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.
less

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 ($C_2H_2O_4.2H_2O$) into a 250 mL volumetric flask and making up to the mark with distilled water.

$M(C_2H_2O_4.2H_2O)$ = 126.1 g mol^{-1} n = m/M and c = n/V

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

m = 1.36 g
V = 250 mL
M = 126.1 g mol^{-1}
n = 0.010785
C = 0.04314

1. $n_{(oxalic\ acid)}$ = 0.010785
n = m ÷ M
1.36 ÷ 126.1 = 0.010785 (5)

2. $c_{(oxalic\ acid)}$ = 0.04314
c = n ÷ V
0.010785 ÷ 0.25 = 0.04314
250 ÷ 1000 = 0.25 (3)

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

V(NaOH) = 20.4

20.4
+20.4
+20.5
61.3 ÷ 3
20.4
I am using 2, 3 and 4 to get my average.

Average = 20.4

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 x V = n

n(oxalic acid) = 0.0010785
25.0 ÷ 1000 = 0.025
0.04314 x 0.025 = 0.0010785
c x v = n

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

$$C_2H_2O_4 + 2NaOH \longrightarrow Na_2C_2O_4 + 2H_2O$$

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(NaOH) = 0.002157

0.0010785 x 2 = 0.002157 ÷ 1 = 0.002157 (4)

• I crossed my titres to get the n for 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(NaOH) = 0.105 7352

(3)

• n ÷ V = C

• 0.002157 ÷ 0.0204 = 0.105 7352.

RESULTS

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

(1)

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. (6)

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. (2)