Group 16 elements are present in many compounds as 2– ions. For example, oxygen ([He]$2s^2 2p^4$) achieves the configuration of the noble gas neon by adding two electrons to form the ion O^{2-}([He]$2s^2 2p^6$).

Ionic Radii

Figure 19 shows the radii of some of the most common ions of the elements. Positive and negative ions have specific names.

A positive ion is known as a **cation.** The formation of a cation by the loss of one or more electrons always leads to a decrease in atomic radius because the removal of the highest-energy-level electrons results in a smaller electron cloud. Also, the remaining electrons are drawn closer to the nucleus by its unbalanced positive charge.

A negative ion is known as an **anion.** The formation of an anion by the addition of one or more electrons always leads to an increase in atomic radius. This is because the total positive charge of the nucleus remains unchanged when an electron is added to an atom or an ion. So the electrons are not drawn to the nucleus as strongly as they were before the addition of the extra electron. The electron cloud also spreads out because of greater repulsion between the increased number of electrons.

Period Trends

Within each period of the periodic table, the metals at the left tend to form cations and the nonmetals at the upper right tend to form anions. Cationic radii decrease across a period because the electron cloud shrinks due to the increasing nuclear charge acting on the electrons in the same main energy level. Starting with Group 15, in which atoms assume stable noble-gas configurations by gaining three electrons,

FIGURE 19 The ionic radii of the ions most common in chemical compounds are shown. Cations are smaller and anions are larger than the atoms from which they are formed.

Periodic Table of Ionic Radii (pm)