

CHAPTER 3

3.2 If the atomic radius of aluminum is 0.143 nm, calculate the volume of its unit cell in cubic meters.

3.6 Show that the atomic packing factor for HCP is 0.74.

3.7 Iron (Fe) has a BCC crystal structure, an atomic radius of 0.124 nm, and an atomic weight of 55.85 g/mol. Compute and compare its theoretical density with the experimental value found in Table: Characteristics of Selected Elements after Appendix E.

3.9 Calculate the radius of an iridium (Ir) atom, given that Ir has an FCC crystal structure, a density of 22.4 g/cm³, and an atomic weight of 192.2 g/mol.

3.15 The atomic weight, density, and atomic radius for three hypothetical alloys are listed in the following table. For each, determine whether its crystal structure is FCC, BCC, or simple cubic and then justify your determination.

Alloy	Atomic Weight (g/mol)	Density (g/cm ³)	Atomic Radius (nm)
A	77.4	8.22	0.125
B	107.4	13.42	0.133
C	127.3	9.23	0.142

3.18 Titanium (Ti) has an HCP unit cell for which the ratio of the lattice parameters c/a is 1.58. If the radius of the Ti atom is 0.1445 nm, (a) determine the unit cell volume, and (b) calculate the theoretical density of Ti and compare it with the literature value.