

Calculations:

Answer on a separate sheet. You **MUST** show all calculation steps clearly. **All numbers must have units!** KEEP at least three significant figures at all times!!!

- [2 pts] Determine the **moles of H₂** gas that should have been produced (theoretical yield) based on the mass of Mg with which you began (*small!*). Record to 3 sig figs even if you only have 2.
- [1 pt] One procedure you did this lab ensured that the **atmospheric pressure = the pressure of the gas inside the tube**. *Explain what you did and how this ensures* that the atmospheric pressure equals the pressure inside the tube in step 10. (Hint: think of how a barometer works.)
- [2 pts] Because the H₂ gas was collected over water, the gas in the eudiometer contains some water vapor, which must be subtracted from the atmospheric pressure to obtain the partial pressure of the H₂. These steps will help you get to the pressure of H₂ gas.

Reference Table: Vapor pressure of water at various temperatures

Temperature °C	P _{H₂O} (mm Hg)	Temperature °C	P _{H₂O} (mm Hg)
16	13.6	21	18.7
17	14.5	22	19.8
18	15.5	23	21.1
19	16.5	24	22.4
20	17.5	25	23.8

Using the table above, find the temperature closest to yours. If your temperature is outside of this range, see your teacher or look up the water vapor pressure on the Internet. Subtract the corresponding vapor pressure from the atmospheric pressure: $P_{H_2} = P_{atm} - P_{H_2O}$. Finally, convert P_{H₂} from mmHg to atm.

- [2 pts] You now have experimental values of P, V, n, and T for the sample of H₂ gas. Use your numbers to determine R in the equation $R = \frac{PV}{nT}$. Make sure you have used the **correct units** and *show the units* of R in your final answer.
- [1 pt] The accepted value of **R is 0.08206 $\frac{L \cdot atm}{mol \cdot K}$** . Calculate your percent error (See Chart B).
Note: See your teacher if your % error is greater than 10%. You will lose 10% (one letter grade) if a calculation or measurement mistake leads to an incorrect value of R with >10% error.

Post Lab Questions: [8 pts] Answer all questions in complete sentences on a separate sheet.

- [2 pts] Why was it important to make sure that the eudiometer was filled completely with water before you inverted it? If it weren't completely filled, how would this have affected the volume of H₂ gas (too high or too low)? Explain your reasoning. How would your value for R be affected? (Too high or too low?) [Look at how V affects R in the calculation.]
- [2 pts] How would the volume of H₂ gas be affected if some of your magnesium did not react (or if it were contaminated)? Explain your reasoning. How would your value for R be affected? [Again, look at equation.]
- [2 pts] When measuring the pressure of H₂ gas in the tube, you rightly assumed that there was some water vapor in the tube along with the H₂. Thus, you corrected your P value by subtracting out the pressure due to the water vapor. If you had not made this correction, would your pressure value be too high or too low? How would this have affected your R value? (too high or too low)? *Explain.*
- [2 pts] What was your percent error in R? Were you accurate (was the error less than 5%)? Was your value for R too high or too low? Give **one** possible change in the procedure that would improve the accuracy of the experiment—explain what the change is (don't just say "change step x") and how/why it would improve the accuracy. Think about where *systematic* error might occur.