(8 Lectures)

Definition, types of macromolecules, degree of polymerization, molar mass, number-average and weight-average molar mass distribution of molar mass, determination of molar mass by osmometry; ultra-centrifuge. Types of polymerization reactions -- mechanism - kinetics of polymerization reactions; initiators-types functions. Conformation and configuration of macromolecules in solution. Crystallinity of macromolecules-factors influencing crystallinity. Properties of macromolecules, their uses.

D. PHOTOCHEMISTRY:

(6 Lectures)

Interaction of radiation with matter, difference between dark (thermal) and photochemical reactions: elementary ideas of phosphorescence, fluorescence, luminescence; laws of photochemistry - Grothus - Draper law, Stark - Einstein law, Lambert's law, Beer's law, Lambert - Beer's law, quantum yield and quantum efficiency.

UNIT -II
(30 Lectures)

(20 Marks)

A. ATOMIC & MOLECULAR SPECTRA: (10 Lectures)

Electromagnetic radiation: Interaction of matter with electromagnetic radiation, different forms of energy viz, translational, electronic, vibrational, rotational energy in molecules, Born - Oppenheimer Approximation, types of spectra - absorption and emission spectra, atomic or line spectra and molecular or band spectra.

Rotational Spectra: diatomic molecules, energy levels of a rigid rotor, selection rules.

Vibrational Spectra: Hook's law, expression for vibrational energy in terms of quantum number, anharmonicity, fundamental modes of vibration, overtones, Morse curves force constant, selection rules, bond energy, bond distance, isotope effect, vibrational frequency of different functional groups.

B. QUANTUM MECHANICS: (10 Lectures)

Elementary Quantum Mechanics: Black body radiation, Photo-electric effect, Bohr model of hydrogen atom (no derivation) and its defects, Compton effect, de Broglie hypothesis, Heisenberg Uncertainty Principle, operators and observable, Hamiltonian operator; Schrodinger wave equation and its importance; interpretation of wave function.

C. STATISTICAL THERMODYNAMICS: (10 Lectures)

Limitation of classical thermodynamics, brief resume of the concept of distribution of energy; thermodynamic probability and entropy; Boltzmann distribution law (with derivation. Preliminaries of Maxwell-Boltzmann statistics, Bose-Einstein Statistics and Fermi- Dirac statistics.

Industrial And Green Chemistry

(Marks:40)

60 Lectures

UNIT:III

INDUSTRIAL CHEMISTRY

Marks: 20

30 Lectures

INDUSTRIAL CHEMISTRY: INORGANIC BASED:

Marks: 10

(15 Lectures)

Water : Modern methods of water treatment and purification.

Fertilisers : Different types of N and P fertilizers, manufacture of ammonia.

Glass : Various types of glass fibers, optical glass, glass ceramics,

Cement: Various types of cement, their composition.

Paints: Constituents of different paints, Role of binder and solvent, Lead and Zinc containing paints.

Paints of common use

Metals and Alloys: General procedure of extraction of metals. Manufacture of steel and stainless steel. Galvanization.

INDUSTRIAL CHEMISTRY: ORGANIC BASED

(Marks 10)

(15 Lectures)

Coal: Fisher-Tropsch process. Chemicals from coal.

Petroleum : Manufacture and industrial reactions of ethane, propane, butadiene. Knocking and octane number. Synthetic petrol, LPG and CNG. Biodiesel.

Oils, Fats and Detergents : Catalytic hydrogenation of vegetable oil and fat for production of soap, synthesis of detergents.

Polymers: Synthetic rubber (including principle of cross-linking and vulcanization),

Enzymes in industries : Production of alcohol by fermentation of starch and sugar (reaction conditions, nature of enzymes used, structural transformation during reaction).

UNIT:IV

GREEN CHEMISTRY

Marks: 20

(30 Lectures)

Definition, Principles of green chemistry; Green synthesis (cycloaddition, benzyl-benzilic acid rearrangement reaction, thiamine catalyzed benzoin condensation, bromination of acetanilide), reaction conditions, solvent free reaction (ammonium formate mediated Knoevenagel reaction), sonochemical reaction (Ulman coupling), Use of green reagents (tetrabutyl ammonium tribromide), green catalysts, and green solvents.

Subject: Chemistry (Practical)
Paper - H8,
Marks:100 (80+20)

A. PHYSICAL CHEMISTRY PRACTICAL (50 Marks);

Time: 6 hours

Internal Assessment :10 Marks

Experiment:30 Marks

Laboratory Note Books:05 Marks

Viva-voce :05 Marks

List of experiments to be performed:

1. Determination of the concentration of a supplied solution by surface tension method using stalagmometer.
2. Determination of the concentration of a supplied solution by viscosity method using Ostwald viscometer
3. Determination of concentration of mixed acid by standard 0.1(N) NaOH conductometrically.
4. Verification of Beer's law and determination of concentration of supplied dichromate solution.
5. Determination of the rate constant of acid catalyzed hydrolysis of ethyl acetate ester at room temperature.
6. Determination of concentration of supplied BaCl₂ by standard Na₂SO₄/K₂SO₄ conductometrically.

B. INDUSTRIAL AND GREEN CHEMISTRY PRACTICAL

(50 Marks) Time: 6 hours

Internal Assessment :10 Marks

Experiment:30 Marks

Laboratory Note Books:05 Marks

Viva-voce :05 Marks

Industrial Chemistry Practicals:

Marks:20

List of experiments to be performed:

1. Base catalyzed aldol condensation (Synthesis of dibenzalpropanone).
2. Separation of reactions products by Column chromatography.

