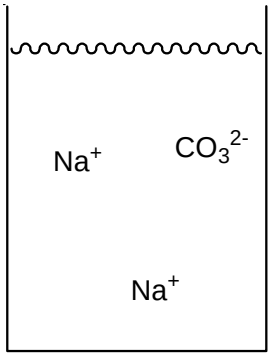
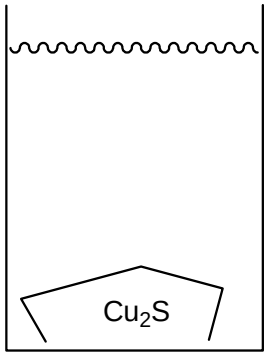
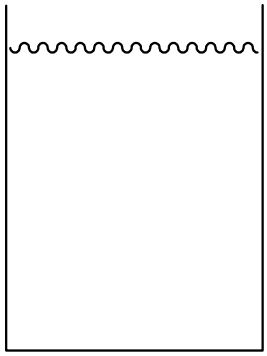
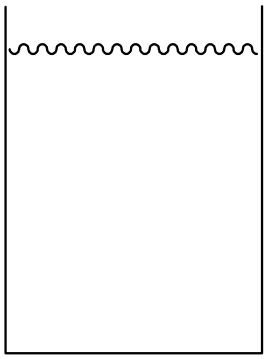
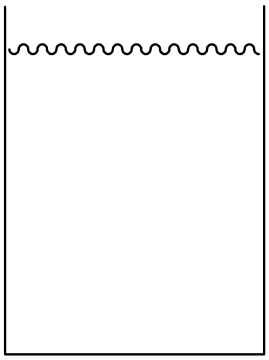
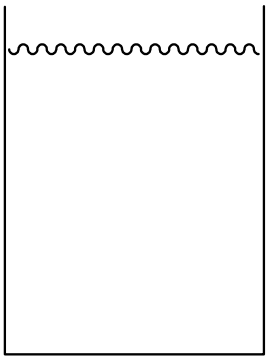
Part A: Solubility Rules for Ionic Compounds

Use the solubility rules on page 216 of your textbook or the ones from lecture to complete question 1.

1) For each of the following ionic compounds in the table below:

- Put an "aq" (for aqueous) in the parenthesis after the formula if the compound is soluble in water or put an "s" (for solid) in the parenthesis after the formula if the compound is insoluble in water.
- Fill in the name of the compound in the space provided.
- Complete the drawing of the beaker of water by showing the compound either broken up into ions (if it is soluble) or sitting on the bottom (if it is insoluble).

The first two drawings (you still need to fill in the states and names) have been done for you and should be used as examples. Notice that the soluble ionic compounds break up into ions that reflect the correct charges and ratios.

Na_2CO_3 ( )	Cu_2S ( )	$(NH_4)_3PO_4$ ( )
name:_____	name:_____	name:_____
		
$Mg(NO_3)_2$ ( )	$Al_2(SO_4)_3$ ( )	PbI_2 ( )
name:_____	name:_____	name:_____
		

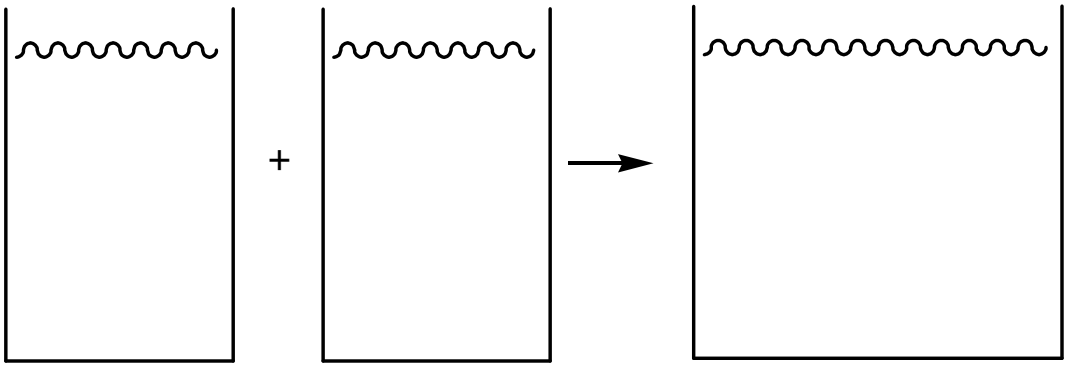
Part B: Predicting Precipitation Reactions

2) For the following two sets of reactants:

- Predict the products; for precipitation reactions, this is done by switching the ions around and combining them in the correct ratio.
- Indicate if each species is soluble (aq) or insoluble (s) in water.
- Balance the reaction.
- Name each reactant and product.
- Draw pictures that represent the reaction (they should be like the ones you drew for question 1).

