

VP & RPTP Science College

Vallabh Vidyanagar

BSc Examination [Semester: IV] 2019

Subject: Physics Course: US04CPHY02

Solid State Physics

Friday, Date 08-03-2019

Time: 3.00 pm to 5.00 pm

Total Marks: 50

INSTRUCTIONS:

- 1 Attempt all questions.
- 2 The symbols have their usual meaning.
- 3 Figures to the right indicate full marks.

Q-1 Multiple Choice Questions: [Attempt all]

- (i) The co-ordination number of bcc lattice is
- (a) 4 (b) 6
(c) 8 (d) 12
- (ii) The atomic packing factor of fcc lattice is
- (a) 0.52 (b) 0.60
(c) 0.68 (d) 0.74
- (iii) _____ bond is a secondary bond.
- (a) Hydrogen (b) Covalent
(c) Metallic (d) Ionic
- (iv) At equilibrium spacing $r = r_0$, the inter-atomic force is _____.
- (a) Zero (b) Half
(c) Double (d) Infinite
- (v) As per classical model, the specific heat at constant volume C_v is equal to _____.
- (a) R (b) 2R
(c) 3R (d) 4R
- (vi) The umklapp process is _____ type of interaction.
- (a) photon-photon (b) phonon-phonon
(c) electron-electron (d) proton-proton
- (vii) Hydrocarbons having single bond are called _____.
- (a) saturated (b) unsaturated
(c) reactive (d) nonreactive
- (viii) If one of the hydrogen atom in polyethylene are replaced by CH_3 , the resulting polymer is called
- (a) polyvinyl chloride (b) polytetrafluoroethylene
(c) polypropylene (d) polycarbonate



Q-2 Answer the following questions in short. (Attempt any Five) 10

- (1) Define primitive and non-primitive unit cell.
- (2) Give names of different point operations. (No detail description is required)
- (3) Show variation of potential energy with inter-atomic spacing graphically.
- (4) State any two properties of ionic crystal.
- (5) Discuss specific heat of solids.
- (6) Define polarization.
- (7) Discuss viscoelastic creep.
- (8) Define homopolymer and copolymer.



Q-3 Discuss seven crystal systems based on lattice parameters, in detail. 8

OR

Q-3 Discuss the scheme to determine Miller indices of a plane with suitable example. 8
Draw planes having Miller indices: (100), (110) and (111).

Q-4 Derive the Madelung constant of ionic crystals in one dimension and three 8
dimensions by taking example of NaCl.

OR

Q-4 (a) Discuss properties of covalent compounds. 4

(b) Discuss properties of metallic crystals. 4

Q-5 Obtain Einstein's formula for specific heat of solids as: 8

$$C_v = 3Nk \left(\frac{h\nu}{kT} \right)^2 \frac{e^{\frac{h\nu}{kT}}}{\left(e^{\frac{h\nu}{kT}} - 1 \right)^2}$$

OR

Q-5 Discuss and derive the equation for electric field of a dipole. 8

Q-6 Give classification of polymers based on molecular characteristics with suitable 8
examples.

OR

Q-6 (a) Write a note on thermoplastic and thermosetting polymers. 4

(b) Write a note on fibers. 4