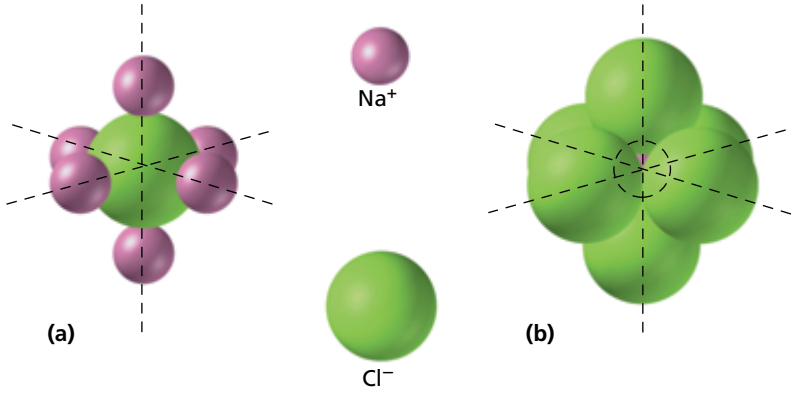

FIGURE 15 The figure shows the ions that most closely surround a chloride anion and a sodium cation within the crystal structure of NaCl. The structure is composed such that (a) six Na^+ ions surround each Cl^- ion. At the same time, (b) six Cl^- ions surround each Na^+ ion (which cannot be seen but whose location is indicated by the dashed outline).

Figure 15 shows the crystal structure of sodium chloride in greater detail. Within the arrangement, each sodium cation is surrounded by six chloride anions. At the same time, each chloride anion is surrounded by six sodium cations. Attraction between the adjacent oppositely charged ions is much stronger than repulsion by other ions of the same charge, which are farther away.

The three-dimensional arrangements of ions and the strengths of attraction between them vary with the sizes and charges of the ions and the numbers of ions of different charges. For example, in calcium fluoride, there are two anions for each cation. Each calcium cation is surrounded by eight fluoride anions. At the same time, each fluoride ion is surrounded by four calcium cations, as shown in **Figure 16.**

To compare bond strengths in ionic compounds, chemists compare the amounts of energy released when separated ions in a gas come together to form a crystalline solid. **Lattice energy** *is the energy released when one mole of an ionic crystalline compound is formed from gaseous ions.* Lattice energy values for a few common ionic compounds are shown in **Table 3.** The negative energy values indicate that energy is *released* when the crystals are formed.

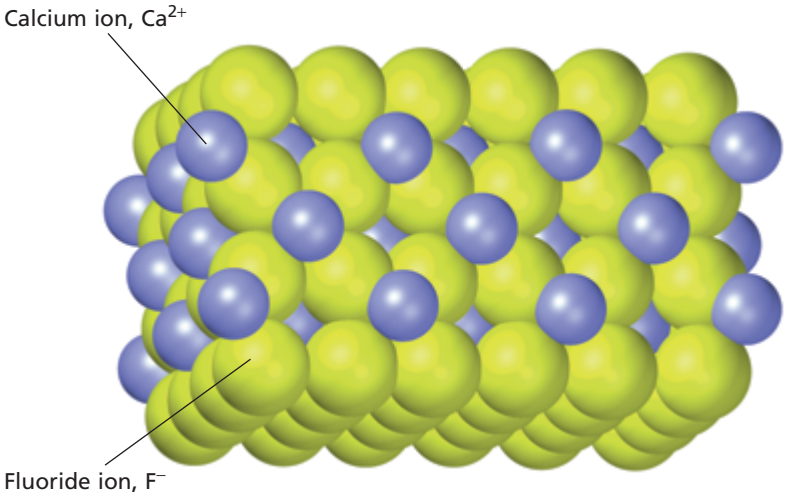

FIGURE 16 In the crystal structure of calcium fluoride, CaF_2, each calcium cation is surrounded by eight fluoride anions and each fluoride ion is surrounded by four calcium cations. This is the closest possible packing of the ions in which the positive and negative charges are balanced.