

HOME WORK 1

Problem 1:

- A) Define a Bravais lattice. How many Bravais lattices exist in 2 and 3 dimensions.
- B) Define fundamental translational vectors for such lattice. Prove there is an infinite set of these triads.
- C) What is primitive unit cell?
- D) What is a composite lattice? What is a sublattice? How many are the number of sublattices in a Bravais lattice.

Problem 2:

- A) Draw a hcp lattice and determine 3 translational vectors. (using a and b as lattice spacings)
- B) Prove for an ideal hcp: $\frac{c}{a} = \sqrt{\frac{8}{3}}$
- C) Draw a hexagonal Wurtzite structure with $u = \frac{3}{8}$. Determine 3 translation vectors and 4 basis vectors.

Problem 3:

- A) Define a Wigner-Seitz cell. How is it obtained from a Bravais lattice?
- B) Draw the Brillouin Zone for a Simple cubic lattice, determine high symmetry points. (Γ, X, M, R)

Problem 4:

- A. What does critical points in the Density of States function imply?
- B. Define four possible critical points, namely: M_0, M_1, M_2, M_3
- C. Derive an expression for DOS near its singular points for a 1,2 and 3 dimensional lattice.

(Refer to Grosso chapter 2)

Good luck

12/8/91