

**ST. ALBERT'S COLLEGE  
ERNAKULAM**

**UNDER GRADUATE CHEMISTRY MODEL 1**

**PRACTICAL-I**

**SEMESTER I and II**

***VOLUMETRIC ANALYSIS***

Credit – 2 (72 Hrs)

**1. Acidimetry and Alkalimetry**

1. Standardization of HCl with standard Na<sub>2</sub>CO<sub>3</sub> solution
2. Standardization of NaOH with standard oxalic acid solution
3. Estimation of any acid using standard NaOH
4. Estimation of any alkali using standard HCl.

**2. Permanganometry**

1. Standardization of KMnO<sub>4</sub> using (i) oxalic acid (ii) Mohr's salt
2. Estimation of Fe<sup>2+</sup> in Mohr's salt and crystalline Ferrous Sulphate using standard KMnO<sub>4</sub>.

**3. Dichrometry**

1. Estimation of Ferrous ions (external indicator)
2. Estimation of Ferrous ions (internal indicator)
3. Estimation of FeSO<sub>4</sub>. 7 H<sub>2</sub>O (external indicator)

**4. Iodimetry and Iodometry**

1. Standardization of Iodine solution
2. Standardization of Sodium thiosulphate
3. Estimation of KMnO<sub>4</sub>
4. Estimation of Copper

## SEMESTER III & IV

### ORGANIC CHEMISTRY PRACTICALS [ 72hrs]

1. Tests for elements: Nitrogen, Halogen and Sulphur
2. Determination of Physical constants
3. Study of reactions of common functional groups.
4. Qualitative analysis with a view to characterization of functional groups and identification of the following compounds: Naphthalene, anthracene, chlorobenzene, benzyl chloride, p-dichlorobenzene, benzyl alcohol, phenol, o-, m- and p- cresols, - naphthol, - naphthol, resorcinol, benzaldehyde, acetophenone, benzophenone: benzoic acid, phthalic acid, cinnamic acid, salicylic acid, ethyl benzoate, methyl salicylate, benzamide, urea, aniline, o-, m- and p- toluidines, dimethyl aniline, nitrobenzene, onitrotoluene, m-dinitrobenzene and glucose.
5. Organic preparation involving halogenation, nitration, oxidation, reduction, acetylation, benzylation, hydrolysis, diazotization
6. Isolation of an organic compound from a natural source.

## ORGANIC CHEMISTRY

### QUALITATIVE ORGANIC ANALYSIS

Credit-2 (72 Hrs)

1. Determination of physical constants of solids and liquids – melting and boiling points.
2. Tests for elements: Nitrogen, Halogens and Sulphur
3. Tests for unsaturation.
4. Tests for aromatic character.
5. Study of the reactions of the following functional groups: carboxylic acid, 1,2-dicarboxylic acid, phenol, aldehyde, ketone, ester, reducing and nonreducing sugars, polynuclear hydrocarbon, primary, secondary and tertiary amines, amides, diamide, nitro and halogen compounds.

6. Systematic analysis and preparation of solid derivative of the following organic compounds: carboxylic acid, 1, 2-dicarboxylic acid, unsaturated acids, phenol, hydroxy acids, aldehyde, ketone, ester, reducing and nonreducing sugars, polynuclear hydrocarbon, primary, secondary and tertiary amines, amide, diamide, nitro and halogen compounds. (Minimum twelve compounds to be analysed)

## **PRACTICAL – II**

### **PHYSICAL CHEMISTRY PRACTICALS**

Credit – 2 (72 Hrs)

1. Viscosity-percentage composition of sucrose solution.
2. Determination of Partition coefficient of a non-volatile solute
3. Transition temperature of salt hydrates, eg. Sodium thiosulphate Sodium acetate etc.
4. Critical solution temperature of phenol water system
5. Phase diagram of two component systems
6. Heat of Solution  $\text{KNO}_3$ ,  $\text{NH}_4\text{Cl}$
7. Heat of neutralization
8. Determination of equivalent conductance of an electrolyte
9. Conductometric titration of strong acid Vs. strong base
10. Potentiometric titrations :  $\text{Fe}^{2+}$  Vs.  $\text{Cr}_2\text{O}_7^{2-}$  and  $\text{Fe}^{2+}$  Vs.  $\text{KMnO}_4$
11. Determination of molecular weight by Rast's method. (Using naphthalene, or biphenyl as solvent and acetanilide, p-dichlorobenzene etc. as solute)
12. Kinetics of simple reactions, e.g. Acid hydrolysis of methyl acetate

