D 120210 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
MARCH 2025

Physics/Applied Physics

PHY6B14 (EL3)—MATERIALS SCIENCE

(Admissions Year—2019 Onwards)

Time : Two Hours Maximum : 60 Marks

The symbols used in this question paper have their usual meanings.

Section A (Short Answer Type)

(*Answer* **all** *questions in two* **or** *three sentences, each correct answer carries a maximum of 2 marks*).

1. What are composites ? Give the classification of composites.
2. Write a short note on thermosetting and thermoplastic polymers.
3. List the important mechanical properties of materials.
4. What is polymerization ? What are the different strengthening mechanisms of polymers ?
5. What is a semiconducting material ? Give the significance.
6. Explain Grain and Grain boundary.
7. Write short notes on Fullerenes.
8. Explain the principle of electron microscopy.
9. What are refractories ?
10. Explain Metallic bonding in crystals.
11. What are Allotropes ? Give one Example
12. What is diffusion in solids and mention the two types of diffusion in solids ?

(Ceiling = 20 marks)

Turn over

Section B (Paragraph / Problem Type)

(*Answer* **all** *questions in a paragraph of about* **half a page** *to* **one page**, *each correct answer carries a maximum of* 5 *marks*)

13. Explain the construction and working Scanning probe microscopy
14. How will you determine grain size of a sample ?
15. Find out the packing fraction of FCC.
16. Explain viscoelastic deformation of polymers.
17. Compute the line energy of dislocations in BCC iron. The Burgers vector in iron is ½ for <111> type. The shear modulus of iron is 80.2 GN m^{-2}.
18. Explain the factors effecting diffusion ?
19. Explain Frenkel defects and derive an expression for the equilibrium concentration for Frenkel defects.

(Ceiling = 30 marks)

Section C (Essay Type)

(*Essays - Answer in about* **two pages**, *any* **one** *question. The question carries* 10 *marks.*

20. Explain dislocations in solids and their importance in material science.
21. Explain the principle and working of Scanning Electron Microscope.

(1 × 10 = 10 marks)

D 100640 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER U.G. (CBCSS–UG) DEGREE EXAMINATION, MARCH 2024

Physics

PHY6B14 (EL3)—MATERIALS SCIENCE

(2019 Admission onwards)

Time : Two Hours Maximum : 60 Marks

The symbols used in this question paper have their usual meanings.

Section A - Short Answer type.

Answer **all** *questions in two or three sentences, each correct answer carries a maximum of* 2 *marks.*

1. Give two examples for HCP crystal structure.
2. Explain Ionic bonding.
3. What are Allotropes ? Give one Example
4. What is glass ceramics ? What are the properties ?
5. What is meant by (a) Lattice (b) Unit cell ?
6. Explain Polymorphism.
7. Write down Fick's first law of diffusion and explain the terms involved.
8. Explain carbon nanotubes.
9. Explain hydrogen bonding in water
10. What are amorphous solids ?
11. Explain Grain and Grain boundary
12. What are the two types of diffusion in solids ?

(Ceiling 20 marks)

Section B - Paragraph / Problem type

Answer **all** *questions in a paragraph of about half a page to one page, each correct answer carries a maximum of* 5 *marks.*

13. Describe Laue's experiments and point out its significance.
14. What is stress-strain behavior of ceramics ?
15. Write a short note on Electron microscopy.

Turn over

16. Explain the factors effecting diffusion.

17. Explain different forms of carbon, classification of carbon and their applications.

18. Find the equilibrium concentration of vacancies in aluminium and nickel at OK, 300 K and 900 K.

19. What are composites ? Explain its properties.

(Ceiling 30 marks)

Section C - Essay type

Essays - Answer in about two pages, any **one** *question.*
Answer carries 10 *marks.*

20. Explain the principle and working of Transmission Electron Microscope.

21. What are surface defects in Solids ? Explain in detail the different types of surface defects in solids.

(1 × 10 = 10 *marks)*

C 40631 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2023

(CBCSS)

Physics

PHY 6B 14 (EL3)—MATERIALS SCIENCE

(2019 Admission onwards)

Time : Two Hours Maximum Marks : 60

Section A (Short Answer Type)

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

1. What is theme of materials science and engineering ?
2. What are smart materials ? What are their components ?
3. Discuss the origin of ionic bonding in NaCl.
4. Explain polymorphism using an example.
5. Draw the [111] and [110] directions in a cubic unit cell.
6. What do you mean by a solid solution ?
7. Give Fick's second law of diffusion and explain the terms involved.
8. What do you mean by an abrasive ceramic ?
9. Explain the term stoichiometry with an example.
10. Distinguish between thermosetting and thermoplastic polymers.
11. What are the methods used to determine the grain size of a sample ?
12. Discuss two applications of a scanning probe microscope.

(Ceiling marks = 20 marks)

Section B (Paragraph/Problem Type)

Answer **all** *questions in* **a paragraph** *of about* **half a page** *to* **one** *page.*
Each question carries 5 *marks.*

13. What do you mean by a composite material ? Why we prepare a composite material ? Give an example.
14. Write short note on close packed structures in solids.

Turn over

15. Discuss the importance of aluminium for integrated circuit interconnects.
16. Write short note on the different structures in ceramics.
17. What are co-polymers ? What are the different types of co-polymers ?
18. Using a schematic, explain an X-ray diffractometer.
19. What is the use of transmission electron microscopy ? Explain the basic principle of this technique.

(Ceiling marks = 30 marks)

Section C (Essay Type)

Answer any **one** *question in about* **two** *pages.*
The question carries 10 *marks*

20. Describe the linear defects in solids.
21. Discuss the stress-strain behaviour and viscoelastic deformation of polymers.

(1 × 10 = 10 marks)

C 20664 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2022

(CBCSS—UG)

Physics/Applied Physics

PHY 6B 14 (EL3)—MATERIALS SCIENCE

(2019 Admissions)

Time : Two Hours Maximum : 60 Marks

The symbols used in question paper have their usual meanings.

Section A (Short Answer Type)

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. Explain the basic components of the discipline materials science and engineering.
2. Why is it so that the properties of polycrystalline materials usually isotropic ?
3. Using a suitable figure, explain a self-interstitial.
4. What is Burgers vector ?
5. Give Fick's first law of diffusion and explain the terms involved.
6. Give expression indicating the temperature dependence of diffusion co-efficient and explain the terms involved.
7. Explain what you mean by macromolecules.
8. Distinguish between homopolymers and copolymers.
9. What are the prerequisites of abrasives ? Give an example.
10. Discuss the structures of any four types of repeating units in polymeric materials.
11. What are the applications of Laue's method ?
12. Explain the term optical microscopy.

(8 × 3 = 24 marks)

Turn over

Section B (Paragraph/Problem Type)

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. What are advanced materials ? Discuss their applications.
14. Give a graph representing the variation of attractive, repulsive and the resultant force on the inter atomic separation for two isolated atoms.
15. Distinguish between edge and screw dislocation in solids.
16. Distinguish between steady state and non-steady state diffusion.
17. Discuss briefly the different molecular structures in polymers.
18. Obtain the Bragg's law of x-ray diffraction.
19. Write short note on scanning probe microscopy.

(5 × 5 = 25 marks)

Section C (Essay Type)

Answer any **one** *question.*
The question carries 11 *marks.*

20. Discuss the formation of (i) Covalent ; and (ii) Van der Waals bonding in solids.
21. Explain briefly the mechanical properties of ceramics.

(1 × 11 = 11 marks)