# EXPERIMENT 3:

# Chemical Reactions/Writing & Balancing Equations

**Materials Required:  Aqueous solutions of**

| | |
|---|---|
| **hydrochloric acid** | **sulfuric acid** |
| **sodium carbonate** | **sodium bicarbonate** |
| **sodium hydroxide** | **potassium hydroxide** |
| **copper(II) sulfate** | **zinc chloride** |
| **cobalt(II) chloride** | **calcium chloride** |

**Purpose of the Experiment:**

Pairs of aqueous compounds will be mixed together and observations recorded in the data sheets. Observations might include the evolution of a gas, the formation of a precipitate, a color change. Or there could be no reaction (write NR). Balanced equations will be written for each reaction. In addition, several numerical problems will provide an opportunity to revise some basic chemical calculations.
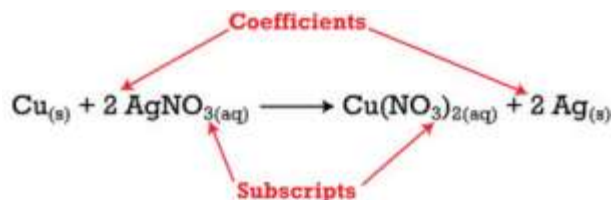
**Experimental Procedure:**

Mix each of the following pairs of solutions to separate test-tubes. Use about 1 mL of each – approx. 1 cm in the test-tubes.

At home for the report, write balanced equations for each reaction (all are aqueous solutions):

1. hydrochloric acid plus sodium carbonate

2. hydrochloric acid plus sodium bicarbonate

3. sulfuric acid plus sodium carbonate

4. sodium hydroxide plus copper(II) sulfate

5. sodium hydroxide plus zinc chloride

6. potassium hydroxide plus cobalt(II) chloride

7. calcium chloride plus sodium carbonate

*(dispose of the Cu, Zn, and Co solutions in the waste containers on bench)*

Note: Equations must be complete and properly balanced as learned in CHEM 1100. And remember, an equation must contain the correct chemical formulas for each substance with the correct formula subscripts, the correct coefficients, and indicate after the formula if the substance is a (s), (l), (g), or (aq) – see eg below:

$$Cu_{(s)} + 2\ AgNO_{3(aq)} \longrightarrow Cu(NO_3)_{2(aq)} + 2\ Ag_{(s)}$$

(Coefficients / Subscripts labeled in diagram)

For the report, use the following pages for your data and answers to questions 1-4 below. write the usual short intro on a blank page, then your data (observations), then under Results, give the balanced equations. Also answer to the following questions (show all working) which are largely review and which you should be able to do from CHEM 1100.

## REVISON CALCULATIONS

1. Calculate the number of moles of HCl in 1.0 mL of a 0.10 M HCl solution
2. Calculate the molar mass of calcium chloride.
3. Calculate the number of moles of $CaCl_2$ in 5.0 g of calcium chloride.
4. Oxidation numbers: For the above reaction between Cu and $AgNO_3$ assign oxidations numbers to Cu, Ag, N and O before and after the reaction. Which element is oxidized and which element is reduced during the reaction?

**EXPERIMENT 3:**

# Chemical Reactions/Writing & Balancing Equations

DATA and OBSERVATIONS

Name _____     Date: _____

Class/Section _____     Instructor _____

**For each combination of reactants, list the reactants that were used by their correct chemical formulas, followed by your observations. If a reaction occurred between the two reactants, write a balanced equation.**

## Reaction 1

**List reactants:**

**Observations:**

**Balanced Chemical Equation:**

_____

## Reaction 2

**List reactants:**

**Observations:**

**Balanced Chemical Equation:**

_____

# Reaction 3

**List reactants:**

**Observations:**


**Balanced Chemical Equation:**

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# Reaction 4

**List reactants:**

**Observations:**


**Balanced Chemical Equation:**

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# Reaction 5

**List reactants:**

**Observations:**


**Balanced Chemical Equation:**

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# Reaction 6

**List reactants:**

**Observations:**


**Balanced Chemical Equation:**

# Reaction 7

**List reactants:**

**Observations:**

**Balanced Chemical Equation:**

_____

## REVISON CALCULATIONS

**1. moles of HCl:**

**2. Molar mass of calcium chloride:**

**3. Moles of calcium chloride:**

**4. Oxidation numbers:**