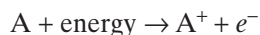


Ionization Energy

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.



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)

Period	1	Group 1		Group 2												Group 13										Group 14										Group 15										Group 16										Group 17										Group 18										Period																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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