12.14 (a) This part of the problem calls for us to determine the unit cell edge length for FeO. The density of FeO is 5.70 g/cm^3 and the crystal structure is rock salt. From Equation 12.1

$$\rho = \frac{n'\left(A_{Fe} + A_O\right)}{V_C N_A} = \frac{n'\left(A_{Fe} + A_O\right)}{a^3 N_A}$$

Or, solving for a

$$a = \left[\frac{n'\left(A_{Fe} + A_O\right)}{\rho N_A}\right]^{1/3}$$

$$= \left[\frac{(4 \text{ formula units/unit cell})(55.85 \text{ g/mol} + 16.00 \text{ g/mol})}{(5.70 \text{ g/cm}^3)(6.023 \times 10^{23} \text{ formula units/mol})}\right]^{1/3}$$

$$= 4.37 \times 10^{-8} \text{ cm} = 0.437 \text{ nm}$$

(b) The edge length is determined from the Fe^{2+} and O^{2-} radii for this portion of the problem. Now

$$a = 2r_{Fe^{2+}} + 2r_{O^{2-}}$$

From Table 12.3

$$a = 2(0.077 \text{ nm}) + 2(0.140 \text{ nm}) = 0.434 \text{ nm}$$