SEMESTER – I

Course I (ANALYTICAL CHEMISTRY-I) **60 hrs. (4h/w)**

Objectives

The objective of this course is to make students aware about the SI Units, concentration terms, various analytical methods, types of errors in chemical analysis, statistical tests of data and safe usage of chemicals and its waste. And Thermal Gravimetry

Course Learning Outcomes:

By the end of the course, the students will be able to:

Understand about SI units
Learn use of analytical equipment
Know types of errors in chemical analysis
Handle statistical tests of data
Know safety with chemicals and waste.

BASIC PRINCIPLES & LABORATORY OPERATIONS

UNIT – I

I. Basic Concepts: **12hrs**

A. SI Units

i) Definitions of the Seven Basic Units (Mass, Length, Time, Temperature, Amount of substance, Electrical current and Luminous intensity), Derived units, Conversion between units, Significant figures.

B. Chemical concentrations

i) Mole, molar mass

ii) Calculations in grams and moles iii) Solutions and their concentrations:

a) Molar concentration b) Analytical molarity c) Equilibrium molarity of a particular species d) Percent concentration e) Parts per million/billion (ppm, ppb) f) Volume ratios for dilution procedures g) p-functions.

C. Preparation of solutions: standard solutions, primary standards, secondary standards.

UNIT – II **12hrs**

Introduction to Analytical Chemistry and Analytical Methods -I

i) General steps in chemical analysis

ii) Introduction to methods of detecting analytes

Physical, Electromagnetic radiations and Electric charge

iii) Single pan analytical balance: (operation and theory of the balance, construction details, errors in weighing, care of an analytical balance).

UNIT III **12hrs**

Introduction to Analytical Chemistry and Analytical Methods - Ii

Description and use of common laboratory apparatus: Volumetric flasks, burettes, pipettes, meniscus readers, weighing bottles, different types of funnels chromatographic columns, chromatographic jars, desiccators, drying ovens, filter crucibles, rubber policeman.

Calibration and use of volumetric glass ware.

pH meter: components of pH meter, use of pH Meter, maintenance of pH meter, application of data. Laboratory notebook

UNIT – IV **12hrs**

Errors in Chemical Analysis

Types of errors, Accuracy and Precision, Absolute and relative uncertainty, propagation of uncertainty. The Gaussian distribution, mean and standard deviation, confidence intervals. Statistical tests of data (the F test, the t test, Q test for bad data, the method of least squares). Calibration curve. Laboratory notebook. Safety with chemicals and waste.

UNIT – V **12hrs**

Principles of Thermogravimetry:

Thermometric methods – Principles of TGA, DTA and Thermometric titrations – application of $CaC_2O.H_2O$, $(CH_3COO)_2$ Ca. H_2O and HCl Vs NaOH Thermometric titrations.

Teaching Learning Process:

Conventional chalk and board teaching,

Visit chemical industries/ Drug industries to get information about the various instruments used in industries

ICT enabled classes.

Power point presentations. Interactive sessions

To get recent information through the internet.

Assessment Methods:

Presentations by Individual Student

Class tests Laboratory test written assignment(s)

LABORATORY COURSE -I 30 hrs (2 h / w)

Practical-I (At the end of Semester-I)

1. Use and calibration of volumetric equipment (volumetric flasks, pipette's and burette's).
2. Preparation of standard solutions of acids and bases.
3. Estimation of sodium carbonate by titrating with hydrochloric acid.
4. Preparation of standard solution of EDTA.
5. Estimation of magnesium using EDTA.
6. Use of pH meter: determination of pH of given dilute solutions of shampoos and soaps
7. Titration of acid-base using pH meter.
8. Preparation of buffers.

SUGGESTED BOOKS

1. Seamus P.J. Higson: Analytical Chemistry.
2. Douglas A. Skoog and Donald M..West: Fundamentals of Analytical Chemistry.
3. Adion A. Gordus: Schaum's Outline of Analytical Chemistry, Tata McGraw-Hill.
4. Gary D. Christian: Analytical Chemistry.
5. Freifelder and Kealy: Analytical Chemistry.
6. Daniel C Harris: Exploring Chemical Analysis.
7. Daniel C Harris: Quantitative Chemical Analysis.

MODEL PAPER

FIRST YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-I

ANALYTICAL CHEMISTRY Course-I

Time: 3 hours Maximum Marks: 75

PART- A 5 X 5 = 25 Marks

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

1. Explain the terms Mole and molar mass.
2. Explain in brief about the general steps in chemical analysis
3. Write short note on methods of detecting analytes.
4. What is a Laboratory note book?
5. Write account on types of errors, Accuracy and Precision
6. Describe the safety with chemicals and waste.
7. What are thermometric methods
8. Explain how the calibration of volumetric glass ware is done

PART- B 5 X 10 = 50 Marks

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

9 (a). Explain standard solutions, primary standards and secondary standards giving examples

(or)

(b). Explain the terms a) Molar concentration b) Analytical molarity c) Equilibrium molarity of a particular species d) Percent concentration e) Parts per million and billion

10 (a). Write an essay on the operation and theory of the Single pan analytical balance

(or)

(b). Explain errors in weighing, care of an analytical balance

11 (a). Describe the use of any five common laboratory apparatus

(or)

(b). What is a pH meter and describe the components of pH meter and its use

12 (a). Explain the Gaussian distribution, mean and standard deviations

(or)

(b). Explain the statistical tests of data. Write in detail about i) F test ii) t test

13 (a). Explain the Principles of TGA and DTA in detail

(or)

(b). What are thermometric titrations and write its applications

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B. Sedimentation and relative centrifugal force
C. Different types of rotors.
D. Density gradient
E. Types of centrifugation techniques.

UNIT – IV **12hrs**

Polarography

Basic principles – Dropping Mercury Electrode (DME) – Advantages and Disadvantages. Diffusion current – The Ilkovic equation (derivation not required). Half – Wave potential – Experimental set up – Applications. Determination of Copper and Zinc in Brass.

UNIT – V **12hrs**

Introduction to Environmental Analysis:

A. Sampling method
B. Environmental pollution from industrial effluents and radiochemical waste.
C. Introduction to water and waste analysis.