

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI -24**

**(For B.Sc. Biochemistry, Botany, Mathematics, Physics, & Zoology  
- Allied Courses)**

(For the candidates admitted from the academic year 2016 – 2017 onwards)

**Allied Course I**

**Chemistry I**

**Hours/Week: 4**

**Credits: 4**

**OBJECTIVES**

1. To understand the various theories of coordination chemistry.
2. To study the various concepts of resonance and halogen compounds.
3. To study the properties of aromatic compounds and organic reactions.
4. To learn the concepts of solid state chemistry.

**UNIT I COORDINATION CHEMISTRY AND INDUSTRIAL CHEMISTRY**

- 1.1 Coordination Chemistry: Nomenclature – Werner's, sidgwick and Pauling's theories. Chelation - industrial importance of EDTA, Biological role of heamoglobin and Chrophyll.
- 1.2 Industrial Chemistry: Fuel gases – Water gas, producer gas, LPG gas, Gobar gas and natural gas. Fertilizers – NPK and mixed Fertilizers- soaps and detergents.

**UNIT- II ELECTRON DISPLACEMENT EFFECTS AND HALOGEN COMPOUNDS**

- 2.1 Polar effects: Inductive effect – Relative Strength of Aliphatic monocarbocyclic acid and aliphatic amines. Resonance – Condition for resonance. Consequences of resonance – resonance of energy. Basic property of aniline and acidic property of phenol. Hyperconjugation – Heat of hydrogenation - Bond length and dipole moment. Steric effect.
- 2.2 Halogen containing compounds: Important chlorohydrocarbons used as solvents. Pesticides – Dichloromethane, chloroform, carbon tetrachloride, DDT and BHC Types of solvents: - Polar, Non polar.

**Unit III AROMATIC COMPOUNDS AND ORGANIC REACTIONS**

- 3.1 Aromatic compounds: Structure, stability resonance and aromaticity of benzene. Substitution reaction: Nitration, Halogenations, Alkylation. Naphthalene – Isolation, properties and uses.

- 3.2 Organic reaction: Biuret, Decarboxylation, Benzoin, Perkin, Cannizaro, Claisen and Haloform reactions
- 3.3 Chemotherapy: Explanation with two examples each for analgesics, antibacterial, anti-inflammatory, antibiotics, antiseptic and disinfectant, anesthetics local and general (Structures not necessary)

#### **UNIT IV SOLID STATE, ENERGETICS AND PHASE RULE**

- 4.1 Solid state: Typical crystal lattices - unit cell, elements of symmetry, Bragg's equation, Weiss Indices, Miller indices, simple body centered and face centered lattices
- 4.2 Energetics: First law of thermodynamics – state and path function – need for the second law – Carnot's cycle and thermo- dynamic scale of temperature, spontaneous and Non – spontaneous processes – entropy – Gibbs free energy.
- 4.3 Phase rule: Phase, component, degree of Freedom, phase rule definitions - one component system– water system.

#### **UNIT V: CHEMICAL EQUILIBRIUM AND CHEMICAL KINETICS**

- 5.1 Chemical equilibrium: Criteria of homogeneous and heterogeneous equilibria, -decomposition of HI,  $\text{N}_2\text{O}_4$ ,  $\text{CaCO}_3 + \text{Pd}_5$ .
- 5.2 Chemical Kinetics: Order of reaction and their determinations - activation energy, effects of temperature on reaction rate.

#### **REFERENCES**

1. Gopalan R, Text Book of Inorganic Chemistry, 2<sup>nd</sup> Edition, Hyderabad, Universities Press, (India), 2012.
2. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7<sup>th</sup> edition), Pearson India, (2011)
3. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35<sup>th</sup> edition), New Delhi: Shoban Lal Nagin Chand and Co.

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## ALLIED COURSE II

### PRACTICAL

**Hours/Week: 3**  
**Credits: 3**

## VOLUMETRIC AND ORGANIC QUANTITATIVE ANALYSIS

### I Volumetric Analysis

#### 1. Acidimetry and alkalimetry

(a) Strong acid VS strong base (b) Weak acid VS strong base (c) Determination of hardness of water.

