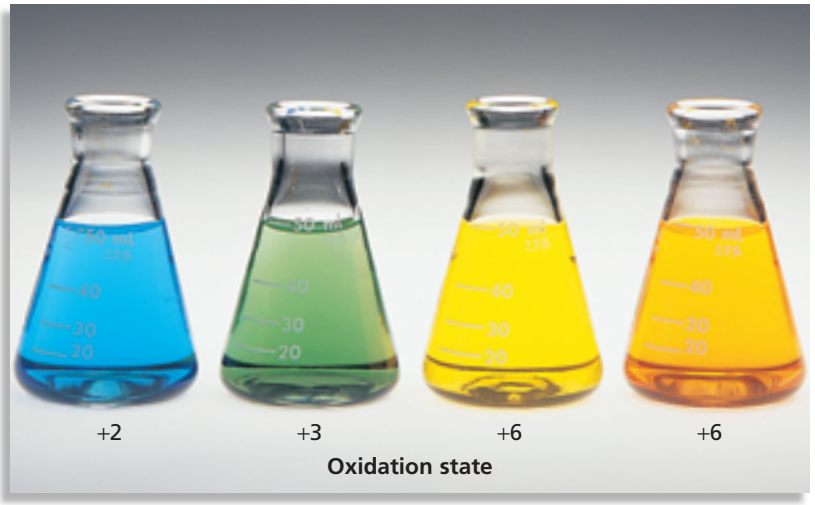

FIGURE 1 The color of solutions containing chromium compounds changes with the oxidation state of chromium.

Chromium provides a very visual example of different oxidation numbers. Different oxidation states of chromium have dramatically different colors, as can be seen in **Figure 1.** The chromium(II) chloride solution is blue, chromium(III) chloride solution is green, potassium chromate solution is yellow, and potassium dichromate solution is orange.

Oxidation

Processes in which the atoms or ions of an element experience an increase in oxidation state are **oxidation** *processes.* The combustion of metallic sodium in an atmosphere of chlorine gas is shown in **Figure 2.** The sodium ions and chloride ions produced during this strongly exothermic reaction form a cubic crystal lattice in which sodium cations are ionically bonded to chloride anions. The chemical equation for this reaction is written as follows.

$$2Na(s) + Cl_2(g) \longrightarrow 2NaCl(s)$$

The formation of sodium ions illustrates an oxidation process because each sodium atom loses an electron to become a sodium ion. The oxidation state is represented by placing an oxidation number above the symbol of the atom and the ion.

$$\overset{0}{Na} \longrightarrow \overset{+1}{Na^+} + e^-$$

The oxidation state of sodium has changed from 0, its elemental state, to the +1 state of the ion (Rules 1 and 7, **Table 1**). *A species whose oxidation number increases is* **oxidized.** The sodium atom is *oxidized* to a sodium ion.

FIGURE 2 Sodium and chlorine react violently to form NaCl. The synthesis of NaCl from its elements illustrates the oxidation-reduction process.