Formation of a Gas

Unstable substances formed as products of ionic reactions decompose spontaneously. An example is carbonic acid, H_2CO_3, the acid in carbonated beverages, which yields a gas as a decomposition product.

$$H_2CO_3(aq) \longrightarrow H_2O(l) + CO_2(g)$$

This reaction goes practically to completion because one of the products, CO_2, escapes as a gas if the container is open to the air.

Formation of a Precipitate

When solutions of sodium chloride and silver nitrate are mixed, a white precipitate of silver chloride immediately forms, as shown in **Figure 6.** The overall ionic equation for this reaction follows.

$$Na^+(aq) + Cl^-(aq) + Ag^+(aq) + NO_3^-(aq) \longrightarrow Na^+(aq) + NO_3^-(aq) + AgCl(s)$$

If chemically equivalent amounts of the two solutes are mixed, only Na^+ ions and NO_3^- ions remain in solution in appreciable quantities. Almost all of the Ag^+ ions and Cl^- ions combine and separate from the solution as a precipitate of AgCl. The reason is that AgCl is only very sparingly soluble in water. It separates by precipitation from what has become a supersaturated solution of AgCl. The reaction thus effectively goes to completion because an essentially insoluble product is formed.

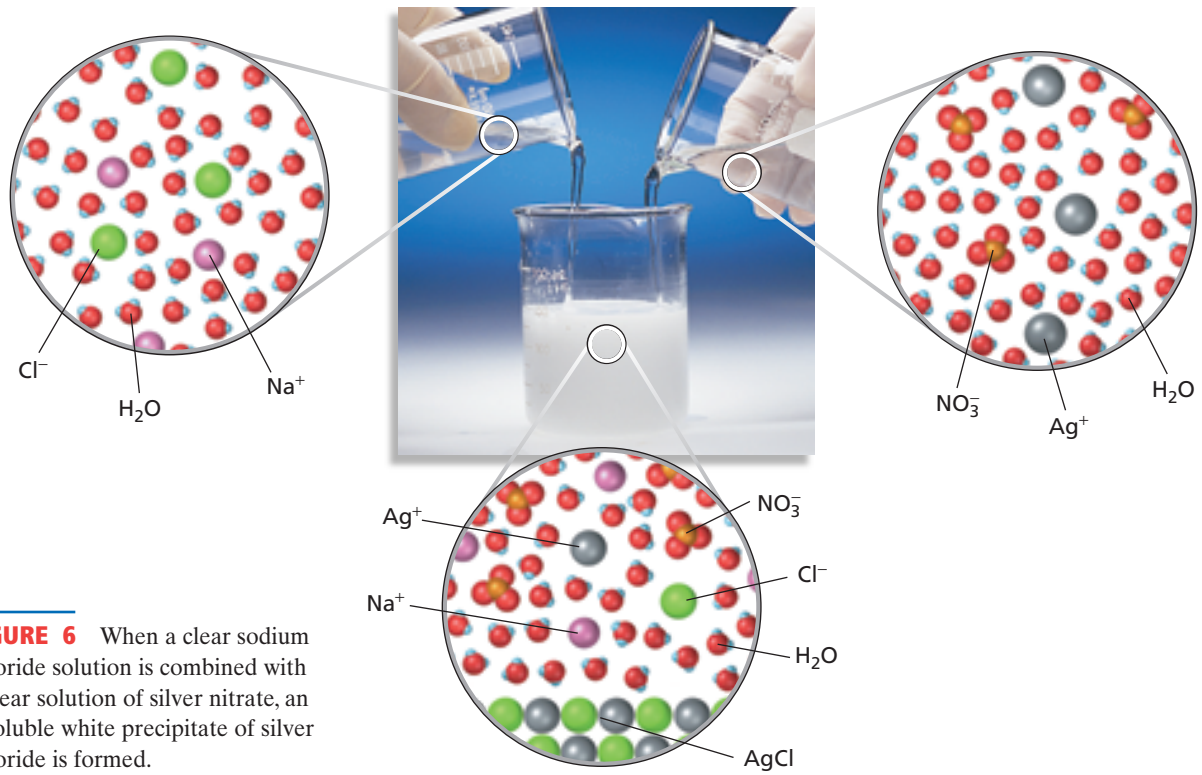

FIGURE 6 When a clear sodium chloride solution is combined with a clear solution of silver nitrate, an insoluble white precipitate of silver chloride is formed.