SC

[51] SEAT No._____ *No. of Printed pages: 03*

SARDAR PATEL UNIVERSITY

M. Sc. Examination Third Semester (CBCS)

Tuesday, 19th March, 2019

02:00 P.M. To 05:00 P.M.

Subject: **Spectroscopy-I (NC)** Paper: **PS03CANC21** [Total Marks: 70]

N.B. (1) Figures to the right of each of the question indicate marks.
(2) Attempt all questions.

1. Choose appropriate answer of the following **[08]**

1. Which of the following is not the requirement of a good flame in flame photometer?

   (a) Liquid sample must be evaporated to form solid residue

   (b) Solid residue must decompose to form atoms

   (c) Atoms must be produced such that they have the ability to get excited to higher states

   (d) Atoms must be produced such that they are in stable state

2. Why do fluorescence spectrometers often use double-beam optics?

   (a) So a reference solution can be used

   (b) To compensate for beam attenuation by the monochromator

   (c) To compensate for power fluctuations in the radiation source

   (d) All of the above

3. Auger electron spectroscopy can be used for surface chemical analysis in a way similar to which of the following?

   (a) ESCA (b) SIMS (c) ISS (d) Ion spectroscopy

4. In AAS, with what material is the cathode in hollow cathode lamp constructed?

   (a) Tungsten (b) Quartz

   (c) Aluminium (d) Elements to be investigated

(1) (P.T.O.)

5. Which among the following helps us in getting a three-dimensional picture of the specimen?

(a) Transmission Electron Microscope (b) Compound Microscope

(c) Scanning Electron Microscope (d) Simple Microscope

6. Where do we obtain the magnified image of the specimen in SEM?

(a) cathode ray tube (b) phosphorescent screen

(c) anode (d) scanning generator

7. Which of the following is not a fuel used in flame photometry?

(a) Acetylene (b) Propane (c) Hydrogen (d) Camphor oil

8. The secondary electrons radiated back in scanning microscope are collected by?

(a) specimen (b) anode (c) vacuum chamber (d) cathode

2. Attempt any SEVEN of the following **[14]**

1. What are the important instrumental features of a modern atomic absorption instrument?
2. Write about the advantages of emission spectroscopy.
3. Explain any two factors that affect Fluorescence and Phosphorescence.
4. Define chemiluminescence and explain briefly any two applications of chemiluminescence.
5. Draw the neat and labeled diagram of SEM.
6. Explain about the tip and cantilever used in AFM.
7. Write about the basic principle of XPS and ESCA.
8. Describe the mechanism for the production of a KLL Auger electron.
9. Define Zeeman effect and Stark effect in AAS.

3. [A] Write the major advantages and limitations of flame photometry. **[6]**

[B] Explain briefly on DCP and ICP sources and discuss about the instrumentation and applications of ICP atomic emission spectroscopy. **[6]**

OR

[B] Discuss in detail about the burners used in AAS **[6]**

(2)

4. [A] Discuss briefly the simultaneous and sequential multi-element spectrometer used in ICP instrument. [6]

[B] Giving neat and labeled diagram of spectrofluorometer explain the function of each components. [6]

OR

[B] Answer the following: [6]

(i) Write the advantages and limitations of fluorimeter.

(ii) Internal conversion and inter system crossing: Explain.

5. [A] Explain in detail about auger electron spectroscopy (AES). [6]

[B] Write about the basic principle and theory of ESCA. [6]

OR

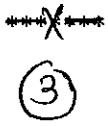
[B] Explain the instrumentation of ICP-AES and applications of plasma emission spectroscopy. [6]

6. [A] Describe the instrumentation with appropriate terminology and the modes of operation of SEM. [6]

[B] What is tunneling current? Write a note on STM along with its application. [6]

OR

[B] Write a note on AFM. [6]



(3)