Name: _____   Chem 10, Section: _____

Lab Partner: _____   Experiment Date: _____

Experimental Determination of the Gas Constant

Experimental Data

	Trial 1	Trial 2
(a) Mass of Magnesium metal used		
(b) Volume of H_2 gas collected		
(c) Temperature of H_2 gas collected		
(d) Atmospheric Pressure		
(e) Temperature of Water in bath (bucket)		
(f) Vapor Pressure of Water at above temperature		

Data Analysis

- Using your experimental data, determine the value of *R*, the gas constant. Show all your conversions and calculations for each step clearly in the table below. Pay attention to units and significant figures.

Trial 1	Trial 2
Volume of H_2 gas (in L)	
Temperature of H_2 gas (in K)	
Moles of H_2 gas	
Pressure of H_2 gas (in atm)	

Experimental value of *R* (include units)	

- Average value of *R* (include units): _____

- Percent Error between your average value and the theoretical value of *R* (show work):

Questions

1) The hydrogen generated in this lab was a product of the reaction between magnesium and hydrochloric acid. Which of these reactants was the limiting reactant? Provide experimental evidence to support your choice.

2) Suppose when you inverted the eudiometer, a bubble of air became trapped inside it. Would this make your experimental value of *R* larger, smaller, or have no effect? Briefly explain your response.

3) In Santa Monica, a sample of dry hydrogen gas inflates a balloon to 43.0 mL at 761 torr (sea-level). If the temperature remains unchanged, what is the balloon's volume (in mL) in Denver, where the pressure is 12.2 psi (5000 ft elevation)? Assume that no gas has been added or removed.

4) Another balloon is inflated to a volume of 1.250 L with dry hydrogen gas, at 28.0 °C. The balloon is then cooled, and its volume drops to 964 mL. If the pressure is unchanged, what is the hydrogen gas temperature (in °C) in the cooled balloon? Assume that no gas has been added or removed.

5) Yet another balloon is inflated to a volume of 434 cm^3 using 0.141 moles of dry hydrogen gas. An additional 0.129 grams of hydrogen is then injected into the balloon at constant pressure and temperature. Calculate the new volume of the balloon (in cm^3).

6) Hydrogen gas can be generated from the reaction between *aluminum* metal and hydrochloric acid:

$$2 \text{ Al } (s) \; + \; 6 \text{ HCl } (aq) \; \rightarrow \; 2 \text{ AlCl}_3 \, (aq) \; + \; 3 \text{ H}_2 \, (g)$$
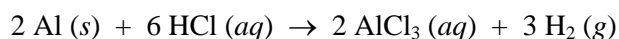
a. Suppose that 3.00 grams of Al are mixed with excess acid. If the hydrogen gas produced is directly collected into a 850. mL glass flask at 24.0 °C, what is the pressure inside the flask (in atm)?

b. This hydrogen gas is then completely transferred from the flask to a balloon. To what volume (in L) will the balloon inflate under STP conditions?

c. Suppose the balloon is released and rises up to an altitude where the temperature is 11.2 °C and the pressure is 438 mm Hg. What is the new volume of the balloon (in L)?