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**POST-LAB REPORT #9**

**Using the Ideal Gas Law**

**I. Calculations:**

* The number of moles of aluminum used = **0.000771 mol**

mass Al = **0.0208 g**

moles Al = = = **0.000771 mol**

* (in mL) for the unknown metal = **21.55 mL**

= **3.30 mL**

= **18.25 mL**

= + = 3.30 mL + 18.25 mL = **21.55 mL**

* (in L) for the unknown metal = **0.02155 L**

= 21.55 mL x = **0.02155 L**

* Temperature (K) for the unknown metal trial = **295.15 K**

Temperature (C) = **22C**

Temperature (K) = Temperature (C) + 273.15 = 22C + 273.15 = **295.15 K**

* (mm Hg) for the unknown metal trial = **723.4 mmHg**

= 772.16 mmHg = **772.2 mmHg**

Temperature (C) = **22C** = **19.8 mmHg**

= **394 mm**

= – – = 772.2 mmHg – – 19.8 mmHg = **723.4 mmHg**

* (atm) for the unknown metal trial = **0.9518 atm**

= 723.4 mmHg x = **0.9518 atm**

* Quantity of hydrogen (mol) for the unknown metal trial = **0.0008465 mol**

= = **0.02155 L**

moles of = = = **0.0008465 mol**

**II. Additional Questions:**

*1. Complete and balance the following reaction. Include the states of reactants and products.*

*2. Show your calculation of the mole ratio of aluminum : hydrogen using your data. How does your calculated mole ratio compare to that in your balanced equation above? What experimental errors may have affected your experimentally-derived mole ratio? In which direction would each listed error affect your data and why?*

moles Al = **0.000771 mol**

- For the Aluminum trial:

* = **3.57 mL**
* = **25.38 mL**
* Temperature (C) = **22.5C** = **20.3 mmHg**
* = **772.2 mmHg**
* = **319 mm**

= = + = 3.57 mL + 25.38 mL = 28.95 mL x = **0.02895 L**

Temperature (K) = Temperature (C) + 273.15 = 22.5C + 273.15 = **295.65 K**

= – – = 772.2 mmHg – – 20.3 mmHg = 728.4 mmHg x = **0.9584 atm**

moles of = = = **0.001143 mol**

Experimental mole ratio of Al to = moles of Al : moles of

= 0.000771 : 0.001143

= 1 : 1.48249

= **2 : 3** **ratio**

My calculated mole ratio is relatively close to that in the balanced equation

- The experimental errors that may have affected the experimentally-derived mole ratio are:

* Add water into the hydrochloric acid solution in a straight angle. This will lead to water mixing with the acid and the reaction is a strong formation that will release a huge amount of energy and increase the temperature of the solution
* Record the volume readings when the metal did not completely react in hydrochloric acid solution

Both errors will lead to inaccurate data readings such as volume, temperature, and distance between water levels. These false data will strongly affect the process to determine the mole ratio and we need to start over.

*3. This semester’s unknown metal M reacts with aqueous hydrochloric acid to give (aq). Given that, show how you calculate the number of moles of unknown metal that reacted.*

- From the unknown metal trial (data provided in Part I):

* = **0.9518 atm**
* = **0.02155 L**
* Temperature (K) = **295.15 K**

moles of = = = **0.0008465 mol**

moles of = moles of unknown metal M = **0.0008465 mol**

*4. From the above, show how to calculate the molar mass of the unknown metal M. With reference to molar masses on the periodic table, which element is the unknown metal? Please explain your answer.*

mass of unknown metal M = **0.0203 g**

moles of unknown metal M = **0.0008465 mol** (from Question 3)

molar mass of unknown metal M = = = 23.98 g/mol = **24.0 g/mol**

**M is Magnesium** (molar mass of Mg = 24.305 g/mol) because 24.0 is approximately close to 24.305