22P407 (Pages: 2) Name: .....

Reg.No: .....

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2024

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC19P PHY4 E11 - MATERIALS SCIENCE

(Physics)

(2019 Admission onwards)

Time : 3 Hours Maximum : 30 Weightage

Section A

Answer ***all*** questions. Each question carries 1 weightage.

1. Explain Zero-Dimensional imperfections in crystalline materials.
2. Discuss the 1-2-1 Rule with neat diagram.
3. State and explain Fick's First Law.
4. What do you meant by Ductile Fracture?
5. Explain the mechanical behaviour of plastics.
6. Differentiate between top-down and bottom-up growth techniques of nanomaterials.
7. Explain Plasma arc discharge in nonlithographic techniques.
8. What is the difference between resolution and magnification?

(8 × 1 = 8 Weightage)

Section B

Answer any ***two*** questions. Each question carries 5 weightage.

9. Discuss the geometry of dislocations. Also explain the properties of dislocations.
10. Give a detailed note on different invariant reactions of binary phase diagrams with neat diagrams.
11. Describe the plastic deformation by slip and based on the model, compare the shear strength of perfect and real crystals. What are whiskers?
12. Explain the basic working principle and instrumentation of Atomic Force Microscopy(AFM).Also explain its pecularities over other characterization techniques.

(2 × 5 = 10 Weightage)

Section C

Answer any ***four*** questions. Each question carries 3 weightage.

13. If there are 10^{10} m^{-2} of edge dislocations in a simple cubic crystal, how much would each of these climb down on an average when the crystal is heated from 0 to 1000 K? The enthalpy of formation of vacancies is 100 KJ mol^{-1}. The lattice parameter is 2 Å. The volume of one mole of the crystal is 5.5 $\times 10^{-6}$ m^3 (5.5 cm^3).
14. Briefly discuss the atomic model of diffusion.
15. What is creep? List the different Mechanisms of creep.
16. Differentiate between Thermosets and Thermoplasts.
17. Most silicate glasses contain network modifiers. Comment on it.
18. Describe the basic working principle of an STM.
19. What are the different types of carbon nanotubes?

(4 × 3 = 12 Weightage)

****