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SARDAR PATEL UNIVERSITY

M.Sc. Chemistry Examination, IIIrd Semester (CBCS)

Date: 04-04-2016

Monday,
Session: Evening

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

Course Code: PS03CORC01

Course 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.
($h=6.626 \times 10^{-34}$ J.s, $C = 3 \times 10^8$ m/s and $1J = 6.2415 \times 10^{18}$ eV) (6)

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.

