**The Molecular Race**

**Objective:**  To do an experiment with two gases and see how well Graham's Law applies to the situation.

**Materials:** Q-tip, HCl, NH3, glass tube, clock, 2 beakers

**Method and Observations:**

* Place ammonia (NH3) in one end of a glass tube, and hydrochloric acid (HCl) in the other **at the same time!!!** Sketch your set-up in your report. You should time how long it takes for the reaction to take place, and how far each gas travels to reach the reaction point.  Record that information in this section, along with your observations of the reaction itself.

**Calculations and Results:**

* Determine which gas went faster.

 The NH3 gas went faster

* Calculate the speed of each gas. { Speed = distance } (Show your work.)

           speed=distance/time

1. HCl= 19.5cm/ 208sec   speed= 0.09375 cm/sec
2. NH3=  25.5cm/ 208sec    speed= 0.122596 cm/sec

* Using these speeds, calculate the ratio of speeds. This is your **experimental** ratio. (Show work)

Speed of Faster gas  =\_\_\_\_NH3/HCL= 25.5cm/19.5cm = .122596/.09375\_\_\_\_\_\_= \_\_\_\_\_\_\_\_\_1.31cm/sec\_\_ Experimental ratio

Speed of Slower gas

* Using the molar masses of these two gases, calculate the **theoretical** ratio of rates by applying Graham's Law. (Show your work. Masses from periodic table rounded to .1 grams)

Rate A (light gas)   = √molar mass B (heavy gas) =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_=\_\_\_\_\_\_\_\_\_\_\_  Theoretical ratio

Rate B (heavy gas) = √molar mass A (light gas)

 Molar mass of NH3= 14.0 + 1.0 + 1.0 +1.0 = 17.0g

Molar mass of HCl= 1.0 + 35.5 = 36.5g       √36.5 / √ 17.0 = **1.47**

* Calculate the percent error of your data (Show work!)

 *Percent error =   (Theoretical- experimental )x 100 =*

*Theoretical*

*1.47-*1.31/1.47  x 100 *=*12*% error*

* Would changing the temperature of the system change the diffusion rates? Why or why not?   Changing the temperature could change the diffusion rates because if there is a higher temperature the particles could move faster in which will cause diffusion to happen faster.
* Would changing the temperature of the system change the ratio of the diffusion rates (i.e. Graham's Law)? Why or why not?

No, If you increase the temp., both gasses move faster and the ratio of their speeds remains the same. Ex: NH3 is always 1.47 times faster than HCl.