SEMESTER - IV

Course V (INORGANIC&PHYSICALCHEMISTRY) 60 hrs (4 h /w)

Course outcomes:

At the end of the course, the student will be able to;

1. Understand concepts Of boundary conditions and quantization, probability distribution, most probable values, uncertainty and expectation values
2. Application of quantization to spectroscopy.
3. Various types of spectra and its use in structure determination.

INORGANIC CHEMISTRY 26 h

UNIT –I

Coordination Chemistry 12 h

IUPAC nomenclature of coordination compounds, Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory (VBT): Inner and outer orbital complexes. Limitations of VBT, Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry, Factors affecting the magnitude of crystal field splitting energy, Spectrochemical series, Comparison of CFSE for Octahedral and Tetrahedral complexes, Tetragonal distortion of octahedral geometry, Jahn-Teller distortion, square planar coordination.

UNIT –II

1. Inorganic Reaction Mechanism: **4h**

Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reaction SN^1 and SN^2, Substitution reactions in square planar complexes, Trans-effect, theories of trans effect and itsapplications

2. Stability ofmetalcomplexes: 2h

Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

Bioinorganic Chemistry: 8h

Metal ions present in biological systems, classification of elements according to the ir action in biological system. Geochemicaleffect on the distribution of metals, Sodium/K- pump, carbonicanhydrase and carboxypeptidase.

Excess and deficiency of some trace metals. Toxicity of metal ions (Hg,Pb,Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its application in bio systems, Haemoglobin, Myoglobin. Storage and transfer of iron.

PHYSICALCHEMISTRY 34 h

UNIT-III

1 .Phase rule 6h

Concept of phase, components, degrees of freedom. Thermodynamic derivation of Gibbs phase rule. Phasediagram of one component system - water system, Study of Phase diagrams of Simple eutectic systems i) Pb-Agsystem, desilverisation of lead ii) NaCl-Water system, Congruent and incongruent melting point- Definition andexamples for systems having congruent and incongruent melting point, freezing mixtures.

UNIT-IV

Electrochemistry 14h

Specific conductance, equivalent conductance, and molar conductance- Definition and effect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications, Definition of transport number, determination of transport number by Hittorf's method. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only), Application of conductivity measurements- conductometrictitrations.

Electrochemical Cells- Single electrode potential, Types of electrodes with examples: Metal-metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements - Potentiometric titrations.

Fuel cells- Basic concepts, examples, and applications

UNIT-V

Chemical Kinetics: 14h

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions.

Comparison of the two theories (qualitative treatment only). Enzyme catalysis- Specificity, factors affecting enzyme catalysis, Inhibitors and Lock & key model. Michaels- Menten equation- derivation, significance of Michaelis-Menten constant.

Co-curricular activities and Assessment Methods Continuous Evaluation: Monitoring the progress of student's learning Class Tests, Worksheets and Quizzes Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality Semester-end Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

List of Reference Books

1. Text book of physical chemistry by SGlasstone
2. Concise Inorganic Chemistry byJ.D.Lee
3. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu andMadan
4. Advanced physical chemistry by GurudeepRaj
5. Principles of physical chemistry by Prutton andMarron
6. Advanced physical chemistry by Bahl andTuli
7. Inorganic Chemistry byJ.E.Huheey
8. Basic Inorganic Chemistry by Cotton andWilkinson
9. A textbook of qualitative inorganic analysis by A.I.Vogel
10. Atkins,P.W.&Paula,J.deAtkin'sPhysicalChemistryEd.,OxfordUniversityPress 10thEd(2014).
11. Castellan,G.W.PhysicalChemistry4thEd.Narosa(2004).
12. Mortimer,R. G.PhysicalChemistry3rdEd.Elsevier:NOIDA,UP(2009).
13. Barrow,G.M.PhysicalChemistry

SEMESTER - IV

Course V **LABORATORYCOURSE** **30**hrs (2 h /w)

Practical-Course -V

Conductometric andPotentiometric Titrimetry **50 M**

Course outcomes:

At the end of the course, the student will be able to;

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Apply concepts of electrochemistry inexperiments.
3. Be familiar with electroanalytical methods and techniques in analytical chemistry which study an analyte by measuring the potential (volts) and/or current (amperes) in an electrochemical cell containing theanalyte

Conductometric andPotentiometricTitrimetry **50 M**

1. **Conductometric titration**- Determination of concentration of HCl solution using standard NaOHsolution.
2. **Conductometric titration**- Determination of concentration of CH_3COOH Solution using standard NaOHsolution.
3. **Conductometric titration**- Determination of concentration of CH_3COOH and HCl in a mixture using standard NaOHsolution.
4. **Potentiometric titration**- Determination of Fe (II) using standard $K_2Cr_2O_7$solution.
5. Determination of rate constant for acid catalyzed esterhydrolysis.

MODEL PAPER

SECOND YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-IV

CHEMISTRY COURSE V: INORGANIC & PHYSICAL CHEMISTRY

Time: 3 hours Maximum Marks: 75

PART- A5 X 5 = 25 Marks

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

1. Write note on Jahn-Tellerdistortion.
2. Explain Labile & inertcomplexes.
3. Explain Job's method for determination of composition ofcomplex.
4. Explain Thermodynamic derivation of Gibb's phaserule.
5. Explain any two conductometrictitrations.
6. Write note on Fuel Cells with examples andapplications.
7. What is enzyme catalysis? Write any three factors effecting enzymecatalysis.
8. Derive Michaels- Mentenequation.

PART-B 5 X 10 =50 Marks

Answer **ALL** the questions. Each carries **TEN** marks

9 (a). Explain Valence Bond theory with Inner and Outer orbital complexes. Write limitations ofVBT.

(or)

(b). Define CFSE. Explain the factors effecting the magnitude of crystalfield splittingenergy.

10 (a). Explain Trans effect. Explain the theories of trans effect and write any two applications of trans effect.

(or)

(b). (i) Write the biological functions of Haemoglobin and Myoglobin.
(ii) Write note on use of chelating agents in medicines.

11.(a). Define Phase rule and terms involved in it. Explain phase diagram of Pb-Ag system.

(or)

(b). (i) Explain phase diagram for NaCl-watersystem.
(ii) Explain briefly about Freezing mixtures.

12.(a). Define Transport number. Write experimental method for the determination of transport number by Hittorf method.

(or)

(b).(i) Define single electrode potential.
(ii) Explain four types of electrodes with examples.

13.(a). Explain general methods for determination of order of a reaction.

(or)

(b).Explain Collision theory and Activated complex theory of bimolecular reactions.

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SUBJECT EXPERTS

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