

Commentary on candidate evidence

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

Candidate 1

1 Aim

The candidate was awarded **1 out of 1 mark** because the aim describes clearly the purpose of the investigation.

2 Underlying environmental science

The candidate was awarded **2 out of 3 marks** because a reasonable understanding of relevant environmental science is demonstrated, at a depth appropriate to National 5. This includes the purpose and NPK (nitrogen, phosphorus and potassium) composition of commercial fertilisers, potential for eutrophication, and minimising the entry of fertilisers into waterways. This could have been improved by more in-depth discussion of eutrophication and its impact on aquatic organisms.

3 Data collection and handling

The candidate was awarded **3 out of 6 marks**. The marks were awarded as follows:

- 3(a) **1 out of 1 mark** was awarded because although succinct, the overall experimental procedure can be visualised.
- 3(b) **0 out of 1 mark** was awarded because insufficient raw data have been collected from the experiment. It would have been appropriate to repeat the counts for each sample.
- 3(c) **1 out of 1 mark** was awarded because the data, including derived values, are displayed appropriately in the table.
- 3(d) **1 out of 1 mark** was awarded because the average number of cells present was calculated for both samples.

The candidate has converted the number of cells in 0.02 mm^3 into the number of cells in 1 cm^3 but has not provided a formula (number of cells $\times 50 \times 1000$) or working to indicate how this was done. This calculation is therefore disregarded.

- 3(e) **0 out of 1 mark** was awarded because no data/information relevant to the aim from an internet/literature source is included in the report.

While there is mention of the NPK ratio in commercial fertilisers, this is not relevant in the context of the investigation since the individual nutrients are not part of the experiment.

- 3(f) **0 out of 1 mark** was awarded because of the omission of data/information relevant to the aim from an internet/literature source.

Three correctly presented URLs relate to the underlying science, not the source of secondary data.

4 Graphical presentation

The candidate was awarded **2 out of 4 marks**. The marks were awarded as follows:

- 4(a) **0 out of 1 mark** was awarded because a line graph is not an appropriate format for counted data; a bar graph would be appropriate for such data.
- 4(b) **1 out of 1 mark** was awarded because the axes of the graph have suitable scales, with box numbers as categories on the x -axis in place of a scale.
- 4(c) **1 out of 1 mark** was awarded because the axes of the graph have suitable labels.
- 4(d) **0 out of 1 mark** was awarded because the lack of minor gridlines makes it difficult to check the accuracy of plotting.

5 Analysis

The candidate was awarded **0 out of 1 mark** because the omission of secondary data/information means a comparison is not possible, and a statement to explain why a comparison cannot be made is not provided.

6 Conclusion

The candidate was awarded **1 out of 1 mark** because a valid conclusion relating to the aim and supported by all the data/information in the report is included.

7 Evaluation

The candidate was awarded **2 out of 2 marks** because a confounding factor has been identified (fertiliser increased the number of cells present), and further investigation into which nutrient is responsible is needed.

8 Structure

The candidate was awarded **2 out of 2 marks**. The marks were awarded as follows:

8(a) **1 out of 1 mark** was awarded because the report has an informative title.

8(b) **1 out of 1 mark** was awarded because the report is clear and concise.

Overall

The candidate was awarded a total of **13 out of 20 marks**.

Candidate 2

1 Aim

The candidate was awarded **1 out of 1 mark** because the aim describes clearly the purpose of the investigation.

2 Underlying environmental science

The candidate was awarded **1 out of 3 marks** because they have demonstrated only a limited understanding of the underlying environmental science. There is no attempt to explain why the spinach discs would float, and although there is an attempt at collision theory, there is little apparent understanding of it.

The candidate has taken some information from an internet source but not expressed it in their own words nor credited the source.

3 Data collection and handling

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

- 3(a) **1 out of 1 mark** was awarded because the nature of the experiment can be visualised.
- 3(b) **0 out of 1 mark** was awarded because the experimental data are insufficient, due to only two temperatures being tested. At least three temperatures should be tested in order to determine a trend.
- 3(c) **0 out of 1 mark** was awarded because although columns 1-7 are correct, the 'average' data are separate to the time heading.
- 3(d) **1 out of 1 mark** was awarded because the average values are correctly calculated.
- 3(e) **1 out of 1 mark** was awarded because the data from the internet/literature source is relevant to the experiment, illustrating a trend expected in the experimental data.
- 3(f) **1 out of 1 mark** was awarded because a reference for the source of the internet/literature data is provided.

