

C 60060

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Name.....

Reg. No.....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2019

(CUCBCSS)

Physics

PHY 6B 13 (E3)—MATERIAL SCIENCE

Time : Three Hours

Maximum : 80 Marks

The symbols used in this question paper have their usual meanings.

Section A (Answer in a word or a phrase)

Answer all questions.

Each question carries 1 mark.

1. Materials science involves investigating the relationship between structures and _____ of materials.
2. For an FCC crystal, if R is the atomic radius, the linear density in the [110] direction is _____.
3. A host atom that occupy an interstitial site is called _____.
4. The number of bonds that a given monomer can form is called _____.
5. Can we use x-rays for chemical identification of materials ?

Write True or False.

6. Secondary bonds are stronger than primary bonds.
7. The number of lattice points in a BCC unit cell is 2.
8. Probability of interstitial diffusion is higher than vacancy diffusion.
9. Ceramics exhibits a combination of ionic and van der Waals bonding.
10. Double bonds between two carbon atoms involve sharing of two pairs of electrons.

(10 × 1 = 10 marks)

Section B (Answer in two or three sentences)

Answer all questions.

Each question carries 2 marks.

11. What are nano-engineered materials ? What are the two approaches adopted in nanomaterials synthesis ?
12. The properties of polycrystalline materials often isotropic. Why ?

Turn over

13. What do you mean by a point defect ? Give an example.
14. Write down the Fick's first law of diffusion and explain the terms involved.
15. Distinguish between homopolymers and copolymers.
16. What are the prerequisites of abrasives ? Give an example.
17. Write down Bragg's law of x -ray diffraction.

(7 × 2 = 14 marks)

Section C (Paragraph Questions)

Answer any five questions.

Each question carries 4 marks.

18. What do you mean by a composite material ? What is the importance of a composite material ?
19. Using a suitable schematic, explain the formation of metallic bonding.
20. Write short note on the periodicity in polycrystalline solids.
21. Explain the term stoichiometry with an example.
22. Distinguish between thermosetting and thermo plastic polymers.
23. Write short note on the different types of refractory ceramics.
24. What is the use of transmission electron microscopy ? Explain the basic principle of this technique.

(5 × 4 = 20 marks)

Section D (Short Essays)

Answer any four questions.

Each question carries 4 marks.

25. Explain why water expands on freezing.
26. Discuss the formation of van der Waals bonding in solids.
27. Using suitable figures, explain the HCP close packed structure.
28. Explain the molecular structure of cross-linked and network type polymers. Give an example for each.
29. Discuss the vacancy diffusion and interstitial diffusion in solids.

30. Using a suitable figure, explain the rock-salt structure in ceramics.
31. What do you mean by grain size? Give a method to determine the same.

(4 × 4 = 16 marks)

Section E (Essays)

Answer any two questions.

Each question carries 10 marks.

32. Explain the way in which crystallographic direction and planes are defined in crystals. Illustrate using examples.
33. Discuss the interfacial defects in solids.
34. Write short note on : (i) Stress-strain behavior ; and (ii) Visco-elastic deformation of polymers.
35. Using suitable figures, explain the principle of scanning probe microscopy.

(2 × 10 = 20 marks)