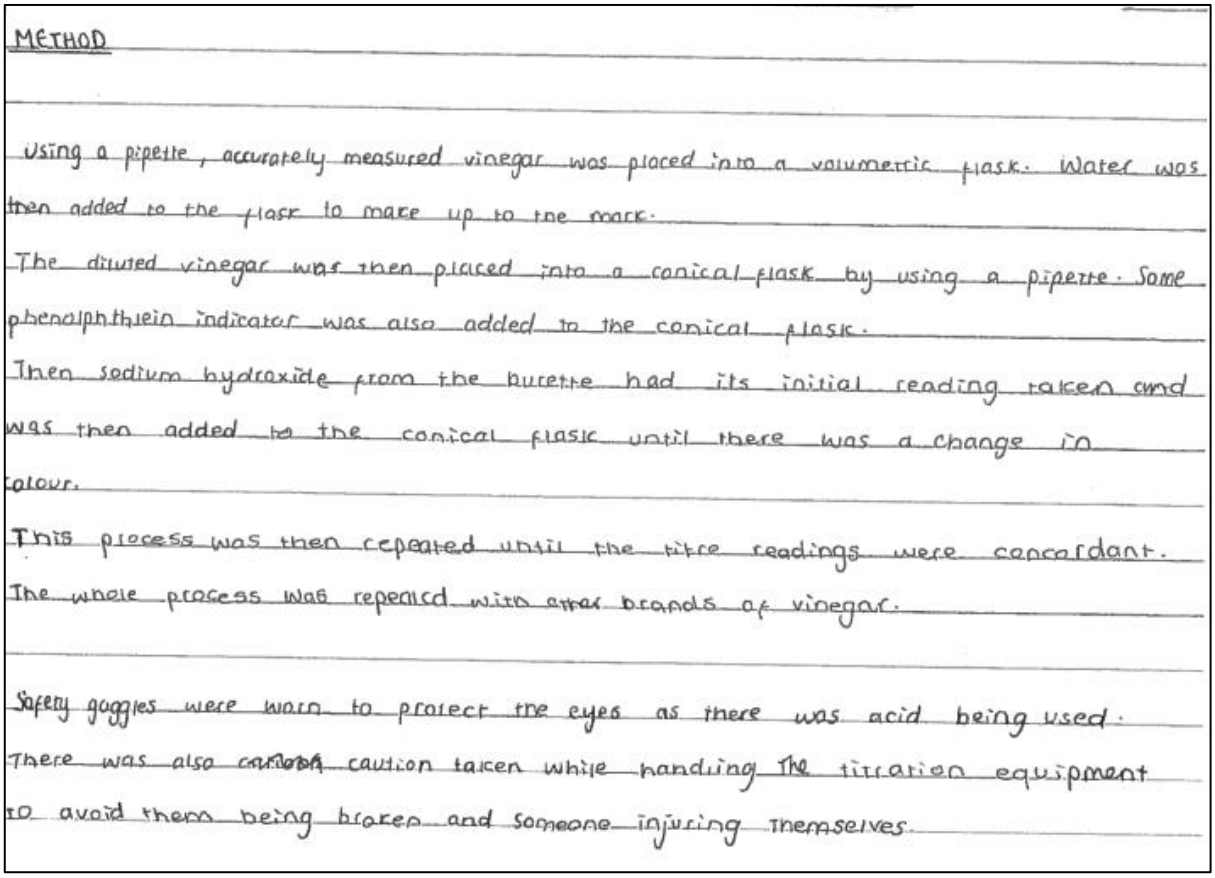
Candidate evidence

Candidate 1

Summary



METHOD

Using a pipette, accurately measured vinegar was placed into a volumetric flask. Water was then added to the flask to make up to the mark.

The diluted vinegar was then placed into a conical flask by using a pipette. Some phenolphthein indicator was also added to the conical flask.

Then sodium hydroxide from the burette had its initial reading taken and was then added to the conical flask until there was a change in colour.

