

8. Vinegar Titration Lab

- [Page 26](#)
- [Page 27](#)
- [Page 28](#)
- [Page 29](#)

8. Vinegar Titration Lab

Purpose:

Determine the concentration of acetic acid in vinegar.

Procedure:

1. Using a clean funnel, fill a buret with NaOH solution, which was determined to have a molarity of 1.00M. Record the initial volume of NaOH in the buret.
2. Measure out 10mL of vinegar using a graduated cylinder. Transfer the vinegar into an Erlenmeyer flask. Add 2 drops of phenolphthalein to the flask.
3. Slowly add the 1.00M NaOH to the vinegar in 1-2mL increments. As the endpoint nears, the color change of the indicator slows. If you feel that you need less than a drop of NaOH, wash the tip of the buret and walls of the flask with a very small amount of distilled water. Continue to add NaOH until the endpoint is reached. The endpoint should be a very faint pink color. Record the final volume of NaOH in the buret.
4. Refill the buret if necessary and repeat the titration process at least 2 more times.
5. Calculate the molarity of the NaOH solutions for each trial.
6. Calculate the percent deviation between the trials. $(\text{high}-\text{low})/\text{avg} \times 100$
7. If the % deviation is greater than 2%, repeat the titration process.

Page 27

Data:

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6
Amount of vinegar	10mL	10mL	10mL	10mL	10mL	10mL
Initial NaOH	1mL	9.9mL	18.0mL	26.2mL	34.4mL	36.65mL
Final NaOH	9.9mL	18.0mL	26.2mL	34.4mL	42.65mL	44.6mL

Observations:

First trial turned dark pink, too much NaOH. Accidentally let out a stream of NaOH near the endpoint. Trial 2 was a light pink, better than trial 1. Trial 3 was terrible. I accidentally added a stream of NaOH. Trial 4 was clear. half a drop turned it pink. Trial 5 was also a drop over from being clear and pink. Trial 6, you can barely tell that it is pink. If you look really close, you can see a very faint pink. It is really close to perfect. With some distilled water.

Analysis: $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$

Trial 1:

$$9.90\text{mL} - 1.00\text{mL} = \underline{8.90\text{mL NaOH used}}$$

$$1.00\text{M} * 8.90\text{mL} / 1000 = 0.0089 \text{ mol NaOH}$$

$$0.0089 \text{ mol} / 10\text{mL} / 1000 = \underline{0.890\text{M Acetic Acid}}$$

Trial 2:

$$18.0\text{mL} - 9.9\text{mL} = \underline{8.1\text{mL}}$$

$$(8.1/1000)/(10\text{mL}/1000) = \underline{0.81\text{M}}$$

Trial 3:

$$26.2\text{mL} - 18.0\text{mL} = \underline{8.2\text{mL}}$$

$$(8.2\text{mL}/1000)/(10\text{mL}/1000) = \underline{0.82\text{M}}$$

Page 28

Trial 4:

$$34.4\text{mL}-26.2\text{mL}=\underline{8.2\text{mL}}$$

$$(8.2/1000)/(10\text{mL}/1000)=\underline{0.82\text{M}}$$

Trial 5:

$$42.65\text{mL}-34.4\text{mL}=\underline{8.25\text{mL}}$$

$$(8.25\text{mL}/1000)/(10\text{mL}/1000)=\underline{0.825\text{M}}$$

Trial 6:

$$44.6\text{mL}-36.65\text{mL}=\underline{7.95\text{mL}}$$

$$(7.95\text{mL}/1000)/(10\text{mL}/1000)=\underline{0.795\text{M}}$$

Average Molarity:

$$(0.89\text{M}+0.81\text{M}+0.82\text{M}+0.82\text{M}+0.825\text{M}+0.795\text{M})/6=\underline{0.842\text{M}}$$

% Deviation:

$$(0.825-0.810)/0.842*100=\underline{1.78\%}$$

Page 29

Conclusion:

The purpose of the lab was to determine the concentration of acetic acid in vinegar. I achieved this by combining NaOH with vinegar until the indicator turned pink. The average concentration across the trials was determined to be 0.842M. The percent deviation was 1.78%, taking the 3 closest trials. This shows that I could be more consistent between trials. It shows that I am not great, but not terrible at doing titrations. Some possible errors include the calculations for trial 1 (in notebook), improperly read measurements, and contamination during trial 6. For those reasons, I would take trial 1 and 6 with a grain of salt, as they are most definitely inaccurate. If I were to do this lab again, I would be more patient. I would spend more time taking measurements and mixing the reactants.