

Chemistry Lab: Precipitation Reactions & Solubility

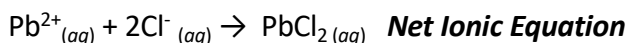
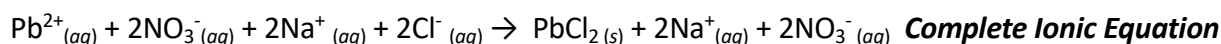
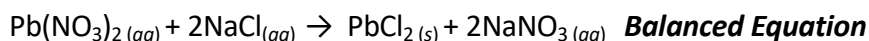
Introduction:

Many ionic solids are soluble in water. Recall that ionic compounds are composed of cations, positive ions, and anions, negative ions. In an ionic compound these ions are held together by electrostatic forces that occur between oppositely charged particles.

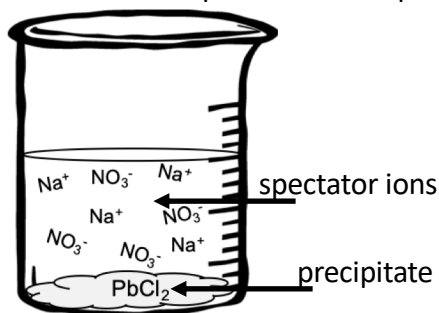
When soluble ionic compounds are dissolved in water, they break apart, dissociate, into the individual ions that make up the compound. For example, when solid $\text{NaCl}_{(s)}$ is dissolved in water, it dissociates into $\text{Na}^+_{(aq)}$ ions and $\text{Cl}^-_{(aq)}$ ions. When an ionic compound that contains a polyatomic ion dissociates in water, the polyatomic ion stays together. For example, when solid $\text{Pb}(\text{NO}_3)_2$ is dissolved in water, it dissociates into $\text{Pb}^{2+}_{(aq)}$ ions and $\text{NO}_3^-_{(aq)}$ ions.

Some ionic *compounds* are not soluble in water. When mixing two soluble solutions sometimes an insoluble compound is formed. The reactants are soluble, but one of the products formed is insoluble and “falls out” as a solid. This solid is called a precipitate.

Example Precipitate Reaction: lead (II) nitrate + sodium chloride \rightarrow lead (II) chloride + sodium nitrate



In this example reaction, the solid precipitate is the lead (II) chloride. The sodium ions and the nitrate ions do not change. They remain in solution. These two ions are referred to as spectator ions. Spectator ions are not part of the reaction.



How do we know which compound in the product will be the precipitate and which will stay in solution as spectator ions? We use solubility rules. In this experiment, you will be mixing several different aqueous solutions, determine the products, and using solubility rules, you will determine the precipitate product.

Safety:

Some of the chemicals used in this experiment can be irritants to the skin and mucus tissue as well as corrosive or staining to clothing. Safety goggles and aprons must be worn. Wash hands immediately should you get chemicals on your hands. Wash hands well after clean up of the lab.

Materials:

- testing solutions in dropping bottles
- well plate
- tooth picks or stirring rods
- solubility chart

Procedure:

1. Use solutions 1-4 for the columns, and solutions A-D for the rows.
2. Begin with solution A and place 5 drops in each well going across the top row.
3. Repeat step 2 with solutions B, C, & D. (See diagram/data table)
4. Begin with solution 1 and place 5 drops in each well going down column 1.
5. Repeat step 4 with solutions 2, 3, & 4.
6. Using a clean toothpick stir the products.
7. Record observations on your data table.

Clean up: Rinse well plates with copious amounts of water. Use a test tube brush to clean wells if necessary. Turn up side down on paper towel for the next class.