Chemistry 534
Lab Tests: Week of October 27th

Value:

	C_2 / C_3	C_1	Contribution to overall term mark
Homework	10%		6%
Test 1.1	45% or 27%		27% or 16.2%
Test 1.2	45% or 63%		27% or 37.8%
Lab reports		50%	20%
Lab test		50%	20%
TOTAL	100%	100%	100%

Content of Test:

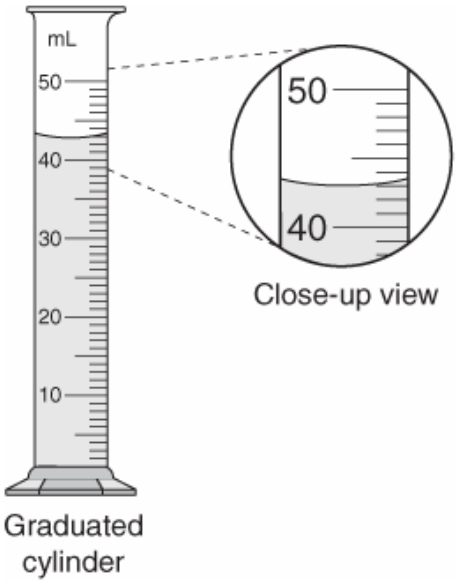
Part 1 Measurement

Part 2 Error Analysis of Labs 1(Percent of Oxygen in Air) and 2 (The Volume of Hydrogen)

Part 3 Final Stage of Explaining Ammonia Demo

Examples:

Part 1 (1) Report the volume with the correct number of sig figs:



Answer: 43.0 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.

(2) Which of the following measurements has a greater error associated with it, and why?

- 0.05 ± 0.01 g
- $10. \pm 1$ 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.

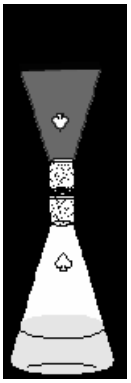
Percent error = 100% - 98.93 = 1.07%

Part 2

- The main source of error in the oxygen lab was the time factor. You have to let the reaction go to completion. If that's done then the main source of errors are the measurement of the water level and the height of the test tube.
- In the hydrogen lab, the main source of error is the air bubble that often is trapped when filling the gas burette with water. That air is then mistakenly counted as hydrogen gas. 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.

Lab Exam Part 3

Does not include **Results of Additional Experiments Suggested By Students (very important addition to be seen on test only)**



In a 250 ml Erlenmeyer water was added along with two drops of phenolphthalein. In a second flask we added about 5 ml of ammonia. We covered the water-filled flask with a wet filter paper and inverted it. We then placed it over the ammonia flask.

After a few seconds, in the water-filled flask, we noticed a fuchsia-coloured, thin shape forming in the centre of the liquid. It elongated progressively until it reached the top of the liquid, which gradually turned a deep shade of fuchsia. The base of the upper flask had a similar colour change, and a chaotic swirling pattern emerging from the funnel eventually coloured the entire upper flask. The lower flask remained clear.

Why was there a colour change?

Why did we get a thin, rising shape? A chaotic pattern? Why did all turn pink?

Be as detailed as possible.

Group Activity Explanations Based on Initial Student Responses

1. "The fact that the ammonia smells bad means that the chemical in the lower flask lets out a gas. This increases the pressure in the lower flask, and the higher pressure forces the gas through the paper. This is why we see the long thin stream of pink. The NH_3 gas reacts with water to form NH_4OH, which is a base that turns the indicator pink. The rotation of the water molecules causes the chaotic pattern to appear.The pink colored compound rises to the top because it is less dense than water. When it gets to the top there is more movement which gradually increases the concentration of the pink colour."

2. "The ammonia, which is a base, is sensitive like perfume; it does not need a change in temperature to easily turn into a gas. The molecules pick up translations easily from the heat of the surrounding air. The gas moves to the top of the flask because it's less dense than air and hits the phenolphthalein. The NH_3 is also less dense than the liquid, so it moves to

the top of the upper flask. Eventually the molecules mix with the rest of the solution."

3. "Water plus smelly gas (ammonia) form the liquid =ammonium hydroxide."
NH_3 gas rises up from the smelly liquid because the liquid is light and fast-moving. NH_3 has a low-boiling point too. Through diffusion the gas enters the water. NH_3 then turns into the base NH_4OH, which reacts with phenolphthalein indicator. The new ammonium hydroxide, now pink, moves according to the movement (vibrations and rotations) of the water. Through osmosis, the ammonium hydroxide spreads. As more NH_3 goes through this process, the whole liquid turns pink."

4. "The NH_3 evaporated and mixed with the wet paper seal. Because it was wet, it contained H_2O, which combines with NH_3 to make NH_4^+ and OH^-. The base ions did not enter the top flask all at once. They then diffused with the phenolphthalein and turned the whole flask's contents pink."