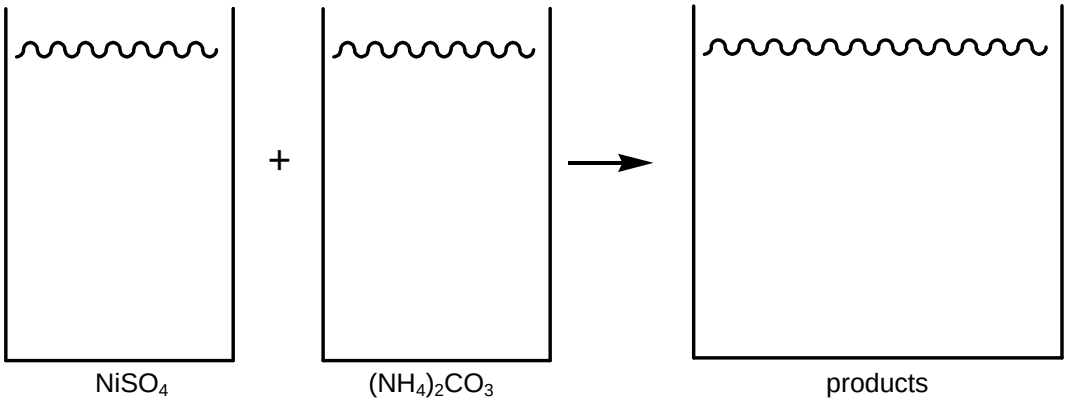
a) _____ $Cu(C_2H_3O_2)_2$ ( ) + _____ Na_2CO_3 ( ) →

Names:



b) _____ $NiSO_4$ ( ) + _____ $(NH_4)_2CO_3$ ( ) →

Names:



Part C: Writing Net Ionic Equations

3) Aqueous solutions of lead(II) nitrate and sodium iodide react to form a precipitate. Answer the follwing questions with regard to this reaction.

a) Write the *molecular equation* for this reaction by:

- Translating the two reactants into their chemical formulae.
- Predict the products.
- Label all the states.
- Balance the reaction.

b) Starting with the *molecular equation* you came up with in question 3a, write the *complete ionic equation* by breaking up all of the (aq) compounds into their corresponding ions; leave all of the (s) compounds together.

c) Starting with the *complete ionic equation* that you came up with in question 3b, write the *net ionic equation (NIE)* for this reaction by cancelling out all of the spectator ions.

4) Aqueous solutions of iron(III) bromide and ammonium carbonate react to form a precipitate. Answer the follwing questions with regards to this reaction.

a) Write the *molecular equation* for this reaction by:

- Translating the two reactants into their chemical formulae.
- Predict the products.
- Label all the states.
- Balance the reaction.

b) Starting with the *molecular equation* you came up with in question 4a, write the *complete ionic equation* by breaking up all of the (aq) compounds into their corresponding ions; leave all of the (s) compounds together.

c) Starting with the *complete ionic equation* that you came up with in question 4b, write the *net ionic equation (NIE)* for this reaction by cancelling out all of the spectator ions.

Part D: Some Additional Solubility Rule Problems

5) Imagine you work as a chemical engineer for the Sacramento water district and need to test samples of drinking water for possible contamination. Based on other tests you have done, you have narrowed down the contamination to either Ca^{2+} ions which are okay in drinking water or Pb^{2+} ions which are dangerous. What possible ionic compound could you add to the drinking water to give results that would tell you if you have Ca^{2+} ions or Pb^{2+} ions present? Briefly explain your answer.

6) Imagine you had second sample of drinking water. Based on other tests you have done, you have narrowed down that there is some combination of Ba^{2+}, Ag^{+}, and/or Fe^{2+} ions in the sample. You perform a series of tests and make the following observations:

- Test #1: add NaI to the sample $\rightarrow$ Result of test #1: a precipitate forms
- Remove the solid from the sample and continue testing the remaining liquid.
- Test #2: add Na_2SO_4 to the sample $\rightarrow$ Result of test #2: no precipitate forms
- Test #3: add NaOH to the sample $\rightarrow$ Result of test #3: a precipitate forms

Based on the test results, which of the possible ions are in the sample? Briefly explain your answer.

7) A third sample of drinking water contains 0.55 g of dissolved Ba^{2+} ions. How many grams of Na_2SO_4 would have to be added to the solution to completely precipitate all of the dissolved Ba^{2+}?