Commentary on candidate evidence

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

1 Aim

Example 1

The candidate was awarded **1 out of 1 mark** because they have provided an appropriate independent and dependent variable.

Example 2

The candidate was awarded **1 out of 1 mark** because they have provided an appropriate independent and dependent variable.

Example 3

The candidate was awarded **1 out of 1 mark** because they have provided an appropriate independent and dependent variable.

Example 4

The candidate was awarded **1 out of 1 mark** because they have provided an appropriate independent and dependent variable.

Example 5

The candidate was awarded **1 out of 1 mark** because they have provided an appropriate independent and dependent variable.

Example 6

The candidate was awarded **1 out of 1 mark** because they have provided an appropriate independent and dependent variable.

2 Underlying biology

Example 1

The candidate was awarded **1 out of 3 marks** for ‘Enzymes are made from proteins which are made from amino acids joined by peptide bonds’.

There is insufficient expansion of the first sentence. The candidate has not indicated that the enzyme remains unchanged.

There is also insufficient expansion of ‘they become denatured’. They have not indicated the meaning of the term ‘denatured’.

The term ‘most active’ is the correct description rather than enzymes ‘most efficiently’.

Example 2

The candidate was awarded **0 out of 3 marks**. There is insufficient expansion of any of the statements made by the candidate. Simple statements without giving depth of knowledge are not sufficient.

Example 3

The candidate was awarded **1 out of 3 marks**. 1 mark was awarded for the first two bullet points together – expanded description of enzymes being produced by every living cell.

There are no labels on the diagrams to indicate active site, enzymes, substrate, products.

Example 4

The candidate was awarded **0 out of 3 marks**.

The statement ‘most active’ is the correct description rather than enzymes ‘work best’.

The statement ‘will become denatured or the rate of reaction will decrease’ offers two options, but only one of which is correct.

Example 5

The candidate was awarded **3 out of 3 marks**.

1 mark was awarded for the description of fermentation.

1 mark was awarded for the ‘enzymes aid the process of fermentation’ and the expanded description of enzymes.

The aim refers to ‘increasing temperature’. The candidate states that at low temperatures, ‘enzyme activity will be slower’, without describing why. The statement ‘at around 40°C an enzymes activity is optimal and so the reaction will happen fastest’ doesn’t explain what is meant by optimal, in that, the enzyme would be most active at 40°C. The candidate also suggests that after 40°C the ‘active site of the enzyme will change shape and will no longer work with its substrate’. There is no explanation as to why it will no longer work (no reference to the substrate no longer being able to fit the enzymes active site, which would also explain why the reaction stops). However, considering these minor errors; there is sufficient information on enzymes overall, to award 1 mark.

3 Data collection and handling

3(a) A brief description of the approach used to collect experimental/fieldwork data.

Example 1

The candidate was awarded **0 out of 1 mark** because they have indicated that the disc will rise then fall, rather than fall then rise.

Example 2

The candidate was awarded **0 out of 1 mark** because it is not clear from the candidate's description how the foam was produced, ‘I put some pH in a boiling tube’.

Example 3

The candidate was awarded **1 out of 1 mark** because they have clearly stated that they will alter pH, using ‘different pH buffers’, and measure ‘height of foam’ with sufficient detail to be able to visualise the nature of the experiment.

Example 4

The candidate was awarded **1 out of 1 mark** because they have clearly stated that they are altering the ‘different temperatures’ and measuring ‘height of froth’ with sufficient detail to be able to visualise the nature of the experiment.

Example 5

The candidate was awarded **0 out of 1 mark** because they have stated that they are altering the ‘different pHs’ and measuring ‘height of froth’, but they are **not** including sufficient detail to be able to visualise the nature of the experiment, in that, there is no mention of source of the enzyme.

Example 6

The candidate was awarded **1 out of 1 mark** because it is clear from the candidate's description that two test tubes have been set up, each containing a yeast suspension, glucose solution and detergent (one tube and its replicate). What the candidate did can be visualised.

