

(3 Hours)

[Total Marks : 70

- N.B. : (1) All questions are compulsory
 (2) Figures to the right indicate full marks
 (3) Draw neat labelled diagram wherever necessary

1. (a) Answer the following (any seven) 7
- (i) Define wavelength of radiation
 - (ii) What is an auxochrome ?
 - (iii) Name any two types of atomization techniques in AAS
 - (iv) Name any one non proportional counter for radio activity measurement
 - (v) Name one reagent used for converting non fluorescent compound to fluorescent derivative.
 - (vi) Give formula for determination of correlation coefficient
 - (vii) Enlist various bending vibrations in IR spectroscopy
 - (viii) Define the unit curie used in radiochemistry
- (b) Answer the following (any four) 8
- (i) Discuss material used for preparation of sample cell in UV, visible and IR spectroscopic analysis
 - (ii) Compare UV spectroscopy and fluorimetry with respect to sensitivity and selectivity
 - (iii) What are cationic interferences in AES ? Give methods to overcome them
 - (iv) What is Wavelength maximum (λ_{max}) ? How it can be determined by using a spectrophotometer ?
 - (v) Explain the term 'F test'
2. (a) Answer the following (any two) 8
- (i) Enlist different types of detectors used in IR spectroscopy. Explain any one in detail
 - (ii) Discuss Stokes, antistokes and Rayleigh scattering with reference to Raman spectroscopy. Support your answer with energy level diagram.
 - (iii) Discuss measurement of equilibrium constant using UV visible spectroscopy
- (b) What is radionuclidic impurity ? Give any one example of the same. Name any one technique used to determine the same 3

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3. (a) Answer the following (any two) 8
- Draw a neat labelled diagram of a flame photometer. Discuss its working
 - What are thermal methods of analysis? Discuss principle involved in differential thermal analysis. Give one application of the same
 - Write a note on 't' test used in statistics
- (b) With the help of energy level diagram, depict harmonic and anharmonic nature of molecular vibrations and state meaning of fundamental bands and overtones 3

4. (a) Answer the following (any two) 8
- State Beer Lambert's Law. Derive the mathematical expression for the same.
 - Find out the linear regression equation for following data obtained in assay of salicylic acid.

Concentration	20.0	40.0	60.0	80.0	100.0	120.0
Absorbance	0.120	0.247	0.370	0.489	0.601	0.725

- Choice of solvent and concentration of analyte play an important role in uv-visible spectroscopic analysis. Justify
- (b) With the help of suitable diagram, explain TG curve in thermogravimetric analysis. 3
5. (a) Answer the following (any two) 8
- Enlist various methods used in quantitative UV spectrophotometric analysis of single component - Discuss any one in detail
 - What is quantum yield in fluorescence spectroscopy? Elaborate Factors affecting quantum yield
 - Differentiate between IR spectroscopy and Raman spectroscopy. Give any 2 applications of Raman Spectroscopy
- (b) What are X - rays? What is X - ray diffraction? What are Miller indices? 3
6. (a) Answer the following (any two) 8
- Explain various techniques for handling solid samples in IR spectroscopy.
 - Draw a neat labelled block diagram of a filter fluorimeter. Explain the function of filters in it.
 - Write principle involved in AAS. Write any two applications of the same
- (b) Calculate concentration of drug A in $\mu\text{g/ml}$. if it gives absorbance of 0.712 in a 4 cm cell, at λ_{max} 254 nm. [Given Molar absorptivity at 254nm = 5229, Molecular weight of drug A = 248] 3