Name _____ Honors Chemistry ___/___/___

Titration Lab

In this lab you will determine the molecular mass of an unknown substance using a process known as titration. The end point of the titration will be signaled by a change in color of an indicator, phenolphthalein. This indicator is pink in basic solutions. It is colorless in acids. If you are careful, you can identify the end point accurately by adding the titrant until the indicator just changes color by the addition of a single drop of titrant from the buret.

Procedure:

□ 1. Your equipment is at your lab station. Put on goggles and an apron.
□ 2. Some of you will be given sample A others will be given sample B. Sample A is monoprotic. Sample B is diprotic. Record the sample number you are using.
□ □ 3. Place your flask on the balance and hit tare. If you are using Sample A, add between 1.50 and 1.90 grams to your flask. If you are using sample B, add between 0.45and 0.65 grams to your flask. Record the exact amount on your data table.
□ □ 4. Add **approximately** 50.0 mL of distilled water to the flask and swirl to dissolve. It may not all completely dissolve.
□ □ 5. Carefully fill your buret with 0.50 M NaOH solution.
□ □ 6. Record the initial volume of the NaOH solution. Read the volume at the bottom of the meniscus. Measurements should include an estimated hundredths place digit.
□ □ 7. **Slowly** add NaOH solution to your flask. Swirl your flask as you add the NaOH. You will observe pink streaks as the NaOH is added. They will fade as you swirl the flask. As you near the endpoint of the titration, the streaks will persist longer.
□ □ 8. Begin to only add one drop of NaOH at a time while constantly swirling the flask until a single drop of NaOH causes a permanent pale pink color that does not fade on swirling. **If you severely over-titrate, re-do the trial**.
□ □ 9. Record the final volume of the buret.
□ □ 10. Pour the contents of your flask down the sink.
□ 11. Do another trial with the same sample by repeating steps 3-10.
□ 12. Clean up. Put your goggles and apron away and return to your seat.

Data Tables (16 points)**:**

	Trial 1	Trial 2
Sample ID		
Mass of substance used, g		
Initial NaOH buret reading, mL		
Final NaOH buret reading, mL		
Volume of NaOH used, mL		
Volume of NaOH used, L		
Moles of NaOH used		
Moles of unknown acid reacted, g/mol		
Molar Mass of unknown acid, g/mol		
Mean Molar Mass, g/mol		

Calculations:

Sample A is monoprotic. We will represent it using the formula HA. Sample B is diprotic. We will represent it using the formula H_2D.
□ 1. Write the balanced chemical neutralization equation for the reaction that takes place between **each acid** and NaOH. (4 points)

□ 2. Use the Molarity formula to determine the moles of NaOH reacted. The concentration of the NaOH is 0.50 M. The volume used can be taken from your data table. Show your work for **both** calculations below. (4 points)

□ 3. Use stoichiometry to determine the number of moles of acid reacted. Show your work for **both** calculations below. (4 points)

□ 4. Calculate the molar mass of your unknown sample using the mass of the sample taken and the moles reacted. Show your work for both calculations below. (4 points)

□ 5. Calculate **your** mean molar mass. (2 points)

□ 6. Calculate **your** percent error using your mean molar mass. Sample A has an actual molar mass of 204.1 g/mol. Sample B has an actual molar mass of 126.0 g/mol. (2 points)

□ 7. List at least two possible reasons for **your** error. Human error is NOT a reason and our equipment works just fine. (2 points)

Post Lab Questions:

1. If 0.5560 grams of HA (molar mass of 126.0 g/mol) requires 37.00 mL of NaOH to reach the end point, what is the molarity of the base? Show all work. (2 points)

2. If 0.5560 grams of H_2D (molar mass of 204.1 g/mol) requires 39.00 mL of NaOH to reach the end point, what is the molarity of the base? Show all work. (2 points)