I yr. II Semester-2017-18

Branch: Common for CSE,IT & EIE

Subject: Applied Physics model questions.

Short answer questions

1. Explain the terms relating to crystal structure i) Unit cell ii) Coordination number iii) Atomic Packing fraction.

2. Iron has BCC structure with atomic weight 55.85 and density 7860 kg/m_3. Find the lattice Constant

3.describe the crystal structure of NaCl.

4. Define Fermi-energy. Derive an expression for the Fermi energy of a system of free electrons at0K

5. Using the Fermi function, evaluate the temperature at which there is 1% probability that an electron in a solid will have energy 0.5eV above E_F of 5eV

6. State de–Broglie hypothesis of matter waves.

7. Write a short note on Heisenberg's uncertainty principle.

8. Calculate the debroglie wavelength of an electron which has been accelerated from rest on application of potential of 400 volts.

9. Write physical significance of wave function.

10. State Bloch theorem for the motion of an electron in a periodic potential well

11. An electron is confined to box of 10^{-9}m length. Calculate the minimum uncertainity in its velocity.

12. Distinguish between intrinsic and extrinsic semiconductors.

13. Define First Brillouin Zone.

14. What are macrostates and microstates of a system.

15. α-iron of 55.85 atomic weight solidifies into BCC structure and has a density of 7860 kg m^{-3}. Calculate the radius of an atom.

Long answer questions

1. Explain different types of Bravais lattices in three dimensions

2. Show that FCC crystals are more closely packed than simple cubic and body centered cubic crystals.

3. Describe in detail HCP crystal structure.

4. write the differences between Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics.

5. Obtain an expression for density of states in metals.

6. Discuss the dual nature of matter. Derive an expression for the de-Broglie wavelength.

7. Derive time independent Schrödinger wave equation. What is the physical significance of the wave function used in the above equation?

8. Derive the Schrödinger time independent wave equation for a free particle enclosed in a one dimensional potential well of length 'a' with infinite potential barrier and get the normalized wave function for the free particle.

9. Using the kronig penny model show that the energy spectrum of an electron contains number of allowed energy bands separated by forbidden bands.

10. Discuss qualitatively how band theory of solids leads to the classification of solids into conductors, semiconductors and insulators

11. Derive an expression for density of electrons in intrinsic semiconductors.

12. Derive an expression for the density of holes in the valence band of an intrinsic Semiconductor.

13. Describe Davisson and Germer's experiment and explain how it enabled the verification of wave nature of matter.

14.a) Explain the concept of effective mass of an electron

b) Draw E-K curve and explain the concept of hole.

15. a)Compare the structure of Zinc blende with that of Diamond.

b)describe the structure of CsCl.