M 7158

Reg. No. : .....

Name : .....

V Semester B.Sc. Degree (CCSS – Reg./Supple./Imp.)
Examination, November 2014
CORE COURSE IN PHYSICS
5B08 PHY : Physics of Solids

Time : 3 Hours

Max. Weightage : 30

PART – A

Answer **all** questions. **Each** bunch carries a weightage of **1** :

1. i) Sodium has body centred packing. If the distance between two nearest atom is 3.7 Å, then lattice parameter is

a) 2.3 Å b) 3.9 Å c) 4.3 Å d) 4.8 Å

ii) A crystal that is transparent to light is due to

a) Ionic bonding b) Metallic bonding
c) Covalent bonding d) Vander Waal's bonding

iii) The co-ordination number for simple cubic crystal is

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

iv) The number of atom per unit cell of a bcc crystal is

a) 1 b) 2 c) 4 d) 8

2. i) Bragg's law is

a) $d \sin \theta = 2\lambda$ b) $2d \cos\theta = \lambda$
c) $2d \sin \theta = n\lambda$ d) $d \tan \theta = 2\lambda$

ii) When temperature of a metal increases, then its mean free path

a) decreases b) increases
c) constant d) first increase and then decrease

P.T.O.

iii) According to Debye's theory of specific heat at high temperature specific heat is proportional to

a) T b) T^2 c) T^3 d) Independent of T

iv) BCS theory relating to

a) Interference b) Superconductivity

c) Specific heat d) None of the above (2×1=2)

PART – B

Answer **any six**. **Each** question carries a weightage of **1**.

3. List the different type of bond with suitable example.
4. What is Miller indices ?
5. What do you mean by packing fraction ?
6. Give the principle of rotating crystal method.
7. List any two drawbacks of classical of theory of free electron model.
8. What are phonons ? Give one property.
9. What is Meissner effect ?
10. Define Josephson's effect. (6×1=6)

PART – C

Answer **any nine** questions. **Each** carries a weightage of **2** :

11. Distinguish between Ionic bond and covalent bond with example.
12. The Bragg angle corresponding to the first order reflection from (1,1,1) planes in a crystal is 30° when X-rays of wavelength 1.75 Å are used. calculate the interatomic spacing.
13. Derive Bragg's law and give its importance.

14. An X-ray beam of wavelength 0.97 Å is obtained in the third order after reflection at 60° from the crystal plane. Another beam is obtained in the first code after reflection at 30°. Find the wavelength of second X-ray beam.

15. Define coordination number and lattice constant of a crystal. Explain how lattice constant in alkali halide crystals was calculated.

16. Calculate the mean free time in copper at 20°C, assuming one free electron/ copper atom. Assuming that the average speed of the free electrons is about 10^6 m/s, estimate the mean free path. $n = 8.48 \times 10^{28}$ electron/m^3 $p = 1.673 \times 10^{-8}$ Ω m.

17. Discuss Einstein's specific heat formula and explain its limitations.

18. What do you understand by sp. heat of solids ? How the concept of phonons be explained ?

19. Explain with suitable example Type I and Type II superconductors.

20. Distinguish between DC Josephson effect and ac Josephson effect.

21. Discuss the phenomenon of thermal conductivity due to electron.

22. Obtain an expression for Debye's frequency. **(9×2=18)**

PART – D

Answer **any one**. **Each** question carries **4** weightage.

23. Discuss Laue's principle of X-ray diffraction and obtain the diffraction condition for a simple cubic lattice. What is Laue spots ?

24. Briefly explain the salient features of BCS theory. Describe one experimental evidence for the existence of energy gap. **(1×4=4)**