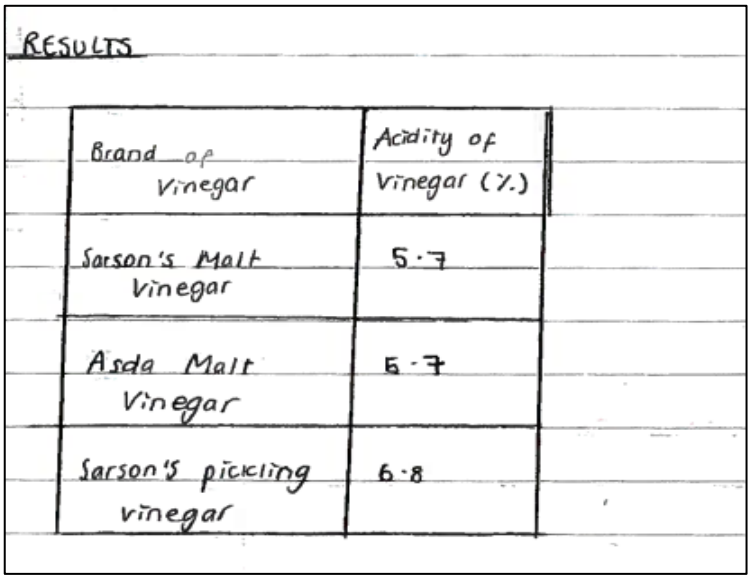
This process was then repeated until the titre readings were concordant.

The whole process was repeated with other brands of vinegar.

Safety goggles were worn to protect the eyes as there was acid being used.

There was also ~~carbon~~ caution taken while handling the titration equipment to avoid them being broken and someone injuring themselves.

Results



RESULTS

Brand of Vinegar	Acidity of Vinegar (%)
Sarson's Malt Vinegar	5·7
Asda Malt Vinegar	5·7
Sarson's pickling vinegar	6·8

Analysis

INTERNET / LITERATURE SOURCE

BRAND OF VINEGAR	Acidity of vinegar (%)	
Sarson's Malt Vinegar	5	① Source
Asda Malt Vinegar	4 -6	② Source
Sarson's Pickling Vinegar	6	③ Source

For Asda Malt Vinegar, there was no exact percentage, only a small range.

ANALYSIS

Brand of Vinegar	Acidity of Vinegar (%)	
	My Data	Internet
Sarson's Malt Vinegar	5·7	5
Asda Malt Vinegar	5·7	4 -6
Sarson's Pickling Vinegar	6·8	6

The results that I got / calculated are very close to percentages stated on the internet, which would make my results fairly accurate. As there was no exact acidity stated on the interner for Asda Malt Vinegar, I have to assume that my results are relatively accurate as my results fall between the range of 4% to 6% that was provided on the internet.

Evaluation

EVALUATION

The experiment went well because the results I obtained were fairly accurate. They were accurate because the results matched the results I got from the internet.

If I were to do the experiment again I would not use the Asda Malt Vinegar because I was unable to find an exact acidity of vinegar percentage.

I would also The experiment also went well because the pH indicator that was used was very brightly and clearly showed when the experiment had finished.

Candidate 2

Summary

Method:	Iodine ~~sol~~ solution was used to titrate different orange juice samples with a starch indicator. Gloves were worn to prevent iodine staining the skin.

Results

Orange Juice Sample	~~Conc~~ Mean Concentration of vitamin C (mg per 100ml)
The Grower's Harvest	53.2
Tesco From Concentrate	43.8
Tesco Not From Concentrate	49.7

Analysis

Internet Source:

	Orange Juice	Concentration of Vitamin C (mg per 100ml)
(1)	The Grower's Harvest	20
(2)	Tesco From Concentrate	25
(3)	Tesco Not From Concentrate	28

Analysis: My results show that 'The Grower's Harvest' has the highest concentration of vitamin C and 'Tesco From Concentrate' has the lowest. However, the internet source shows that 'Tesco Not From Concentrate' has the highest concentration and 'The Grower's Harvest' has the lowest concentration. My results are also a lot higher than the internet source's. My results for 'The Grower's Harvest' are 266% bigger, my results for 'Tesco From Concentrate' are 175.2% bigger and my results for 'Tesco Not From Concentrate' are 177.5% bigger.

Evaluation

Evaluation:

~~The Tesco website is~~ Data from the Tesco website must comply with EU Regulations and is peer-reviewed and monitored by the Food Standards Agency meaning it is a ~~good~~ reliable source for comparison.

However, EU Regulations state that the concentration of vitamin C varies naturally in the fruit so every batch of orange juice may be different. This means my internet data is likely to be an average and may not be accurate for my samples, making it less reliable.

