

SEC0101003: Basic Analytical Chemistry

Total Marks: 75

Credits: 3

Theory

Marks = 60 [End Semester (50) Internal Assessment (10)]

Unit I: Introduction

Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

6 Lectures, Marks – 5

Unit II: Basic principles of quantitative analysis

Estimation of metal ions from aqueous solution, geometrical isomer, keto-enol tautomers, determination of metal complex composition using Job's method of continuous variation and mole ratio method.

6 Lectures, Marks – 5

Unit III: Analysis of soil

Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators

- Determination of pH of soil samples.
- Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

8 Lectures, Marks - 10

Unit IV: Analysis of water

Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.

- Determination of pH, acidity and alkalinity of a water sample.
- Determination of dissolved oxygen (DO) of a water sample.

8 Lectures, Marks - 10

Unit V: Analysis of food products

Nutritional value of foods, idea about food processing and food preservations and adulteration.

- Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.
- Analysis of preservatives and colouring matter.

9 Lectures, Marks - 10

Unit VI: Chromatography

Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

- Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+}).
- To compare paint samples by TLC method.

8 Lectures, Marks - 10

Suggested Applications

- To study the use of phenolphthalein in trap cases.

Suggested Instrumental demonstrations:

- a. Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry

Reference Books

1. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
2. Skoog, D.A., Holler, F.J. & Crouch, S. *Principles of Instrumental Analysis*, Cengage Learning India Edition, 2007.
3. Skoog, D.A.; West, D.M. & Holler, F.J. *Analytical Chemistry: An Introduction 6th Ed.*, Saunders College Publishing, Fort Worth, Philadelphia (1994).
4. Harris, D. C. *Quantitative Chemical Analysis*, 9th ed. Macmillan Education, 2016.
2. Dean, J. A. *Analytical Chemistry Handbook*, McGraw Hill, 2004.
3. Day, R. A. & Underwood, A. L. *Quantitative Analysis*, Prentice Hall of India, 1992.
4. Freifelder, D.M. *Physical Biochemistry 2nd Ed.*, W.H. Freeman & Co., N.Y. USA (1982).
5. Cooper, T.G. *The Tools of Biochemistry*, John Wiley & Sons, N.Y. USA. 16 (1977).
6. Vogel, A. I. *Vogel's Qualitative Inorganic Analysis 7th Ed.*, Prentice Hall, 1996.
7. Mendham, J., A. I. *Vogel's Quantitative Chemical Analysis 6th Ed.*, Pearson, 2009.
8. Robinson, J.W. *Undergraduate Instrumental Analysis 5th Ed.*, Marcel Dekker, Inc., New York (1995).
9. Christian, G.D. *Analytical Chemistry*, 6th Ed. John Wiley & Sons, New York, 2004.

Basic Analytical Chemistry (Lab Work)**Marks: 15 (Lab Work)**

- I. Any one Experiment to be Set in the Examination 1X5=5
- a. Separation and identification of monosaccharides present in a given mixture (Glucose and Fructose) by paper chromatography. Report R_f Values.
- b. Separation of organic compounds present in a given mixture by TLC method.

- c. Estimate the Ni (ii) present in a given solution by gravimetric analysis.
- d. Estimate the alkali present in a given antacids.
- e. Determine the dissolve oxygen in water.

II. Identification of different analytical instruments.	2
II. Practical Note Book	3
III. Viva-Voce	5

Reference Books

1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by G. H. Jeffery and others) 5th Ed., The English Language Book Society of Longman.
2. Willard, Hobert H. et al.: Instrumental Methods of Analysis, 7th Ed., Wardsworth Publishing Company, Belmont, California, USA, 1988.
3. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age, International Publisher, 2009.
