Chem 106 - Cubic Unit Cell relationships

\[ r = \text{radius of atom} \]

\[ f = a^2 + a^2 = 2a^2 \]
\[ f = \sqrt{2}a \]

a = length of one side of unit cell
f = \( \sqrt{2}a \) Use Pythagorean theorem!

In a face-centered unit cell, atoms touch along the diagonal that connects opposite corners of one face.

\[ f = 4r = \sqrt{2}a \]
\[ r = \frac{\sqrt{2}a}{4} \]

In a body-centered cubic unit cell, atoms touch along the diagonal that connects opposite corners of the cube.

\[ b = 4r \]
\[ \sqrt{3}a = 4r \]
\[ r = \frac{\sqrt{3}}{4}a \]