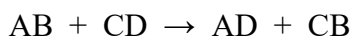

Experiment 7 – Double Displacement Reactions

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:



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.

1. Mix 5 drops of 0.1 M NaCl(aq) with 5 drops of 0.1 M KNO₃(aq).
2. Mix 5 drops of 0.1 M NaCl(aq) with 5 drops of 0.1 M AgNO₃(aq).
3. Mix 5 drops of 0.1 M Na₂CO₃(aq) with 5 drops of dilute 6 M HCl(aq).
4. Mix 5 drops of 10% NaOH(aq) with 5 drops of dilute 6 M HCl(aq).
5. Mix 5 drops of 0.1 M BaCl₂(aq) with 5 drops of dilute 3 M H₂SO₄(aq).
6. Mix 5 drops of dilute 6 M NH₄OH(aq) with 5 drops of dilute 3 M H₂SO₄(aq).
7. Mix 5 drops of 0.1 M CuSO₄(aq) with 5 drops of 0.1 M Zn(NO₃)₂(aq).
8. Mix 5 drops of 0.1 M Na₂CO₃(aq) with 5 drops of 0.1 M CaCl₂(aq).
9. Mix 5 drops of 0.1 M CuSO₄(aq) with 5 drops of 0.1 M NH₄Cl(aq).
10. Mix 5 drops of 10% NaOH(aq) with 5 drops of dilute 6 M HNO₃(aq).
11. Mix 5 drops of 0.1 M FeCl₃(aq) with 5 drops of dilute 6 M NH₄OH(aq).
12. IN THE HOOD: Add a small amount of Na₂SO₃(s) to 5 drops of water and mix to dissolve. Add 5 drops of dilute 6 M HCl(aq) to the first solution.

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

Data for Experiment 7

Record your observations for each combination below. If a reaction occurs, write balanced MOLECULAR, IONIC, 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 $\text{KNO}_3\text{(aq)}$

Observations:

Molecular:

Ionic:

Net-Ionic:

2. NaCl(aq) and $\text{AgNO}_3\text{(aq)}$

Observations:

Molecular:

Ionic:

Net-Ionic:

3. $\text{Na}_2\text{CO}_3\text{(aq)}$ and HCl(aq)

Observations:

Molecular:

Ionic:

Net-Ionic:

4. NaOH(aq) and HCl(aq)

Observations:

Molecular:

Ionic:

Net-Ionic:

Name: _____

Section: _____

5. $\text{BaCl}_2(\text{aq})$ and $\text{H}_2\text{SO}_4(\text{aq})$

Observations:

Molecular:

Ionic:

Net-Ionic:

6. $\text{NH}_4\text{OH}(\text{aq})$ and $\text{H}_2\text{SO}_4(\text{aq})$

Observations:

Molecular:

Ionic:

Net-Ionic:

7. $\text{CuSO}_4(\text{aq})$ and $\text{Zn}(\text{NO}_3)_2(\text{aq})$

Observations:

Molecular:

Ionic:

Net-Ionic:

8. $\text{Na}_2\text{CO}_3(\text{aq})$ and $\text{CaCl}_2(\text{aq})$

Observations:

Molecular:

Ionic:

Net-Ionic:

Name: _____

Section: _____

9. $\text{CuSO}_4(\text{aq})$ and $\text{NH}_4\text{Cl}(\text{aq})$

Observations:

Molecular:

Ionic:

Net-Ionic:

10. $\text{NaOH}(\text{aq})$ and $\text{HNO}_3(\text{aq})$

Observations:

Molecular:

Ionic:

Net-Ionic:

11. $\text{FeCl}_3(\text{aq})$ and $\text{NH}_4\text{OH}(\text{aq})$

Observations:

Molecular:

Ionic:

Net-Ionic:

12. $\text{Na}_2\text{SO}_3(\text{aq})$ and $\text{HCl}(\text{aq})$

Observations:

Molecular:

Ionic:

Net-Ionic:

Questions

1. For each of the reactions listed below, write balanced molecular, ionic, 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:

Ionic:

Net-Ionic:

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

Molecular:

Ionic:

Net-Ionic:

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

Molecular:

Ionic:

Net-Ionic:

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

Molecular:

Ionic:

Net-Ionic:

E. Hydrochloric acid solution is reacted with a solution of lithium carbonate.

Molecular:

Ionic:

Net-Ionic:

Name: _____

Section: _____

F. Hydroiodic acid and ammonium sulfite solutions are mixed.

Molecular:

Ionic:

Net-Ionic:

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

Molecular:

Ionic:

Net-Ionic:

H. Ammonium chloride and potassium hydroxide solutions are reacted.

Molecular:

Ionic:

Net-Ionic:

I. Solid strontium bromide is mixed with a solution of potassium phosphate.

Molecular:

Ionic:

Net-Ionic:

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

Molecular:

Ionic:

Net-Ionic: