

D6BPH2005

Reg.No.....

Name:

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023**(Regular/Improvement/Supplementary)****PHYSICS****GPHY6E03T: MATERIALS SCIENCE****Time: 2 Hours****Maximum Marks: 60****SECTION A: Answer the following questions. Each carries *two* marks.****(Ceiling 20 Marks)**

1. What are smart materials? Mention their uses.
2. Differentiate between substitutional and interstitial impurity point defects.
3. What is meant by screw dislocation?
4. Give the principle of scanning electron microscope.
5. State Fick's first law explaining the symbols.
6. Give the temperature dependence of diffusion coefficients.
7. What are the salient features of refractory ceramics?
8. Mention the commonly used microscopes used for examination of crystals.
9. What is the metallographic technique? Why it is called so?
10. Give the principle of transmission electron microscope.
11. What are the features that differentiate the scanning probe microscopy from other microscopic techniques?
12. Explain the intercept method of grain size determination.

SECTION B: Answer the following questions. Each carries *five* marks.**(Ceiling 30 Marks)**

13. Show that atomic packing factor for the FCC structure is 0.74.
14. Copper has FCC crystal structure and its atomic radius is 0.128 nm. If the atomic weight of copper is 63.5 g/mol, calculate its theoretical density.
15. Calculate the equilibrium number of vacancies per cubic meter for copper at 1000°C. Given that (i) energy for a vacancy formation is 0.9 eV/atom (ii) atomic weight of copper = 63.5 g/mol and (iii) density of copper at 1000°C = 8.4 g/cc
16. The density of Schottky defects in a certain sample of NaCl is 5×10^{11} per cubic meter at 25°C. If the interionic distance in NaCl is 2.82 Å, calculate the average energy required to create one Schottky defect.
17. Calculate the molecular weight of Teflon ($\text{CF}_2 = \text{CF}_2$) whose degree of polymerization is 10^5 . Atomic weights of carbon and fluorine are 12 and 19 respectively.
18. Describe the properties and applications of glass ceramics.
19. The lattice parameter for BCC iron is 0.2866 nm. Calculate the interplanar spacing and the diffraction angle for the (220) set of planes. Given that monochromatic X-rays of wavelength 0.1790 nm is used for first order reflection.

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. Describe the different types of primary and secondary bonding between atoms in a solid with suitable examples.
21. Describe the classification of polymers, based on the structure of the molecular chains.

(1 × 10 = 10 Marks)