

SEAT No. _____

No. of Printed Pages : 2

[107] Sardar Patel University, Vallabh Vidyanagar – 388120

B Sc [Semester- V]

Subject: Physics; US05CPHY03 Subject: Solid State Physics

Monday, Date 28-12-2020

Time: 2.00 pm to 4.00 pm

Total Marks-70

Q-1 Multiple Choice Question [Attempt all]

[10]

- 1 What is the energy of a neutron used in a diffraction method?
(a) 0.08 GeV (c) 0.08 KeV
(b) 0.08 MeV (d) 0.08 eV
- 2 Range of wavelength used in a Laue diffraction experiments are _____
(a) 2 Å to 200 Å (c) 0.2 Å to 2 Å
(b) 0.2 Å to 20 Å (d) 2 Å to 2000 Å
- 3 Electron diffraction are used to determine _____
(a) Strength (c) Surface properties
(b) Structural properties (d) Color of the material
- 4 Drude model of free electron theory cannot explain
(a) Electron diffraction (c) Isotopic Mass
(b) Electrical and thermal conductivity (d) Electron heat capacity & paramagnetic susceptibility
- 5 Type - II superconductor are known as
(a) Soft superconductors (c) No name
(b) Hard superconductors (d) Only the name
- 6 Fermi-Dirac distribution function is applicable to _____
(a) Spin particle (c) Spin with half integral
(b) Spin with opposite sign (d) Zero spin
- 7 At a equilibrium conditions, the rate of generation of electron-hole pair and rate of recombination are _____?
(a) Unpredictable (c) Infinite
(b) Same (d) Zero
- 8 p-type semiconductors can be made using _____ impurity
(a) Tetravalent (c) Pentavalent
(b) Divalent (d) Trivalent
- 9 Nanotechnology is the engineering of the structure less than _____ size
(a) 100 nm (c) 100 Amp
(b) 100 Cm (d) 100 C
- 10 The colour of the nano materials changes with the thickness because of
(a) Surface to volume ratio (c) Density to volume ratio
(b) mass to electron ratio (d) Gravity to volume ratio

Q-2 Attempt all

[08]

- 1 When the crystal is made rotate the direct and reciprocal lattice _____
- 2 Every reciprocal lattice vector is normal to set of parallel _____
- 3 Entropy of the superconductor is equal to _____
- 4 Type - I superconductor are known as _____ superconductor
- 5 Pure semiconductors are insulator at _____ temperature.
- 6 Semiconductors are _____ materials
- 7 MEMS are used for _____ purpose.
- 8 At nano scale the colour of the materials changes with the thickness?

[1]

C.P.T.O.]

Q-3

Attempt any ten questions in brief.

[20]

- 1 Which source is used by Powder diffractometer?
- 2 When electron diffraction techniques are used.
- 3 When neutron diffraction techniques are used.
- 4 What is the maximum size of the crystal which is used in Rotating crystal method?
- 5 What is band-effective mass?
- 6 What is type-I superconductor?
- 7 What is Fermi energy?
- 8 What are intrinsic semiconductors?
- 9 What is photoelectric effect?
- 10 What is photovoltaic effect?
- 11 What is Nano Science?
- 12 State Moore's first and second law.

Q-4

Attempt any 4 (Four)

[32]

- 1 Describe $\frac{P}{\lambda}$ ^{Powder} method for determination of crystal structure in detail.
- 2 Discuss the Ewald construction of X-ray diffraction.
- 3 Derive the energy levels of free electron using Schrodinger equation.
- 4 Discuss the effect of temperature on Fermi-Dirac Distribution function.
- 5 Discuss n-type semiconductor with energy level diagram.
- 6 Explain the metal-metal junction theory with energy level diagram.
- 7 Discuss about dip pen lithography.
- 8 What is molecular recognition?

————— X —————

[2]