

NAME:

## HONORS CHEMISTRY

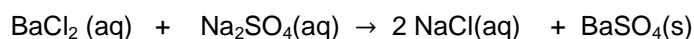
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SECTION:

### Precipitation in Double Displacement Reactions

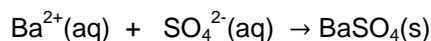
In chemistry, the term precipitation does not refer to meteorological phenomena such as rain or snow. Rather, *precipitation* occurs in solution when two chemicals react to form a product that is insoluble in water and falls out of solution like rain or snow. A *precipitate* is a solid substance that separates from solution during a chemical reaction. A precipitate can be identified by the cloudy, milky, gelatinous, or grainy appearance it gives to the mixture. The solid might even settle to the bottom of the container.

A barium sulfate precipitate can be produced by the reaction of barium chloride and sodium sulfate. A complete chemical equation to describe the reaction is written and balanced as follows:



Barium sulfate,  $\text{BaSO}_4$ , is a common precipitate used as an X-ray contrast medium because it is insoluble in water and opaque to X-rays. Typically, a patient drinks an aqueous slurry of barium sulfate just before he or she is X-rayed. The precipitate coats the stomach and intestines, so the organs show up on the X-ray film in vivid contrast.

A net ionic equation shows only the solution components directly involved in the equation. Spectator ions (ions which remain in solution throughout the reaction) are not shown. The net ionic equation for the formation of barium sulfate is given below:



Notice that the reaction that forms  $\text{BaSO}_4$  is a double-displacement reaction in which the cations and the anions of the reactants trade partners to form the products. You should also take note that the ratios in which the cations and anions combine to form reactants are different from the ratios for the products. For example,  $\text{Na}^+$  combines with  $\text{SO}_4^{2-}$  in a ratio of 2:1 in sodium sulfate, whereas  $\text{Na}^+$  combines in a 1:1 ratio in sodium chloride,  $\text{NaCl}$ . According to the rules of formula writing, formulas for ionic compounds must be written so that the net charge of the formula is zero.

In this lab, you will carry out a number of double displacement reactions using microscale techniques to mix various solutions. You will observe and describe the precipitates that are formed, using a solubility table to determine the identity of the precipitate. Finally, you will write and balance complete chemical equations to describe the precipitation reactions.

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### Objectives

- Observe precipitation reactions by mixing aqueous solutions of cations and anions.
- Write and balance complete chemical equations to describe precipitation reactions.
- Write net ionic equations for chemical reactions.

### Safety

- Wear your safety glasses.
- Use full microscale pipettes only for the carefully controlled delivery of solutions.
- Silver nitrate can stain the skin, so avoid contact with this solution.
- Several of the solutions are skin irritants, so avoid contact with all the solutions.

### Roles (must be assigned)

Project Manager \_\_\_\_\_

Quality Control Manager \_\_\_\_\_

Materials Manager \_\_\_\_\_



3. Sketch particle-level drawings to differentiate between two soluble compounds: one that is a strong electrolyte, and one that is a non-electrolyte.
4. On a separate piece of paper, write complete, balanced chemical equations for each of the reactions that formed a precipitate. Include states of matter for each formula. (Hint: Check your formula writing before balancing equations)
5. Pick 5 of your equations from above and write them as net ionic equations.

Data Sheet for Double Displacement Lab

Formulas→ ↓ SOLUTIONS	7	6	5	4	3	2	1
	____ (ions)	____ (ions)	____ (ions)	____ (ions)	____ (ions)	____ (ions)	____ (ions)
1 ____ (ions)							<b>OMIT</b>
2 ____ (ions)						<b>OMIT</b>	
3 ____ (ions)					<b>OMIT</b>		
4 ____ (ions)				<b>OMIT</b>			
5 ____ (ions)			<b>OMIT</b>				
6 ____ (ions)		<b>OMIT</b>					
7 ____ (ions)	<b>OMIT</b>						

