[Time: 3 Hours]   **[Marks:70]**

Please check whether you have got the right question paper.

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

Q.1   a)   Answer the following (Any five).   5M
  i.   Name any two detectors used in colorimeters.
  ii.   Write the equation indicating relation between absorbance and transmittance.
  iii. Give any two examples of auxophores
  iv.   Write wave number ranges of the three regions of IR radiations
  v.   How is wavelength maxima of a compound determined?
  vi.   Define specific activity of a radionuclide.

b)   Answer the following (Any five)   10M
  i.   Explain the term bathochromic shift with the help of a suitable diagram.
  ii.   Comment on sensitivity of fluorimetric analysis as compared to that of UV-Visible spectroscopic analysis.
  iii. With the help of a suitable example explain the term cationic interference in flame photometry.
  iv.   Explain absorption filters.
  v.   Define the terms Relative Biological Effectiveness and Gray in radiochemistry.
  vi.   Comment on the significance of Cut off wavelength of solvents in UV-visible spectroscopy.

Q.2   a)   Answer the following (Any two)   8M

  i.   Name two sources used in
        i)   UV-Visible spectroscopy
        ii)   IR Spectroscopy.
        Explain one source used in IR spectroscopy in detail.
  ii.   Give four points of difference between Infrared and Raman Spectroscopy.
  iii. With the help of a diagram explain various types of scattering in Raman Spectroscopy

b)   Write a note on Isotope Dilution Analysis.   3M

Q.3   a)   Answer the following (Any two)   8M
  i)   What is atomic spectroscopy? Give principle involved in atomic absorption Spectroscopy. Draw a neat labeled diagram of atomic absorption Spectrophotometer.
  ii)   With the help of a TG curve discuss principle of thermo gravimetric analysis. Enlist any four factors affecting the TG curve.
  iii) Write a note on applications of Near IR spectroscopy

b)   Explain the term overtone bands in IR spectroscopy.   3M

Turn Over

Q.4   a) Answer the following (any two)   8 M

    i)   State and derive Beer Lambert's law

    ii)   Fixed dose of vitamin B12 was given every fourth week to six patients. The content of Hemoglobin in these patients observed before and after treatment was as follows

Hemoglobin %

Before	After
12.2	13
11.3	13.4
14.7	16
11.4	13.6
11.5	14
12.7	13.8

State whether there is significant difference in the % Hemoglobin before and after therapy at 5% significance. [Tabulated t-value at 5 degrees of freedom for $\alpha = 0.05$ is 2.57].

    iii)   The following molarities were calculated from replicate standardization of NaOH solution.
0.526, 0.5029, 0.5023, 0.5031, 0.5025, 0.5232, 0.5027, 0.5026, 0.5212.
Assuming no determinate errors, within what range are you 95% certain that the true value of molarity falls? The corresponding t-value for 8 degrees of freedom is 2.306.

    b) How do DTA and DSC techniques differ from each other? Give any one application of each of them. 3M

Q.5   a) Answer the following (Any two)   8M

    i)   With the help of an energy level diagram explain the terms singlet state and triplet state.
Enlist different types of quenching in fluorescence spectroscopy with one example of each.

    ii)   Explain the standard curve method in UV- visible spectroscopy for assay of single component formulation.

    iii)   Explain the terms linear regression and correlation coefficient.

    b) Explain Miller's indices. Give three applications of x-ray diffractometry.   3M

Q.6   a) Answer the following (Any two).   8M

    i)   Draw a block diagram of a spectrofluorimeter. Mention role of each of its components.

    ii)   Discuss principle of sample handling in IR spectroscopy with ATR technique.

    iii)   Write a note on FTIR spectrophotometer.

    b) Calculate concentration of a drug in given solution if absorbance measured at 284 nm in 1cm cell was 0.795. Molar absorptivity of the drug is 1.75×10^4 and molecular weight of the drug is 200. Express the concentration in micrograms per ml.   3M