Student 3: Low Merit

NZQA Intended for teacher use only

Purpose:

To investigate by quantitative analysis, the variation in the concentration of Vitamin C (in gL^{-1}) of "Just Juice Orange and Mango" juice when heated to 20, 40, 60, and 80 degrees Celsius for 10 minutes.

Calculations:

Part A – calculation of blank titration:

$V(S_2O_3^{2-}) = 0.02925$

$n = c/V$ therefore $n(S_2O_3^{2-}) = 0.0511 \times 0.02925 = 1.494675 \times 10^{-3}$

$n(I_2$ total$) = ½ \times 1.494675 \times 10^{-3} = 7.47335 \times 10^{-4}$

Part B – calculation of back titration:

20°C

$n(I_2) = 7.47335 \times 10^{-4}$

$n(S_2O_3^{2-}) = 0.0511 \times 0.018167$ (average at this temperature)

$n(S_2O_3^{2-}) = 9.283337 \times 10^{-4}$

$n(I_2$ remaining$) = ½ \times 9.283337 \times 10^{-4} = 4.6416685 \times 10^{-4}$

$n(I_2$ reacted with vit C$) = n(I_2$ remaining$) = 7.47335 \times 10^{-4} - 4.6416685 \times 10^{-4} = 2.8317065 \times 10^{-4}$

mol = n(vitamin C)

c(vitamin C$) = n/V = 2.8317065 \times 10^{-4} / 0.1 = 2.8317065 \times 10^{-3}$

c(vitamin C$) = 176 \times 2.8317065 \times 10^{-3} = 0.498380344$

(1)

Final Evaluation:

From the data obtained in the experiment and from the graphs of the data we can see that there is quite a strong negative relationship between the temperature of the juice and the vitamin C content of the juice.

(2)

The procedure used for this investigation was the analysis of the amount of vitamin C in juice using an iodine-thiosulfate back titration. The iodine used was produced by reacting KIO_3 with KI as it would have been too difficult to handle an iodine solution.

$IO_3^- + 5I^- + 6H^+ \rightarrow 3I_2 + 3H_2O$

Using this method of indirectly producing iodine the known number of moles in the solution is more accurate.

(3)

In the original method, the concentration of sodium thiosulfate was 0.1 $molL^{-1}$. However it was determined that this concentration of thiosulfate meant that the range that the number of moles of iodine would decrease was too small to determine an accurate difference, therefore it was decided to use a concentration of approximately 0.05 $molL^{-1}$.