

**Formation of a Precipitate**

In order to predict double replacement reactions yielding precipitates, one **must memorize** the solubility rules listed on page 50.

**Exercise 9-1:** Predict and balance the following double replacement or metathesis reactions based on the solubility of the products. Use the abbreviations (aq) and (s) for the reactants and products. **All reactants are aqueous.** *Note:* Some of these reactions do not go to completion.

1. silver nitrate + potassium chromate
2. ammonium chloride + cobalt(II) sulfate
3. iron(III) sulfate + barium iodide
4. zinc acetate + cesium hydroxide
5. ammonium sulfide + lead(II) nitrate
6. lithium hydroxide + sodium chromate
7. chromium(III) bromide + sodium nitrate
8. rubidium phosphate + titanium(IV) nitrate
9. ammonium carbonate + nickel(II) chloride
10. tin(IV) nitrate + potassium sulfite

*Note:* Correct molecular formulas must be written for both the reactants and products before an equation may be balanced.

**Exercise 9-2:** Predict and balance the following double replacement or metathesis reactions. Use the abbreviations (s), (l), (g), and (aq) for the reactants and products. All reactants are aqueous unless otherwise stated. *Note:* Some of these reactions do not go to completion.

1. Ammonium sulfate and potassium hydroxide are mixed together.
2. Ammonium sulfide is reacted with hydrochloric acid.
3. Cobalt(II) chloride is combined with silver nitrate.
4. Solid calcium carbonate is reacted with sulfuric acid.
5. Potassium sulfite is reacted with hydrobromic acid.
6. Potassium sulfide is reacted with nitric acid.
7. ammonium iodide + magnesium sulfate
8. solid titanium(IV) carbonate + hydrochloric acid
9. solid calcium sulfite + acetic acid
10. strontium hydroxide + ammonium sulfide

**Exercise 9-3:** Predict and balance the following reactions. Use the abbreviations (s), (l), (g), and (aq) for the reactants and products. All reactants are aqueous unless otherwise stated.

1. Carbon dioxide gas is bubbled through a solution of lithium hydroxide.
2. Sodium nitrite is reacted with hydrochloric acid.
3. ammonium bromide + sodium hydroxide
4. Carbon dioxide gas is reacted with solid potassium oxide.
5. Solid magnesium oxide is reacted with hydrochloric acid.
6. Equal numbers of moles of potassium hydroxide and phosphoric acid react.
7. Sodium fluoride reacts with dilute nitric acid.
8. ammonium carbonate + potassium bromide
9. Oxalic acid (0.1 M) reacts with an equal volume of 0.1 M cesium hydroxide.
10. silver nitrate + sodium chromate