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**Reg. No. : .....**

**Code No. : 20565 E      Sub. Code : SMPH 64**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2021.

Sixth Semester

Physics — Core

**SOLID STATE PHYSICS**

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — ( $10 \times 1 = 10$  marks)

Answer ALL questions.

Choose the correct answer.

1. Packing factor of FCC is \_\_\_\_\_.  
(a) 75%                      (b) 74%  
(c) 76%                      (d) 70%
2. The coordination number for HCP structure is  
(a) 14                      (b) 11  
(c) 12                      (d) 10

3. If the strength of the electric field is increased, the strength of the induced dipole is \_\_\_\_\_.
- (a) decreases                      (b) increases  
(c) zero                              (d) infinity
4. The diamagnetic susceptibility is always
- (a) positive  
(b) negative  
(c) zero  
(d) depending on the material
5. Which of the interatomic bonds are directional?
- (a) Covalent                      (b) Metallic  
(c) Ionic                              (d) Vander Waals
6. Which of the following solids show a tendency to polymerise?
- (a) Ionic                              (b) Covalent  
(c) Metallic                          (d) Hydrogen bond

7. In superconductors, the Fermi energy level is
- (a) below the ground state
  - (b) midway between the ground state and first excited state
  - (c) above first excited state
  - (d) at first excited state
8. The energy required to break a cooper pair is \_\_\_\_\_ of the energy gap of superconductor.
- (a) one half
  - (b) equal to
  - (c) twice
  - (d) thrice
9. Industrial catalysts should have \_\_\_\_\_ surface area.
- (a) maximum
  - (b) minimum
  - (c) moderate
  - (d) zero
10. The size of the nanoparticle range is between \_\_\_\_\_.
- (a) 10-100 mm
  - (b) 1-100 nm
  - (c) 1-1000 cm
  - (d) 10-50 mm

PART B — ( $5 \times 5 = 25$  marks)

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

Each answer should not exceed 250 words.

11. (a) Write a note on BCC structure.

Or

- (b) State and explain Bragg's law.

12. (a) Explain the domain theory of ferromagnetism.

Or

- (b) Derive an expression for electronic polarizability in dielectric materials.

13. (a) Write a short note on ionic and covalent bonding in crystals.

Or

- (b) Explain the bonding energy of NaCl molecule.

14. (a) Describe the occurrence of superconductors and explain Meissner Effect.

Or

- (b) Discuss the general properties of superconductors.
15. (a) Explain sol gel method in synthesis of nanomaterials.

Or

- (b) Write a note on carbon nanotubes.

PART C — ( $5 \times 8 = 40$  marks)

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

Each answer should not exceed 600 words.

16. (a) Describe the Bravais lattices of seven Crystal system with a neat sketch.

Or

- (b) Explain the Miller indices in crystal planes and the procedure for finding the miller indices with suitable examples.

17. (a) Explain Weiss theory of paramagnetism.

Or

- (b) Discuss different types of polarization in detail and obtain the expression for total polarizability.

18. (a) Explain about Vander Waals bonding and Hydrogen bonding in detail.

Or

- (b) Explain Madelung constant for sodium chloride crystal and its applications.

19. (a) Explain in detail both AC and DC Josephson effect in Superconductors.

Or

- (b) List the thermal and magnetic properties of superconductors.

20. (a) Explain the characterization methods to analyse the nano materials.

Or

- (b) Explain the ball milling method in synthesis of nano materials.