Green Chemistry Practicals:

Marks:20

List of experiments to be performed:

1. Preparation of Manganese(III) acetylacetonate by using KMnO₄ and acetylacetone.
2. Preparation of Iron(III) acetylacetonate by using FeCl₃, KOH and acetylacetone.

RECOMMENDED BOOKS

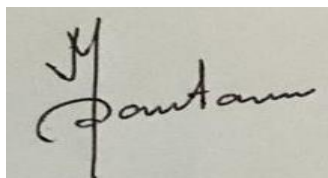
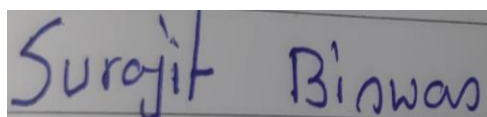
Organic Chemistry(Honours):

1. Organic Chemistry - I.L. Finar, Vol. I, 6th Edn. ELBS
2. Advanced Organic Chemistry - J. March
3. A guide to Organic Reaction Mechanism - P. Sykes, Orient Longman.
4. Organic Chemistry - R.T. Morrison & R.N. Boyd, Prentice-Hall.
5. Fundamentals of Organic Chemistry - Solomon
6. Organic Chemistry - Wade (Jr)
7. Stereochemistry of Carbon Compounds - E. Eliel.
8. Stereochemistry of Carbon Compounds - D. Nasipuri, John Wiley
9. Organic Spectroscopy - Y.R. Sharma
10. Organic Spectroscopy - W. Kemp
11. Organic Spectroscopy - P.S. Kalshi
12. Organic Reaction Mechanism - P.S. Kalsi

13. Organic Reaction mechanism - R.K. Bansal
14. Advanced Organic Chemistry - N.K. Visnoi
15. Advanced Practical Chemistry - R. Mukhopadhyaya & P. Chatterjee.
16. Advanced Organic Chemistry - Miller
17. Organic Chemistry – Loudon

Inorganic Chemistry(Honours):

1. Basic Inorganic Chemistry - F.A. Cotton & G. Wilkinson & Gous
2. New concise Inorganic Chemistry - J.D. Lee
3. Inorganic Chemistry - Huheey, Keitar & Medhi
4. Selected topics in inorganic chemistry -- Mallick, Tuli, Madan
5. Inorganic Chemistry - Sharpe
6. Inorganic Chemistry - W.W. Porterfield
7. Introduction to Modern Inorganic Chemistry - Mackay & Mackay
8. Elements of Bioinorganic Chemistry - G.N. Nukherjee & A. Das
9. Fundamental Concepts of Inorganic Chemistry-A.K. Das

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B.Sc. Pass, Semester - VI
Subject - Chemistry
Paper - Project
Full Marks: 100

In the final semester (vi), students have to carry out their project work under the guidance of a faculty member. The area of the work is to be decided by the faculty member. Upon completion of the project work students have to submit the work in the form of a dissertation followed by oral presentation.

RECOMMENDED BOOKS

Organic Chemistry(Pass):

1. Organic Chemistry - I.L. Finar, Vol. I, 6th Edn. ELBS
2. Advanced Organic Chemistry - B.S. Bahl & A. Bahl, S. Chand
4. Organic Chemistry - R.T. Morison & R.N. Boyed, Prentice-Hall.
5. Stereochemistry of Carbon Compounds - D. Nashipuri, John Wiley
6. Basic Stereochemistry of Organic Molecules - Subrata Sengupta, Book Syndicate
7. Advanced Organic Chemistry - N.K. Visnoi
8. Jaiba Rasayan - Subrata Sengupta, Book Syndicate.

Inorganic Chemistry (Pass):

1. Inorganic Chemistry Vol. I & II - R.L. Datta
2. Advanced Inorganic Chemistry Vol. I & II - Prakash, Tuli, Basu and Madan, S. Chand
3. Fundamental concepts of Inorganic Chemistry - A.K. Das
4. General and Inorganic Chemistry - R. P. Sarkar, Central...
5. General and inorganic chemistry - S.N. Podder & S.P. Ghosh

Physical Chemistry(Pass):

1. Bhouta Rasayan - N.N.Kundu, Vol. I & II
2. Essentials of Physical Chemistry - Bahl & Tuli, S. Chand
3. Bhouta Rasayan - P.C. Rakshit & P.R. Gupta, Sarat Book House.
4. Elementary Physical Chemistry - S.R. Palit, Syndicate Pvt. Ltd.

Practical Chemistry(Pass):

1. A Manual of Practical Chemistry (Vol. I & II) - R.C. Bhattacharjee
2. University hand book of undergraduate chemistry experiments - G.N. Mukherjee, University of Calcutta
3. College practical chemistry - Ahluwalia, Dingra & Gulati.
4. Bebaharic Rasayan, Podder & Ghosh

Some Important Text Books

Inorganic Chemistry

- 1) Advanced Inorganic Chemistry - Satyaprakash, Basu, Tuli
- 2) Inorganic Chemistry - Puri, Sharma and Kalia
- 3) Inorganic Chemistry - J.D. Lee

Ref. Books:

- 1) General and Inorganic Chemistry (Part-I & II) R. Sarkar
- 2) Basic Inorganic chemistry - Cotton and Wilkinson
- 3) Inorganic Chemistry – Huhey

