

Commentary on candidate evidence

The candidate evidence has achieved the following marks for the analysis and evaluation section of this course assessment component.

Candidate 1

5. Analysis

The candidate was awarded **0 out of 1 mark** because they did not make a valid comparison of the experimental data with data from the internet/literature source.

The candidate would have been awarded the mark if they had stated that there was a direct relationship between concentration and rate, with the rate increasing as concentration was increased, as shown in both their experimental data and literature source.

7. Evaluation

The candidate was awarded **0 out of 3 marks** because they did not make any valid evaluative points.

The candidate would have been awarded the marks for evaluation if they had:

- ◆ Evaluated their literature source (1 mark).
- ◆ Identified the rogue point in their data from the graph (at 20 cm³ KI) and stated that they should have repeated the experiment at this volume (1 mark).
- ◆ Commented on the ease of identification of the colour change in the experiment that allowed for good agreement between the times recorded for the repeat experiment (1 mark).

Candidate 2

5. Analysis

The candidate was awarded **0 out of 1 mark** because they did not make a valid comparison of the experimental data with data from the internet/literature source.

The candidate would have been awarded the mark if they had commented on the directly proportional relationship between concentration and rate shown in both their experimental data and their internet source. In both sets of data, a doubling of concentration (of KI) results in an approximate doubling of rate.

7. Evaluation

The candidate was awarded **0 out of 3 marks** because they did not make any valid evaluative points.

The candidate would have been awarded the marks for evaluation if they had:

- ◆ Evaluated their literature source (1 mark).
- ◆ Commented on the good set of experimental results which matched the expected trend:
 - The candidate could have made a statement about what made the experiment easy to carry out, for example, that it was easy to determine when the cross was unable to be seen and that resulted in a set of results that matched the expected trend (1 mark).
 - The candidate also carried out the experiment three times at each concentration with good agreement between the results. This is good practice and allowed results that matched the expected trend to be obtained (1 mark).

Candidate 3

5. Analysis

The candidate was awarded **0 out of 1 mark** because they did not make a valid comparison of the experimental data with data from the internet/literature source.

They have attempted to compare the relative rates of their calculated experimental data and the data interpreted from the literature source graph.

This candidate's experimental data is in good agreement with the expected trend in a concentration against rate experiment and is, therefore, in good agreement with the internet data.

The candidate's results show that as concentration increases, so does the rate. As concentration is doubled from 0.05 mol l^{-1} to 0.1 mol l^{-1} , the rate approximately doubled from 0.012 s^{-1} to 0.025 s^{-1} . The same trend can be seen as the concentration is doubled from 0.1 mol l^{-1} to 0.2 mol l^{-1} , and the rate approximately doubled from 0.025 s^{-1} to 0.049 s^{-1} .

This is in good agreement with the trend shown in the internet data. As the concentration is doubled from 0.1 mol l^{-1} to 0.2 mol l^{-1} , the rate approximately doubled from 0.2 s^{-1} to 0.39 s^{-1} .

If the candidate had provided this comparison, then the mark could have been awarded.

7. Evaluation

The candidate was awarded **0 out of 3 marks** because the evaluative points given do not refer to the experimental data.

The candidate would have been awarded the marks for evaluation if they had:

- ◆ Evaluated their literature source (1 mark).
- ◆ Commented on the good set of experimental results which matched the expected trend:
 - The candidate could have made a statement about what made the experiment easy to carry out, for example, that it was easy to determine when the cross was unable to be seen and that resulted in a set of results that matched the expected trend (1 mark).
 - The candidate also carried out the experiment three times at each concentration with good agreement between the results. This is good practice and allowed results that matched the expected trend to be obtained (1 mark).

Candidate 4

5. Analysis

The candidate was awarded **1 out of 1 mark** because they have made a valid comparison of the experimental data with data from the internet/literature source by describing the trends **between** and **within** their data sets.

