C 3536

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Name..

Reg. No..................................

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2016

(CUCSS)

Physics

PHY 4E 11—MATERIAL SCIENCE

(2012 Admission onwards)

Time : Three Hours   Maximum : 36 Weightage

Section A

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

1. Give an account of dislocation multiplication.

2. Discuss in details edge dislocation

3. Give a brief account of binary phase diagrams.

4. Illustrate with a diagram the two ring and the four ring diffusion mechanism.

5. Briefly explain Kirkendall effect.

6. What is the basis of nomenclature of polymers ?

7. What do you know about the mechanism of polymerization and step polycondensation ?

8. Give the limitations of lithographic processes.

9. Explain the Principle of molecular beam epitaxy.

10. Explain the basic principle of SEM.

11. What do you meant by Fullerene and tubules ?

12. Draw the electronic band diagram of carbon nano tube.

(12 × 1 = 12 weightage)

Section B

Answer **both** *questions.*
Each question carries 20 *weightage.*

13. (a) Explain in detail with necessary sketch the surface imperfections.

    (b) Describe the atomic arrangement in detail at planar boundaries.

14. (a) With a neat sketch explain the salient features of the atomic model of diffusion.

    (b) Discuss about other diffusion processes.

Turn over

15. (a) List and explain the properties of ceramics. Give its applications.

    (b) Explain about thermoplastic and thermosetting resins.

16. (a) Explain in detail any method of synthesis of nano materials,

    (b) Explain in detail quantum size effect and its application.

$(2 \times 6 = 12$ weightage)

Section C

Answer any **four** *questions.*
Each question carries 4 weightage.

17. Estimate the number of vacancies per atom in thermal equilibrium for a crystal at T = 300° and T = 600 °, assuming that the energy required to form a vacancy is 1 eV.

18. The surface of a copper crystal is of the [1 1 1] type. Calculate the surface energy of copper.

19. List and explain the different mechanism for the self-diffusion process.

20. A sample of glass has a crack of half length 2 μm. The Youngh's modulus of the glass is 70 GNm^{-2}. Estimate its fracture strength and compare it with its Young's modulus.

21. Draw the structure and electronic band diagram of metallic and semi-conducting carbon nanotubes.

22. Give a neat labeled sketch of SEM and explain its principle.

$(4 \times 3 = 12$ weightage)