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Reg. No. : _____

Code No. : 20303 E Sub. Code : CMPH 68

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

Sixth Semester

Physics — Core

SOLID STATE PHYSICS

(For those who joined in July 2021 and 2022 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. In a crystal, the Miller Indices of a given plane is 3 : 2 : 1. What are the intercepts?
(a) 1a, 2b, 3c (b) 2a, 3b, 6c
(c) 2a, 1b, 3c (d) 3a, 2b, 1c
2. _____ is equation of Braggs law.
(a) $n\lambda = 2d \sin \theta$ (b) $n = 2d \sin \theta$
(c) $n\lambda = d \sin \theta$ (d) $n\lambda = 8d \sin \theta$

3. _____ Bonds are called Primary bonds.

- (a) Ionic (b) Covalent
(c) Metallic (d) All the above

4. The atoms of solid Ar are held together by

- (a) Vanderwaals's force
(b) Hydrogen bonds
(c) Ionic bonds
(d) Hydrophobic forces

5. Gold is an example for a _____ magnetic material.

- (a) Dia (b) Para
(c) Ferro (d) Ferri

6. Domain formation is necessary features of _____.

- (a) Diamagnetism
(b) Paramagnetism
(c) Ferrimagnetism
(d) Ferromagnetism

7. A super conductor is a perfect _____ material.

- (a) Insulator (b) Semi-Conductor
(c) Dielectric (d) Diamagnetic

8. The first successful theory on superconductivity was due to

- (a) Schrieffer
(b) Onnes
(c) Ampere and Schrieffer
(d) Bardeen Cooper and Schrieffer

9. Sol-gel method is _____ approach.

- (a) Bottom up (b) Up bottom
(c) Top down (d) Down top

10. CNTs stands for

- (a) Carbon Nanotubes
(b) Carbon Nanotechnology
(c) Carbon Nanoscience and technology
(d) Carbon Nine Technology

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain the crystal classification into seven systems and Bravice lattices.

Or

- (b) Draw the structure of Sodium Chloride and Diamond Structure.

12. (a) Comparison between ionic and covalent solids.

Or

- (b) Discussion about the Sodium Chloride crystal and its application.

13. (a) Explain Classical theory of Langevin's theory of paramagnetism.

Or

- (b) Define Dielectrics and what are the different types of electric polarization.

14. (a) State and explain Meissner effect.
Or
(b) Explain about the general properties of Superconductors.
15. (a) What are nanomaterials? Write a different modes of classification of nanomaterials.
Or
(b) What is a carbon nano tubes and explain.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Explain the following structures with their diagram :
(i) Simple Cubic (SC)
(ii) Face Centered Cubic (FCC)
(iii) Body Centered Cubic (BCC)
(iv) Hexagonal Close Packed (HCP)
Or
(b) Describe the method to determine Miller Indices of a plane. Find the Miller Indices for a plane having intercepts a, b, c on the crystallographic axes.

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17. (a) Explain the types of bonding in crystals :
(i) Ionic bonds
(ii) Covalent bond
(iii) Metallic bond.

Or

- (b) What is meant by the cohesive energy of a solid? Discuss the nature of the interactions that contributes to the cohesive energy of ionic solid.

18. (a) Derive the expression for the Clausius-Mosotti's Relation.

Or

- (b) Discuss the Weiss theory of Para Magnetism.

19. (a) Write a note on Type-I and Type-II Superconductors.

Or

- (b) Briefly discuss the BCS theory of superconductivity.

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20. (a) Explain the methods are chemical vapour deposition and sol-gel technique.

Or

- (b) Discuss about the properties and applications of nanomaterials.
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