Sc

[161]

No. of Printed Pages: 2

SARDAR PATEL UNIVERSITY

M.Sc. Examination, Third Semester (CBCS)

Tuesday, Date: 23-10-2018

Time: 2.00 p.m. to 5.00 p.m.

Subject: Spectroscopy-I Paper: PS03CANC21

[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. External and internal conversions compete so successfully with phosphorescence that this type of emission observed at
   (a) Very low viscosity and high temperature
   (b) Very low temperature and high viscosity
   (c) Both are incorrect
   (d) Both are correct

2. Degree of scattering in transmission electron microscope is a function of _____.
   (a) wavelength of electron beam used
   (b) number of atoms that lie in the electron path
   (c) number and mass of atoms that lie in the electron path
   (d) mass of atoms that lie in the electron path

3. What component is present in a simultaneous ICP-AES instrument but absent from a sequential ICP-AES:
   (a) a light dispersing element (b) a nebulizer
   (c) a light source (d) multiple detectors

4. In XPS or ESCA, the primary and secondary beams consist respectively the_____.
   (a) X-ray photon, electrons (b) Electrons, electrons
   (c) UV photons, electrons (d) Above all

5. The function of nebulizer burner system is to
   (a) Produce mist or aerosol of the test solution (b) Covert liquid to solid state
   (b) Both (a) and (b) are correct (d) None of above

6. The secondary electrons radiated back in scanning microscope are collected by _____.
   (a) Specimen (b) Anode (c) Vacuum chamber (d) Cathode

7. Molecules which fluoresce with a high quantum efficiency have
   (a) conjugated double bonds or high resonance stability
   (b) electron donating group
   (c) high molar absorptivity and a rigid structure
   (d) All are correct

8. Electron spectroscopy can be used for the identification of all the elements in the periodic table except_____.
   (a) Hydrogen and Helium (b) Carbon (c) Chlorine (d) Copper

(PTO)

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

(i) Explain for which type of transitions the quantum efficiency is greater.

(ii) State the advantages and disadvantages of total consumption burner.

(iii) What is Doppler broadening?

(iv) Write about the operating parameters of AFM.

(v) Explain the basic principle of AAS.

[vi] What is quenching? Give the steps to avoid quenching.

[vii] Explain the double beam fluorescence spectrophotometers and its advantages.

[viii] Give the basic principle of electron spectroscopy.

[ix] Explain, how the instrumental signals in SEM are monitored?

3 **[a]** Discuss in detail on various common devices used for the formation of an atomic vapour. **(6)**

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

(i) Give the relationship between AAS and flame emission spectroscopy.

(ii) Write about the interferences in AAS.

OR

[b] Explain with a neat and labeled diagram for ICP-AES instrument. Also give the applications of plasma emission spectroscopy. **(6)**

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

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

(i) Give the major advantages and limitations of AAS and FES.

(ii) Write a note on quenching in photoluminescence.

OR

[b] Give the principle of fluorescence and phosphorescence. With a neat and labeled diagram explain the deactivation processes to interpret fluorescent spectra. **(6)**

5 **[a]** Describe in detail about the various applications of ESCA. **(6)**

OR

[a] An XPS electron was found to have a kinetic energy of 1052.6 eV when ejected with an (Al,Kα) source (λ = 8.34 Å) and measured in a spectrometer with a work function of 27.8 eV. The electron is believed to be a N(1s) electron in $NaNO_3$. Calculate the binding energy for the electron. What would be the kinetic energy of the electron if a Mg, K_α (λ = 9.890 Å) source were used? **(6)**
($h = 6.626 \times 10^{-34}$ J.s, $C = 3 \times 10^8$ m/s and $1J = 6.2415 \times 10^{18}$ eV)

[b] Give the complete account on the instrumentation of ESCA or XPS. **(6)**

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

[i] Discuss in brief on elastic and inelastic scattering events in SEM.

[ii] Explain the type of interactions of primary beam electrons involved with sample in SEM.

[b] Discuss the instrumentation of STM **OR** AFM and describe the functions of each components. **(6)**

—X—