23U611 (Pages: 2) Name: .....

Reg.No: .....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2026

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19UPHY6B14 / CC20UPHY6B14 - MATERIALS SCIENCE

(Physics - Elective Course)

(2019 Admission onwards)

Time : 2.00 Hours Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 2 marks.

1. Differentiate between material science and material engineering with example.
2. Distinguish between primary and secondary bonding.
3. Give properties of polycrystalline materials
4. What is a line defect?
5. Cite two reasons why interstitial diffusion is normally more rapid than vacancy diffusion?
6. What is diffusion coefficient?
7. For refractory ceramic materials, cite three characteristics that improve with and two characteristics that are adversely affected by increasing porosity.
8. What are the different polymorphic forms of carbon?
9. Sketch repeat unit structures for the following polymers:
   (a) polychlorotrifluoroethylene, and (b) poly(vinyl alcohol).
10. Mention the uses of X-ray diffraction technique.
11. Give a short note on optical microscopy.
12. Give the relationship between ASTM grain size number and number of grains per square inch.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer ***all*** questions. Each question carries 5 marks.

13. Show that the body-centered cubic crystal structure with unit cell edge length a and the atomic radius R are related through a relation 4R= $\sqrt{3}$ a.

14. Rhodium has an atomic radius of 0.1345 nm and a density of 12.41 g/cm^3. Determine whether it has an FCC or BCC crystal structure atomic weight of rhodium is 102.91g/mol.

15. Calculate the unit cell edge length for an 85 wt% Fe–15 wt% V alloy. All of the vanadium is in solid solution, and at room temperature the crystal structure for this alloy is BCC.

16. Explain the diffusion mechanism in Integrated circuit interconnects.

17. A three-point bending test was performed on an aluminum oxide specimen having a circular cross section of radius 3.5 mm (0.14 in.); the specimen fractured at a load of 950 N (215 lbf) when the distance between the support points was 50 mm (2.0 in.). Another test is to be performed on a specimen of this same material, but one that has a square cross section of 12 mm (0.47 in.) length on each edge.At what load would you expect this specimen to fracture if the support point separation is 40 mm (1.6 in.)?

18. Sketch cis and trans structures for (a) butadiene, and (b) isoprene

19. What is meant by stress relaxation and viscoelastic creep?

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

20. In detail explain the formation of ionic and covalent bonding and discuss the properties of these bonds.

21. Derive Bragg's law for X-ray diffraction in crystals. Describe and explain rotating cryatal method of crystal structure analysis.

(1 × 10 = 10 Marks)

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