Sem-III

QP Code : BV-8370

(2 ½ Hours) [Total Marks : 60

N.B.: (1) All questions are compulsory.
(2) Use of log table or nonprogrammable calculator is permitted.

Q.1 a. Attempt any **Two** of the following. 8

i. Draw a schematic diagram of the scanning electron microscope. Explain the function of each component.

ii. Discuss the applications of scanning probe microscope.

iii What is an Auger electron? How is it produced?

iv Explain the working of electron spectrometer used in ESCA with a suitable diagram.

b. An Auger peak was observed at 532 eV.Estimate the difference in energy between the inner shell from which the electron was ejected and the outer shell from which the second electron fell. The binding energy of the Auger electron is 573eV. 4
($h = 4.1 \times 10^{-15}$ eV , $c = 3 \times 10^{8}$ ms^{-1})

OR

b. What is UPS? What information is obtained from this technique? 4

Q.2 a. Attempt any **Two** of the following 8

i Explain isomer shift and quadrupole splitting with respect to Mossbauer's spectroscopy.

ii Discuss the different cells used in photo acoustic spectroscopy.

iii What are the applications of spark source spectroscopy?

iv Explain the arc and spark source methods with reference to sample types and sample handling.

b. Discuss the basic principle of atomic emission spectroscopy with plasma sources. 4

OR

b What are the applications of Mossbauer spectroscopy? 4

Q.3 a Attempt any **Two** of the following 8

i Explain the basic principle of TAST polarography. How is current measured in this technique?

ii Discuss the applications of polarography in organic and inorganic analysis.

iii What are screen printed electrodes? How are the analytes determined using these electrodes?

iv Describe the disposable multilayer p-ion system with a suitable example.

b In the chronopotentiometric analysis of a metal ion, the transition time of 3.47 sec was observed for a 25 cm^3 solution containing 1.6 millimoles of the metal ions. For another 25 cm^3 sample solution of the same metal ion under identical conditions, the transition time was found to be 2.44 sec. Calculate the concentration of the metal ion in the second solution. 4

OR

b Give an account of chemically modified electrodes. What is their significance? 4

Q.4	a	Attempt any **Two** of the following	8
	i	Explain the use of luminol in chemiluminescence methods.	
	ii	Give an account of liquid phase chemiluminescence titrations.	
	iii	Describe the various prisms used in polarimeter.	
	iv	Explain the following terms: Cotton effect Mutarotation	
	b	Discuss the basic principle of Circular dichroism.	4
		OR	
	b	Iron (II) ions catalyse the oxidation of luminol by H_2O_2 .The intensity of the resulting chemiluminescence varies linearly with iron (II) concentration from 10^{-10} to 10^{-8} M. 2.0 cm^3 of water was added to a 3.0 cm^3 of Fe (II) solution of unknown concentration, followed by 3.0 ml of dilute H_2O_2 solution and 1.0 cm^3 of an alkaline solution of luminol. The chemilumunescence signal from the mixture was integrated over a 10.0 sec period and found to be 26.3.To a second 3.0 cm^3 aliquot of the sample was added, 1.0 cm^3 of a 5.75×10^{-5} M Fe(II) solution followed by the same volume of H_2O_2 and luminol. The integrated intensity was 40.6. Calculate the Fe (II) molarity of the sample.	4
Q.5		Attempt any **Four** of the following	12
	i	Describe the tip and cantilever of atomic force microscope.	
	ii	What is tunneling microscope? How is it used for surface analysis?	
	iii	What is Mossbauer's effect?	
	iv	Discuss the basic principle of photo acoustic spectroscopy.	
	v	Compare and contrast chronopotentiometry and chronoamperometry.	
	vi	What are electrolytically modified electrodes?	
	vii	What are the applications of ORD?	
	viii	How is the chemiluminescence technique used for the determination of gaseous air pollutants?	