LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **PHYSICS**

FIFTH SEMESTER – **NOVEMBER 2012**

# PH 5405 - MATERIAL SCIENCE

 Date : 10/11/2012 Dept. No. Max. : 100 Marks

 Time : 9:00 - 12:00

**PART – A**

Answer **ALL** questions: (10x2=20)

1. Why do solids expand on heating?
2. State Why ionic and covalent bonded solids are bad conductors of heat and electricity?
3. State Bragg’s law of X-ray diffraction.
4. What is Frenkel defect?
5. What are elinvars?
6. What is meant by work – hardening?
7. Mention the popular radiographic methods of NDT.
8. Draw the schematic diagram of metallurgical microscope.
9. How are materials classified according to their magnetic susceptibility?
10. State why ferroelectric materials exhibit hysteresis?

**PART – B**

Answer any **FOUR** questions : (4x7.5=30)

1. Write a note on secondary bond formation in different kinds of materials.
2. With neat sketches discuss the formation of edge and screw dislocations.
3. Draw the stress – strain curve for a plastic material and explain the various regions of interest. Why does the experimental result deviate from the theoretical one for large stress?
4. With schematic diagram describe how ultrasonic method is effective in detecting cracks and cavities in a material. What are the advantages of the method?
5. Write notes on ferro, ferri and antiferro magnetic materials.

**PART – C**

Answer any **FOUR** questions: (4x12.5=50)

1. Demonstrate with the necessary potential energy curve, the different equilibriums of a tilting rectangular block.
2. What is meant by enthalpy of formation? How does imperfection affect the enthalpy of the system? Obtain an expression for the concentration of crystal imperfections in terms of the enthalpy of formation.
3. With necessary diagram, discuss the atomic model of elastic behavior and obtain the relation connecting Young’s modulus Y, rigidity modulus K, bulk modulus G and Poisson’s ratio σ.
4. Draw the sketch of a scanning electron microscope and discuss its working.
5. What is meant by polarization? What are the different kinds of polarization? Explain their frequency dependence with suitable diagram.

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