

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



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

**FIFTH SEMESTER – NOVEMBER 2022**

**UPH 5602 – MATERIALS SCIENCE**

Date: 30-11-2022

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

**PART – A**

**Answer all questions**

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

- 1 Give two examples for ceramic materials and organic polymers.
- 2 Mention the different levels of structure.
- 3 What is meant by ultimate tensile strength (UTS) of the material?
- 4 What are elastomers?
- 5 Define Magnetic induction and give its SI unit.
- 6 What is intrinsic breakdown of a dielectric material?
- 7 What is non-destructive testing? Write any two methods used for NDT?
- 8 Mention the medical applications of shape memory alloys.
- 9 What is a dielectric elastomer?
- 10 Write down the principle of photoconductivity.

**PART – B**

**Answer any four questions**

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

- 11 Elucidate the concept of stability and metastability employing a tilting rectangular block.
- 12 With a neat sketch, explain the working of a metallurgical microscope.
- 13 Draw the structure of Barium titanate crystal and discuss its ferroelectric properties.
- 14 Highlight the essential features of NEMS and MEMS and discuss the materials employed in their fabrication.
- 15 Differentiate between hard magnetic materials and soft magnetic materials.
- 16 With a neat diagram, explain the instrumentation of FTIR with a neat diagram.

**PART – C**

**Answer any four questions**

**(4 x 12.5 = 50 Marks)**

- 17 With a necessary diagram, discuss the atomic model of elastic behaviour and obtain the relation connecting Young's modulus  $Y$ , rigidity modulus  $K$ , bulk modulus  $G$  and Poisson's ratio  $\sigma$ .
- 18 (a) Define lattice energy and briefly explain Born-Haber cycle for the formation of NaCl. **(7 Marks)**  
(b) Calculate the electron affinity of iodine with the help of the following data. **(5.5 Marks)**
- Heat of formation of NaI = -440.3 kJ/mol  
Heat of sublimation of sodium = 108.4 kJ/mol  
Heat of dissociation of Iodine = 495.4 kJ/mol  
Lattice energy of NaI = -692 kJ/mol
- 19 Define polarization and mention various types of polarization with a suitable diagrams.
- 20 Write a note on (a) ferrofluids (b) dielectric elastomers
- 21 Explain the working of electron microscope with a neat diagram.
- 22 (a) Write a note on Micro hardness testing. **(6.5 Marks)**  
(b) Discuss how the variations in bonding character influence the properties of materials. **(6 Marks)**

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