

**M. Sc. (Semester-IV) Examination April-2016**  
**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 the instrument and explain the working AC ARC Source used in AES.
- (b) Write a short note on inductively coupled plasma method in AES.

**OR**

- (a) Explain the principle of atomic absorption spectroscopy. Write a short note on different atomizers used in the AAS technique.
- (b) Give an account of electric discharge lamp used in the AAS.

**Q-2 Attempt following questions**

**14**

- (a) Give a comparison of proton and carbon atoms with respect to NMR techniques. Explain the limitations of  $^1\text{H}$ -NMR with suitable examples.
- (b) What are the factors that affecting the chemical shift in  $^{13}\text{C}$ -NMR spectrum? Explain the  $^{13}\text{C}$ -NMR spectrum of acetophenone.
- (c) Three derivatives of trichlorobenzene are placed in unlabeled vials, how will you determine all three correctly with the help of  $^{13}\text{C}$ -NMR technique?

**OR**

- (a) Write a short note on Time of Flight (ToF) mass analyzer.
- (b) What is Molecular ion peak in Mass spectrum? Give few suitable examples of Molecular ion. Give a possible mechanism for Molecule when exposed to 70 eV ionization source.
- (c) How will you determine isotopes by using Mass spectrum?

**Q-3 Attempt any three of following questions**

**14**

- (a) What is Mid-IR region? Give principle of IR spectroscopy and explain the vibration of a methylene group.
- (b) Give principle of X-Ray emission. Explain the importance  $K_\alpha$  and  $K_\beta$  line in the X-ray analysis.
- (c) How will you distinguish hydrogen bonding using IR spectroscopy? Explain the effect of hydrogen bonding on the frequency of  $-\text{OH}$  and  $-\text{C}=\text{O}$  functional groups.
- (d) Write a short note on ATR sample preparation method in IR.
- (e) Define the term "Microwave spectroscopy." Give classification of types of molecules and briefly, explain the linear molecule.
- (f) Explain the working of Michelson Interferometer.

**Q-4 Attempt following questions**

**14**

- (a) Give an account of scintillation counter.
- (b) Define " $\gamma$ -rays." Name any one detector used to determine " $\gamma$ -rays" and explain in briefly.

**OR**

- (a) Define following: (i)  $\alpha$ -Particle (ii)  $\beta$ -Particle (iii) Neutron (iv) Half-life period
- (b) Derive the equation for  $t_{1/2}$  and show its importance in radioanalytical chemistry.

**Q-5 Attempt any two of the following questions**

**14**

- (a) Give an account of neutron activation analysis.
- (b) Write a brief note on the proportional counter.
- (c) Write a short note on spallation, and fission process in neutron bombardment.
- (d) What are nuclear emissions? Explain the characteristic of  $\alpha$ -Particle.