## **SEMESTER V & VI PRACTICALS**

### **QUALITATIVE INORGANIC ANALYSIS**

Credit – 3 (108 Hrs)

1. Study of the reactions of the following radicals with a view to their identification and confirmation.  $\text{Ag}^+$ ,  $\text{Hg}^{2+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Bi}^{2+}$ ,  $\text{Cd}^{2+}$ ,  $\text{As}^{3+}$ ,  $\text{Sn}^{2+}$ ,  $\text{Sb}^{3+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Al}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Li}^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ .  $\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{F}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{BO}_2^-$ ,  $\text{C}_2\text{O}_4^{2-}$ ,  $\text{C}_4\text{H}_4\text{O}_6^{2-}$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{PO}_4^{3-}$ ,  $\text{AsO}_3^{3-}$ ,  $\text{AsO}_4^{3-}$  and  $\text{CrO}_4^{2-}$
2. Systematic qualitative analysis of mixtures containing two acid and two basic radicals from the above list without interfering radical and with one interfering radical by Semi- micro method only. (Minimum of 10 mixtures to be analyzed)

## ORGANIC PREPARATIONS & LABORATORY TECHNIQUES

Credits - 2 (72 Hrs)

### A. Basic Laboratory Techniques

1. Crystallisation – Any four compounds using ethyl acetate, ethanol, and water - Record the yield of recovery.
2. Distillation - Purification of water and ethyl acetate-Record the yield of recovery.
3. Solvent extraction – aniline from water - methyl benzoate from water - using ether-
4. Record the yield of recovery. (Any two experiments shall be done).

### B. Organic Preparations

Organic preparations involving:

1. Oxidation (benzaldehyde to benzoic acid).
2. Hydrolysis (methyl salicylate or ethyl benzoate to the acid).
3. Nitration (m-dinitrobenzene and picric acid).
4. Halogenation (p-bromoacetanilide from acetanilide).
5. Acylation (Benzoylation of aniline, phenol,  $\beta$ -naphthol).
6. Esterification (benzoic acid ester).
7. Iodoform from acetone or ethyl methyl ketone.
8. Side chain oxidation (benzyl chloride to benzoic acid).
9. Claisen – Schmidt reaction: Dibenzal acetone from benzaldehyde.

## C. Chromatography

1. TLC - Separation and identification- Determination of R<sub>f</sub> value of o-and p-nitroanilines, o- and p-chloroanilines, p-chlorophenol and p-nitrophenol, p-chloroaniline and p-nitroaniline, benzil and o-nitroaniline or any two amino acids.
2. Column Chromatography – Purification of o-nitro aniline, o-nitrophenol, benzil, m-dinitro benzene, benzene azo –β-naphthol (non-evaluative).

## PHYSICAL CHEMISTRY PRACTICALS

Credits 3 (108 hrs)

1. Viscosity – percentage composition of a mixture.
2. Heat of solution – KNO<sub>3</sub>, NH<sub>4</sub>Cl
3. Heat of neutralization
4. Determination of equivalent conductance of an electrolyte
5. Conductometric titration – strong acid vs. strong base, weak acid-strong base
6. Transition temperature of salt hydrates. (Sodium thiosulphate, sodium acetate)
7. Determination of the surface tension of a liquid(Drop number method or Drop weight method)
8. Critical solution temperature of phenol-water system.
9. Effect of electrolytes on the CST of phenol-water system.
10. Molecular weight determination by Rast's method. (using naphthalene, camphor or biphenyl as solvent and acetanilide, p-dichlorobenzene etc. assolute.)
11. Kinetics of simple reactions eg. Acid hydrolysis of methyl acetate.
12. Potentiometric titration – Fe<sup>2+</sup> vs. Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup>, I<sup>-</sup> vs. MnO<sub>4</sub><sup>-</sup>
13. Data analysis of kinetic experiments using spreadsheet program (determination of rate constant)

14. Determination of equivalence point of potentiometric and conductometric titrations using spreadsheet program.

## **GRAVIMETRIC ANALYSIS**

2 Credits (36 Hrs)

1. Estimation of Barium as barium sulphate
2. Estimation of iron as  $\text{Fe}_2\text{O}_3$
3. Estimation of sulphate as barium sulphate
4. Estimation of copper as cuprous thiocyanate
5. Estimation of nickel as nickel dimethyl glyoxime.