

Chemical Reactions / Stoichiometry

Procedure:

Work with your lab partners using the following lab and chemical disposal instructions. For each of the following parts, write your observations on the report form that is provided, and then complete the corresponding chemical equations with formulas for each reactant and product, balance each equation, and answer the accompanying questions. For formulas, ionic charges & names of polyatomic ions refer to:

<http://chemconnections.org/general/chem106/polyatomics.html>

Part A: *Synthesis (Combination) Reaction*

1. Hold a strip of magnesium metal (approx. 2 cm in length) with crucible tongs and ignite the metal in a Bunsen burner flame. CAUTION: DO NOT look directly at the burning magnesium!! Observe out of the corner of your eye.
2. Fill a test tube about 25% full with de-ionized water. Place a strip of magnesium metal that is ~2 cm long into the water. Observe the test tube ~ every 15 min. for a period of 1.5 hours and record any changes.

Part B: *Decomposition Reactions*

Add sodium hydrogen carbonate (baking soda) into a 250 mL Erlenmeyer flask so as to sparsely cover the bottom. Support the flask with a utility clamp on a ring stand with wire gauze and ring.

- a) Hold a flaming wooden splint inside the flask and observe how long it burns. (A flaming wooden splint will gradually go out in air, burn more brightly in the presence of oxygen gas and go out quickly in the presence of carbon dioxide.)
- b) Heat the flask strongly with a Bunsen burner until moisture collects at the neck of the flask; again hold a flaming wooden splint inside the flask and observe how long it burns.
- c) Dispose in the sink.

Part C: *Single Replacement Reactions*

- 1) Put about 40 drops of silver nitrate into a test tube and add a small piece of copper wire (~ 1 cm). Allow a few minutes for the reaction to take place and then record your observation. Dispose in AQUEOUS METAL WASTE.
- 2) Place about 40 drops of 6 M hydrochloric acid in a test tube. CAUTION: Hold the test tube with a test tube holder, NOT your bare hand. Drop in a small piece of magnesium. Hold a flaming wooden splint over the mouth of the test tube (A “pop” indicates hydrogen gas being produced). Dispose in AQUEOUS METAL WASTE.

- 3) Place a few milliliters of distilled water in a small test tube. CAUTION: Hold the test tube with a test tube holder, NOT your bare hand. Drop in a small piece of calcium metal. Again hold a flaming wooden splint over the mouth of the test tube. Dispose in HOOD SINK.

Part D: *Double Replacement Reactions*

- 1) Put 40 drops of silver nitrate into a small test tube and then add 40 drops of potassium iodide. Mix well and check for reaction. Dispose in AQUEOUS METAL WASTE and rinse test tubes with distilled water.
- 2) Put 40 drops of silver nitrate into another small test tube and then add 40 drops of sodium phosphate. Mix well and check for reaction. Dispose in AQUEOUS METAL WASTE and rinse test tubes with de-ionized water.
- 3) Put 20 drops of 0.1 M nitric acid into a test tube along with 1-2 drops of phenolphthalein indicator. Add about 5 drops of 0.1 M NaOH and mix well with a stirring rod. Continue to add approx. 5 drops of 0.1 M NaOH at a time (counting the drops) and mix well with stirring rod until a permanent color change throughout the whole test tube is observed. Record the total number of drops needed to observe the permanent color change. Note: Phenolphthalein is an indicator which is colorless in acidic conditions and pink in base conditions. Dispose of solution in the HOOD SINK.
- 4) Put 20 drops of 0.1 M sulfuric acid into a test tube along with 1-2 drops of phenolphthalein indicator. Add about 5 drops of 0.1 M NaOH and mix well with a stirring rod. Continue to add approx. 5 drops of 0.1 M NaOH at a time (counting the drops) and mix well with stirring rod until a permanent color change throughout the whole test tube is observed. Record the total number of drops needed to observe the permanent color change. Note: Phenolphthalein is an indicator that is colorless in acidic conditions and pink in base conditions. Dispose of solution in the HOOD SINK.