Is calcium phosphate, $Ca_3(PO_4)_2$, soluble or insoluble? According to **Table 1,** most phosphates are insoluble. Calcium phosphate is not one of the exceptions listed, so it is insoluble. Dissociation equations cannot be written for insoluble compounds.

The information in **Table 1** is also useful in predicting what will happen if solutions of two different soluble compounds are mixed. If the mixing results in a combination of ions that forms an insoluble compound, a double-displacement reaction and precipitation will occur. Precipitation occurs when the attraction between the ions is greater than the attraction between the ions and surrounding water molecules.

Will a precipitate form when solutions of ammonium sulfide and cadmium nitrate are combined? By using the table, you can tell that cadmium nitrate, $Cd(NO_3)_2$, is soluble because it is a nitrate and all nitrates are soluble. You can also tell that ammonium sulfide, $(NH_4)_2S$, is soluble. It is one of the sulfides listed in the table as being soluble. Their dissociation equations are as follows.

$$(NH_4)_2S(s) \xrightarrow{H_2O} 2NH_4^+(aq) + S^{2-}(aq)$$

$$Cd(NO_3)_2(s) \xrightarrow{H_2O} Cd^{2+}(aq) + 2NO_3^-(aq)$$

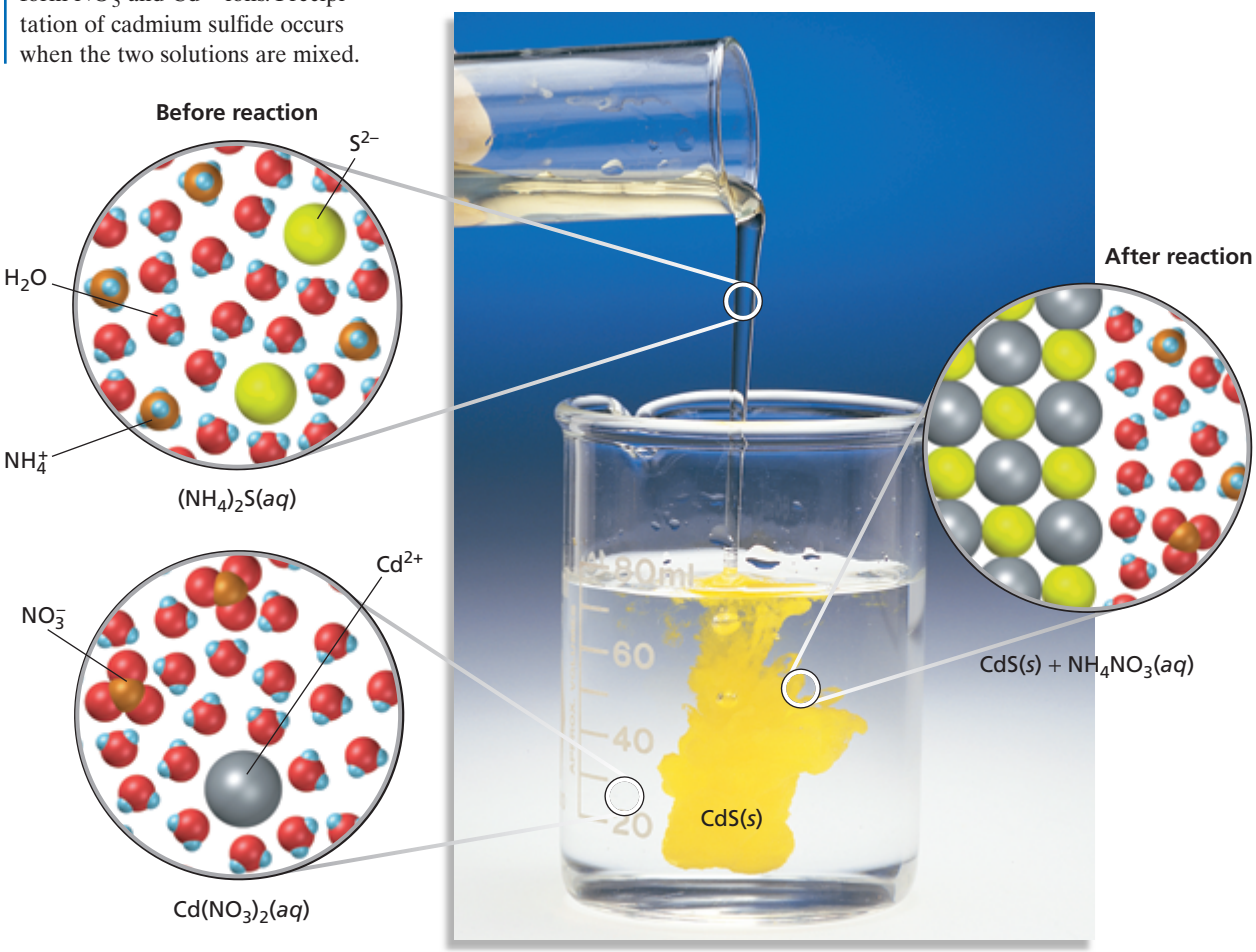

FIGURE 3 Ammonium sulfide is a soluble compound that dissociates in water to form NH_4^+ and S^{2-} ions. Cadmium nitrate is a soluble compound that dissociates in water to form NO_3^- and Cd^{2+} ions. Precipitation of cadmium sulfide occurs when the two solutions are mixed.