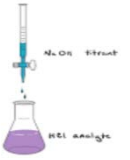
Acid-Base Titration Lab Activity



Name:_____ **Block:** _____
Group Members:_____ **Date:** _____/_____/_____
Due Date:_____ **Drop Date:**_____

The report is submitted in full, **on the due date**. If you are absent on the day, the report is expected to be submitted electronically. Late reports are penalized, and will *not accepted past the drop date*.

Criteria	Student Self Evaluation	Teacher Assessment
Flow Chart: a flow chart diagram of the procedure completed individually by each group member ***before the lab***! **Pre-Lab Questions:** displays a critical understanding of the background theory.	**/6**	**/6**
Data, Results: *(word processed)* Provides results & detailed observations (and diagrams where appropriate) that are presented in **correctly labelled** tables with **descriptive, numbered titles**.	**/4**	**/4**
Follow up Questions:*(may be hand written **IF neat**, or typed up…**all working out** for calculations must be shown)* Correctly identifies and explains the theory relating to the experiment and supports this with accurate observations & data.	**/11**	**/11**
Presentation: Practical report is presented in third person past tense & in the **correct format**. Is written fluently and provides **appropriate section headings** and accurate referencing. ***Tables & graphs*** have numbered headings & descriptive titles. Data & calculations may be hand written, however the remainder of the report is to be **word-processed.**	**/2**	**/2**
Conclusion: *(word processed)* Identifies and defines important concepts and principles relevant to the experiment by relating back to the objective and hypothesis. Be sure to address the points listed in the lab handout when answering the conclusion.	**/3**	**/3**
Practical: Demonstrates an organized and safe approach to experimental work during the lab. Shows maturity, cooperation and leadership during laboratory work. **Titrated average volume falls within an accepted range** **[NaOH] is accurate**	**/4**	**/4**
Results Summary	**/30**	**/30**

We will be doing the lab on _____.

In order to be ready to go, you need to complete the following sections of your lab report:

- ☐ *Flow Chart*
- ☐ *Pre-Lab Questions*
- ☐ *Data & Observations: Draw & set-up Table 1 into your lab notebook.*

Objective

To determine the concentration of an unknown sodium hydroxide solution.

Procedure: Use this to prepare a flow chart for next class ***(MUST be completed to participate in the lab!)***

Safety glasses are to be worn at all times, for all experiments!

1. Prepare a burette by *rinsing the burette* with about 5mL of the NaOH solution before emptying and re-filling it with 25.0 mL of NaOH solution of unknown concentration. Use a dry clean beaker to obtain the solution from the stock bottle. *(your teacher may have done this for you)*

2. Obtain approx. 40 mL of the acid solution whose concentration is known in a 100 mL beaker. This does not need to be an exact measurement, as you will further measure the acid solution later.

3. Prepare and standardize a volumetric pipette by rinsing the pipette with 1-2mL of the acid solution before emptying and re-filling it with 10.0 mL of the acid solution. Using a volumetric pipette, transfer an appropriate amount (10.0 mL) of the acid solution into a 125mL Erlenmeyer flask.

4. Add three to four drops of phenolphthalein indicator.

5. Record the initial reading of the burette and dispense the NaOH solution into the flask, ***swirling during and after each addition.***

6. As you near the endpoint the pink colour of the indicator will begin to last longer in solution before it is swirled away. At this stage you are only a few drops away from the endpoint. Begin adding NaOH ***drop by drop***, rinsing each drop with distilled water from a wash bottle. *(NOTE: this will affect the volume, not the number of moles or acid or base in the flask)*

7. Stop adding NaOH when a pink color is obtained that **persists** (ie: lasts for at least 10 seconds). At the *endpoint*, one drop should change the solution from colorless to pink.

8. Record the final volume of NaOH.

9. **Repeat as many trials necessary to measure the needed volume of NaOH to within one drop *(ie: 0.01mL).***

Reagent Disposal: all waste is to be collected in the **WASTE DISPOSAL**.

Clean Up: clean up all materials, wipe lab bench with disinfectant and wash hands *well* with soap and water before you leave the lab each day.

Pre-Lab Questions: *(You may need to research some of these online or use your notes)*

1. What two rules must be followed in order to get accurate volume measurements when using a buret? ***(1 mark)***

2. Before filling a burette or a pipette it should be rinsed with the solution that is going to be put into it *(especially if it is wet).* Why? ***(1 mark)***

3. Why is it important the beaker used in Step 1 not have any water in it? ***(1 mark)***

4. The Erlenmeyer flask used in Step 2 doesn't have to be dry. Explain why. ***(1 mark)***

5. How should you dispose of the following reagents when you are finished? ***(1 mark)***
   a) NaOH remaining in the buret.
   b) Erlenmeyer flask containing NaOH, acid and phenolphthalein.

Data, Results & Calcualtions: ***(4 marks)***

- **Note**: You may need more than four trials, depending on how closely your trials agree. ***Leave space*** in case your need to do more trials.
- **When you are collecting your data, make sure you think about how to accurately and precisely read scales.**

Table 1:

	Trial 1	Trial 2	Trial 3	Trial 4
Volume of acid (mL)				
Initial buret reading (mL)				
Final buret reading (mL)				
Volume of NaOH used (mL)				
Average Volume of NaOH (mL)				

Note:

- Ignore any trials that were "rough" or unreliable, but be sure to make a comment below your table as to which trial was discounted from the average calculation *(you should continue trials until you have 3 final burette readings within 0.01mL of each other)*.

Follow-Up Questions:

1. Write the balanced equation for the reaction involved *(be sure to include state symbols)*. ***(2 marks)***
2. Determine the average volume of NaOH used. ***(1 mark)***
3. Calculate the moles of acid used. ***(2 marks)***
4. Calculate the moles of NaOH. ***(2 marks)***
5. Calculate the ***unknown*** concentration of the base. ***(2 marks)***
6. While doing a titration, it is permissible to use a wash bottle and distilled water to wash down any material that may have splashed higher up. This would appear to increase the volume of the acid in the flask. Why will it have no effect on the results? ***(2 marks)***

Practical Evaluation: ***(5 marks)***

- Titrations are a lab skill where your patience & attention to detail makes a HUGE difference. While you are performing your titration, be as careful & precise as possible.
- Remember, there will always be sources of experimental error, however **human errors can be avoided** and are *never considered to be a valid source of error.*
- You will be evaluated based on whether your **titrated average volume falls within an accepted range** (2 marks) and if your calculated **[NaOH] is accurate** (2 marks)