

Friday,
Session: Evening

Time: 02.00 p.m. to 5.00 p.m.

Date: 21-10-2016

Subject: Spectroscopy-I Paper : PS03CIPC01

[Total Marks: 70]

N.B. (1) Figures to the right indicate full marks.

(2) Attempt all questions.

Q. 1 Select the correct answer from each of the following: (08)

1. In EIS, the primary beam is made up of _____.
(a) X-ray photons (c) X-ray photon or ions
(b) Electrons (d) ions
2. _____ in which the solid or liquid samples are put to high current or to a high potential.
(a) Sputtering device (b) Ovens (c) Electric arcs (d) Flame atomizer
3. In atomic force microscopy (AFM), cantilever tip is made up of _____.
(a) Gold (b) Diamond (c) Graphite (d) Above all
4. The technique in which the incident electrons that interact with specimen atoms in an inelastic fashion are used to provide information regarding bonding state of each element, composition, oxidation states is called _____.
(a) ESCA (b) AFM (c) SEM (d) STM
5. Determination of Ca in blood serum is possible in the present of _____.
(a) Na (b) Mg (c) La (d) Ba
6. Fluorescence emission is over in _____.
(a) 10^5 s (b) 10^{-5} s (c) $10^{-1/5}$ s (d) Above all
7. The non-luminous air-acetylene flame at 2450 °C is the best flame for routine determination of elements
(a) Fe, Ca, Mg (c) Both (a) and (b) are correct
(b) Transition elements (d) None of all
8. The standard used in fluorescence spectroscopy is
(a) TMS (b) DSS (c) Rhodamine (d) Acetanilide

Q. 2 Answer the following: (Any Seven) (14)

- (i) Explain external conversion in molecular luminescence.
- (ii) Write the principle of XPS.
- (iii) What is the Grothus Draper law?
- (iv) Describe the importance of surface analysis in science and technology.
- (v) Why flame emission is mainly used for quantitative determination of alkali and alkaline earth metals only?

- [vi] Explain sampling methods used in spectroscopic surface method.
- [vii] Write the sequence of events taking place in atomization of sample (MX) in flame atomizer.
- [viii] Define the term "Sensitized fluorescence".
- [ix] Give neat and labeled diagram of SEM instrument.
- 3 [a] Explain in detail about the burners which have been used in atomic absorption spectroscopy. (6)
- [b] Answer the followings: (6)
- [i] What is ICP? Explain instrumentation of ICP-AES.
- [ii] Write in brief note on Zeeman background correction.
- OR
- [b] Answer the followings: (6)
- [i] Discuss various applications of plasma emission spectroscopy.
- [ii] Calculate the ratio of number of sodium atoms in the 3P excited states to the number in the ground state at 2350 K. The average wavelength for the two sodium emission lines involving the 3P to 3S transition is 5895Å.
 $[h=1.987 \times 10^{-16} \text{ erg/cm}^{-1}, \text{ Boltzmann Const}= 1.38 \times 10^{-16} \text{ erg/deg}, c= 2.9979 \times 10^8 \text{ m/s}]$
- 4 [a] Give an account in detail on chemiluminescence. (6)
- [b] Describe advantages, limitations and required precautions of spectrofluorometer. (6)
- OR
- [b] Answer the following: (6)
- [i] Discuss about quenching in photoluminescence.
- [ii] Define the terms: Intersystem crossing and internal conversion in molecular fluorescence.
- 5 [a] Explain in brief on instrumentation of ESCA. (6)
- [b] Answer the following: (6)
- [i] Explain in brief on chemical shift in ESCA.
- [ii] Calculate the observed frequency of the radiation emitted from a sodium atom in a vacuum if the atom is moving toward the detector at a velocity of $8.50 \times 10^5 \text{ m/s}$ and if the wavelength of radiation emitted by Sodium with no motion is 589 nm.
- OR
- [b] Write a note on auger electron spectroscopy (AES). (6)
- 6 [a] Write a note on scanning tunneling microscope (STM) OR atomic force microscope (AFM) (6)
- [b] Answer the following: (6)
- [i] Explain the type of interactions of primary beam electrons involved with sample in SEM.
- [ii] Differentiate AFM and STM techniques.