061018 XRD Quiz 4

1) Derive Bragg's law assuming mirror-like behavior. Show all steps and give a description of what you must do.

2) Give the crystal structure and number of atoms in a unit cell for copper, aluminum, zinc, magnesium.

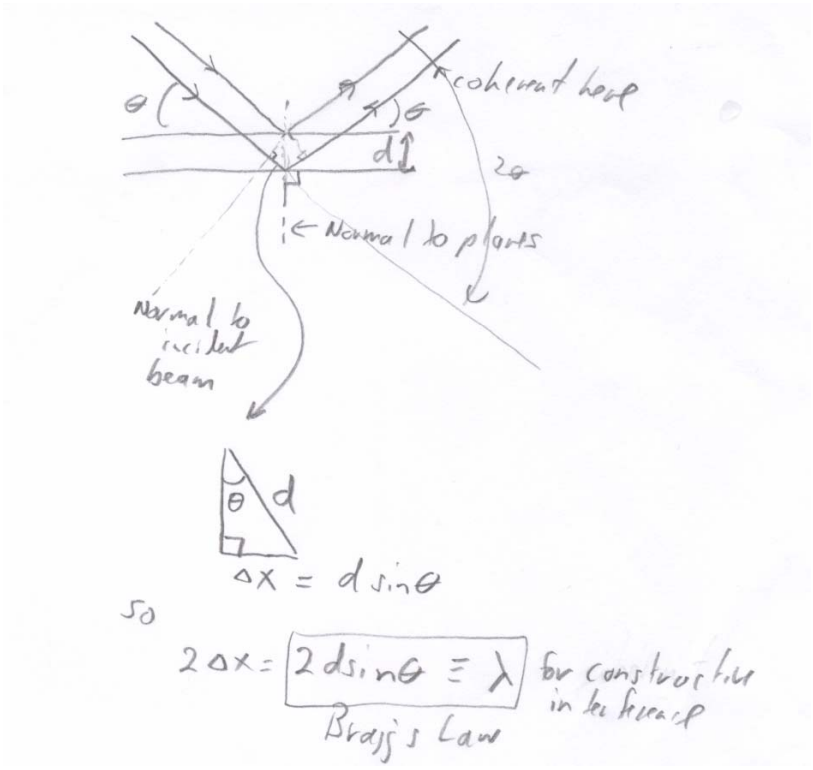
3) Give the crystal structure and number of atoms in a unit cell for α-iron, γ-iron, silicon, diamond.

4) Give the crystal structure and number of atoms in a unit cell for sodium chloride, potassium bromide, lead, nickel.

5) FCC and HCP both occupy 74% of the volume for touching spheres. What other similarities exist for these two crystal structures? Give details on the similarity and difference between FCC and HCP structures.

ANSWERS 061018 XRD Quiz 4

1)



2) Copper FCC 4; Aluminum FCC 4; Zinc HCP 6 or 2; Magnesium HCP 6 or 2.

3) α-iron BCC 2; γ-iron FCC 4; Silicon FCC (diamond type) 8; diamond FCC 8

4) NaCl FCC 8; KBr FCC 8 (NaCl type); Lead FCC 4; Nickel FCC 4.

5) The FCC (111) plane is hexagonal and in the [111] direction the first two planes of atoms are the same as the HCP structure in the [100] direction. The next layer is difference in FCC leading to the ABCABCABC repeat. HCP displays a repeat of ABABABABABA in the [100] direction.