## Donald P. Shiley School of Engineering EGR 221 Materials Science Assignment 2, Fall 2015

- 1 a) Why is "helium" called helium? When and where was it first detected?
- 1 b) Why is "titanium" called titanium? When and where was it first detected?
- 2) Show for the body-centered cubic crystal structure that the unit cell edge length a and the atomic radius R are related through a =4R/(3)<sup>1/2</sup>
- 3) Show that the atomic packing factor for HCP is 0.74.
- 4) Iron has a BCC crystal structure, an atomic radius of 0.124 nm, and an atomic weight of 55.85 g/mol. Determine the theoretical density. How does it compare with the experimentally determined value of 7.87g/cm<sup>3</sup>? The theoretical density is close to experimental, but measurably different. What conclusion do you reach from this?
- 5) What are the point coordinates for all atoms in the following crystal structures' unit cells (don't forget to include appropriate sketches):
  - a) FCC
  - b) BCC
- 6) Within a cubic unit cell, sketch the following directions:

(a) [1 1 0], (b) [1 2 1], (c) [0 2 1], (d) [ 0 1 0]

7) Determine the indices for the following directions in the cubic unit cell (for 3D visualization, assume both ends of the arrows are on the edge of the unit cell shown):







