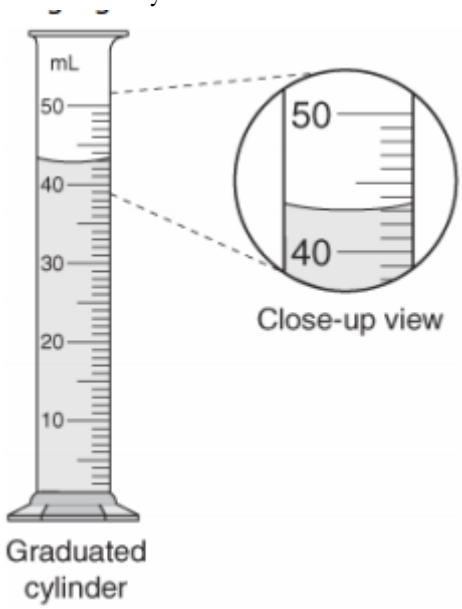
Lab Pretest

(1) Report the volume with the correct number of sig figs and express the uncertainty:



Answer: 43.0 ± 0.5 mL. Notice that the measurement must have just as many sig figs as a measurement which is not perceived to be exactly on the line. Take the smallest division, divide by two. ½ = ± 0.5

(2) Which of the following measurements has a greater error associated with it, and why?
(A) 0.05 ± 0.01 g
(B) 10. ±1 g

Answer: The first measurement has a 0.01/0.05*100% = 20% error. In the second case, the error is 1/10*100% = 10%

(3) If according to the theory from PV=nRT, the volume of hydrogen gas was supposed to be 0.04204 L, and you measured 41.59 ml, what was your percent yield, and what was the percent error?
Answer: Percent yield = 41.59/42.04 *100% = 98.93%, assuming that all other measurements had at least 4 sig figs.
Percent error = 100% - 98.93 = 1.07%

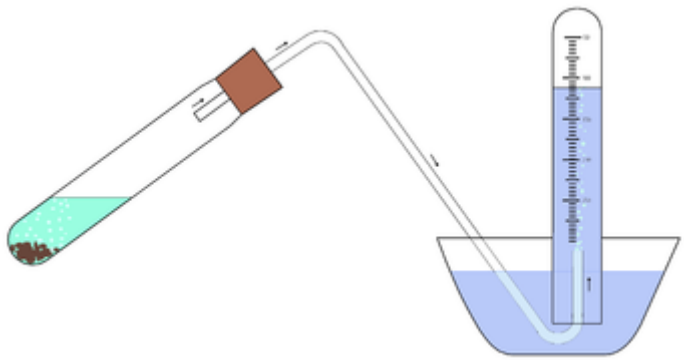
(4) a) What was the main source of error in the oxygen lab?

The main source of error in the oxygen lab was the time factor. You have to give time for the oxygen-producing reaction go to push all the air (78%nitrogen) out of the flask.

b) Which collected test tube contains the purest oxygen?

The last one.

c) Draw the setup used to collect oxygen generated by the decomposition of hydrogen peroxide catalyzed by KI.



d) Would this setup have succeeded if oxygen was more soluble in water? Why?

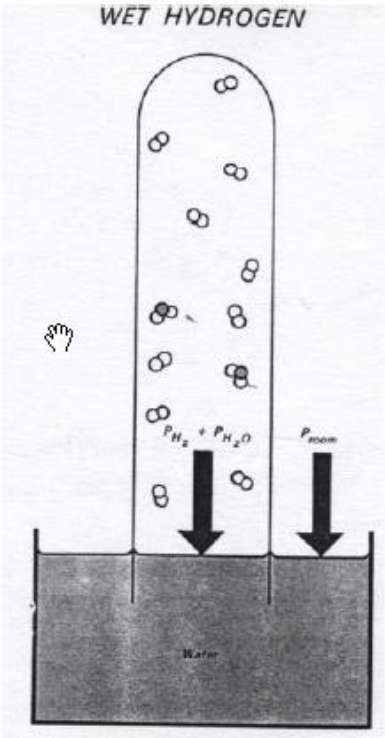
No. If the gas went into solution it would not have come out of the water to exert pressure and push the water out.

(5) a) In the hydrogen lab, what were the main error sources?

The main sources of error are
(1) the air bubble that often is trapped when filling the gas burette with water. That air is then mistakenly counted as hydrogen gas and it inflates the percent yield.
(2) Also if the magnesium had been slightly oxidized we would have obtained less hydrogen then predicted.

b) How were other errors eliminated through the design of the experiment---for example how did we correct for the fact that hydrogen gas was not pure?
Note that other errors were eliminated by balancing pressure; waiting for temperature to cool; and accounting for the water that evaporates and mixes with the hydrogen gas by using partial pressure.

c) In the hydrogen lab, the gas was generated using acid and magnesium. A copper cage was placed around the magnesium. If you had used no cage at all or an iron cage instead of copper, the experiment would have failed in both cases. Explain.



The cage keeps the small pieces of reacting magnesium trapped. This way the acid can generate all the hydrogen that the mass of Mg can possibly produce.

If made out of iron, unlike copper, iron reacts with HCl acid to produce hydrogen gas. This gas would be unaccounted for if you're assuming that Mg would be the only source of the gas. And you could lose Mg.

d) TRUE? Or FALSE?

If the level of the water outside the biuret was <u>higher</u> than the level of water inside the biuret, then the pressure of the gas collected > pressure outside the biuret

True

e) What was the purpose of generating the hydrogen gas and measuring it so accurately?

To see if the amount predicted by PV=nRT agreed with the volume we actually measured after adjustments.

5. a) How does holding the bottom of the hand boiler make the liquid rise? (seemingly on its own)

The liquid evaporates very easily (the bonds between its special liquid are much weaker than those between water). The glass absorbs heat form the hand and the liquid absorbs it from the glass, allowing some of the liquid to evaporate. The vapor pressure in the lower part then pushes down on the liquid and makes it rise through the vertical column(tunnel).

b) Why does removing the hand let the fluid flow down again?

Upon cooling the gas at the bottom goes back to liquid, lowering the pressure and allowing gravity to make the liquid go back down.