Ionization Energy

An electron can be removed from an atom if enough energy is supplied. Using A as a symbol for an atom of any element, the process can be expressed as follows.

$$A + \text{energy} \rightarrow A^+ + e^-$$

The A^+ represents an ion of element A with a single positive charge, referred to as a 1+ ion. *An* **ion** *is an atom or group of bonded atoms that has a positive or negative charge.* Sodium, for example, forms an Na^+ ion. *Any process that results in the formation of an ion is referred to as* **ionization.**

To compare the ease with which atoms of different elements give up electrons, chemists compare ionization energies. *The energy required to remove one electron from a neutral atom of an element is the* **ionization energy,** ***IE*** *(or first ionization energy, IE_1).* To avoid the influence of nearby atoms, measurements of ionization energies are made on isolated atoms in the gas phase. **Figure 15** gives the first ionization energies for the elements in kilojoules per mole (kJ/mol). **Figure 16** presents this information graphically.

FIGURE 15 In general, first ionization energies increase across a period and decrease down a group.

Periodic Table of Ionization Energies (kJ/mol)