**Andhra University**

**Department of Inorganic and Analytical Chemistry**

**M.Sc.(Final) Chemistry Syllabus for 3rd Semester**

**Specialization - Environmental Chemistry**

**PAPER –IV : INSTRUMENTAL METHODS OF ENVIRONMENTAL ANALYSIS-I**

**(Effective from 2020-2021 Admitted batch)**

**Unit-I**

1. **Vibrational Spectroscopy :** Factors influencing vibrational frequencies, instrumentation-NIR,MIR,FIR; sampling techniques, characteristic frequencies of organic molecules, qualitative and quantitative analysis, principles of Fourier transform IR.
2. **UV and Visible spectroscopy**: Principles-instrumentation(single and double beam)-quantitative analysis by absorption measurements-simultaneous determinations(Cr and Mn)- applications.
3. **Fluorimetry** : Principle-instrumentation-applications.

**Unit-II**

**I) Atomic absorption spectroscopy :**

1. **Flame photometry :** Principle, instrumentation, applications and limitations
2. **AAS** :general discussion- Instrumentation, non flame techniques(Graphite tube furnace, cold vapour technique and hydride generation) - resonance line sources(HCL), interferences(chemical and spectral)-applications and limitations.

**II) Atomic emission spectroscopy :**

1. **Inductively couple plasma spectrometry** (ICP): Basic principles-instrumentation-advantages over AAS- application to estimation of specific mixtures containing chromium, aluminium, arsenic etc.

**Unit-III**

Electro analytical Methods: Theory of electrogravimetric analysis, polarogrpahy-Ilkovic equation, limiting current, diffusion current, Half wave potential, AC polarography, pulse polarography-normal pulse, differential pulse and square wave polarography. Principle of stripping voltametry. Cyclic voltametry –Principle, instrumentation, applications, Principles of coulometry, coulometry at controlled potential and at constant current, coulometric titrations. Amperometry-principle, amperometric titrations and applications.

**Text books**:

1. Instrumental Methods of Analysis : Hobart H.Lynne L. Willard, Merit Jr. and John A Dean
2. Vogel Book of Quantitative Inorganic Analysis : Basset, Re Dnnex, G.H. Jeffery and J.Mendham.
3. Physical methods in Inorganic Chemistry : R S Drago
4. Thermal Methods of Analysis : Wendland.
5. Inorganic Thermogravimetric Analysis : Duvval

**DEPARTMENT OF INORGANIC AND ANALYTICAL CHEMISTRY**

MODEL QUESTION PAPER

M.Sc.(Final) CHEMISTRY- 3rd SEMESTER

Specialisation: **ENVIRONMENTAL CHEMISTRY**

PAPER-IV**: INSTRUMENTAL METHODS IN ENVIRONMENTAL ANALYSIS-I**

Time: 3 hours Max. Marks: 80

**SECTION-A**

**ANSWER ALL QUESTIONS 4x5=20 Marks**

1. a) Discuss the factors influencing vibrational frequencies

Or

b) Explain Beer-Lambert’s law and its limitations.

1. a) Explain the principle of flame photometry. What are limitations of this technique

Or

b) Give the schematic diagram of AAS and briefly explain the function of each component

1. a) Describe the principle involved in coulometric method of analysis

Or

b) Describe the anode stripping voltametry and its applications in trace analysis

1. a) Describe the principle and applications of Fluorimetry.

Or

b) What are the different interferences encounter in AAS and how they are eliminated?

**SECTION-A**

**ANSWER ALL QUESTIONS 4x15=60 Marks**

1. a) Describe the instrumentation and sampling techniques of Infra red spectroscopy.

Or

b) Write a detailed procedure for the simultaneous determination of Mn and Cr in a mixture by spectrophotometric method

1. a) Discuss the non flame techniques of AAS

Or

b) Describe the basic principle and instrumentation and advantages of ICP over AAS.

1. a) State and explain the Ilkovic equation. Distinguish between limiting current and diffusion current

Or

b) Explain the following terms:

1. Amperometry (ii) Cyclic voltametry

8. a) Discuss the principle and instrumentation of FTIR.

Or

b) Discuss the theoretical aspects of thermogravimetry and write its applications.