

Reg. No. :

Code No. : 30317 E Sub. Code : SMPH 64

Sc. (CBCS) DEGREE EXAMINATION, APRIL 2022

Sixth Semester

Physics — Core

SOLID STATE PHYSICS

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

Coordination number for closest packed crystal structure

- (a) 16 (b) 12
(c) 8 (d) 4

Most Bravais lattices are of the type

- (a) Primitive unit cell
(b) Body centered unit cell
(c) End centered unit cell
(d) Face centered unit cell

Which of the following is Type I superconductor

- (a) Lead (b) Gold
(c) Vanadium (d) Niobium

The transition temperature of mercury is

- (a) 1 K (b) 1.14 K
(c) 4.12 K (d) 9.22 K

1 mm = _____ nm.

- (a) 10^6 (b) 10^{-6}
(c) 10^7 (d) 10^{-7}

The diameter of bucky ball is about _____

- (a) 1 Å (b) 10 Å
(c) 100 Å (d) 1000 Å

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

- (a) Describe the face centered cubic structure.

Or

State and explain Bragg's law.

3. Magnetic susceptibility is positive for

- (a) Paramagnetic material
(b) Ferromagnetic material
(c) Diamagnetic material
(d) Anti ferromagnetic

4. Polarization is defined as the dipole moment per unit

- (a) Length (b) Area
(c) Volume (d) Time

5. The madelung constant for the NaCl structure converges to a value _____

- (a) 1.7475 (b) 1.7745
(c) 1.7557 (d) 1.7345

6. The coordination number of a NaCl crystal is

- (a) 4 (b) 6
(c) 12 (d) 8

12. (a) Outline the classical theory of diamagnetism.

Or

- (b) Explain Antiferromagnetism.

13. (a) Write the types of bonds in crystals. Describe ionic bond with a diagram.

Or

- (b) Explain the cohesive energy of ionic solids.

14. (a) Define :

- (i) Effect of magnetic field
(ii) Meissner effect
(iii) Isotope effect.

Or

- (b) Write a note on type II superconductors.

15. (a) Write a note on synthesis of nanomaterials.

Or

- (b) Describe Fullerence 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) Explain the seven classes of crystals.

Or

- (b) Explain the Miller indices.

17. (a) Explain Weiss theory of paramagnetism.

Or

- (b) Explain the electronic polarization.

18. (a) Explain ionic and covalent bonds.

Or

- (b) Explain application to sodium chloride crystal.

19. (a) Outline general properties of superconductors.

Or

- (b) Explain high temperature T_c superconductors.

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20. (a) Outline the classification of nanomaterials.
Explain sol gel technique.

Or

- (b) Explain carbon nanotubes.

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