They have compared their experimental result for each tablet with the expected values. They have stated that their results 'shows a higher mass of vitamin C for all tablets'. This is the comparison **between** the data sets.

They have also stated that, from the internet data, 'all tablets should have equal mass of vitamin C' but that in their data, Morrisons tablets have the greatest mass of vitamin C and that Tesco tablets have the least mass of vitamin C. This is the comparison **within** the data sets.

7. Evaluation

The candidate was awarded **2 out of 3 marks** for two valid evaluative points.

The candidate was awarded **1 mark** because they correctly evaluated their internet source as being 'subject to UK government standards and food safety standards'.

The candidate was awarded **1 mark** because they correctly identified that iodine is a non-specific oxidising agent and that the Vitamin C tablets contained other substances that may have also reacted with the iodine. The candidate's results were all higher than the stated values and so this is a correct evaluative point. The use of an alternative oxidising agent specific for vitamin C in the titration could improve the results.

The candidate obtained concordant results from the titration, so they could have made an evaluative point to explain this, for example, the distinct colour change observed in the reaction between iodine and the starch indicator (1 mark).

The candidate could also have obtained a mark for commenting on the experiment being carried out three times at each concentration with good agreement between the results. This is good practice and allowed results that matched the expected trend to be obtained (1 mark).

Candidate 5

5. Analysis

The candidate was awarded **0 out of 1 mark** because they did not make a valid comparison of the experimental data with data from the internet/literature source.

They have compared their experimental result for each juice with the expected values from the internet source. They have stated that their results for all three juices show 'a much higher mass of vitamin C per 100 ml than the source shown'. This is the comparison **between** the data sets.

They have not compared the trends within the data sets. They would have obtained the mark if they had also commented that from their experimental results, the highest concentration of vitamin C was found in orange juice, followed by blueberry juice, with cherry juice having the lowest concentration. This trend differed from the external source which stated that blueberry and cherry juice have the same vitamin C concentration, with orange having less vitamin C than the other two juices.

7. Evaluation

The candidate was awarded **0 out of 3 marks** because the evaluative points given do not refer to the experimental data.

The candidate would have been awarded the marks for evaluation if they had:

- ◆ Evaluated their internet source (1 mark).
- ◆ Commented on their experimental results all being higher than the literature values and suggested a reason to justify these results, for example, the use of iodine, a non-specific oxidising agent, and so substances other than vitamin C in the juices may have reacted with the iodine. Use of an alternative oxidising agent specific for vitamin C in the titration could improve the results (1 mark).
- ◆ Commented on the ease of obtaining concordant results from the titration and suggested a reason, for example, the distinct colour change observed in the reaction between iodine and the starch indicator (1 mark).

Candidate 6

5. Analysis

The candidate was awarded **1 out of 1 mark** because they have made a valid comparison of the experimental data with data from the internet/literature source by describing the trends **between** and **within** their data sets.

The candidate has not simply stated that as concentration increases, so does rate, they have identified that both the graph plotted from their experimental data and their second graphical source show a 'directly proportionate relationship between the rate and the concentration'.

7. Evaluation

The candidate was awarded **2 out of 3 marks** for two valid evaluative points.

The evaluation of the second source as being a textbook 'endorsed by SQA' is accepted for **1 mark**.

The repeated experimental results are in good agreement at each concentration. The comment about the colour change and the timing ensuring 'the most precise and accurate results' is confirmed by the experimental results and so this evaluative statement is accepted for **1 mark**.

The candidate could also have obtained a mark for commenting on the experiment being carried out three times at each concentration with good agreement between the results. This good practice allowed results that matched the expected trend to be obtained (1 mark).

Candidate 7

5. Analysis

The candidate was awarded **0 out of 1 mark** because they did not make a valid comparison of the experimental data with data from the internet/literature source.

They have attempted to compare the results obtained in two different experiments, rather than comparing the trends.

The candidate would have been awarded the mark if they had commented on the directly proportional relationship between concentration and rate shown in both their experimental data and their internet source. In both sets of data, a doubling of concentration results in an approximate doubling of rate.

7. Evaluation

The candidate was awarded **1 out of 3 marks** for one valid evaluative point.

The evaluation of the data from the second source as being 'carried out by scientists' and 'repeated and peer reviewed' is accepted for **1 mark**.

The other evaluative statements are not supported by the candidate's data.

Drying beakers between each experiment and using a more accurate piece of equipment for volume measurement than a measuring cylinder, would be good experimental practice. However, the candidate obtained reasonably good experimental results, that fit the expected trend.

The identification of an outlier result at 0.05 or 0.09 or 0.10 mol l⁻¹ KI could have led to a correct evaluative point. However, the attempted justification about use of a measuring cylinder would have affected all measurements and not just this outlier.

The candidate could have made a statement about what made the experiment successful, for example, that it was easy to determine when the reaction had taken place due to its quick colour change and that resulted in a set of results that matched the expected trend (1 mark).

The candidate could also have obtained a mark for commenting on the experiment being carried out three times at each concentration with good agreement between the results. This is good practice and allowed results that matched the expected trend to be obtained (1 mark).

Candidate 8

5. Analysis

The candidate was awarded **0 out of 1 mark** because they did not make a valid comparison of the experimental data with data from the internet/literature source.

They have compared their experimental results for enthalpy of combustion with their internet source data. They have stated that their experimental results are all lower than the internet source data. This is the comparison **between** the data sets.

They have not compared the trends within each of the data sets. They would have been awarded the mark if they had also commented that their experimentally determined enthalpy of combustion values increased with increasing number of carbons in the alcohols, in agreement with the trend shown in their internet source.

7. Evaluation

The candidate was awarded **2 out of 3 marks** for two valid evaluative points.

The candidate has given one valid reason for their experimental data being consistently lower than their internet data, in that there was unavoidable heat loss to the surroundings (**1 mark**).

The candidate has also made reference to the consistency in their results ('My results were all around the same times smaller than the internet results' – as calculated in the analysis section). They have attributed this to the number of replicates carried out (**1 mark**).

The candidate would have been awarded a further mark for evaluation if they had:

- ◆ Evaluated their literature source (1 mark).

Candidate 9

5. Analysis

The candidate was awarded **0 out of 1 mark** because they did not make a valid comparison of the experimental data with data from the internet/literature source.

They have stated that there is no 'general trend' which is not sufficient for this mark.

The candidate would have been awarded the mark if they had:

- ◆ Described the trend within their data sets, stating the difference and similarity. In their experimental results, cranberry and apple juice was found to have the highest concentration of vitamin C, followed by cranberry classic. In the internet source, the highest concentration of vitamin C was cranberry classic, followed by cranberry and apple. However, in both sets of data, cranberry and raspberry was found to have the lowest concentration of vitamin C.

and

- ◆ Commented on the difference between their experimental results and the internet source values. The internet source values for cranberry classic and cranberry and raspberry are higher than the experimental values (or the cranberry classic and cranberry and raspberry results are quite similar) but the internet value for cranberry and apple is lower than the experimental value.

7. Evaluation

The candidate was awarded **2 out of 3 marks** for two valid evaluative points.

The evaluation of the internet source as being 'from a website that follows UK food regulations' is accepted for **1 mark**.

The use of 50 cm³ cranberry and raspberry juice samples (compared with 25 cm³ samples of the other juices) is evidenced by the titre values obtained. The titre values obtained for the increased sample volumes are more in line with the values obtained for the classic cranberry juice (**1 mark**).

The candidate could have obtained an evaluative mark if they had suggested a reason for the variation in the titre values obtained for the classic cranberry juice. For the other two juices, concordancy was obtained within the first two titrations (although the candidate has performed a third titration). A possible suggestion could be the relative colours of the juices.