

E 1694

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Reg. No.....

Name.....

**B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2015**

**Sixth Semester**

**Core Course—CONDENSED MATTER PHYSICS**

[Common for B.Sc. Physics Model I, B.Sc. Physics Model II, B.Sc. Physics E.E.M. and  
B.Sc. Physics - Instrumentation]

Time : Three Hours

Maximum Weight : 25

**Part A (Objective Type Questions)**

*Answer all questions.*

*Each bunch of four questions carries a weight of 1.*

**Bunch I**

1. The ideal  $c/a$  ratio for hexagonal close packed structure is :

(a) 1.

(b)  $\frac{\sqrt{8}}{\pi}$ .

(c)  $\sqrt{3}$ .

(d)  $\sqrt{\frac{8}{3}}$ .

2. A crystallographic plane has intercept 1 along 'a' 2 along 'b' and 3 along 'c'. The Miller indices are :

(a) (1, 2, 3).

(b) (2, 4, 6).

(c) (3, 2, 1).

(d) (6, 3, 2).

3. Which of the following has hydrogen bonding ?

(a)  $\text{CH}_4$ .

(b) C.

(c) HF.

(d)  $\text{C}_2\text{Cl}_2$ .

4. At absolute zero temperature all the allowed energy states upto Fermi level will be :

(a) Empty.

(b) Occupied.

(c) Half occupied and half empty.

(d) Partially occupied and partially empty.

**Bunch II**

5. The density of allowed states between energy states of  $E$  and  $E + dE$  is proportional to :

(a)  $E^{1/2}$ .

(b)  $E$ .

(c)  $E^{3/2}$ .

(d)  $E^2$ .

**Turn over**

6. Two dimensional lattice with highest rotational symmetry is :

- (a) Triangular lattice.
- (b) Hexagonal lattice.
- (c) Square lattice.
- (d) All of the above.

7. The volume of a primitive unit cell of a F.C.C. structure with lattice constant 'a' is :

- (a)  $a^3$ .
- (b)  $\frac{a^3}{2}$ .
- (c)  $\frac{a^3}{4}$ .
- (d)  $\frac{a^3}{8}$ .

8. The volume of a crystal primitive cell is 'V'. The volume of the first Brillouin zone is :

- (a)  $\frac{1}{V}$ .
- (b)  $v$ .
- (c)  $2\pi^3 v$ .
- (d)  $\frac{2\pi^3}{V}$ .

#### Bunch III

9. Which of the following shows tendency to polymerize ?

- (a) Ionic.
- (b) Covalent.
- (c) Metallic.
- (d) Van der Waals.

10. Phonon is \_\_\_\_\_.

- (a) Electromagnetic wave.
- (b) Polarization wave.
- (c) Magnetisation wave.
- (d) Quantised lattice vibration.

11. At low temperature, the electrical resistivity varies as :

- (a) T.
- (b)  $T^2$ .
- (c)  $T^3$ .
- (d)  $T^6$ .

12. At low temperature above absolute zero for  $E \ll E_F$ , the Fermi Dirac function approaches :

- (a)  $\frac{-E}{eKT}$ .
- (b) Zero.
- (c) Unity.
- (d) Infinity.

13. The maximum symmetry elements presents in :

- (a) Ortho rhombic crystal.
- (b) Cubic crystal.
- (c) Trigonal crystal.
- (d) Hexagonal crystal.

14. A crystal possess maximum \_\_\_\_\_ point groups.

- (a) 23.
- (b) 32.
- (c) 532.
- (d) 1.

15. Five fold rotation axis \_\_\_\_\_ is lattice.

- (a) Exist.
- (b) Does not exist.
- (c) May possible.
- (d) All the above are correct.

16. An X-ray tube works in 60 kV. What will be minimum wave length of X-rays emitted from it ?

- (a)  $0.2 \times 10^{-10}$  m.
- (b)  $2\text{\AA}$ .
- (c)  $20\text{\AA}$ .
- (d)  $200\text{\AA}$ .

#### Part B (Short Answer Questions)

Answer any five questions.

Each question carries a weight of 1.

17. What is Bragg's Law ? Explain.

18. Distinguish between Point group and Space group.

19. State Bloch Theorem.

20. What is reciprocal lattice and why it is called so ?

21. What are Brillouin Zones ?

22. What is Meissner effect ?

23. Distinguish between Type 1 and Type 2 super conductors.

24. Bring out the application of Nanomaterials.

#### Part C (Short Essay/Problems)

Answer any four questions.

Each question carries a weight of 2.

25. Explain Curie Weiss's Law in magnetism.

26. What is London equation in superconductivity ? Explain.

27. Give the free electron theory in one dimension.

28. What are amorphous superconductors ?

29. Show that in a simple cubic lattice the separation between successive lattice planes (100), (110) and (111) are in the ratio of 1 : 0.71 : 0.58.