

**THE UNIVERSITY OF ZAMBIA**  
**SCHOOL OF ENGINEERING**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

**MEC 2309 TUTORIAL SHEET 1**

**CRYSTALLINE STRUCTURE OF MATERIALS**

**Question 1**

The atomic radius of an iron atom is  $1.238 \times 10^{-10}$  m. Iron crystallises as b.c.c. Calculate the lattice parameter. of the unit cell, a. How many atoms are contained within the b.c.c. unit cell?

**Question 2**

The atomic weight of copper is 63.54, and the atomic radius of copper is  $1.276 \times 10^{-10}$  m. Copper crystallises as f.c.c. Avogadro's number,  $N_0$ , is  $6.023 \times 10^{23}$ . Calculate the density of copper.

**Question 3**

- a) Sketch a cubic unit cell and mark the positions of the following planes: (220), (010) and (-111),
- b) What is the separation distance between adjacent planes of each type, in terms of the lattice parameter a?

**Question 4**

Considering that metal atoms in a single plane are represented as discs of uniform diameter, show, by calculation, that the packing density in FCC (111) planes is greater than in BCC (110) planes.