Example 7

The candidate was awarded **0 out of 1 mark**.

They give a list of different types of tissue used 'carrot, apple, potato and liver' and the volumes and concentrations of the hydrogen peroxide used. The candidate has not demonstrated the ability to summarise the method.

3(b) Sufficient raw data from the candidate's experimental work.

3(c) Data presented in a correctly produced table.

3(d) Data presented in a correctly produced table.

Example 1

The candidate was awarded **3 out of 3 marks**.

They have provided sufficient raw data from their experimental work.

Data has been presented in a correctly produced table. (The heading vegetable sources matches with the aim).

They have correctly calculated the averages (and has been consistent with the rounding of the averages).

Example 2

The candidate was awarded **1 out of 3 marks**.

For 3(b), 1 mark was awarded for sufficient range and repeats.

For 3(c), 0 marks were awarded because the heading 'time taken' is unclear. It does not state what the time was taken for, and is therefore not acceptable as a clear heading.

Example 3

The candidate was awarded **3 out of 3 marks**.

For 3(b), the candidate has provided sufficient raw data from their experimental work, one repeat is the minimum requirement.

For 3(c), data has been presented in a correctly produced table.

For 3(d), the candidate has correctly calculated the averages, and the correct units have been provided next to each of the calculated averages.

Example 4

The candidate was awarded **2 out of 3 marks**.

For 3(b), 1 mark was awarded for sufficient raw data and range.

For 3(c), 1 mark was awarded. The candidate has written units in each box as opposed to in the heading, which is acceptable.

For 3(d), 0 marks was awarded because the averages are incorrectly calculated.

Example 5

The candidate was awarded **1 out of 3 mark**.

For 3(b), 1 mark was awarded for sufficient range and repeats.

For 3(c), 0 marks were awarded. The candidate has used an overarching heading (height of foam) that incorrectly includes temperature. Units are also incorrect for temperature.

For 3(d), 0 marks were awarded. The average value for 80^0C has been rounded incorrectly.

3(e) Data/information relevant to the aim from an internet/literature source.

3(f) A reference for the source of the internet/literature data or information.

Example 1

The candidate was awarded **1 out of 2 marks**.

For 3(e), there is insufficient evidence to establish the relevance to the aim. The candidate has not included a supporting statement that indicates the link between

catalase and the time taken for the immobilised balls to fall and rise to the surface.

It would be good practice to provide a supporting statement to indicate a link between the data included and its relevance to the aim.

For 3(f), the reference is sufficient as the candidate has provided a full URL.

Example 2

The candidate was awarded **1 out of 2 marks**.

For 3(e), there is insufficient evidence to establish the relevance to the aim.

The candidate has not included a supporting statement that indicates the link.

There is nothing in the data provided here to link the pH and rate of reaction to an enzyme.

It would be good practice to provide a supporting statement to indicate a link between the data included and its relevance to the aim.

For 3(f), the reference is sufficient as the candidate has provided a full URL.

Example 3

The candidate was awarded **2 out of 2 marks**.

For 3(e), 1 mark was awarded. The data provided illustrates the trend or pattern expected in the experimental data.

For 3(f), 1 mark was awarded – a full URL is given.

Example 4

The candidate was awarded **1 out of 2 marks**.

For 3(e), 1 mark was awarded – although ‘Rate of reaction’ alone is unacceptable, the supporting information in the top right corner makes the data relevant to the aim, and the data provided illustrates the trend or pattern expected in the experimental data.

It would be good practice to provide a supporting statement to indicate a link between the data included and its relevance to the aim.
In this example the aim refers to a specific enzyme, but the data from research is a generic graph showing the effect of temperature on the rate of an enzyme – controlled reaction.

For 3(f), 0 marks were awarded – a page number is missing from the reference.

Example 5

The candidate was awarded **1 out of 2 marks**.