5

Our experiment was carried out over 2 days and the orange juice cartons were open before we began the experiment. This means the vitamin C would have begun oxidising with the air. To prevent this from affecting our results we should have opened each carton just before we titrated the samples, giving the juice as little time as possible to lose vitamin C and making our results more accurate.

During titration, solutions were swirled by hand. Due to human error, some samples may have been swirled faster than others. To fix this we could have used a magnetic stirrer to ensure every solution was fully mixed and had the same chance of molecules colliding. This would make sure the volume of iodine added wasn't too much, making our results more accurate.

Candidate 3

Summary

Method:
The temperature change of a measured mass of water was recorded. The inital and final mass of the alcohol burned was recorded and repeated for three different alcohols.

Results

Results.

Alcohol	initial mass of burner (g)	final mass of burner (g)	mass of water (kg)	initial temp of water (°C)	~~final~~ initial temp of water (°C)
methanol	148.01	150.31	0.1	21	33
	150.31	153.02	0.1	22	36
	153.02	155.51	0.1	21	32
propanol	126.14	128.22	0.1	18	30
	128.22	130.42	0.1	19	33
	130.42	133.19	0.1	21	33
butan-1-ol	136.45	139.86	0.1	22	~~41~~
	139.86	142.44	0.1	24	~~36~~ 44
	142.44	146.31	0.1	21	~~33~~ 45

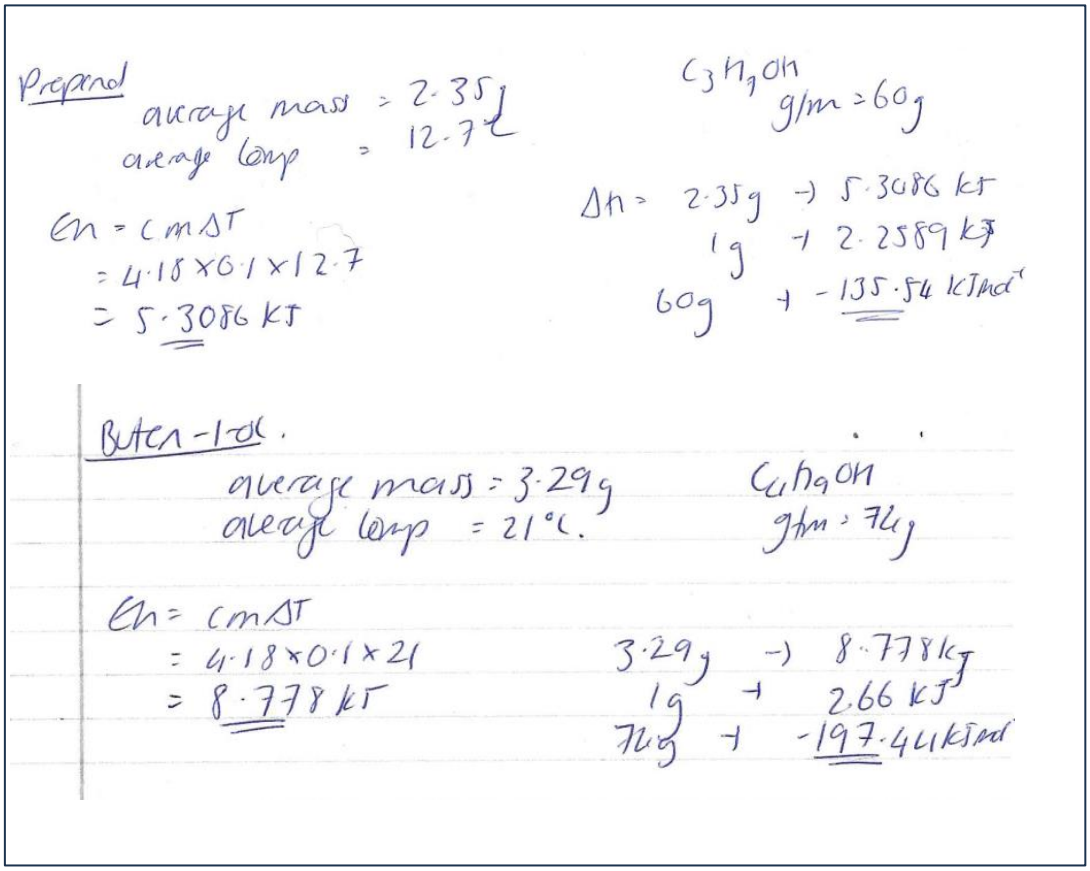
Calculations.

methanol average mass = 2.5g
average temp change = 12.3°C

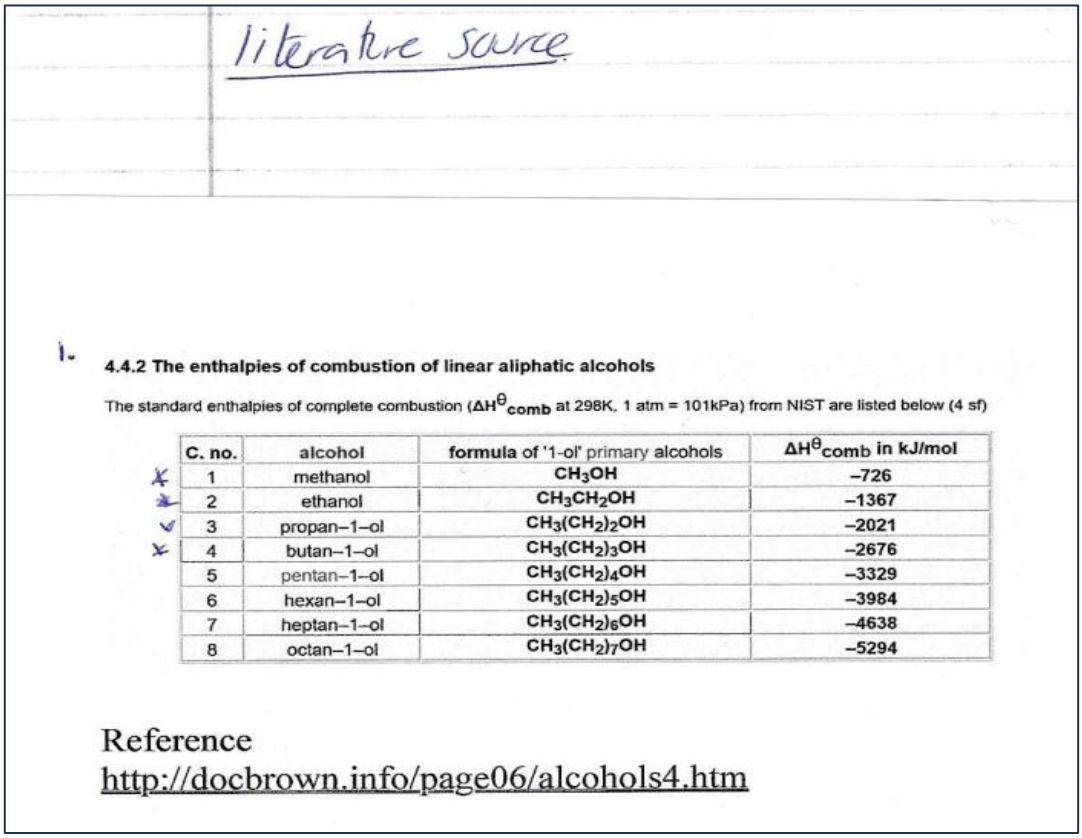
CH_3OH
gfm = 32g

$E_h = cm\Delta T$
$= 4.18 \times 0.1 \times 12.3$
$= 5.14$ kJ.

ΔH = 2.5g → 5.14 kJ
1g → 2.056 kJ
32g → −65.79 kJmol^{-1}


Propanol
average mass = 2.35g
average temp = 12.7°C
C_3H_7OH
g/m = 60g
$q = cm\Delta T$
$= 4.18 \times 0.1 \times 12.7$
$= 5.3086$ kJ
ΔH = 2.35g → 5.3086 kJ
1g → 2.2589 kJ
60g → −135.54 kJmol⁻¹
Butan-1-ol.
average mass = 3.29g
average temp = 21°C.
C_4H_9OH
g/m = 74g
$q = cm\Delta T$
$= 4.18 \times 0.1 \times 21$
$= 8.778$ kJ
3.29g → 8.778kJ
1g → 2.66 kJ
74g → −197.44kJmol

Analysis


literature source
1.
4.4.2 The enthalpies of combustion of linear aliphatic alcohols
The standard enthalpies of complete combustion (ΔH^{θ}_{comb} at 298K, 1 atm = 101kPa) from NIST are listed below (4 sf)
C. no. | alcohol | formula of '1-ol' primary alcohols | ΔH^{θ}_{comb} in kJ/mol
1 | methanol | CH_3OH | −726
2 | ethanol | CH_3CH_2OH | −1367
3 | propan−1−ol | $CH_3(CH_2)_2OH$ | −2021
4 | butan−1−ol | $CH_3(CH_2)_3OH$ | −2676
5 | pentan−1−ol | $CH_3(CH_2)_4OH$ | −3329
6 | hexan−1−ol | $CH_3(CH_2)_5OH$ | −3984
7 | heptan−1−ol | $CH_3(CH_2)_6OH$ | −4638
8 | octan−1−ol | $CH_3(CH_2)_7OH$ | −5294
Reference
http://docbrown.info/page06/alcohols4.htm

Analysis.

alcohol	calculated value ($kJ\ mol^{-1}$)	literature value ($kJ\ mol^{-1}$)
methanol	-67.8	-726
propanol	-135.54	-2021
butan-1-ol	-197.44	-2676.

Both of my source and the literature source show the same increasing trend that as you move up the alcohols (number of carbon) more energy is produced.
My results are a lot lower, than the theoretical values most likely due to heat loss.
Comparing my values to literature.

methanol = $\frac{726 - 67.8}{726} \times 100 = 90.7\%$

propanol = $\frac{2021 - 135.54}{2021} \times 100 = 93\%$

butanol = $\frac{2676 - 197.44}{2676} \times 100 = 93\%$

My results are all 90-93% less than the ~~calculated values~~ literature value
This shows that although mine are a lot lower they are consistently lower.

Evaluation

Evaluation

1.) Source 2 comes from docbrown website. ~~I trust~~ This website is written by scientists and chemistry teachers which Doc Brown says it is. Therefore this information is trustworthy and can be used as a comparison.

2.) My results are an average of 92% lower than the theoretical this is most likely to be due to heat loss this could be reduced by using heat shields and ensuring as much of the heat is directed to the water.

Candidate 4

Summary

procedure:

add sulphuric acid to pottasium permanganate solution and water. Heat the mixture to a specific temperature. once at the correct temperature add oxalic acid to the mixture and record the time it takes for the mixture to ~~go colorless~~ colourless. When handling sulphuric and oxalic acid wear gloves to protect your hands from the chemicals corrosive properties.

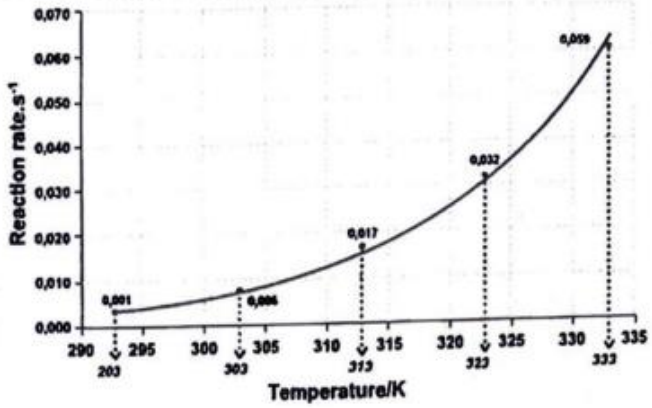
Results

Temperature (°C)	Time taken for solution to go colourless (s)			Average time (s)	Relative Rate = (s^{-1})
	1st	2nd	3rd		
25	177	300	163	213	0.005
35	79	72	39	~~130~~ 63	0.02
45	27	24	32	28	0.04
55	9	10	10	9.7	0.1
65	9	6	9	8	0.13

Analysis

Internet source:

