DO NOT WRITE ON THIS PAPER

Title: LAB: Precipitates and Solubility Rules

Introduction

In a general sense, solubility can be thought of as the tendency of a substance (the solute) to dissolve in another substance (solvent). Ionic compounds dissolve in water by a process known as **dissociation**. In this process, the crystal lattice of the solid breaks down, and free ions move throughout the solution. The total number of positive charges is equal to the total number of negative charges in an ionic solution. If aqueous (water) solutions of two different ionic compounds are mixed, one of two things will occur. If all of the ions remain free, "nothing" will happen. That is, the mixture will remain clear, or transparent. However, if two oppositely charged ions are attracted to each other strongly enough, they will bond together to form an ionic compound that is insoluble in water. In such a case, a precipitate forms.

Target:

Students will use aqueous solutions of several different ionic compounds and different combinations of solutions will be mixed and the reaction results observed. Using solubility rules students will predict products and identify the solid that forms in these precipitation reactions.

Pre-Lab Discussion

1. How many products are there in a double replacement reaction from which to choose the precipitate?
2. How can you recognize a precipitate when you see one?
3. Why is it necessary to use different micropipets for different solutions?
4. Why is distilled water, and not tap water, used for the solutions?
5. What compounds, from the materials list, do you think are or will form precipitates?

Materials

Equipment: goggles, well plates, toothpicks, dropper pipette, distilled water.

Chemicals:

SET A: silver nitrate, barium chloride, sodium carbonate, magnesium sulfate, calcium nitrate, sodium phosphate.

SET B: zinc nitrate, lead II nitrate, sodium hydroxide, potassium iodide, potassium sulfate, sodium acetate.

Safety

Observe all normal safety precautions. Wear safety goggles and protective clothing at all times when working in the lab.

Procedure

1. Obtain two well plates. Mark the well plates with names of the solutions you will be mixing. (See data table). Add three to five drops of barium chloride to the first well in the first row of your well plate. Then add five drops of silver nitrate to this same well. Mix the solutions thoroughly with a clean toothpick. Record your observations in the Data Table. Pay particular attention to the color of any precipitate that forms. It may help to observe the well plate first on top of a piece of white paper.
2. Repeat step one for the next well in your well plate, except this time use silver nitrate and sodium carbonate.
3. Continue this procedure until al possible combinations have been tested. Refer to the

data table for the combinations.

4. Discard the materials in the well plates. Wash and dry the well plates using distilled water.

Data/Observations
SOLUTION SET A

	$AgNO_3$	$BaCl_2$	Na_2CO_3	$MgSO_4$	$CaCl_2$
$BaCl_2$					
Na_2CO_3					
$MgSO_4$					
$CaCl_2$					
Na_3PO_4					

SOLUTION SET B

	$Zn(NO_3)_2$	$Pb(NO_3)_2$	NaOH	KI	K_2SO_4
$Pb(NO_3)_2$					
NaOH					
KI					
K_2SO_4					
$FeCl_3$					

Equations: For each precipitate formed in the experiment, write a balanced molecular **and** net ionic equation for the reaction that occurred.

SET A
(Example)

- $2AgNO_3\ (aq) + BaCl_2\ (aq) \rightarrow 2AgCl\ (s) + Ba(NO_3)_2\ (aq)$
- $2Ag^+(aq) + 2Cl^-(aq) \rightarrow 2AgCl(s)$

SET B

Questions:

1. Formulate a hypothesis about the relative tendency of the following ions to form soluble or insoluble salts within water.
   Na^+, K^+, NH_4^+, Ag^+, NO_3^-, Cl^-, CO_3^{2-}, PO_4^{3-}, $C_2H_3O_2^-$
2. Compare your experimental results and conclusions with the solubility data in the table A-7?

Conclusion:
In this section you will summarize the findings of the lab activity.

- Discuss the overall results in one or two sentences.
- Explain the purpose (target) of the experiment
- What is the error (or errors) in your data? You must evaluate the information you gathered by describing realistic sources of error and their effect.
- Describe any problems encountered during the experiment. (i.e. Do you accidentally spill part of a reactant altering the volume needed? Did you wait too long during part of the lab procedure?
- Express what concepts you learned in the lab

It is not wrong to make mistakes during a lab procedure. However, it is wrong to falsify or misrepresent results!