

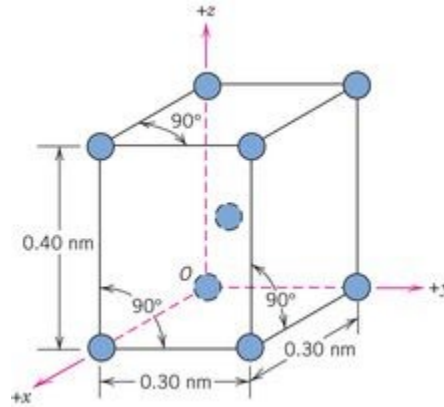
CHAPTER 3

3.20 Rhenium (Re) has an HCP crystal structure, an atomic radius of 0.137 nm, and a c/a ratio of 1.615. Compute the volume of the unit cell for Re.

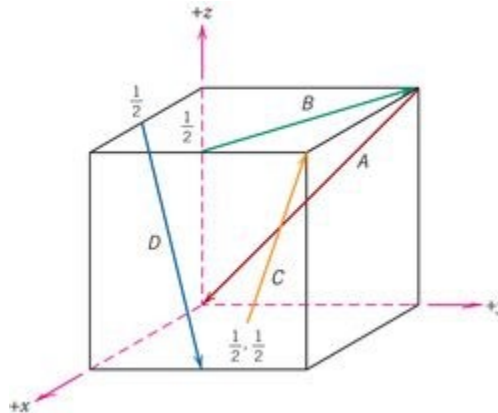
3.21 Iron (Fe) undergoes an allotropic transformation at 912 °C: upon heating from a BCC (α phase) to an FCC (γ phase). Accompanying this transformation is a change in the atomic radius of Fe—from $R_{\text{BCC}} = 0.12584$ nm to $R_{\text{FCC}} = 0.12894$ nm—and, in addition a change in density (and volume). Compute the percent volume change associated with this reaction. Does the volume increase or decrease?

3.22 The accompanying figure shows a unit cell for a hypothetical metal.

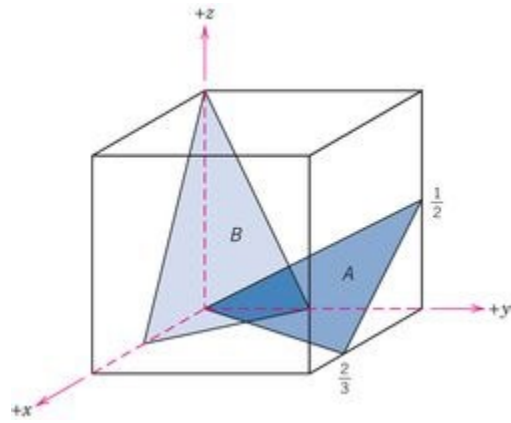
- (a) To which crystal system does this unit cell belong?
- (b) What would this crystal structure be called?
- (c) Calculate the density of the material, given that its atomic weight is 141 g/mol.



3.34 Determine the indices for the directions shown in the following cubic unit cell:



3.47 Determine the Miller indices for the planes shown in the following unit cell:



3.54 Determine the indices for the planes shown in the following hexagonal unit cells:

