

Student 6: High Not Achieved

Intended for teacher use only

Results (of trials):

In my trial of finding out how many mL of NaOH I needed to dilute the commercial vinegar. I needed 10 mLs of NaOH to turn the vinegar pink. I also added an indicator named phenolphthalein and put a few drops of that in before I started to add the NaOH. This was my rough trial.

PROPOSED PROCEDURE:

The original solution of commercial vinegar needs to be diluted 10 x times and a 10 mL sample of this diluted solution will be titrated.

The required dilution can be achieved by pipetting 10 mL of the original solution and adding distilled water to make it up to the mark on a 100 mL volumetric flask.

In the actual titration with the sodium hydroxide I will use a 10 mL pipette to deliver an aliquot of the diluted vinegar into a titration flask, add a few drops of phenolphthalein indicator and titrate with the standardised sodium hydroxide until a colour change from colour to pink occurs.
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Using this procedure, I would predict an average titre volume of approximately mL.

Preparation of the oxalic acid solution

This oxalic acid solution was made by adding 1.36 g of hydrated oxalic acid crystals ($C_2H_2O_4 \cdot 2H_2O$) into a 250 mL volumetric flask and making up to the mark with distilled water.

$$M(C_2H_2O_4 \cdot 2H_2O) = 126.1 \text{ g mol}^{-1}$$

$$n = m/M \quad \text{and} \quad c = n/V$$

Use this information to calculate the number of moles of oxalic acid added and the concentration of the final solution.

$$1. n_{(\text{oxalic acid})} = 0.010785$$

$$\bullet n = m \div M$$

$$\bullet 1.36 \div 126.1 = 0.010785 \quad (5)$$

$$2. c_{(\text{oxalic acid})} = 0.04314$$

$$\bullet c = n \div V$$

$$\bullet 0.010785 \div 0.25 = 0.04314$$

$$\bullet 250 \div 1000 = 0.25 \quad (3)$$

3. Calculate the average volume of the concordant titres (to 3 sig figs and including units)

$$V(\text{NaOH}) = 20.4$$

$$\begin{array}{r} 20.4 \\ + 20.4 \\ + 20.5 \\ \hline 61.3 \\ \hline 20.4 \end{array}$$

$$\bullet \text{Average} = 20.4$$

\bullet I am using 2, 3 and 4 to get my average.

4. Use the known volume and concentration of the oxalic acid solution calculated in Q2 above to calculate the amount, in moles, of oxalic acid used in the standardisation. ($c = n/V$) $c \times V = n$

$$n_{(\text{oxalic acid})} = 0.0010785$$

$$\bullet 25.0 \div 1000 = 0.025$$

$$\bullet 0.04314 \times 0.025 = 0.0010785$$

$$c \times V = n$$



5. The balanced equation for the titration can be summarised as:



Use the mole ratio in this equation and your answer to Q4 to determine the amount, in moles, of sodium hydroxide present in each titration at the endpoint.

$$n(\text{NaOH}) = 0.002157$$

$$0.0010785 \times 2 =$$

$$0.002157 \div 1 =$$

$$0.002157$$

• 1 crossed myself to get the n of NaOH

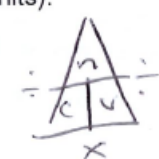


6. Use the volume of sodium hydroxide solution reacted in this titration and your answer to Q5 to calculate the concentration of the sodium hydroxide (to 3 sig figs and including units).

$$c(\text{NaOH}) = 0.1057352$$

$$n \div v = c$$

$$0.002157 \div 0.0204 = 0.1057352$$



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RESULTS

Titration	1	2	3	4	5	6
Final Reading / mL	16.78 mL	34.45	16.54	34.76	17.20	16.78
Initial reading / mL	0.00 mL	16.98 mL	0.00	16.54	0.00	0.00
Titre / mL	16.78 mL	17.45	16.54	18.22	17.20	16.78

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Report Summary:

Controlled variables – In my investigation I tried to make everything controlled and I did this by rinsing all the equipment with the solution I was going to put in it.

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When I was doing my readings I made sure I put a paper behind it and read from the bottom of the meniscus.

Conclusion – from my results the concentration of the of the vinegar sample was 0.078.

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