

Commentary on candidate evidence

The candidate evidence has achieved the following marks for each section of this assignment.

1 Aim

The candidate was awarded **1 out of 1 mark** because their aim clearly describes the purpose of the investigation. 'To determine the concentration of vitamin C in different orange juices.'

2 Underlying chemistry

The candidate was awarded **2 out of 3 marks** because they have provided a reasonable understanding of the relevant chemistry at a depth appropriate to Higher Chemistry level. This includes some information about antioxidants, oxidising and reducing agents, and a description of how a titration can be used to determine an unknown concentration.

There is a small error in their structural equation of the oxidation of vitamin C where they have incorrect balancing (this should show 2H^+), however they have also included a correctly balanced formulae equation.

They could have included descriptions of oxidation and reduction in terms of oxygen to hydrogen ratios and free radical scavengers.

3 Data collection and handling

The candidate was awarded **4 out of 6 marks**. The marks were awarded as follows:

- 3(a) The candidate has been awarded **0 out of 1 mark** because they have not given the independent variable. They have stated "add the orange juice" but have not made any reference to multiple juices being used. The safety statement would have been accepted.
- 3(b) The candidate was awarded **1 out of 1 mark** because they have provided sufficient raw data. The candidate has given raw data for titrations of three different orange juice types.
- 3(c) The candidate was awarded **0 out of 1 mark** because they have not provided clear headings with units for every column or included units after every data entry for their raw data. They have not provided the units in the column headings for 'Volume of iodine'.

The table of processed data (average titre and concentration of vitamin C) however is correct.

- 3(d) The candidate was awarded **1 out of 1 mark** because they have correctly carried out calculations based on their experimental data, including those involving the relationship between moles, concentration, and solution volumes as well as those involving the relationship between moles and gram formula mass.
- 3(e) The candidate was awarded **1 out of 1 mark** because they have provided data from an internet source that is relevant to their experiment.
- 3(f) The candidate was awarded **1 out of 1 mark** because they have correctly cited and referenced their internet sources.

4 Graphical presentation

The candidate was awarded **4 out of 4 marks**. The marks were awarded as follows:

- 4(a) The candidate was awarded **1 out of 1 mark** because they have provided a bar graph which is an appropriate format for their experimental data.
- 4(b) The candidate was awarded **1 out of 1 mark** because they have provided suitable scales on their axes.
- 4(c) The candidate was awarded **1 out of 1 mark** because they have provided suitable labels and units on their axes.
- 4(d) The candidate was awarded **1 out of 1 mark** because they have correctly plotted their data points.

5 Analysis

The candidate was awarded **0 out of 1 mark** because their statement provides only a partial relationship. They have correctly stated that all the values from their experiment are higher than those stated on the packaging. They have given some comparisons of their results with those of the source, such as Grower's Harvest and Tesco (from concentrate). These values being the same in the source but different in their experiment. They also state incorrectly at the end of the analysis section that the Tesco (not from concentrate) value was 43.6 mg/100ml but this should be 44mg/100ml. This contradicts the correct information given in the table at the start of the analysis section.

6 Conclusion

The candidate was awarded **0 out of 1 mark** because their conclusion does not relate to their stated aim. Their aim was to 'determine the concentration of vitamin C in different orange juices', which they have done and therefore their conclusion

is incorrect. Although the conclusion cannot merely be a restatement of the experimental results, in this case that would have been appropriate in order to satisfy the aim.

7 Evaluation

The candidate was awarded **2 out of 3 marks** because they have made two valid evaluative statements:

- ◆ 1 mark is awarded for 'The internet sources is reliable' as 'information about a food product must be very accurate', with respect to food standards.
- ◆ 1 mark is awarded for 'carry out titration on several bottles of the same orange juice and take an average' in order to 'improve accuracy of my results'.

The candidate has also made a statement regarding the colour change being difficult to see, as being the reason for their results being higher than the internet values. This is not a valid statement since their results are almost double those of the internet source. There is no evidence that this difference could be caused by a difficult to observe end point.

8 Structure

The candidate was awarded **1 out of 1 mark** because they have provided a clear and concise report with an informative title.

Overall

The candidate was awarded a total of **14 out of 20 marks**.