Name: _____ Section: _____

Experiment 4 – Double Displacement Reactions

Discussion

In this experiment, double displacement reactions will be studied, where two water solutions, each containing positive and negative ions, will be combined. Consider the generalized reaction shown below:

$$AB + CD \rightarrow AD + CB$$

where AB exists as A^+ and B^- ions in solution, and CD exists as C^+ and D^- ions in solution. Each of the positive ions can combine with the negative ion of the other compound as shown above. But the question then becomes: has there been a reaction? To answer this question, we look at the products. Is either one an insoluble compound giving a precipitate (information available from a solubility table), is either one a gas or producer of a gas, or would a temperature change be predicted? Has a weak electrolyte such as a weak acid been formed? If no to all of these, then no reaction occurs; this is simply a mixture. If yes to any one or more of these, then a reaction occurs.

Procedure

Each part of the experiment below consists of mixing equal volumes of two solutions from dropper bottles in a 24 well-plate. Place 5 drops of each indicated chemical in the well-plate. Write your observations on the report sheet. Note the formation of any precipitate or gas. If neither results, test the well-plate with a thermometer for any temperature change. If no change is noted, write NR (No Reaction) for the mixture. *Note: $NH_3(aq) = NH_4OH(aq)$*

1. Mix 5 drops of 0.1 M NaCl(aq) with 5 drops of 0.1 M KNO_3(aq).
2. Mix 5 drops of 0.1 M NaCl(aq) with 5 drops of 0.1 M $AgNO_3$(aq).
3. Mix 5 drops of 10% NaOH(aq) with 5 drops of dilute 6 M HCl(aq).
4. Mix 5 drops of 0.1 M $BaCl_2$(aq) with 5 drops of dilute 3 M H_2SO_4(aq).
5. Mix 5 drops of dil. 6 M NH_3(aq) with 5 drops of dilute 3 M H_2SO_4(aq).
6. Mix 5 drops of 0.1 M $CuSO_4$(aq) with 5 drops of 0.1 M $Zn(NO_3)_2$(aq).
7. Mix 5 drops of 0.1 M Na_2CO_3(aq) with 5 drops of 0.1 M $CaCl_2$(aq).
8. Mix 5 drops of 0.1 M $CuSO_4$(aq) with 5 drops of 0.1 M NH_4Cl(aq).
9. Mix 5 drops of 10% NaOH(aq) with 5 drops of dilute 6 M HNO_3(aq).

Dispose of all solutions in the appropriate WASTE CONTAINER in the hood.

Name: _____ Section: _____

Data for Experiment 4

Record your observations for each combination below. If a reaction occurs, write balanced MOLECULAR and NET-IONIC equations. If no reaction occurs, write NR. Make sure to include the physical states of all the products.

1. NaCl(aq) and KNO_3(aq)

   Observations:

   Molecular:

   Net-Ionic:

2. NaCl(aq) and $AgNO_3$(aq)

   Observations:

   Molecular:

   Net-Ionic:

3. NaOH(aq) and HCl(aq)

   Observations:

   Molecular:

   Net-Ionic:

Name: _____ Section: _____

4. $BaCl_2(aq)$ and $H_2SO_4(aq)$

   Observations:

   Molecular:

   Net-Ionic:

5. $NH_4OH(aq)$ and $H_2SO_4(aq)$

   Observations:

   Molecular:

   Net-Ionic:

6. $CuSO_4(aq)$ and $Zn(NO_3)_2(aq)$

   Observations:

   Molecular:

   Net-Ionic:

7. $Na_2CO_3(aq)$ and $CaCl_2(aq)$

   Observations:

   Molecular:

   Net-Ionic:

Name: _____ Section: _____

8. $CuSO_4(aq)$ and $NH_4Cl(aq)$

   Observations:

   Molecular:

   Net-Ionic:

9. $NaOH(aq)$ and $HNO_3(aq)$

   Observations:

   Molecular:

   Net-Ionic:

Questions

1. For each of the reactions listed below, write balanced molecular and net-ionic equations. If no reaction occurs, write NR. Assume all reactants are aqueous unless otherwise noted. Include all physical states.

   A. Lead(II) nitrate and magnesium sulfate solutions are combined.

      Molecular:

      Net-Ionic:

   B. Zinc chloride solution is poured into a solution of ammonium carbonate.

      Molecular:

      Net-Ionic:

C. Magnesium chloride solution is mixed with nickel(II) nitrate solution.

Molecular:

Net-Ionic:

D. Cobalt(II) sulfate and lithium sulfide solutions are combined.

Molecular:

Net-Ionic:

E. Sodium hydroxide solution is poured into a solution of cobalt(II) chloride.

Molecular:

Net-Ionic:

F. Solid zinc bromide is mixed with a solution of potassium phosphate.

Molecular:

Net-Ionic:

G. Solutions of ammonium sulfate and sodium chloride are combined.

Molecular:

Net-Ionic: