12.20 We are asked to specify possible crystal structures for an AX type of ceramic material given its density (2.10 g/cm^3), that the unit cell has cubic symmetry with edge length of 0.57 nm, and the atomic weights of the A and X elements (28.5 and 30.0 g/mol, respectively). Using Equation 12.1 and solving for n' yields

$$n' = \frac{\rho V_C N_A}{\sum A_C + \sum A_A}$$

$$= \frac{(2.10 \text{ g/cm}^3)\left[(5.70 \times 10^{-8} \text{ cm})^3/\text{unit cell}\right](6.023 \times 10^{23} \text{ formula units/mol})}{(30.0 + 28.5) \text{ g/mol}}$$

$$= 4.00 \text{ formula units/unit cell}$$

Of the three possible crystal structures, only sodium chloride and zinc blende have four formula units per unit cell, and therefore, are possibilities.