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[104] SARDAR PATEL UNIVERSITY

M.Sc. Chemistry Examination, III[rd] Semester (CBCS)

Monday, Date: 04-04-2016

Session: Evening Time: 2.30 p.m. to 5.30 p.m.

Course Code : PS03CANC01

Corse Title: Spectroscopy-I

[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. Which compound, below, is expected to have greater fluorescence quantum yield?
(a) Benzene (b) Biphenyl (c) Fluorene (d) Cyclohexane

2. _____electrons emitted diffused through the specimen.
(a) primary (b) secondary (c) backscattered (d) none of all

3. Fluorescence more commonly found in compounds in which lowest energy transition is _____.
(a) $\sigma^* \rightarrow \sigma$ (b) $\pi \rightarrow \pi^*$ (c) $\sigma \rightarrow \pi^*$ (d) $n \rightarrow \pi^*$

4. Luminous air-acetylene flames provide the reducing conditions for the element.
(a) Mg (b) Fe (c) Ba (d) Ca

5. In surface spectroscopy, the secondary beam results from _____
(a) scattering (b) sputtering (c) Emission (d) any of these

6. In AAS, _____ is a continuous source which emits radiation over a wide range of wavelength.
(a) Xe-Arc Lamp (b) Hg vapour lamp (c) Laser (d) Above all

7. A high-powered microscope that produces an image from scattered secondary electrons is the _____.
(a) TEM (b) AFM (c) SEM (d) STM

8. _____is attenuation in the intensity of EMR after passing through sample.
(a) Intensity (b) Path length (c) Absorbance (d) Transmission

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

[i] Aniline gives fluorescence but nitro benzene does not give fluorescence, Why?

[ii] Define binding energy in electron spectroscopy.

[iii] Write the principle of UPS?

[iv] Give neat and labeled diagram of STM instrument.

[v] Explain intersystem crossing in photoluminescence.

[vi] What is main difference between AAS and FES?

[vii] Describe the instrumental signals are monitored in SEM?

[viii] Explain the function of flame in FES.

[ix] Define the photoelectric effect.

3 **[a]** Discuss in detail on various types of atomizers used in flame emission spectroscopy. **(6)**

[b] Give an account on inductive coupled plasma-atomic emission spectroscopy with reference to its principle, instrumentation and application. **(6)**

OR

[b] Write in brief note on Zeeman background correction and Doppler effect. **(6)**

4 **[a]** Discuss in detail on various applications of fluorometric analysis.. **(6)**

[b] Derive the relationship between fluorescence intensity (F) and Concentration (C) of the sample. **(6)**

OR

[b] Answer the followings: **(6)**

[i] Distinguish configuration of spectrophotometer and spectrofluorometer.

[ii] Define the term "chemiluminescence". Explain in brief about instrumentation of "chemiluminescence"

5 **[a]** Answer the following: **(6)**

[i] Discuss in detail about cylindrical mirror analyzer used in ESCA.

[ii] Describe the mechanism for LMM Auger electron formation.

[b] Explain in brief on instrumentation and application of Auger electron spectroscopy. **(6)**

OR

5 [b] Calculate the binding energy for F, if the incident x-ray photon that was used to create the inner-shell vacancy had a wave-length of 834 pm(Al, K_α). The work function of the spectrometer was 5.11 eV and the kinetic energy of the measured electron was 790 eV. (6)

($h=6.626 \times 10^{-34}$ J.s, $C = 3 \times 10^{8}$ m/s and $1J = 6.2415 \times 10^{18}$ eV]

6 [a] Explain mode of operation of scanning tunneling microscopy (STM). (6)

[b] Give the detail about the instrumentation of AFM. (6)

OR

[b] Answer the following: (6)

[i] Discuss in brief on applications of AFM.

[ii] Explain elastic and inelastic scattering events in SEM.