Roll No. ☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 19

M.Sc. (Chemistry) PIT (2015 to 2017)   (Sem.-2)
ADVANCED CHARACTERIZATION TECHNIQUES
Subject Code : CHL-414
Paper ID : [51151]

Time : 3 Hrs.   Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :
1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SIX questions carrying FIVE marks each and students have to attempt ALL questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Differentiate between contact and non-contact modes of AFM.

2. Why vaccum is necessary in scanning electron microscope?

3. Differentiate between unit cell and primitive unit cell.

4. What are secondary and backscattered electrons? How one can use these in materials characterization?

5. Why Copper (Cu) is being used as target metal for the production of X-rays?

6. Why wavelength dispersive spectroscopy (WDS) is considered as better technique than energy dispersive spectroscopy (EDS)?

7. What is an "atomizer"?

8. Discuss two applications of DTA and DSC.

9. What is the role of a monochromator in the atomic absorption spectrophotometer?

10. Why sample coating is necessary in SEM and not in TEM?

SECTION-B

11. What do you mean by charging of sample in SEM? How it can be minimized?

12. List advantages and disadvantages of AFM.

13. Explain the TGA curve of calcium oxalate monohydrate.

14. TEM is operated at very high operating voltage while SEM is operated at low voltage-Explain.

15. With the help of a well-labelled diagram, explain the working principle of hollow cathode lamp (HCL).

16. Explain the physical phenomenon responsible for diffraction to occur.

SECTION-C

17. Explain the Braggs law of X-ray diffraction. Determine the crystal structure and lattice constant of an element showed diffraction peaks at the following 2θ angle : 38.116, 44.277, 64.426, and 77.472. Wavelength of incoming radiation is 0.154 nm. What are the Miller indices corresponding to each diffraction plane?

18. Explain the working principle of transmission electron microscope (TEM). What do you understand by depth of penetration in SEM and how does it get affected by acceleration voltage and atomic mass?

19. Describe the working principle of X-ray tube for XRD with the help of a neat schematic diagram. Differentiate between DSC and DTA.