4 Graphical presentation

The candidate was awarded **1 out of 4 marks**. The marks were awarded as follows:

- 4(a) **0 out of 1 mark** was awarded because a bar graph is not appropriate in this instance; when measuring temperature against time, a scatter graph would be appropriate. However, temperature has been treated as a discrete variable rather than continuous.
- 4(b) **0 out of 1 mark** was awarded because the use of a common zero suggests the x -axis scale starts at 0 when it is not relevant here.
- 4(c) **0 out of 1 mark** was awarded because the y -axis label does not indicate that the plotted data are average values. The individual bars have been labelled but use of a key and appropriate shading or symbols would have been more appropriate.
- 4(d) **1 out of 1 mark** was awarded because the data are accurately plotted.

5 Analysis

The candidate was awarded **0 out of 1 mark** because the experimental data have not been compared with the data from the internet.

6 Conclusion

The candidate was awarded **0 out of 1 mark** because the conclusion does not state **how** photosynthesis is affected by temperature.

7 Evaluation

The candidate was awarded **1 out of 2 marks** because although a factor linked to experimental procedure is identified, the suggested method to minimise it is too vague. In addition, use of 'accuracy' is incorrect in this context.

8 Structure

The candidate was awarded **1 out of 2 marks**. The marks were awarded as follows:

- 8(a) **0 out of 1 mark** was awarded because the title is not sufficiently informative, making no reference to photosynthesis or temperature.
- 8(b) **1 out of 1 mark** was awarded because the report is clear and concise.

Overall

The candidate was awarded a total of **9 out of 20 marks**.

Candidate 3

1 Aim

The candidate was awarded **1 out of 1 mark** because the aim describes clearly the purpose of the investigation.

2 Underlying environmental science

The candidate was awarded **1 out of 3 marks** because a limited understanding of the underlying environmental science is demonstrated. The description of hydroelectric generation and fuels are basic, and CO₂ is spelt incorrectly.

3 Data collection and handling

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

- 3(a) **1 out of 1 mark** was awarded because the nature of the experiment can be visualised from the brief description.
- 3(b) **1 out of 1 mark** was awarded because the raw data are sufficient.
- 3(c) **0 out of 1 mark** was awarded because the headings and units are missing from columns 2-5 in the table.
- 3(d) **0 out of 1 mark** was awarded because there is an error in the mean calculation for 10 cm height.
- 3(e) **1 out of 1 mark** was awarded because an appropriate second source is provided. Although it was not clear the candidate understood the second source, the data on it are appropriate.
- 3(f) **1 out of 1 mark** was awarded because the weblink for the second source of data/information is given in the report.

4 Graphical presentation

The candidate was awarded **3 out of 4 marks**. The marks were awarded as follows:

- 4(a) **1 out of 1 mark** was awarded because a line graph is appropriate for the data.
- 4(b) **0 out of 1 mark** was awarded because there is an error in the y -axis scale.
- 4(c) **1 out of 1 mark** was awarded because the axes are correctly labelled. Although the units are not given, the labels are the same as the table, and the candidate has already been penalised for omitting units.
- 4(d) **1 out of 1 mark** was awarded because the graph is correctly plotted. The error in the y -axis scale does not affect the plotting in this instance.

5 Analysis

The candidate was awarded **1 out of 1 mark** because the candidate compared the two sets of data correctly.

6 Conclusion

The candidate was awarded **0 out of 1 mark** because the conclusion relates to electricity rather than power generated, which is stated in the aim.

7 Evaluation

The candidate was awarded **2 out of 2 marks** because the candidate identified a possible error (water flow) and stated how this was countered.

8 Structure

The candidate was awarded **2 out of 2 marks**. The marks were awarded as follows:

- 8(a) **1 out of 1 mark** was awarded because the report has an informative title.
- 8(b) **1 out of 1 mark** was awarded because the report is clear and concise.

Overall

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