# **Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Double Replacement Lab**

**Background Information:** Many ionic solids dissolve in water to form clear, aqueous solutions that conduct electricity. But when you mix them together what happens?

**Guiding Questions**: Do all reactions form a precipitate? How can you identify the precipitates formula?

**Pre-lab Questions:**

1. What ions are present in the following solutions?

 NaCl(aq) 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ AgNO3(aq) 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. When these solutions are mixed together new combinations of chemicals can form. What are the new combinations?

3. Using the solubility table, which of the new combinations will be soluble and which is insoluble?

4. Draw the reaction before and after mixing:





 NaCl (aq) AgNO3(aq) After Reaction

5. Write the overall reaction equation for this reaction. Be sure to indicate the correct phase for each reactant and each product.

6. Write the complete ionic equation for this reaction.

7. Write the net ionic equation for this reaction.

**Procedure:**

1. Place the last sheet called “Spot Plate Sheet” of one team member’s lab in a sheet protector.

2. Place 1 drop of each of the solutions in the boxes on your spot plate sheet over the printed letter.

3. Continue until all combinations have been tested.

4. On your Data Table,

* if a clear solution is present and you can still see the letter, place an X in the box.
* if a precipitate forms and you cannot see the whole letter, write the formula of the insoluble solid precipitate that formed (use solubility table F).

**Data**

|  | HCl | CuSO4 | Na2CO3 | Fe(NO3)3 | BaCl2 |
| --- | --- | --- | --- | --- | --- |
| AgNO3 | 1 | 2 | 3 | 4 | 5 |
| BaCl2 | 6 | 7 | 8 | 9 |  |
| Fe(NO3)3 | 10 | 11 | 12 |  |  |
| Na2CO3 | 13 | 14 |  |  |  |
| CuSO4 | 15 |  |  |  |  |

For two reactions that formed a precipitate, draw particle diagrams for the reactants and products. Write the formulas for the reactants and products on the lines below the diagram. Also write the molecular equation, complete ionic equation, and net ionic equation for each reaction. Include phases.

Reaction \_\_\_\_: 

Molecular Equation:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Complete Ionic Equation:

Net Ionic Equation:

Reaction \_\_\_\_: 

Molecular Equation:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Complete Ionic Equation:

Net Ionic Equation:

**Post lab Analysis:**

Water treatment plants take groundwater and cleanse it to create tap water in a series of steps.

1. Coagulation and flocculation: Chemicals with a positive charge are added to the water. The positive charge of these chemicals neutralizes the negative charge of dirt and other dissolved particles in the water. When this occurs, the particles bind with the chemicals and form larger particles, called floc.
2. Sedimentation: Floc settles to the bottom of the water supply, due to its weight. This settling process is called sedimentation.
3. Filtration: The clear water on top of the floc will pass through filters of varying compositions (sand, gravel, and charcoal) and pore sizes, in order to remove dissolved particles, such as dust, parasites, bacteria, viruses, and chemicals.
4. Disinfection: A disinfectant (for example, chlorine, chloramine) may be added in order to kill any remaining parasites, bacteria, and viruses, and to protect the water from germs when it is piped to homes and businesses.

In common household tap water, the most abundant cations present in water are calcium (Ca+2), magnesium (Mg+2), sodium (Na+), and potassium (K+); the most abundant anions are bicarbonate (HCO3-), chloride (Cl-), and sulfate (SO4-2).

**Questions**:

1. Based on your observations and analysis of results of this lab, explain why more than one type of positive ion is added to the water to “neutralize” the water? (Why isn’t only Mg+2 or only Ca+2 ions added?)
2. Why are negative ions also abundant in tap water like bicarbonate (HCO3-), chloride (Cl-), and sulfate (SO4-2)?
3. Based on the work done in this lab, what would a chemist call the “floc” formed in the water?
4. Why does the floc settle to the bottom? What property explains why it settles?
5. Will the filtration process remove all impurities from the water? Consider your understanding of homogeneous and heterogeneous mixtures to answer this.
6. Many civilians don’t understand the water treatment process and worry about their tap water being chlorinated. What does chlorine do in the water?



**Spot Plate Sheet**

|  | HCl | CuSO4 | Na2CO3 | Fe(NO3)3 | BaCl2 |
| --- | --- | --- | --- | --- | --- |
| AgNO3 | 1 | 2 | 3 | 4 | 5 |
| BaCl2 | 6 | 7 | 8 | 9 |  |
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