Con 3267-13. BS-6033

(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. Explain the following terms with respect to ESCA.
   a. Satellite peaks c.Fermi level
   b. Binding energy d.Work function

ii. What is ultraviolet photoelectron spectroscopy? How does it differ from ESCA?

iii Explain the scanning electron microscope with a suitable diagram.

iv Explain the basic principle and working of Atomic force microscope. 4

(b) The work function of an instrument is 12.3 eV when excited with radiations of wavelength 833.4 pm. Calculate the kinetic energy of the electron if the binding energy is 16.1eV.
($h = 4.1 \times 10^{-15}$ eV , $c = 3 \times 10^{8}$ ms^{-1}) 4

OR

(b) Discuss the applications of Auger Electron Spectroscopy. 4

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

i Draw a block diagram of a single beam photo acoustic spectrometer and explain the function of each component.

ii Give the applications of Mossbauer spectroscopy with reference to iron compounds.

iii Explain the inductively coupled plasma source with a suitable diagram.

iv Describe the instrumentation involved in Mossbauer spectroscopy.

(b) Give an account of the types of samples and their handling in arc source method. 4

OR

(b) Explain the principle of Photo acoustic Spectroscopy. 4

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

i Give an account of screen printed electrodes.

ii Explain the term transition time in chronopotentiometry. How is it obtained?

iii Describe the construction of disposable multilayer p-ion system used for the determination of potassium ions.

iv What are chemically and electro catalytically modified electrodes?

(b) Discuss the applications of polarography in organic and inorganic analysis. 4

OR

(b) In chronopotentiometry the transition time for 10 micromoles of an active species present in 50 cm^3 of the solution was 2.68 sec. What will be the transition time for a solution containing 20 micromoles of the same electro active species in 75 cm^3 of the solution under identical conditions? 4

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Q.4 (a) Attempt any **Two** of the following — 8

i How is the chemiluminescence technique useful in the analysis of gaseous air pollutants?

ii Explain the basic principle of ORD and CD.

iii What are chemiluminescence titrations? Explain with suitable examples.

iv Discuss the applications of ORD .

(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. 4

1.0 cm^3 of water was added to a 2.0 cm^3 of Fe (II) solution of unknown concentration, followed by 2.0 cm^3 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 16.1.

To a second 2.0 cm^3 aliquot of the sample 1.0 cm^3 of a 4.75×10^{-5} M Fe(II) solution was added followed by addition of the same volume of H_2O_2 and luminol.The integrated intensity was 29.6. Calculate the Fe (II) molarity of the sample.

OR

(b) Describe the chemiluminescence apparatus with a neat labelled diagram. 4

Q.5 Attempt any **Four** of the following — 12

i What is the principle of Auger electron spectroscopy?

ii Describe the various prisms used in polarimetry.

iii Discuss the principle of scanning tunneling microscope.

iv What are the applications of spark source spectroscopy?

v State Sand's equation. Explain the various terms involved in it.

vi What is chronoamperometry?

vii What are the applications of chemiluminescence in organic analysis?

viii Give an account of the detectors used in photo acoustic spectroscopy.
