

## SARDAR PATEL UNIVERSITY

5<sup>th</sup> Semester B. Sc. EXAMINATION (Under CBCS) (NC)

Thursday,

12<sup>th</sup> May 2016

Time 10:30 am to 1:30 pm

Subject Code: PHYSICS [USO5CPHY03]

(Solid State Physics)

Total Marks: 70

N.B: (i) All the symbols have their usual meanings.

(ii) Figures at the right side of questions indicate full marks.

Que.-1

To answer the multiple choice questions choose the correct option. [10]

- (i) In the X-Ray diffraction Powder method \_\_\_\_\_ Specimen is placed in a beam of monochromatic X-Ray.  
(a) single (b) polycrystalline (c) crystalline (d) None
- (ii) Electrons are \_\_\_\_\_ penetrating than X-rays.  
(a) less (b) more (c) equal (d) none
- (iii) The distance of each of the points from the origin preserves the interplanar spacing of that stack of parallel planes it is the \_\_\_\_\_.  
(a) k-spacing (b) d-spacing (c) h-spacing (d) none of these
- (iv) Mobility of the electron is \_\_\_\_\_.  
(a) flow of electron per unit electric field.  
(b) average electron drift velocity per unit electric field.  
(c) reciprocal of conductivity.  
(d) none of these.
- (v) The temperature at which a conductor becomes superconductor is called \_\_\_\_\_ temperature.  
(a) superconducting (b) curie (c) ohm's (d) transition
- (vi) If the frequency of incident light increases stopping potential \_\_\_\_\_.  
(a) constant (b) decreases (c) increases (d) none
- (vii) For intrinsic semiconductor in case  $m_e^* = m_h^*$  then the Fermi level lies exactly at \_\_\_\_\_.  
(a) middle of the forbidden gape (b) near the valance band  
(c) near the conduction band (d) valance band edge
- (viii) The increase in the electrical conductivity of photo conductor is due to the production of electron-hole pairs by the absorption of \_\_\_\_\_.  
(a) phonon (b) photon (c) neutron (d) electron
- (ix) The amount of \_\_\_\_\_ flowing between a scanning tip and a surface is measured in scanning tunneling microscope.  
(a) protons (b) electric current (c) neutrons (d) magnetic field
- (x) The process of mixing the chemicals and get nanostructures by letting the molecules sort themselves out is called \_\_\_\_\_.  
(a) e-beam lithography (b) moleculer synthesis  
(c) self assembly (d) nanosphere lift off lithography

(P.T.O.)

①

- Que.-2 Answer in brief any ten of the following questions. [20]
- (1) Explain back reflection laue method.
  - (2) State Bragg's law.
  - (3) List out the properties of X-rays.
  - (4) What is Meissner effect?
  - (5) Explain the effect of isotop on superconductor.
  - (6) Give the basis points of Lorentz modification of the drude model and give the relation between drude and Lorentz model.
  - (7) What is photovoltaic effect?
  - (8) Define intrinsic and extrinsic semiconductor.
  - (9) Draw energy levels diagram for two metals before and after contact at  $T=0$  K.
  - (10) Explain the meaning of lithography.
  - (11) What is molecular synthesis? Explain its uses.
  - (12) Giving an example, explain smart materials
- Que.-3 (a) What is X-ray crystallography? Give the name of three experimental X-ray diffraction methods and explain any one of them. [06]
- (b) Write a note on Geometrical construction of reciprocal lattice. [04]
- OR
- Que.-3 (a) Explain the properties of reciprocal lattice. [06]
- (b) Write a note on structure factor for bcc crystal. [04]
- Que.-4 (a) What is superconductor and superconductivity? Explain type-1 and type-2 superconductor. [06]
- (b) Explain electrical conductivity and Ohm's law. [04]
- OR
- Que.-4 (a) State the free particle Schrodinger equation in three dimension and derive the equation for free electron gas in three dimension. [06]
- (b) List out the thermal properties of superconductors and explain any two of them. [04]
- Que.-5 (a) Draw energy level diagram for a metal and n-type semiconductor ( $\phi_m > \phi_s$ ) before and after junction formation and explain rectifying contacts. [06]
- (b) Explain hall effect in semiconductors. [04]
- OR
- Que.-5 (a) Write a detail note on photo electric effect. [06]
- (b) Explain different types of color centers. [04]
- Que.-6 Explain at length Tools for measuring nanostructures. [10]
- OR
- Que.-6 Explain at length Self assembly. [10]

-----XXX-----

