3.15 In order to determine the APF for U, we need to compute both the unit cell volume (V_C) which is just the product of the three unit cell parameters, as well as the total sphere volume (V_S) which is just the product of the volume of a single sphere and the number of spheres in the unit cell (n). The value of n may be calculated from Equation 3.5 as

$$n = \frac{\rho V_C N_A}{A_U}$$

$$= \frac{(19.05\ \text{g/cm}^3)(2.86)(5.87)(4.95)(\times 10^{-24}\ \text{cm}^3)(6.023 \times 10^{23}\ \text{atoms/mol})}{238.03\ \text{g/mol}}$$

$$= 4.01\ \text{atoms/unit cell}$$

Therefore

$$\text{APF} = \frac{V_S}{V_C} = \frac{(4)\left(\frac{4}{3}\pi R^3\right)}{(a)(b)(c)}$$

$$= \frac{(4)\left[\frac{4}{3}(\pi)(1.385\text{Ź x } 10^{8}\ \text{cm})^3\right]}{(2.86)(5.87)(4.95)(\text{xŹ}10^{24}\ \text{cm}^3)}$$

$$= 0.536$$