

Name \_\_\_\_\_ Date \_\_\_\_\_ Lab # \_\_\_\_\_

### Types of Chemical Reactions: Single Replacement

#### Pre-Lab Discussion

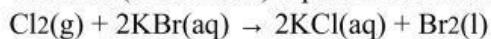
There are many kinds of chemical reactions and several ways to classify them. One useful method classifies reactions into four major types. These are: (1) synthesis; (2) decomposition (3) single replacement; and (4) double replacement

In a single replacement reaction, one substance in a compound is replaced by another, more active, substance (an element). Equations for single replacement reactions have two general forms. In reactions in which one metal replaces another metal, the general equation is  $X + YB \rightarrow XB + Y$ . In those in which one nonmetal replaces another nonmetal, the general form is  $X + AY \rightarrow AX + Y$ . The following equations illustrate these types of reactions:

Zinc metal replaces copper (II) ion:



Chlorine (a nonmetal) replaces bromide ions:



All of the types of reactions discussed here may be represented by balanced molecular equations. In a balanced equation, the number of atoms of any given element must be the same on both sides of the equation. Multiplying the coefficient and the subscript of an element must yield the same result on both sides of the balanced equation.

In this investigation you will observe examples of a single replacement reaction described above. You will be expected to balance the equations representing the observed reactions.

#### Purpose

Observe some chemical reactions and identify reactants and products of those reactions. Classify the reactions and write balanced equations.

#### Equipment

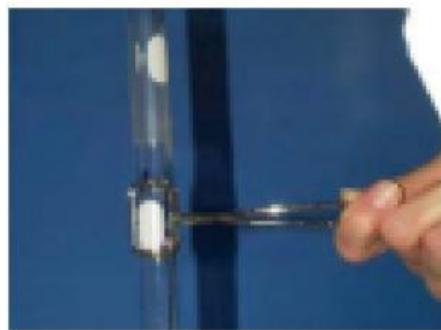
Test tubes  
Safety goggles  
Test tube holder  
Test tube rack

#### Materials

- Zinc Metal
- 6 M hydrochloric acid (HCl)

#### Safety

In this investigation you will be working with open flames, heating chemicals, handling acids,



and producing gaseous products. Take precaution when using flames. **CAUTION.** Handle acids with care. They can cause painful burns. Do not inhale any HCl fumes. Keep the area around you clear. Wear safety goggles and protective clothing at all times when working in the lab.

### Procedure: SINGLE REPLACEMENT

1. Stand a clean, dry test tube in the test tube rack. Add about 2 ml of 6 M hydrochloric acid (HCl) to the tube.
2. Carefully drop a small piece of zinc metal (Zn) into the acid in the test tube. Observe and record what happens. (data table #4)
3. Using a test tube holder, invert a second test tube over the mouth of the test tube in which the reaction is taking place.
4. Remove the inverted tube after about 30 seconds and quickly insert a burning wood splint into the mouth of the tube. (A “pop” indicates the presence of hydrogen gas.) Note the appearance of the substance in the reaction test tube. Record observations.

#### Observations and Data

Appearance of zinc metal before reaction	Appearance of zinc metal after the reaction
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#### Questions

1. What test was used to test for hydrogen gas?

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2. Write the balanced equation for the single replacement reactions below. Write the word equation for each reaction as well.



3. Word equation:

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form

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