D 40054 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH/APRIL 2018

(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 questions carries 1 *mark.*

1. ———— are smart materials that generate an electric field when their dimensions are altered.
2. The packing fraction for a BCC structure is ————.
3. A host atom that occupy an interstitial site is called.
4. A ———— refers to the small molecule from which a polymer is synthesized.
5. Which one gives higher magnification, electron microscope or optical microscope ?

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

6. Polymers have very large chain like molecular structure with a backbone of carbon atoms.
7. Ionic bonding is directional in nature.
8. The relative orientations of Burgers vector and dislocation line are perpendicular in case of a screw dislocation.
9. Ceramics exhibits a combination of ionic and van der Waals bonding.
10. The Laue's method is commonly used to determine the crystal symmetry.

(10 × 1 = 10 marks)

Section B

(Answer in two **or** *three sentences)*
Answer **all** *questions.*
Each question carries 2 *marks.*

11. Discuss the basic components of the discipline materials science and engineering.
12. What do you mean by polymorphism ?
13. What are amorphous solids ?

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14. What do you mean by a twin boundary ?
15. Distinguish between homopolymers and copolymers.
16. Briefly explain the properties of refractory ceramics.
17. Discuss Bragg's law of X-ray diffraction.

(7 × 2 = 14 marks)

Section C

(Answer in a paragraph of about **half a page** *to* **one page***)*
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 force on the inter atomic separation for two isolated atoms.
20. Specify the point coordinates for all atoms positions of a BCC unit cell.
21. Explain what is meant by Schottky and Frenkel defects in solids.
22. Distinguish between thermosetting and thermo plastic polymers.
23. Discuss the important properties of glass ceramics.
24. Explain the difference between constant current and constant height modes of operation of STM.

(5 × 4 = 20 marks)

Section D

(Short essay questions. Answer in a paragraph of about **half a page** *to* **one page***)*
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 plane.
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 marks)

Section E

(Essays-answer in about **two pages***)*
Answer any **two** *questions.*
Each question carries 10 *marks.*

32. Explain the formation of :
    (i) covalent and
    (ii) van der Waals bonding in solids.
33. Discuss steady state and nonsteady state diffusion processes.
34. Discuss briefly the mechanical properties of Ceramics.
35. Discuss the construction and working of a scanning Electron Microscope.

(2 × 10 = 20 marks)