

## B.Sc. Semester III

### Chem. – 201 [Organic Chemistry]

#### Unit:- I

##### [A] Carbohydrates

[Marks -8]

Introduction, classification of carbohydrates, osazone formation, epimerization, step up and step down reactions of monosaccharides, simple structures of glucose and fructose, Fischer's proof of configuration of D-glucose.

##### [B] Amino acid :

[Marks -6]

Introduction of amino acid, Classification and properties of amino acids, Zwitter ion , Isoelectric point, Strecker's and Gabriel phthalimide synthesis of amino acids.

#### Unit:- II

##### [A] Electrophilic aromatic Substitution:

[Marks -8]

Introduction, effect of substituent groups, determination of orientation and relative reactivity, classification of substituent groups, electrophilic substitution (ES) reactions. (Nitration, Sulfonation, Halogenation, Friedel Craft alkylation and acylation), Orientation in mono and disubstituted benzene.

##### [B] Polynuclear hydrocarbon

[Marks -6]

Nomenclature, structure and synthesis of Naphthalene and its derivatives. Reactions (oxidation, reduction and electrophilic substitution reaction (ESR)) of naphthalene.

#### Unit III

##### [A] Heterocyclic Compounds

[Marks -8]

Introduction, structure of Pyrrole, Furan and Thiophene, Paal Knorr synthesis and electrophilic substitution of Pyrrole, Furan and Thiophene, reactivity and orientation of electrophilic substitution reactions (ESR) in five membered heterocycles (Pyrrole, Furan and Thiophene) Structure of Pyridine, Electrophilic and Nucleophilic substitution reactions of pyridine. Basicity of pyridine.

##### [B] $\beta$ -dicarbonyl compounds

[Marks -6]

Introduction, synthesis of Ethyl acetoacetate (EAA) and Diethylmalonate Acidic and ketonic hydrolysis of  $\beta$ -dicarbonyl compounds, Synthetic applications of  $\beta$ -dicarbonyl compounds. (i) Crotonic acid from EAA (ii) Valeric Acid from diethyl malonate

## Unit-IV

### **Chemical Reactivity and Molecular Structure: (Acid- Base Properties)**

**[Marks-14]**

Acid-Bases, scale of acidity-basicity, Resonance effect, drawing of structures and the condition for resonance, Effect of change of hybridization on acidity and basicity, Inductive and electronic effects, steric effect and hydrogen bonding, Lewis acid and bases, Keto – enol tautomerism . Difference between resonance and tautomerism.

### **REFERENCES**

1. Robert Thornot Morrison and Robert Neilson Boyd, "***Organic Chemistry***", Prentice Hall of India Pvt Ltd, New Delhi, Sixth Edition, 1992.
2. Bhupinder Mehta, Manju Mehta, "***Organic Chemistry***", Prentice Hall of India Pvt Ltd, New Delhi, 2005.
3. James B Hedrickson Donald J. Cram and George S. Hammond, "***Organic Chemistry***", Mc-Graw-Hill Kogakusha,Ltd., Third Edition.
4. Arun Bahl, B. S. Bahl, "***Advance Organic Chemistry***", S. Chand & Company Ltd., New Delhi, First Edition, 2003.
5. I. L. Finar, "***Organic Chemistry***", Pearson Education Pet Ltd, New Delhi, First Edition, 2002.
6. G. Marc Loudon, "***Organic Chemistry***", Oxford University Press, Forth Indian edition, 2010.
7. P.S.Kalsi, "***Text book of Organic Chemistry***", MacMillan of India Pvt. Ltd., 1999.
8. P.L. Soni and H.M. Chawala, "***Text book of Organic Chemistry***", Sultan Chand & Sons Publication, New Delhi, 26<sup>th</sup> Edition, 1995.

**B.Sc. Semester III**  
**Chem. – 202 [Physical Chemistry]**

**Unit:- I**

**(A) Thermodynamics**

**[8 marks]**

Physical significance of entropy; Entropy change during phase change - solid to liquid and liquid to vapor; Entropy of mixing of ideal gases; Entropy change in reversible and irreversible process; Work and free energy functions; Helmholtz function and variation of free energy change with temperature and pressure; Gibbs Helmholtz equation, derivation.

**(B) Chemical Kinetics**

**[6 marks]**

Theories of reaction rates: Collision theory of bimolecular gaseous reactions and Activated Complex theory of bimolecular reactions; Effects of temperature on reaction rates; Derivation of Arrhenius equation.

