Lab: Double Displacement Reactions

SCH3UE

Introduction

When solutions of soluble ionic salts are mixed, a double displacement reaction occurs between pairs of ions of opposite charge.

For example, when aqueous solutions of barium nitrate and sodium sulphate are mixed. Which precipitate will form?

Ions Present	Ba^{2+}	NO_3^-	Na^+	SO_4^{2-}
Possible Precipitates	$BaSO_4$,	$NaNO_3$		
From solubility rules	$Na NO_3$ is soluble,	$BaSO_4$ is not soluble		

Net Ionic Equation $Ba^{2+}_{(aq)} + SO_{4}^{2-}{}_{(aq)} \longrightarrow BaSO_{4\,(s)}$

It is therefore, possible to survey a large number of combinations of ions simply by mixing solutions of various ions and by using solubility rules identifying and predicting the precipitates formed, and thus write net ionic equations for these precipitates.

Objectives

To observe the reactions of a large number of aqueous ionic solutions.
Identify the possible new combinations of ions which might precipitates.
Use the solubility chart to determine if one or both new combinations is insoluble.
To write net ionic equations for any reactions observed.

Materials

well -plates

1.	Sodium chloride	2.	Silver nitrate
3.	Silver nitrate	4.	Potassium iodide
5.	Iron (III) chloride	6.	Sodium hydroxide
7.	Sodium chloride	8.	Potassium nitrate
9.	Sodium carbonate	10.	Calcium chloride.

Procedure

1. Prepare a Data Table to record your observations.
2. Using a well-plate, place 10 drops of solution 1 and then 10 drops of solution 2 in a well.
3. Observe the mixture and record any evidence of a reaction.
4. Describe the appearance and colour of any product that has formed.
5. Repeat steps 1 - 4 for the following pairs of solutions:
   3 & 4 5 & 6 7 & 8 9 & 10

Data Processing

1. Using the solubility rules, determine the precipitate that forms in each reaction.
2. Write a balanced chemical equation for each reaction. For each reaction include the state.
3. Write net-ionic equation for each reaction where a precipitate was observed.

Applying the Idea

1. Explain which precipitate will form when $CuNO_{3\,(aq)}$, $NaCl_{(aq)}$, and $MgSO_{4\,(aq)}$, solutions are mixed together.
2. Explain what solution you would use to separate Mg^{2+} ions and Ba^{2+} ions from an aqueous solution.
3. A solution is known to contain Ba^{2+}, Pb^{2+}, Cu^{2+} and Na^{+}. If a student wants to separate these ions by precipitating them "selectively" one by one from the solution by adding negative ions in the correct order. Explain how the student may perform this. Which positive ion will remain in the solution at the end? Why?