

SEMESTER - VI

Core Chemistry Paper X

PHYSICAL METHODS & CHEMICAL STRUCTURE

Instructional Hrs : 75

Sub. Code : 15CHUC610

Max. Marks : CIA-25; ESE-75

Credits : 4

Objective: To appreciate the importance of internal structure of molecules and its impact on other properties. To utilize the variation in various properties to study the internal structure. To gain the knowledge of techniques used for structure determination.

UNIT I

12 Hrs.

Magnetic Properties Of Molecules: Meaning Of The Terms Magnetic Susceptibility - Magnetic Moment - Diamagnetism - Para Magnetism – Ferromagnetism - *Determination Of Magnetic Susceptibility By Guoy's Method* –Application Of Magnetic Properties In Solving Structural Problems Involving Simple Ions And Co ordination compounds.

UNIT II

12 Hrs.

Electrical Properties Of Molecules: Molar Polarization - Orientation Polarization And Distortion Polarization. **Polar And Non-Polar Molecules:** Determination Of Dipole Moments Of Polar Gases - Liquids – Solids - *Applications Of Dipole Moment In The Study Of Simple Molecules.*

UNIT III

12 Hrs.

Spectroscopy: Absorption Spectra – Fundamental Concepts - Electromagnetic Spectrum - The Various Regions Of The Spectrum And The Relative Energies Of The Radiation In Each Region - Types Of Changes Induced By The Interaction Of Radiation With Matter - Theory Of Rotation Spectra - Molecular Rotation - Diatomic Molecule As Rigid Rotor - Intensities Of Spectral Lines - Applications Of Rotation Spectra – Bond Length - *Isotopic Substitution.*

UNIT IV

12 Hrs.

IR Spectra : Theory - Simple Harmonic Oscillator Model-Information On Molecular Constitution From IR Spectra – Applications Of IR Spectra. **Raman Spectra:** *Theory - Comparision Of IR And Raman Spectra.*

UNIT V

12 Hrs.

UV And Visible Spectra: Theory – Franck - Condon Principle – Predissociation -Determination Of Dissociation Energies Using Bridge - Spooner Method - *Applications Of UV Spectra To Simple Molecules*. **NMR Spectra :** Basic Principles - Chemical Shift - NMR Spectra Of Simple Molecules. (High Resolution Details Not Expected). **ESR Spectra:** Basic Principles - 'G' Factor Lande's Splitting Factor – ESR Spectrum Of Free Radicals H., CH₃.

Note : *Italics* denotes Topics for Self Study

TEXT BOOKS

1. **Kheterpal S.C.**, *Physical Chemistry Vol. I & II*, Pradeep Publications, Jalandhar , 2nd Edition, 2004.
2. **Puri B.R., Sharma L.R., Pathania M.S.**, *Principles Of Physical Chemistry*, Sobanlal Nagin chand & co., New Delhi, 28th Edition, 2009.
3. **Soni P.L., Dharma Rao D.P.**, *Text Book Of Physical Chemistry*, S.Chand & co., New Delhi, 12th Edition, 1980.

REFERENCE BOOKS

1. **Banwell C.N.**, *Fundamentals Of Molecular Spectroscopy*, Tata MC Graw Hill, New Delhi, 4th Edition, 2011.
2. **Barrow G.M.**, *Introduction To Molecular Spectroscopy*, MC Graw Hill, New York, 1st Edition, 1962.
3. **Russel S.**, *Physical Methods In Inorganic Chemistry*, Drago East west Press, 1st Edition, 1978.
4. **Sharma Y.R.**, *Elementary Organic Absorption Spectroscopy*, S. Chand & co., New Delhi, 1st Edition, 1980.

SEMESTER - VI

Core Chemistry Practical - III

GRAVIMETRIC ANALYSIS AND PHYSICAL CHEMISTRY

Practical Hrs : 105

Sub. Code : 15CHUCP03

Max. Marks : CIA-60; ESE-90

Credits : 5

Objective: To acquire the skill of analyzing the samples gravimetrically and to understand the principles of physical chemistry and also to apply them experimentally for determination of physical constants.

I GRAVIMETRIC ANALYSIS

1. Estimation Of Barium As Barium Sulphate
2. Estimation Of Barium As Barium Chromate
3. Estimation Of Lead As Lead Chromate
4. Estimation Of Calcium As Calcium Oxalate
5. Estimation Of Calcium As Calcium Carbonate

II PHYSICAL CHEMISTRY EXPERIMENTS

1. Determination Of Rate Constant Of Acid - Catalysed Hydrolysis Of An Ester (Methyl Acetate Or Ethyl Acetate).
2. Determination Of Rate Constant Of Inversion of Cane Sugar by Polarimetry
3. Determination Of K_f Molecular Weight By Rast Method-Naphthalene, Biphenyl, Biphenyl Amine As Solvents.
5. Determination Of Critical Solution Temperature Of Phenol Water System.
6. Determination Of Concentration Of An Electrolyte (NaCl / KCl/ Succinic Acid)
7. Determination Of Transition Temperature Of Sodium Acetate, Sodium Thiosulphate, And Strontium Chloride.
8. Phase Diagram-Simple Eutectic System.
9. Determination Of Cell Constant, Specific Conductance And Equivalent Conductance Of Strong Electrolyte.
10. Determination Of Dissociation Constant Of A Weak Acid (Acetic Acid)
11. Conductometric Titration, Strong Acid –Strong Base.
12. Potentiometric Titrations – Redox titrations

13. Verification of Adsorption Isotherms

SEMESTER - VI ELECTIVE PRACTICAL

Practical Hrs : 45

Sub. Code : 15CHUEP01

Max. Marks : CIA-40; ESE-60

Credits :5

Objective: To acquire the skill of determining the physical constants.

To learn and develop the skill of various methods of dyeing.

I. Estimations

- (i) Estimation Of Hardness Of Water Using EDTA
- (ii) Estimation Of Zinc Using EDTA

II. Colorimetric Experiments

- (i) Involving Nessler's Tube
 - a. Estimation Of Fe^{3+} With Ammonium Thio Cyanate
 - b. Estimation Of Mn^{2+} In Potassium Permanganate Using Potassium Periodate.
 - c. Estimation Of Ni Using Dimethyl Glyoxime
- (ii) Determination of OD using Colorimeter

III. Determination of pH of buffers and unknown solution.

IV. Determination of Melting point/ Boiling point of organic substances

V. Dyeing and Printing

- a. Dyeing Of Direct Dyes On Cotton Fibre.
- b. Effect Of Temperature Of Dyeing Of Direct Dyes On Cotton Fibres.
- c. Effect Of Adding Common Salt During Dyeing-Direct Dyes On Cotton Fibre.
- d. Dyeing Of Reactive Dyes On Cotton Fibre.
- e. Dyeing Of Direct Dyes On Viscose Rayon
- f. Dyeing Of Reactive Dyes On Viscose Rayon
- g. Block Printing

VI. Separation of compounds by Paper Chromatography (Group Experiments)