**Sheet 1**

**CRYSTAL STRUCTUR**

1-Determine the crystal structure for the following: (a) a metal with *a*o 4.9489 Å,

*r* 1.75 Å and one atom per lattice point; and (b) a metal with *a*o 0.42906 nm,

*r* 0.1858 nm and one atom per lattice point.

2-The density of potassium, which has the BCC structure and one atom per lattice

point, is 0.855 g/cm3. The atomic weight of potassium is 39.09 g/mol. Calculate

(a) the lattice parameter; and (b) the atomic radius of potassium.

3-A metal having a cubic structure has a density of 2.6 g/cm3, an atomic weight of

87.62 g/mol, and a lattice parameter of 6.0849 Å. One atom is associated with each

lattice point. Determine the crystal structure of the metal.

4-Bismuth has a hexagonal structure, with *a*o 0.4546 nm and *c*o 1.186 nm.

The density is 9.808 g/cm3 and the atomic weight is 208.98 g/mol. Determine

(a) the volume of the unit cell and (b) how many atoms are in each unit cell.





7-Determine the repeat distance, linear density, and packing fraction for FCC nickel,

which has a lattice parameter of 0.35167 nm, in the [100], [110], and [111] directions.

Which of these directions is close-packed?

8-Determine the repeat distance, linear density, and packing fraction for BCC lithium,

which has a lattice parameter of 0.35089 nm, in the [100], [110], and [111] directions.

Which of these directions is close-packed?

9-Determine the planar density and packing fraction for FCC nickel in the (100),

(110), and (111) planes. Which, if any, of these planes is close-packed?

10-Determine the planar density and packing fraction for BCC lithium in the (100),

(110), and (111) planes. Which, if any, of these planes is close-packed?

11-A diffracted x-ray beam is observed from the (220) planes of iron at a 2u angle of

99.1o when x-rays of 0.15418 nm wavelength are used. Calculate the lattice parameter

of the iron

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12-In a FCC unit cell, how many *d*111 are present between the 0,0,0 point and the 1,1,1 point?

13-The Figure shows the results of an x-ray diffraction experiment in the form of the intensity of the diffracted peak versus the 2ɵ diffraction angle. If x-rays with a wavelength of 0.15418 nm are used, determine

(a) the crystal structure of the metal,

(b) the indices of the planes that produce each of the peaks, and

(c) the lattice parameter of the metal.



14-The Figure shows the results of an x-ray diffraction experiment in the form of the intensity of the diffracted peak versus the 2u diffraction angle. If x-rays with a wavelength of 0.0717 nm are used, determine

(a) the crystal structure of the metal,

(b) the indices of the planes that produce each of the peaks, and

(c) the lattice parameter of the metal.