①

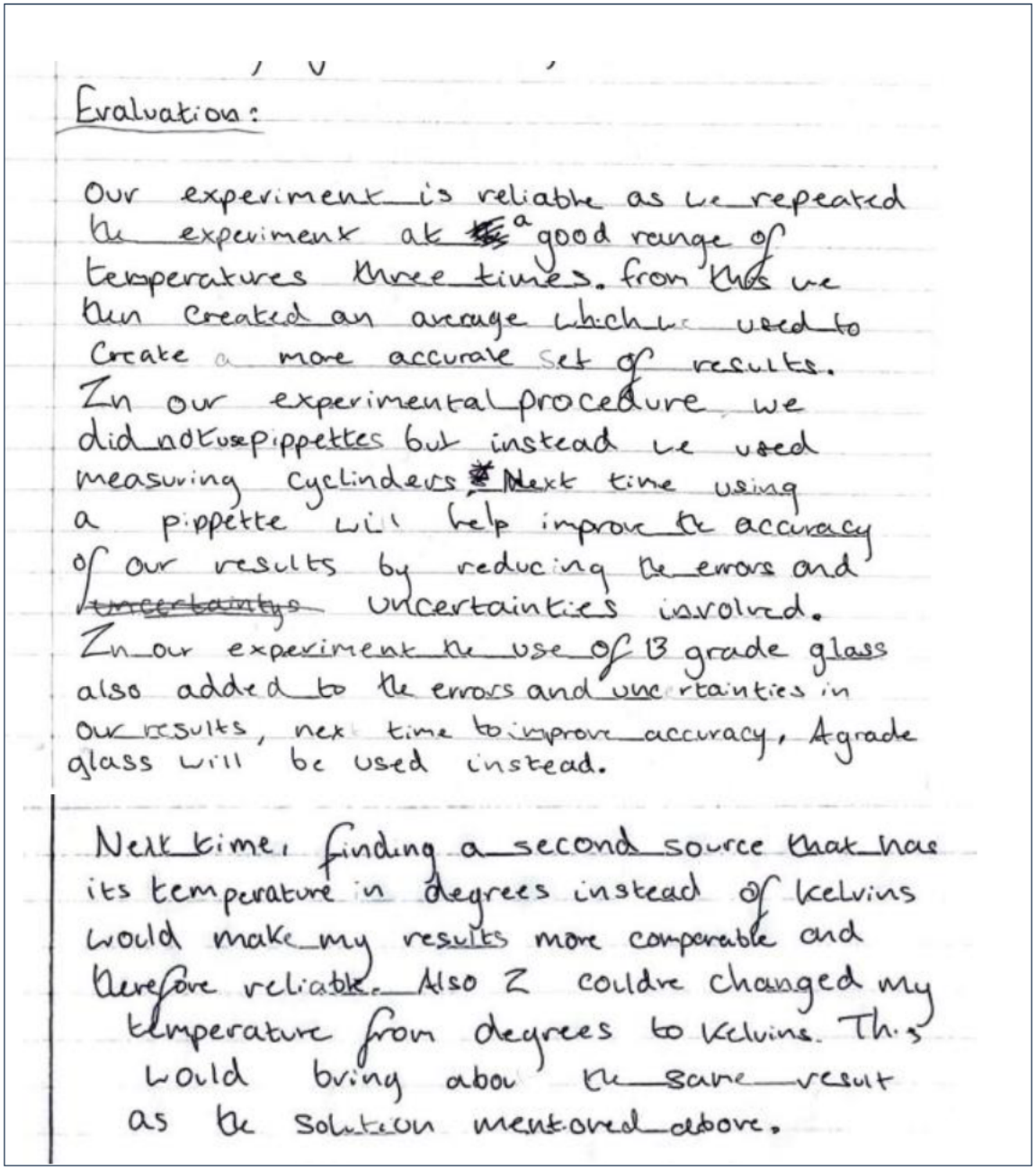


① = http://chemstasis.blogspot.com/2016_05_01_archive.html?view=sidebar (February 2019)

Analysis:

Although the second source's temperature is measured in Kelvins and my graph is measured in degrees. They both show the same trend of as you increase temperature, relative rate also increases.

Evaluation



Evaluation:

Our experiment is reliable as we repeated the experiment at a good range of temperatures three times. from this we then created an average which we used to create a more accurate set of results. In our experimental procedure we did not use pippettes but instead we used measuring cyclinders. Next time using a pippette will help improve the accuracy of our results by reducing the errors and uncertainties involved. In our experiment the use of B grade glass also added to the errors and uncertainties in our results, next time to improve accuracy, A grade glass will be used instead.

Next time, finding a second source that has its temperature in degrees instead of kelvins would make my results more comperable and therefore reliable. Also I couldve changed my temperature from degrees to kelvins. This would bring about the same result as the solution mentioned above.