Q.P. Code :02683

[Time: 3Hours] **[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 diagrams wherever necessary.

Q.1 a) Answer the following (Any Seven) 7 M

i) Atomic spectrum is a line spectrum but molecular spectrum is a band spectrum. Justify
ii) Write an equation to convert wavelength of electromagnetic radiation to frequency.
iii) How can you convert Curie to Becquerel?
iv) What is half life of a radioisotope?
v) Write the necessary and sufficient condition for IR absorption by molecules.
vi) Define wavelength maxima
vii) What is the meaning of fingerprint region in IR spectrum?
viii) Why is fluorescence spectroscopy more sensitive than UV Visible Spectroscopy?

b) Explain the following terms. (Any Four) 8 M

i) Radioactive Decay
ii) Fluorophores
iii) Physical interference in flame photometry
iv) Jacquinot and Felgett advantage of FTIR
v) Chromophore and auxochrome

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

i) With the help of neat labeled diagram, explain the principle of Raman Spectroscopy.
ii) Illustrate and explain the working of a grating as monochromator.
iii) Enlist three detectors used in
i) UV Visible spectroscopy
ii) IR Spectroscopy
Explain any one in detail.

b) Write a note on radionuclidic and radiochemical purity. 3 M

Q.3 a) Answer the following (Any Two) 8 M

i) With the help of a partial energy level diagram, explain the phenomenon of atomic emission and atomic absorption. Draw a neat labeled diagram of atomic absorption spectrophotometer.
ii) Write a note on thermo gravimetric method of analysis.
iii) Give three points of comparison between atomic emission spectroscopy and atomic absorption spectroscopy. Describe the working of a flame photometer.

b) Discuss three factors affecting molecular vibrational frequency in IR spectroscopy with examples. 3 M

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

i) A drug X has A (1%, 1cm) value of 715 at 257nm. 100mg of sample of X was weighed and dissolved in solvent to make 100 ml. 2 ml of this solution was diluted to 25ml. The absorbance of resulting solution in 1cm path length cell was found to be 0.560 at 257nm. Calculate percent content of drug 'X' in the sample

ii) Give the statement of Beer Lambert's law. Derive it. Enlist any three limitations of Beer Lambert's law.

iii) Given below are the absorbance values recorded for different analyte concentrations.

Concentration (ppm)	Absorbance
2	0.11
4	0.23
6	0.35
8	0.43
10	0.56

Perform linear regression to calculate slope and intercept of the line for above data.

b) Give two points of comparison between DTA and DSC. Give any two pharmaceutical applications of DSC. 3 M

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

i) Enlist three methods by which single component assay can be performed in UV visible spectroscopy. Describe any one in detail. Name the method which does not require reference standard of the analyte.

ii) Give the fundamental equation for fluorescence intensity. Discuss any four factors which can affect fluorescence intensity

iii) With the help of an energy level diagram explain the process of fluorescence and phosphorescence.

b) Derive Bragg's Equation 3 M

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

i) Draw a neat labeled diagram of a double beam UV visible spectrophotometer. Discuss its working.

ii) Give approximate range of wave numbers of IR absorption bands of the following molecular bond vibrations.

$-\overset{O}{\overset{||}{C}}-$ stretch in ketones

$-C-H$ stretch in aromatic ring

$C \equiv N$ stretch in nitriles.

$N-H$ stretch in amines.

iii) Write a note on Michelson's interferometer

b) A drug with molecular weight of 312 has a molar absorptivity of 5910 litre moles^{-1} cm^{-1}. Calculate its specific absorbance. 3 M