M. Sc. (Semester-IV) Examination-April-2017
P-XIV Spectral Methods and Radio-Analytical Techniques
Code: 3544

Time: 2.5 hours **Marks: 70**

Q-1 Attempt following questions 14

a. Give the principle of AES. Give the schematic diagram of AES instrument with proper labelling and explain the working DC ARC Source used in AES.
b. Write a short note on various atomizers used in atomic spectroscopy.

OR

a. Give the principle of AAS. Draw the schematic diagram of hallow cathode with proper labelling and explain its working in brief.
b. Illustrate the principle of atomic spectroscopy. Give a brief account of pre-mix burner used in AAS.

Q-2 Attempt following questions 14

a. Give comparison of proton and carbon atoms with respect to NMR techniques. Explain the limitations of ^{1}H-NMR with suitable examples.
b. What are the factors that affecting the chemical shift in ^{13}C-NMR spectrum? Explain the ^{13}C-NMR spectrum of 2-Bromobutane.
c. How will you differentiate Propanone and Propanal by using ^{13}C-NMR technique?

OR

a. What is Molecular ion peak in Mass spectrum? Give few suitable examples of Molecular ion. Give possible mechanism for Molecule when exposed upon 70 ev ionization source.
b. How will you determine isotopes by using Mass spectrum? Explain with suitable example.
c. Draw schematic diagram of Time of Flight (ToF) mass analyzer and explain its working in details.

Q-3 Attempt of following questions 14

a. Define the term "Microwave spectroscopy." Give classification of types of molecules and briefly explain the linear molecule.
b. Explain the working of Michelson Interferometer.
c. Give principle of X-Ray emission. Explain the importance K_α and K_β line in the X-ray analysis.

OR

a. How will you distinguish hydrogen bonding using IR spectroscopy? Explain the effect of hydrogen bonding on the frequency of –OH and –C=O functional groups.
b. Give an account of Ge(Si) semiconductor used for detection of X-ray.
c. What is Fermi resonance in IR? Explain the phenomenon with suitable example.

Q-4 Attempt any two of following questions 14

a. Define following: (i) α-Particle (ii) β-Particle (iii) Neutron (iv) Half-life period (v) γ-Rays
b. Derive the equation for $t_{1/2}$ and show its importance in Radio-analytical Chemistry
c. Give schematic diagram of Geiger- Muller counter (GM-tube) and explain its working
d. Write a brief note on fission process for generating neutrons.

Q-5 Attempt any two of following questions 14

a. Write a short note on Spallation process in Neutron Bombardment.
b. What are nuclear emissions? Explain the characteristic of β-Particle.
c. What is Scintillation? Explain the scintillation counter.
d. Write degradation pathway for $^{238}_{92}U$