**Unit:- II**

**(A) Electrochemistry**

**[8 marks]**

Transport number; Determination of transport numbers by moving boundary method; Conductometric titrations: Principle and advantages; Titration of Strong acid against strong base (HCl vs NaOH); Titration of Weak acid against strong base (CH<sub>3</sub>COOH vs NaOH); Titration of Strong acid against weak base (HCl vs NH<sub>4</sub>OH); Titration of very weak acid against strong base (H<sub>3</sub>BO<sub>3</sub> vs NaOH); Titration of mixture of acids against strong base (HCl + CH<sub>3</sub>COOH vs NaOH); Activity and activity coefficient; Ionic strength.

**(B) Phase Rule**

**[6 marks]**

Theoretical derivation of phase rule; One component system : water system and sulphur system; Condensed phase rule; Silver – lead (Ag-Pb) system;

**Unit:- III**

**(A) Adsorption**

**[8 marks]**

Definition of terms, Types of adsorption (physical, chemical and their difference), Types of adsorption isotherms (5 types), Derivation of Freundlich adsorption isotherm, Derivation of Langmuir adsorption isotherm, Applications of adsorption

**(B) Catalysis**

**[6 marks]**

Characteristic of catalysis, Homogenous and heterogeneous catalysis, Enzyme catalysed reaction and derivation mechanism, Marten reaction

**Unit –IV**

**(A) Polymer Chemistry**

**[8 marks]**

Definition: Monomer, Polymer, Polymerization, Classification of Polymers; Chain polymerization: Free radical and Ionic polymerization [cationic and anionic], Coordination polymerization, Step polymerization: Polycondensation and Polyaddition and Ring Opening Polymerization.

**(B) Colloids**

**[6 marks]**

Colloidal Systems; Preparation of Colloidal Solutions; General Properties of Colloidal Systems; Properties of hydrophobic Colloidal Systems

**REFERENCES**

1. B.R. Puri, L.R. Sharma, Madan S. Pathania, *“Principles of physical chemistry”*, Vishal publishing-Jalandhar, 44<sup>th</sup> Edition, 2010-2011.
2. S. Glasstone, *“Thermodynamics for chemistry”*.
3. S. Glasstone, *“An introduction to electrochemistry”*, Affiliated East-West press Pvt. Ltd, New Delhi, Madras.
4. B.S.Bahl, G.D.Tuli and Arun Bahl, *“Essential of physical chemistry”*, S.Chand-New Delhi, Reprint, 2006.
5. V.R. Gowarikar, *“Polymer chemistry”*, New Age International(P) Ltd, Fifteen Reprint, Sep.,1999.

## B Sc Semester III

### Chem.Pract. – 203 [Inorganic & Physical Practicals]

#### [A] Inorganic Mixture

Semi micro method of analysis of inorganic mixture containing four radicals (excluding phosphate, arsenite, arsenate and borate)

Minimum eight mixtures should be performed.

Mixture may be partly soluble in water and soluble in acid.

#### [B] Physical Experiment

1. To determine the relative strength between HCl and H<sub>2</sub>SO<sub>4</sub> by studying hydrolysis of methyl acetate.
2. To determine the temperature coefficient and energy of activation of hydrolysis of methyl acetate catalyzed by acid.
3. To study the adsorption of an organic acid by Animal Charcoal. (Acetic acid /Oxalic acid).
4. Conductometric titration.
  - (i) Strong acid → Strong base (HCl → NaOH)
  - (ii) Weak acid → Strong base (CH<sub>3</sub>COOH → NaOH)
  - (iii) Mixture of acids → Strong base (HCl+CH<sub>3</sub>COOH → NaOH)
5. To determine specific refraction and molar refraction of liquid A,B and its Mixture
6. To determine absolute viscosities of liquid A, B and its Mixture

## REFERENCES

1. Vogel's "*Textbook of Quantitative chemical Analysis*", Pearson Education Ltd. Sixth Edition, 2008.
2. Vogel's "*Qualitative Inorganic Analysis*", Pearson Education Ltd. Seventh Edition, 2009.
3. Gurdeep Raj, "*Advanced Inorganic Chemistry*", Goel Publishing House, Meerut, Volume –I, 24<sup>th</sup> Revised Edition, 1998.
4. J .B.Yadav , "*Advance Physical Practical Chemistry*", Goel Publishing House, Meerut
6. P.H.Parsania, "*Experiments in Physical Chemistry*", Neminath Printers Rajkot First Edition 2004.
7. A.M.. James and F.E.Prichard "*Practical Physical Chemistry*", Longman Group Limited London Third Edition Reprinted 1979