21P407

Name: ....

Reg.No: ....

FOURTH SEMESTER M.Sc DEGREE EXAMINATION, APRIL 2023

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC19P PHY4 E11 - MATERIAL SCIENCE

(Physics)

(2019 Admission onwards)

Time : 3 Hours

Maximum : 30 Weightage

Section A

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

1. Explain Glide motion with neat diagram.

2. Explain the Pressure-temperature diagram for the one-component system of iron.

3. State and explain Fick's First Law.

4. Discuss some methods of protection against Fracture.

5. Compare ceramic and nonceramic phases.

6. Differentiate between top-down and bottom-up growth techniques of nanomaterials.

7. Describe the preparation of nanomaterial by chemical vapour deposition(CVD) process.

8. Describe the basic working principle of an SEM.

(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. Using a neat phase diagram, explain the Iron–Iron-Carbide system and discuss its pecularities.

11. Explain the plastic deformation by slip and based on the model, compare the shear strength of perfect and real crystal. Also explain Whiskers.

12. Explain the instrumentation and working principle of Atomic Force Microscopy.List its advantages and disadvantages.

(2 × 5 = 10 Weightage)

Section C

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

13. Calculate the ratio of the number of vacancies in equilibrium at 300 K in aluminium to that produced by rapid quenching from 800 K.

14. Briefly discuss the atomic model of diffusion.

15. The yield strength of a polycrystalline material increases from 120 MN m^{-2} to 220 MN m^{-2}, on decreasing the grain diameter from 0.04 mm to 0.01 mm. Find the yield stress for a grain size of ASTM 9.

16. (a) What do you mean by DOP.

    (b) Styrene is polymerized to a DOP of 10,000. Calculate its molecular weight.

17. A stress of 1200 psi(8.3 Mpa) is required to strech a 10 cm rubber band to 14 cm. After 42 days at 20°C in the same streched position, the band exerts a stress of only 600 psi(4.31 Mpa). (a) What is the relaxation time? (b) What stress would be exerted by the band in the same streched position after 90 days?

18. Describe the basic working principle of an STM.

19. Explain how AFM can be used in biological applications.

(4 × 3 = 12 Weightage)

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