ASSIGNMENT I

CRYSTAL STRUCTURE & X-RAY DIFFRACTION

* What is meant by unit cell, primitive cell and lattice constant? Find the number of atoms per unit cell in SC, BCC and FCC lattices.
* What do you understand by space lattice? Describe seven crystal system and fourteen bravias lattice system.
* Define atomic packing density(APF), atomic radius and coordination number of SC, BCC and FCC lattices.
* Describe the structure of NaCl crystal; give its main feature with diagram.
* Describe the crystal structure of diamond.
* What are miller indices? How are they determined? Derive the formula for interplaner distances.
* Derive Bragg’s law for the diffraction of X-rays by crystals. Describe Bragg’s X-rays Spectrometer.
* Derive expression for Compton shift and discuss about modified and unmodified radiations.
* The X-rays of wavelength of 0.3A are incident on a crystal with a lattice spacing 0.5A. find the angles at which 2nd and 3rd Bragg’s diffraction maxima are observed.
* Calculate the interplaner spacing for a plane (321) in a SC lattice, whose lattice constant is 4.2 x10-10 m.
* Deduce the miller indices of a plane which cuts off intercepts in the ratio 1a:3b:-2c along the three coordinate axes, where a, b and c are primitives.
* A substance with FCC lattice has a density 6250 kg/m3and molecular weight 60.2. calculate the lattice constant ‘a’. Given that Avogadro number 6.023x1023.
* An X- ray photon is found to have its wavelength doubled on being scattered through 900. Find the wavelength and energy of the incident photon.
* Calculate Compton shift if X rays of wavelength 10-10m are scattered from a carbon block. The scattered radiation is viewed at 90 0 to the incident beam.
* Find the miller indices of a set of a parallel planes make intercept in a ratio 2a:3b along x-y axis and parallel to z axis.
* short notes on:

1. Laue’s experiment.
2. kinetic energy and direction of recoil electron