Name_____period_____

LAB 10-2 MOLAR VOLUME OF HYDROGEN GAS

1. Obtain an envelope containing a piece of magnesium ribbon. Record this mass on the data table.

2. Pour about 15 mL of 3M HCl into a burette tube. Incline the tube and carefully add water to the brim. Do not shake the tube.

3. Coil your magnesium ribbon and tie a piece of thread to it.

4. Record the room temperature and the barometric pressure.

5. Insert the coil of magnesium ribbon into the mouth of the tube. Holding the thread, invert the tube into the beaker and place on the bottom. Secure the arrangement with a clamp.

6. Allow the reaction to go to completion (until the bubbles stop) and allow it to cool for 5 minutes.

7. Record the volume of the gas from the eudiometer tube. add correction factor for gas volume at top

8. Use a ruler to measure the difference (in mm) between the level of water in the tube and in the ~~jar~~ bin. Record.

1. Mass of Mg ribbon from envelope _____ g

2. Room temperature _____ °C _____ K

3. Atmospheric pressure _____ mm Hg

4. Difference in water levels _____ mm

5. Volume of gas at room conditions _____ mL _____ L
add correction factor for volume at top

6. Water vapor pressure at room temperature _____ mm Hg
(chart pg. 899)

CALCULATIONS:

1. Determine the pressure of the dry gas by correcting for water vapor and differences in water levels.

2. Determine the volume of the dry gas at STP.

3. Given the balanced equation for the lab: $Mg + 2\ HCl \longrightarrow MgCl_2 + H_2$

It is apparent that each mole of Mg reacted produces one mole of hydrogen gas. Calculate the number of moles of hydrogen gas produced.

4. Calculate the volume occupied by one mole of hydrogen gas at STP. Use the volume from #2 and the moles from #3 above.

5. The theoretical volume of one mole of any gas at STP is 22.4 Liters or 22,400 mL. Calculate the % error in your lab.

6. Explain, showing all calculations why is would have been impractical to use ~~0.0558~~ grams of Mg.
0.0758

Name Mr. Ward period ____

LAB 10-2	MOLAR VOLUME OF HYDROGEN GAS

1. Obtain an envelope containing a piece of magnesium ribbon. Record this mass on the data table.

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6. Allow the reaction to go to completion (until the bubbles stop) and allow it to cool for 5 minutes.

7. Record the volume of the gas from the eudiometer tube. add correction factor → Volume at the top

8. Use a ruler to measure the difference (in mm) between the level of water in the tube and in the jar. Record.

1. Mass of Mg ribbon from envelope	.0363 g
2. Room temperature	20.2 °C 293 K
3. Atmospheric pressure	620 mm Hg
4. Difference in water levels	9.0 cm mm = 90 mm
5. Volume of gas at room conditions (50 + 5.1 − 10.1 = add correction factor)	45 mL .045 L
6. Water vapor pressure at room temperature (chart pg. 899)	17.5 mm Hg

Lab

CALCULATIONS:

1. Determine the pressure of the dry gas by correcting for water vapor and differences in water levels.

$$\frac{90 \text{ mm } H_2O}{13.6 \text{ mm } H_2O / 1 \text{ mm Hg}} = 6.62 \text{ mm Hg}$$

620 mm Hg
− 6.62 mm Hg − water level
− 17.5 mm Hg − water pressure
596 mm Hg

2. Determine the volume of the dry gas at STP.

$$.045 \text{ L} \left(\frac{273 \text{ °K}}{293 \text{ °K}}\right)\left(\frac{596 \text{ mm Hg}}{760 \text{ mm Hg}}\right) = .0329 \text{ L}$$

From #2 on front

3. Given the balanced equation for the lab: $Mg + 2\,HCl \longrightarrow MgCl_2 + H_2$

It is apparent that each mole of Mg reacted produces one mole of hydrogen gas. Calculate the number of moles of hydrogen gas produced. In theory

$$\frac{.0363 \text{ g Mg} \,/\, 1 \text{ mol Mg}}{24.3 \text{ g Mg} \,/\, 1 \text{ mol Mg}} \,/\, \frac{1 \text{ mol } H_2}{1 \text{ mol Mg}} = .00149 \text{ mol } H_2$$

4. Calculate the volume occupied by one mole of hydrogen gas at STP. Use the volume from #2 and the moles from #3 above.

#2 L / #3 mol

$$\frac{1 \text{ mol } H_2}{.00149 \text{ mol } H_2} \,/\, .0329 \text{ L} = 22.1 \text{ L}$$

5. The theoretical volume of one mole of any gas at STP is 22.4 Liters or 22,400 mL. Calculate the % error in your lab.

$$\frac{22.4 \text{ L} - 22.1 \text{ L}}{22.4 \text{ L}} \times 100 = 1.3\% \text{ error}$$

6. Explain, showing all calculations why is would have been impractical to use 0.0~~7~~58 grams of Mg.

$$.0758 \text{ g Mg} \,/\, \frac{1 \text{ mol Mg}}{24.3 \text{ g Mg}} \,/\, \frac{1 \text{ mol Mg}}{1 \text{ mol } H_2} = .003119 \text{ mol } H_2 \,/\, \frac{22400 \text{ mL}}{1 \text{ mol } H_2} = 69.9 \text{ mL}$$

This volume is too great to be collected