(6 pages) Reg. No. : .....

Code No. : 20309 E **Sub. Code : AMPH 63**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2023.

Sixth Semester

Physics – Core

SOLID STATE PHYSICS

(For those who joined in July 2020 only)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The primitive lattice cell is a _____ cell.
   (a) minimum volume
   (b) maximum volume
   (c) low density
   (d) all the above

2. Bragg's law is
   (a) $2d\sin\theta = n\lambda$
   (b) $2d\sin\theta = n\lambda^2$
   (c) $2d\sin 2\theta = n\lambda$
   (d) None of the above

3. The Quazi crystals are _____.
   (a) nearly insulators
   (b) semiconductors
   (c) good conductors
   (d) none of the above

4. Made lung constant for simple crystal structure is
   (a) 1.2 – 1.4 (b) 1.6 – 1.8
   (c) 1.3 – 1.5 (d) None of the above

5. Lorentz field is
   (a) $E = \frac{P}{3\epsilon_0}$ (b) $E = -\frac{P}{3\epsilon_0}$
   (c) $E = \frac{2P}{\epsilon_0}$ (d) $E = \frac{3P}{\epsilon_0}$

6. The orientation polarizability per molecule in a polyatomic gas is proportional to
   (a) T (b) T^2
   (c) $1/T$ (d) $1/T^2$

7. Hard superconductor is type _____ superconductor.
   (a) I (b) II
   (c) III (d) None of the above

8. Ac Josephson effect, the current oscillates with frequency
   (a) $w = 2/ev_0\hbar$ (b) $w = \frac{\hbar}{2ev_0}$
   (c) $w = 2ev_0\hbar$ (d) $w = \frac{2ev_0}{\hbar}$

9. An example of OD nano structure is
   (a) Carbon nanowire
   (b) Bucky ball
   (c) Tee ball
   (d) Quantum dot

10. Carbon nanotube is
    (a) Non-polar molecule
    (b) Polar molecule
    (c) A good heat conductor
    (d) None of the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) State and explain Bragg's law.

    Or

    (b) Explain the sodium chloride structure.

12. (a) Focus the perpendicular distance between two parallel planes.

    Or

    (b) Explain the quasi crystals.

13. (a) Write a short note on piezo-electricity.

    Or

    (b) Write a note on dielectric properties.

14. (a) Explain the isotope effect on superconductors.

Or

(b) Write a note on type II superconductors.

15. (a) Define : Nanomaterials. Give five examples.

Or

(b) Write the applications of nano-materials with suitable examples.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss in detail about Wigner-Seitz cell.

Or

(b) Discuss in detail about miller indices.

17. (a) Discuss the types of bonds with suitable examples.

Or

(b) Compare ionic and covalent solids.

18. (a) Explain in detail about orientational polarization.

Or

(b) Discuss Weiss theory of ferro-electricity. Give some applications of ferroelectric materials.

19. (a) Describe Meissner effect and type I, II superconductors.

Or

(b) Obtain London equation.

20. (a) Describe neat sketch and synthesis of sol-gel technique.

Or

(b) Explain the following

(i) CNT

(ii) Carbon Nanobuds

(iii) Inorganic nanotubes

(iv) Nano shells.

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