For 3(e), 0 marks were awarded – it is not clear why the data included is relevant to the aim and there is no supporting statement to explain the link between absorbance and enzyme activity, or that the vegetables were the sources of catalase.

For 3(f), 1 mark was awarded – full URL given.

4 Graphical presentation

Example 1

The candidate was awarded **4 out of 4 marks**.

They have:

- selected an appropriate graph format
- included appropriate scales
- included suitable labels and units, as indicated in their table
- have accurately plotted the data (which has been rounded correctly and consistently) with clear bar tops

Example 2

The candidate was awarded **3 out of 4 marks**.

They have:

- selected an appropriate graph format
- included appropriate scales; they have converted their data from cm to mm for the plotting of the data
- included suitable labels and units, as indicated in their table – although the candidate has written ‘high of foam’, it is clear that they are referring to ‘height of foam’

The candidate has not plotted the data accurately. The data for pH7, 9 and 11 is incorrectly plotted.

Example 3

The candidate was awarded **3 out of 4 marks**.

They have:

- selected an appropriate graph format
- included appropriate scales
- included suitable labels and units, as indicated in their table

The candidate has not accurately plotted all the data. The data for 40°C and 60°C is incorrectly plotted.

5 Analysis

Example 1

The candidate was awarded **0 out of 1 mark**.

The analysis of the candidate's own experimental results is incorrect – 'cucumber contained the smallest amount of catalase'.

There is insufficient comparison of the candidate's own experimental data and source data.

Example 2

The candidate was awarded **0 out of 1 mark**.

The analysis only refers to one source of data – the internet source. There is no comparison made between the experimental data and the data from the internet.

Example 3

The candidate was awarded **1 out of 1 mark**.

The candidate's analysis compares their experimental data with the data from the literature source. The candidate highlights the similarities and differences between them.

Example 4

The candidate was awarded **0 out of 1 mark**.

The candidate has not compared the similarities between their own experimental data and the data from the internet source. The candidate has not made the connection that the time taken for phenolphthalein to 'return colourless' was quickest at 40°C, and that both sets of data have the same trend.

6 Conclusion

Example 1

The candidate was awarded **1 out of 1 mark** because they have given a suitable conclusion that relates to the aim and in both sets of data, beef was shown to be the tissue where catalase was most active. The candidate has made the correct link between the height of foam and catalase activity.

Example 2

The candidate was awarded **0 out of 1 mark**.

The conclusion given is a restatement of the candidate's experimental data, and the last statement is incorrect, the enzyme was still active at 55°C (it had not become denatured).

Example 3

The candidate was awarded **0 out of 1 mark**.

The conclusion given is a restatement of the candidate's experimental data. The candidate's experimental data does show that pH 7 is 'the best pH for enzymes to work'. However, the candidate has not commented on the differences between their data and the data from research. The data from research shows that at pH 7 the time taken for the reaction to reach completion took the longest and that pH 5 and pH 6 were the quickest.

7 Evaluation

Example 1

The candidate was awarded **0 out of 2 marks**.

A factor has not been identified and the candidate has not provided a suitable explanation for an identified factor.

Example 2

The candidate was awarded **0 out of 2 marks**.

A factor has not been identified. Using controls would not have a significant effect on the results and they would ensure validity not reliability.

Example 3

The candidate was awarded **1 out of 2 marks**.

The factor identified by the candidate is the difficulty in measuring the height of the foam.

Repeating the experiment is not an acceptable improvement as the candidate instructions for the research stage states that ‘You must obtain repeat measurements’.

Example 4

The candidate was awarded **1 out of 2 marks**.

The factor the candidate has identified is the accuracy of the volume of hydrogen peroxide measured.

The second mark is not awarded as they have incorrectly stated that using a beaker would give a more accurate measurement of volume than a measuring cylinder.

Example 5

The candidate was awarded **2 out of 2 marks**.

The factor the candidate has identified is that the mass of the potato pieces may not have been constant.

The candidate has correctly stated that using a balance to keep the mass the same each time would minimise this.