K17U 2320

Reg. No.: .....

Name: .....

V Semester B.Sc. Degree (CCSS – Sup/Imp.) Examination, November 2017
(2013 & Earlier Admission)
Core Course in Physics
5B08PHY : PHYSICS OF SOLIDS

Time : 3 Hours

Total Weightage : 30

SECTION – A

(Multiple choice questions in bunches of **four**. **Each** bunch carries a weightage of **1**).

1. i) Pure and dry ionic compounds are

   a) Metals
   b) Insulators
   c) Semiconductors
   d) Semi-metals

   ii) Polycrystalline solids

   a) atoms or molecules are arranged upto a few molecular distances
   b) consists of grains which are highly ordered crystalline regions of irregular size and orientation
   c) single crystals having a long range order.
   d) single crystals having a short range order

   iii) The coordination number of body centred cubic structure is

   a) 6 b) 2 c) 12 d) 8

   iv) The de Broglie wavelength associated with an electron of mass m and accelerated by a potential V is

   a) $h\sqrt{2mVe}$ b) $h/2Vem$ c) h/Vem d) $\sqrt{2mVeh}$

2. v) The kinetic energy of the electron is given by

   a) $\frac{3}{2}k_BT$ b) k_BT c) $\frac{1}{2}k_BT$ d) $3k_BT$

P.T.O.

vi) According to Einstein's theory of specific heat, as temperature decreases the molar specific heat (C_v)

a) increases
b) remains constant
c) drops exponentially
d) increases exponentially

vii) According to Debye's approximation, the specific heat at very low temperature is proportional to

a) T^3 b) T c) T^6 d) T^2

viii) The conductivity of superconductors at critical or transition temperature

a) increases
b) decreases
c) remains infinite
d) remains constant **(2×1=2)**

SECTION – B

(Short answer questions **eight** questions; Answer **any six**. **Each** carries a weightage of **1**)

3. What are Cooper-pairs in superconductors ?
4. What are the seven systems of crystal ?
5. What is Bragg's law ?
6. Calculate the number of atoms per unit cell in bcc structure.
7. How are ionic bonds formed ? Give 2 examples of ionic molecules.
8. What is Wiedemann-Franz law ?
9. What is Dulong-Petit law ?
10. State any 4 important properties of superconductors. **(6×1=6)**

SECTION – C

(Short essay/problem or both **twelve** questions. Answer **any nine**. **Each** question carries a weightage of **2**)

11. Calculate the bond energy of NaCl molecule.
12. Distinguish between covalent and metallic bonds with examples.

13. Calculate the atomic packing factor of hcp structure.

14. Explain the steps involved in the determination of Miller indices and state its important features.

15. An ortho-rhombic crystal has axial vectors in the ratio a : b : c :: 0.424 : 1 : 0.367. Find the miller indices of those crystal planes whose intercepts are in the ratio 0.212 : 1 : 0.183.

16. Explain the powder crystal method.

17. A beam of X-rays is incident on a sodium chloride crystal with a lattice spacing of 1.82×10^{-10}m. The first order Bragg reflection is observed at a glancing angle of 30°. What is the wavelength of X-rays ?

18. Give a brief account of Mattheissen's rule.

19. What is relaxation time and mean free path of an electron ?

20. What are the assumptions made for Dulong and Petit law ? Using classical theory, calculate the amplitude of harmonic oscillator at 300 K. Given that the value of k is 20.

21. What is Meissner effect and how superconductors are classified depending on this effect ?

22. Brief account of Josephson's effect. **(9×2=18)**

SECTION – D

(Long essay questions **two** questions. Answer **any one**. **Each** question carries a weightage of **4**)

23. Explain Bragg's X-ray Spectrometer ? What is rotating crystal method.

24. Deduce a formula to show that the resistivity is depended on the temperature and also state how the resistivity changes with pressure ? **(1×4=4)**
