

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**



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

**FIFTH SEMESTER – APRIL 2023**

**PH 5405 – MATERIALS SCIENCE**

Date: 11-05-2023

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

**PART – A**

**(10 x 2 = 20 Marks)**

**Q. No. Answer ALL questions**

- 1 Differentiate between bond length and bond energy.
- 2 Give two examples each for organic polymers and ceramic materials.
- 3 What is a unit cell?
- 4 State Bragg's law.
- 5 Define magnetic induction and give its SI unit.
- 6 Distinguish between hard and soft magnetic materials.
- 7 Define Poisson's ratio.
- 8 What are ferroelectric materials?
- 9 What are the advantages of ultrasonic testing?
- 10 Outline the principle of radiographic method.

**PART – B**

**(4 x 7.5 = 30 Marks)**

**Answer any FOUR questions**

- 11 Explain with the necessary potential energy curve, the different equilibriums of a tilting rectangular block.
- 12 With neat diagrams, discuss the formation of edge and screw dislocations.
- 13 Draw the stress – strain curve for a plastic material and explain the various regions of interest.
- 14 Explain the different levels of structure of materials.
- 15 Describe the working of a metallurgical microscope with a neat diagram.
- 16 With schematic diagram describe how ultrasonic method is effective in detecting cracks and cavities in a material.

**Answer any FOUR questions**

- 17 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  $\sigma$ .
- 18 What is meant by polarization? What are the different kinds of polarization? Explain their frequency dependence with suitable diagram.
- 19 Discuss in detail the three important steps involved in the formation of ionic bond with specific reference to NaCl crystal.
- 20 Discuss the working of powder X-ray diffractometer with necessary diagram and explain the experimental procedure to determine the crystal structure.
- 21 Draw the sketch of a scanning electron microscope and discuss its working.
- 22 a) Give the lattice specifications of 7 crystal systems. (7.5)  
b) Write short notes on ferro, ferri and antiferro magnetic materials. (5)

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