

C 80286

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Name.....

Reg. No.....

SIXTH SEMESTER B.A./B.Sc. DEGREE EXAMINATION, MARCH 2020

(CUCBCSS—UG)

Physics

PHY 6B 13 (E3)—MATERIALS 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. _____ are materials that show a combination of properties from different materials incorporating the best characteristics of each of the component materials.
2. What is the bonding existing in water ?
3. A host atom that occupy an interstitial site is called _____.
4. Give an example of an abrasive ceramic.
5. How many triple bonds exist in acetylene ?

Questions 6 to 10 : write True or False :

6. Ceramics are usually oxides, nitrides and carbides.
7. For a cubic crystal, the planes and directions having the same indices are parallel to one another.
8. Copper and nickel are completely soluble in one another at all proportions.
9. Thermoplastics harden when heated and soften when cooled.
10. Graphite is more stable than diamond.

(10 × 1 = 10 marks)

Section B (Short Answer Questions)

Answer all questions ; each question carries 2 marks.

11. What are the major components of the discipline materials science and engineering ?
12. Give any *two* properties of ionic materials.
13. What are silicate ceramics ?

Turn over

14. What do you mean by interdiffusion ?
15. What are macromolecules ?
16. Give any *two* properties of glass ceramics.
17. Mention *two* applications of a scanning probe microscope.

(7 × 2 = 14 marks)

Section C (Paragraph Questions)

Answer any five questions ; each question carries 4 marks.

18. Write short note on smart materials.
19. Draw a graph representing the variation of attractive, repulsive and the resultant potential energies on the inter atomic separation for two isolated atoms.
20. Explain what is meant by a solid solution.
21. Discuss the factors affecting diffusion.
22. Discuss the structures of any *four* types of repeating units in polymeric materials.
23. What are MEMS ? Discuss their applications.
24. Explain a method to determine the grain size of a sample.

(5 × 4 = 20 marks)

Section D (Short Essays)

Answer any four questions ; each question carries 4 marks.

25. Discuss the origin of anomalous expansion of water on freezing.
26. Distinguish between Frenkel and Schottky defects in solids.
27. Discuss the vacancy and interstitial diffusion.
28. Write short note on the different structures in ceramics.
29. Discuss the isomerism in hydrocarbon compounds giving an example.
30. Explain the plastic deformation in non-crystalline ceramics:
31. Discuss the principle of powder diffraction method of structural analysis.

(4 × 4 = 16 marks)

Section E (Essays)

Answer any two questions ; each question carries 10 marks.

32. Using suitable figures discuss the HCP and FCC close packed structures. Write short note on single crystals, polycrystalline solids and non-crystalline solids.
33. Explain the linear defects in solids.
34. Discuss the stress-strain behavior of ceramics and give a method to determine the flexural strength of ceramics.
35. Using a suitable schematic, explain the method of transmission electron microscopy.

(2 × 10 = 20 marks)