SC

(A-77 to A-81)

No. of printed pages: 3

**SARDAR PATEL UNIVERSITY**
**M Sc - Chemistry (III Semester) Examination**
**18 April 2015 (Saturday)**
**2.30 - 5.30 pm**
**PS03CORC01 / PS03CIPC01 / PS03CINC01 / PS03CPHC01 / PS03CANC01**
**Spectroscopy I**

**Total Marks : 70**

**Note:** (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 surface analyses, the surface being examined may be contaminated or alter by
(a) adsorption of components of atmosphere
(b) primary beam itself
(c) above both are correct
(d) none of above

2. Which quantum number changes during the shake up peak?
(a) n (b) l (c) m (d) s

3. Analytically useful wavelength range for AAS is from _____.
(a) 300 nm to 700 nm
(b) 400 nm to 800 nm
(c) 190 nm to 800 nm
(d) 200 nm to 900 nm

4. The collision energy of the filler gas ions is utilized to vaporize atoms form the cathode surface in a process known as _____
(a) Electric arcs
(b) Flame atomization
(c) AC spark
(d) Sputtering

5. Quantum efficiency for a reaction in which 5.6 $x10^{18}$ photons were absorbed and 3.4 x $10^{18}$ photons were emitted during fluorescence would be _____.
(a) 0 (b) 0.61 (c) 1 (d) 1.65

6. _____measures the electrical conductance between the probe tip and the surface.
(a) STM (b) AES (c) AFM (d) TEM

7. In atomic force microscopy (AFM), cantilever tip is made up of _____.
(a) Gold (b) Diamond (c) Graphite (d) Silicon nitride

8. _____ temperature at which plasma sources operate.
(a) 4000 °C (b) 5000 °C (c) 5727 °C (d) 7500 °C

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

[i] Define the term "resonance fluorescence".

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

[iii] Explain: Electron microscope.

[iv] Discuss the principle of auger electron spectroscopy.

[v] Define the term work function in electron spectroscopy.

[vi] Explain the principle of atomic force microscopy (AFM).

[vii] Write the sequence of events taking place in atomization of sample (MX) in flame atomizer of AAS.

[viii] Why the some compounds are photoluminescent?

[ix] Draw the neat and labelled schematic diagram of atomic absorption spectrometer (AAS).

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

[i] Write the major advantages and limitations of flame photometry.

[ii] Name the different sources of radiation used in atomic spectroscopy. Hence describe any one line source with its neat and labeled diagram.

**[b]** Give an account on inductive coupled plasma-atomic emission spectroscopy with reference to its principle, instrumentation and write two main advantages of ICP cell. **(6)**

**OR**

**[b]** Discuss briefly the simultaneous and sequential multi-element spectrometer used in ICP instrument. **(6)**

**4 [a]** Discuss on factors which are affecting on photoluminescence. **(6)**

**[b]** Explain in brief the following: **(6)**

[i] Differentiate fluorescence and phosphorescence.

[ii] Draw a neat and labelled diagram of spectrofluorometer and explain in brief about the function of each component.

**OR**

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

**5 [a]** The 2s electron of sulfur has a binding energy of 165.4 eV. Estimate the work function of the electron spectrometer if the incident radiation is the $K_{\alpha 2}$ line of aluminium (834.17 pm) and the kinetic energy of the measured electron is 182.5 eV. **(6)**

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

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

[i] Discuss in brief on source used in auger electron spectroscopy (AES) and Draw the schematic diagram of AES.

[ii] Differentiate ESCA and auger electron spectroscopy (AES).

**OR**

**[b]** Describe in detail on the various applications of ESCA. **(6)**

**6 [a]** Explain Instrumentation and mode of operation of scanning electron microscopy (SEM). **(6)**

**[b]** What is tunnelling current? Write a note on scanning tunnelling microscope along with its applications. **(6)**

**OR**

**[b]** Discuss instrumentation of atomic force microscopy (AFM) and explain its mode of operation. **(6)**