C 40208

(Pages : 2)

Name.....

Reg. No.....

SIXTH SEMESTER (CUCBCSS–UG) DEGREE EXAMINATION MARCH 2023

Physics

PHY 6B 13 (E2)—MATERIALS SCIENCE

(2017-2018 Admissions)

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. What is the bonding that is predominant in ceramics ?
2. The packing fraction for a BCC structure is _____.
3. A host atom that occupy an interstitial site is called _____.
4. The average number of repeat units per average molecule in a polymer is called _____.
5. How many hexagons are there in a C_{60} molecule ?

Questions 6 *to* 10 *: Write True* **or** *False*

6. Piezoelectric materials generate an electric field when their dimensions are altered.
7. Ionic bonding is directional in nature.
8. Ferromagnetic domain walls belong to interfacial defects.
9. The magnitude of diffusion co-efficient decreases exponentially with temperature
10. The elastic modulus of carbon nanotubes is of the order of one terapascal.

(10 × 1 = 10 marks)

Section B (Short Answer Questions)

Answer **all** *questions; each question carries* 2 *marks.*

11. What are shape memory alloys ?
12. What do you mean by polymorphism ?
13. What are single crystals ?
14. Give an expression for the temperature dependence of the equilibrium number of vacancies in a crystal and explain the terms involved.
15. Distinguish between homopolymers and copolymers.

Turn over

16. What are the advantages of ceramic ball bearings?

17. Discuss Bragg's law of x-ray diffraction.

(7 × 2 = 14 mar

Section C (Paragraph Questions)

Answer any **five** *questions; each question carries 4 marks.*

18. What are advanced materials ? Illustrate their applications.

19. Draw a graph representing the variation of attractive, repulsive and the resultant forc the inter atomic separation for two isolated atoms.

20. Determine the planar density along the (110) plane of an FCC unit cell. Given that atomic radius is R.

21. Explain what is meant by Schottky and Frenkel defects in solids.

22. Briefly discuss the structure and properties of graphite.

23. Discuss the important properties of glass ceramics.

24. Explain the difference between constant current and constant height modes of operat STM.

(5 × 4 = 20 m

Section D (Short Essays)

Answer any **four** *questions; each question carries 4 marks.*

25. Explain the essential properties of (i) biomaterials and (ii) ceramic materials.

26. Discuss the origin of metallic bonding. What are its features?

27. List the different steps adopted in determining the Miller indices of a crystallographic

28. Discuss the isomerism in hydrocarbon compounds giving an example.

29. Distinguish between edge and screw dislocation in solids.

30. Discuss the different molecular structures in polymers.

31. Draw the schematic of a transmission electron microscope indicating the parts.

(4 × 4 = 16

Section E (Essays)

Answer any **two** *questions; each question carries 10 marks.*

32. Using suitable examples, explain the formation of (i) covalent and (ii) van der Waals in solids.

33. Discuss steady state and non-steady state diffusion processes explaining Fick's laws

34. Using suitable figures, discuss the different crystal structures in ceramics.

35. Discuss the construction and working of a scanning electron microscope.