LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **CHEMISTRY**

THIRD SEMESTER – **APRIL 2014**

CH 3875 - MATERIAL SCIENCE

Date : 12/04/2014 Dept. No. Max. : 100 Marks

Time : 01:00-04:00

Part-A

Answer *all* the questions. Each carries *two* marks.

1. Schematically indicate the (111), (001), and (100) Miller planes.
2. Explain the inversion centre symmetry.
3. List the major advantages of neutron diffraction.
4. Outline the procedure for preparing the seed crystals by low temperature crystal growth method.
5. Write the equation for Young's modulus of a composite material.
6. How is Na_xWO_3 prepared?
7. State Josephson effect.
8. What is small scale nuclear fusion? Give an example.
9. Define cooper pair of electrons.
10. State Curie-Weiss law.

Part-B

Answer any *eight* questions. Each carries *five* marks.

11. Discuss the instrumentation and working principle of a DTA.
12. Highlight the unique properties of rubber-like materials and derive the expression for equation of state.
13. Discuss the structural details and properties of a silica gel.
14. Explain the Laue method of X-ray diffraction.
15. With the help of stress-strain plot discuss the behaviour of an elastic material as a function of loading.
16. Distinguish between point symmetry and space symmetry elements with necessary diagrams.
17. Write a short note on the conductivity of graphite intercalation compounds.
18. What are metal excess defects? Explain the types with examples.
19. Draw and explain the structure of 123 oxide.
20. Discuss any five differences between hard and soft magnets.
21. Write briefly on the second harmonic generators with a schematic diagram.
22. Define piezoelectricity. Discuss any two applications.

Part-C

Answer any *four* questions. Each carries *ten* marks.

23. Employing the Bridgman geometry explain the procedure for growing single crystals by melt technique.

24a. Mention the importance of low temperature solution growth technique.

b. With suitable diagrams discuss the experimental procedure along with various parameters to be optimized for achieving the growth of high quality and defect free single crystals.

(5+5)

25. State the conditions to form three dimensional lattices and draw the 14 lattices along with necessary rules pertaining to axis and angle.
26. Explain the hysteresis in ferromagnets in brief.
27. Discuss the photocatalytic splitting up of water using TiO_2.

28a. What is p-n junction? Explain any one application of p-n junction.

b. What are shape memory alloys? Discuss their characteristics. (5+5)