Student 3: Low Merit

Intended for teacher use only

Preparation of oxalic acid:

$n(C_2H_2O_4.2H_2O) = n = \frac{m}{M}$

$n = \frac{1.61g}{126.1 g mol^{-1}}$

$n = 0.012767644 73$

$n = 0.0128 mol$ (3 sig fig)

$c(C_2H_2O_4) = c = \frac{n}{v}$

$c = \frac{0.0128 mol}{0.25L}$

$c = 0.051070578 92$

$c = 0.0511 mol L^{-1}$ (3 sig fig)

Standardisation of sodium hydroxide solution:

Titration	1	2	3	4	5
Final Reading / mL	24.35	47.95	23.75	46.95	24.85
Initial Reading / mL	0.40	24.35	0.00	23.75	1.25
Titre / mL	23.95	23.60	23.75	23.20	23.60

$V(NaOH) = \frac{23.60 + 23.75 + 23.60}{3} = 23.65$

$= 0.02365L$

$n(C_2H_2O_4) = n = c \times v$

$n = 0.0510705 7892 mol L^{-1} \times 0.025L$

$n = 0.012767642 5$

$n = 0.0128 mol$ (3 sig fig)

4

$n(NaOH) = 1 : 2$

$2 \times 0.012767642 5 mol$

$n = 0.025535285$

$n = 0.0255 mol$ (3 sig fig)

$c(NaOH) = c = \frac{n}{v}$

$c = \frac{0.025535285 mol}{0.02365L}$

$c = 0.107971606 8$

$c = 0.108 mol L^{-1}$ (3 sig fig)

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Analysis of white vinegar:

$V(NaOH) = \frac{20.70 + 21.00 + 21.00}{3} = 20.9$

$= 0.0209L$

$n(NaOH) = n = c \times v$

$n = 0.108 mol L^{-1} \times 0.0209L$

$= 0.022572$

$= 0.0226 mol$ (3 sig fig)

4

$n(CH_3COOH) = 1 : 1$

$= 1 \times 0.022572 mol$

$= 0.022572 mol$

$= 0.0226 mol$ (3 sig fig)

$c(CH_3COOH) = c = \frac{n}{v}$

$c = \frac{0.022572 mol}{0.025L}$

~~$c = 0.090288$~~

~~$= 0.0903 mol L^{-1}$ (3 sig fig)~~

$c = 0.090288$

$c = 0.0903 mol L^{-1}$ (3 sig fig)

From **Q10** in Part C	c(diluted CH_3COOH) = 0.0903 mol L^{-1} (3 sig fig)
From dilution information above	dilution factor = 10
Combining the above two	original concentration = 0.90288 mol L^{-1} 0.903 mol L^{-1} (3 sig fig)

12. The molar mass of ethanoic acid is $M(CH_3COOH) = 60.0$ gmol^{-1} and $M = m/n$
Use this information and your final value in **Q11** above to calculate the concentration of ethanoic acid present in the original Homebrand vinegar in units of gL^{-1}.

concentration × molar mass
0.903 mol L^{-1} × 60.0 g mol^{-1}
= 54.1728
= 54.173 g L^{-1} (3 sig fig)

Summary Report:

Some control variables used in this investigation was the volume. By using the equipment of the burette, conical flasks and pipette this ensured that the volume of ethanoic acid and the original homebrand vinegar were all kept at the exact and same volumes needed. Another controled variable was the concentration. This was ~~#~~ controled due to the repeating of the expirment 4 times. By repeating the expirmend multiple times, this ensured that the results would be fairly accurate and kept at a titre value of between 0.30ml. From there, ~~#~~ by taking the most concordant titre measurments, an average can be found to show a high accuracy. Other control of variables were through ensuring that the burette was free of any air bubbles. By freeing the air bubbles this ensured the final result of the reading would be more accurate. This is due to the fact that the air bubbles stuck in the burrette give an inaccurate showing of the amount and also make it harder to release the acid into the conical flask. Overall the concentration found was 54.173 g L^{-1}, which was 5.827 g L^{-1} less than the 60.0 g L^{-1} found by the manufacturer. Although they are close, the concentration found was lesser, this could be because of a slight inaccuracy when using the burette to pour into the conical flask and accidentally going slight over the infact needed amount. Overall though, the concentration was found very close and somewhat accurate when compared to the concentration claimed by the manufacturer.

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