



FIGURE 2 Ionic compounds can be soluble or insoluble in water. NiCl_2 , KMnO_4 , CuSO_4 , and $\text{Pb}(\text{NO}_3)_2$ are soluble in water. AgCl and CdS are insoluble in water.

Precipitation Reactions

Although no ionic compound is completely insoluble, compounds of very low solubility can be considered insoluble for most practical purposes. Some examples of ionic compounds that are soluble and insoluble in water are shown in **Figure 2**. It is difficult to write solubility rules that cover all possible conditions. However, we can write some general guidelines to help predict whether a compound made of a certain combination of ions is soluble. These general solubility guidelines are given in **Table 1**.

By looking at the table you can tell that most sodium compounds are soluble. Sodium carbonate, Na_2CO_3 , is soluble because it contains sodium. Its dissociation equation is as follows.



TABLE 1 General Solubility Guidelines

1. Sodium, potassium, and ammonium compounds are soluble in water.
2. Nitrates, acetates, and chlorates are soluble.
3. Most chlorides are soluble, except those of silver, mercury(I), and lead. Lead(II) chloride is soluble in hot water.
4. Most sulfates are soluble, except those of barium, strontium, lead, calcium, and mercury.
5. Most carbonates, phosphates, and silicates are insoluble, except those of sodium, potassium, and ammonium.
6. Most sulfides are insoluble, except those of calcium, strontium, sodium, potassium, and ammonium.

