|  |
| --- |
| **Rates of Diffusion** |

|  |
| --- |
| **Your Tasks (Mark these off as you go)** |
| * Define key vocabulary * Make a prediction * Test your prediction * Analyze your data * Interpret your results * Receive credit for this lab |

* **Define key vocabulary**

**Kinetic Energy**

|  |
| --- |
|  |

**Ideal Gas**

|  |
| --- |
|  |

**Molecular velocity**

|  |
| --- |
|  |

**Effusion**

|  |
| --- |
|  |

**Diffusion**

|  |
| --- |
|  |

**Precipitate**

|  |
| --- |
|  |

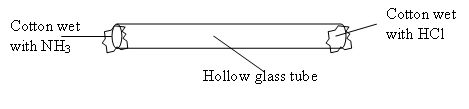
* **Make a prediction**

Hydrochloric acid and ammonia are both gases that react to form a gaseous precipitate. Because NH3 and HCl have different masses, they will diffuse through the tube at different rates.

NH3

HCl





|  |
| --- |
| Calculate the molar mass for both NH3 and HCl |
|  |
| Based on the molar masses you calculated above, predict where you think the two gases will collide. Indicate this on the diagram below. Write a sentence to support your prediction. |
|  |

* **Test your prediction**

|  |
| --- |
| Follow the procedure below to test your prediction |
| **The cotton balls should be handled with tweezers. If you come in contact with the ammonia or hydrochloric acid, wash your hands immediately**.   1. Label on end of the tube HCl. Label the other end NH3. 2. Predict where the precipitate will occur in the tube and mark this spot 3. Add a few milliliters (about 20 drops) of ammonia to one cotton ball 4. Add a few milliliters (about 20 drops) of hydrochloric acid to another cotton ball 5. Simultaneously place the cotton balls on each end of the buret tube and secure as shown above. 6. Measure the distance between the cotton balls and record this value below 7. Watch carefully, then mark the location where the precipitate forms (this can take about 10 minutes) 8. Record the distance the hydrochloric acid (HCl) traveled in the tube below 9. Record the distance the ammonia (NH3) traveled in the tube below |

**Data table**

|  |  |
| --- | --- |
| Distance between cotton balls |  |
| Distance HCl traveled |  |
| Distance NH3 traveled |  |

* **Analyze your data**

|  |
| --- |
| To calculate the theoretical collision point you will use Graham’s law. The following steps will walk you through the process.   * Calculate the molar mass of NH3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g * Calculate the molar mass of HCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g * Calculate the ratio of the square root of the molar masses of NH3 and HCl   = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| If we let “x” equal the distance NH3 should have traveled, then the distance HCl should have traveled is equal to the distance between the cotton balls minus x or,  Distance NH3 travels = x  Distance HCl travels = distance between the cotton balls – x  Substitute the distance between the cotton balls with the value you recorded. Substitute the ratio that you calculated in step 3. Then solve the equation below for “x”.     * The distance NH3 traveled (x) \_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm |
| If “x” represents the distance NH3 should have traveled. How far did NH3 actually travel? Locate the value you recorded. Calculate the percent error associated with your value.     * Percent Error \_\_\_\_\_\_\_\_\_\_\_\_\_\_ % |

* **Interpret your results**

|  |
| --- |
| Answer the following in complete sentences. You must also be mindful of spelling, punctuation and overall writing quality. |
| What was the purpose of this experiment? |
|  |
| In your own words, summarize what you did to accomplish the purpose. |
|  |
| Discuss how your prediction for where the collision should have occurred compared to the actual. Are they different? Why? |
|  |
| Consider the following gases. If experiment was repeated with different gases. Circle the pair of gases that would collide closest to the center of the tube? Provide an explanation.  HCl and CH3NH3 HCl and NH3 HBr and CH3NH2 HBr and NH3 |

* **Receive Credit for this lab**

Each group member must complete and submit their own lab to receive credit