Seat No.:_____

[347]

SARDAR PATEL UNIVERSITY

T.Y.B.Sc Vth Semester Examination, (under CBCS)

USO5CAPH02 (Solid State Physics)

Wednesday, 13th November 2019

10.00 A.M. – 01.00 P.M.

Marks: 70

Que 1 Multiple choice questions. [10]

(1) Which of the following have a non-crystalline structure?
(a) iron (b) quartz (c) silica glass (d) tungsten

(2) The atomic packing factor for FCC lattice is _____%.
(a) 54 (b) 60 (c) 68 (d) 74

(3) The forces which are responsible for binding the atoms and molecules together are _____ forces.
(a) electrical (b) gravitational (c) frictional (d) weak

(4) The bond energy of NaCl molecule is given by the relation V = _____.
(a) $e^2/(4\pi\epsilon_0 r_0)$ (b) $- e^2/(4\pi\epsilon_0)$ (c) $- e/(4\pi\epsilon_0 r_0)$ (d) $- e^2/(4\pi\epsilon_0 r_0)$

(5) The potential energy of the molecule at the equilibrium spacing between two atoms is _____. (a) unity (b) infinite (c) zero (d) minimum

(6) In electrical DC conductivity of metals, the mean drift velocity can be written as _____.
(a) $- (eE/m)\ \tau$ (b) $- (E/m)\ \tau$ (c) $- (eE/m)$ (d) $- (eE\ m)\ \tau$

(7) The Sommerfeld theory of electric conduction in metals, the net time rate of change of the distribution function can be expressed as _____. (a) df/dt (b) dp/dt (c) dl/dt (d) da/dt

(8) The Fermi energy E_F is often expressed in terms of temperature by the relation _____.
(a) $E_F = T_F$ (b) $E_F = K_B T_F$ (c) $E_F = K_B/ T_F$ (d) $E_F = T_F/ K_B$

(9) In density of state, represent the number of possible states depend on _____ energy. (a) Total (b) Kinetic (c) Potential (d) Fermi

(10) Which of the following scientists suggests by the motion of electrons in a simple one-dimensional periodic potential?
(a) Heitler-London (b) Kronig-Penny (c) Blooch-London (d) Pauli-Sommerfeld

Que 2 Short answer types question (Any Ten) [20]

(1) Distinguish between crystalline and non-crystalline solids.

(2) Define: Unit cell, Space lattice.

(3) Definition: Co-ordination number, APF.

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(PTO)

(4) Shows the graph of variation of potential energy with inter atomic spacing.

(5) State the any two features of ionic bond.

(6) Give any two properties of metallic bonds.

(7) Define: Fermi temperature and Fermi level.

(8) Derive the relation between ac and dc conductivity in electrical conductivity of metals.

(9) Define: Pauli principle.

(10) State two characteristic features appear for k - space.

(11) Define: Density of states.

(12) State the Brillouin zones.

Que 3	(a) Explain BCC crystals structure and determine APF.	[06]
	(b) Distinguish between point group and space group symmetry.	[04]

OR

Que 3	(a) Discuss the seven crystals system with necessary figure.	[06]
	(b) Write the procedure to determine Miller indices.	[04]

Que 4	Derive the equation for cohesion of atom and energy for the condition for $n > m$ for repulsive force increases rapidly for decreasing value of r.	[10]

OR

Que 4	(a) Derive the calculation of Madelung constant of ionic crystals.	[06]
	(b) Write a note on Born-Hyber cycle.	[04]

Que 5	(a) Discuss the electrical DC conductivity of metals equations for drude theory.	[06]
	(b) Discuss the Drude model.	[04]

OR

Que 5	(a) Derive the Sommerfeld model.	[06]
	(b) Write a note on Fermi-Dirac distribution function.	[04]

Que 6	(a) Discuss the Bloch theorem and calculate Green's identity constant.	[06]
	(b) Write a direct experimental evidence for band structure in detail.	[04]

OR

Que 6	(a) State and prove that Kronig-Penny model.	[06]
	(b) Write a note on origin of energy gap for a band structure.	[04]

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