

Name: \_\_\_\_\_

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### Stoichiometry Lab

Hydrochloric acid is an aqueous solution of hydrogen chloride. The concentration is usually described in terms of “moles per liter” which is abbreviated “mol/L” or “molar” or “M.” The most concentrated hydrochloric acid is 12 M, but for safety reasons we will be using a solution that is 3.0 M.

#### Objectives:

1. To write the equation for the reaction between Hydrochloric acid and Aluminum.
2. To identify the limiting and excess reactant in an experiment
3. To calculate the Percent Yield from an experiment

#### Procedure :

1. Gather the necessary safety equipment, a centigram scale, a 50 mL graduated cylinder, aluminum foil, and three 100.0 mL beakers.
2. Label the 100.0 mL beakers: 1 (room temperature) 2 (fridge) and 3 (freezer)
3. Obtain 3 pieces of approximately 0.25 grams of aluminum foil. Record the exact mass, and tear each piece into tinier pieces.
4. Using a graduated cylinder measure 50.0 mL of the 3.0 M Hydrochloric acid into each of the three separate 100.0 mL beakers. Record the masses of each beaker with solution in it.
5. Place the ~0.25 g foil pieces on the balance tray **next** to the beaker of acid, and record the total mass (do this a total of three times). [If this total mass does not equal the sum of number 2 and 3, you should remeasure.]
6. Place the ~0.25g foil pieces separately into the three acid filled beakers, then place one:
  - on the countertop
  - in the fridge
  - in the freezer
7. Wait for approximately 10 mins and then record the final mass of the beaker with the solution after the reaction has occurred.
8. Dispose of the materials in the beaker by dilution and filtration. First rinse with solution with a significant amount of water then pour the solution through a funnel to trap any solids. The solution can go down the drain, the rinsed solid can go in the trash bin.

### Data and Observations:

	Room temp (~20 °C)	Fridge temp (~ 4 °C)	Freezer temp (~-4 °C)
Mass of aluminum foil			
Mass of beaker with 50.0 mL of 3.0 M HCl			
Combined mass of foil and acid <b>before</b> rxn			
Combined mass <b>after</b> 10 mins			

### Analysis:

1. Write the chemical equation for the reaction that took place. Don't forget to include the states of matter (s, l, g, or aq). Balance it.
2. Calculate the **number of moles** of aluminum used.
3. Calculate the **number of moles** of Hydrochloric acid used
4. Predict the mass of hydrogen that should be produced by this much **aluminum reacting**.  
Predict the mass of hydrogen that should be produced by this much **hydrochloric acid** reacting.
5. Calculate the **average mass of hydrogen gas** that was produced during your reaction.
6. Calculate the "percent yield" for your reaction (actual/expected X 100).

### Discussion:

1. Which reactant, Hydrochloric acid or Aluminum, is the limiting reactant? Which is the excess reactant?
2. Why was your percent yield what it was? In other words, if you got 100%, why? If you got less than 100%, what happened?
3. Why do you think this experiment was conducted under three different temperatures? Explain your reasoning.

### Source of Error:

List only the errors associated with the equipment that you used to collect your data.

### Conclusion:

Answer the questions implied in OBJECTIVES 1-3. Make a connection to everyday life.