#### 2. Permanganometry

(a) Estimation of ferrous sulphate (b) Estimation of oxalic acid

#### 3. Iodometry

(a) Estimation of potassium dichromate (b) Estimation of potassium permanganate

### II. Organic Analysis

Analyse the following organic Compounds.

1. Carbohydrate, 2. Amide, 3. Aldehyde, 4. Ketone, 5. Acid & 6. Amine

The students may be trained to perform the specific reactions like tests for elements (nitrogen only), aliphatic or aromatic, saturated or unsaturated and functional group present and record their observations.

### REFERENCES

1. R. Gopalan, Elements of analytical chemistry, S. Chand, New Delhi, 2000.
2. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry lab manual, S. Viswanathan and Co. Pvt. Ltd. Chennai-1998

**Note: Scheme for Practical Evaluation.**

**Organic Qualitative Analysis - 20**

**Volumetric Estimation -35**

Record - 5

Internal Assessment - 40

Total : 100

### **Volumetric Analysis :35**

Procedure 5 marks

Results

< 2 % - 30 marks

2-3 % -20 marks

3-4 % - 10 marks

> 4 % - 5 marks

### **Organic Qualitative Analysis :20**

Identification of Nitrogen - 4 marks

Saturated and unsaturated - 3 marks

Aliphatic or Aromatic - 3 marks

Preliminary reactions with

Procedure - 5 marks

Functional group identified

Correctly - 5 marks

Total: 20

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**Allied Course III**  
**General Chemistry II**

**Hours/Week: 4**  
**Credits: 4**

**OBJECTIVES**

- To learn the basics of nuclear chemistry and metallic bond.
- To understand the properties and applications of carbohydrates, amino acids and proteins.
- To study the basic concepts of polymers, heterocyclic compounds and stereoisomerism.

**UNIT I : NUCLEAR CHEMISTRY AND METALLIC BOND**

- 1.1 Nuclear Chemistry : Fundamental particles of nucleus- isotopes, isobars, isotones and isomers – differences between chemical reactions and nuclear reactions, nuclear fusion and fission- radioactive series.
- 1.2 Metallic bond : Electron gas, Pauling and band theories, semiconductors – intrinsic, extrinsic n-type and p-type semi conductors.
- 1.3 Compounds of sulphur and sodium thiosulphate

**UNIT II: CARBOHYDRATES, AMINOACIDS AND PROTEINS**

- 2.1 Carbohydrates: classification – glucose and fructose – preparation and properties –structure of glucose – Fischer and Haworth cyclic structures.
- 2.2 Amino acids and proteins : Amino acids – Classification based on structure. Essential and non – essentials amino acids – preparation, properties and uses – peptides (elementary treatment only) – proteins – Classification based on physical properties and biological functions. Structure of proteins – primary and secondary (elementary treatment).

**UNIT III: POLYMERS, HETEROCYCLIC COMPOUND AND STEREOISOMERISM**

- 3.1. Synthetic polymers: preparation, properties and uses of teflon, epoxy resins, polyester resin.
- 3.2 Heterocyclic compounds: Furan, pyrrole and pyridine – preparation, properties and uses – basic properties of pyridine and pyrrole.
- 3.3 Stereoisomerism: Optical isomerism – Lactic and tartaric acid – racemic mixture and resolution. Geometrical isomerism – maleic and fumaric acids.

#### **UNIT IV: SURFACE AND PHOTO CHEMISTRY**

4.1 Surface Chemistry: Emulsions, gels – preparation, properties - Electrophoresis and applications, chromatography – Column, paper and thin layer Chromatography.

4.2 Photochemistry : Laws of photochemistry and applications.

#### **UNIT V: ELECTROCHEMISTRY, pH AND BUFFER**

5.1 Electrochemistry: Specific and equivalent conductivity – their determination – effect of dilution on conductivity. Ostwald's Dilution law, Kohlrausch law, conductivity measurements, and conductometric titrations.

5.2 pH and buffer: Importance of pH and buffers – pH determination by colorimetric and electrometric methods.

#### **REFERENCES**

1. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.
2. Bahl, B.S. and Bahl, A., Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010)
3. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.

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