Commentary on candidate evidence

Candidate 2

Investigating the effect of alcohol concentration on the activity of alpha amylase

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

Section		Mark awarded	Comments on project report
1.	**Abstract (1 mark)** A brief abstract stating the main aim(s) and overall findings/conclusion(s).	1/1	The abstract follows the contents page. The aim and findings are stated. Although the findings refer to starch hydrolysis rather than the activity of the enzyme (alpha amylase), it is made clear that the enzyme is responsible for the hydrolysis of starch, therefore this is acceptable. The findings are consistent with the conclusion. **1/1**
2.	**Introduction (5 marks)** a) A clear statement of aim(s) together with relevant hypotheses.	1/1	The aim and a relevant hypothesis are both clearly stated.
	b) An account of the underlying biology, with justification of the biological importance of the project. ♦ The account of underlying biology is relevant. ♦ Biological terms/ideas are explained clearly and accurately.	3/4	The information given is relevant as it is linked to the aim. It is clear and coherent with most ideas explained accurately. Some of the information is at an appropriate depth. However, it would benefit from some expansion on the details of inhibition and more about how alcohol affects enzymes, including

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	♦ Biological terms/ideas are at an appropriate depth. ♦ The biological importance is justified.		amylase. Given the aim of the project, concentration effect should also have been considered. The candidate fails to recognise the difference between alcohol effects *in vivo* and *in vitro.* A reasonable justification is given, however, this could have been more clearly linked to amylase. **4/5**
3.	**Procedures (9 marks)**		
	a) Procedures are appropriate to aim(s).	1/1	
	b) Procedure(s) described in sufficient detail to allow the investigation to be repeated.	2/2	The procedures could be followed by the descriptions given, but these are overly wordy in places. The description of how the alcohol solutions were obtained could have been clearer. It would have been helpful to know the source of amylase, but it was not essential. The use of tables to support the text is appropriate in this instance.
	c) Appropriate controls are identified.	0/1	Although a negative control was used ie, tube 6 (no alcohol), this is not identified as being the negative control. Tube 9 is incorrectly identified as the negative control, when it is actually missing both alcohol and the enzyme.
	d) Control of confounding variables is described.	1/1	There was good control of temperature using a water bath, pH using buffers and concentration by utilizing different pipettes. The colorimeter was zeroed correctly.

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	e) Sample size is appropriate.	1/1	Four repeats per alcohol concentration is an appropriate sample size.
	f) Independent replication is described and a separate data set(s) is provided.	1/1	A description is given of how independent replication was carried out and a separate data set is provided (replicate 2).
	g) Justification of how the pilot study informed the final procedure(s).	1/1	Very good justification, with evidence, of how the pilot study was used to determine the correct volume and concentration of enzyme, and the appropriate sample size. However, the extensive description given is not required.
	h) Procedures show complexity, creativity or accuracy.	1/1	The organisation and management of a large number of solution combinations, adds an element of complexity to the protocol. The importance of stopping the reaction to improve the accuracy of the measurements has been considered. **8/9**
4.	**Results (6 marks)**		
	(a) Data is relevant to the aim(s).	1/1	
	(b) Raw data is recorded and within the limits of accuracy of measurement.	1/1	The raw data is provided in the appendix. The data is within the limits of accuracy of the measuring instrument.
	(c) Results presented appropriately.	1/1	The tables and line graphs are appropriate for the data.
	(d) Overall results calculated and presented.	1/1	Overall average values have been calculated and presented as a graph (figure 3.5) and supported by an appropriate table (figure 3.4).

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	(e) Presentation of tables and graphs is correct and accurate. ♦ Tables are of sufficient quality - headings/units and correct mean/average values.	1/1	The table headings are clear and the units are correct. Units are not required for absorbance readings. The mean values are calculated correctly. All three tables (figures 3.0, 3.2 & 3.4) could have been combined to present the data.
	♦ Graphs are of sufficient quality - scales/labels/units/clarity and accuracy of plotting.	1/1	Scales, labels and units are correct. The mean values are plotted accurately. The range bars are not considered at this point. **6/6**
5.	**Discussion (conclusion(s) and evaluation) (7 marks)** (a) Conclusion(s) relevant to the aim(s) and supported by data in the report.	1/1	The conclusion relates to the aim and is supported by the data in the report. Although the indirect measurement (absorbance) is referred to, reference is also made to the enzyme activity (dependent variable).
	(b) Conclusion(s) is valid.	1/1	The conclusion is valid, as an appropriate method was used, variables were controlled adequately and there is evidence of repeatable results from sufficient replication and sample size. Although the mark for 3(c) was not awarded, there is no penalty here, as a correct negative control was included.

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	(c) Evaluation of procedures with justification on: ♦ means by which accurate measurements were achieved/sources of error in measurement and their impact on the results ♦ why the sample size was appropriate and how independent replication was achieved ♦ how the controls contributed to the overall validity of the investigation ♦ how confounding variables were controlled or monitored and their impact on the validity of results ♦ solutions to problems and reasoning behind modifications to procedures in light of the pilot study	1/2	The candidate has provided a weak evaluation of the following aspects of their procedures, with justification: ♦ how independent replication was achieved and why this was important ♦ why the control treatment (tubes without ethanol) contributed to the validity ♦ the use of a water bath to maintain a constant temperature and why this was necessary ♦ solution to the problem in the preparation of the starch solution found in the pilot study
	(d) Results analysed and interpreted, and findings discussed critically and scientifically, including: ♦ analysis of results ♦ interpretation of results ♦ critical and scientific discussion of the finding(s)	1/3	1 mark was awarded for a good critical discussion of one area - analysis of results. **4/7**

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6.	**Presentation (2 marks)** (a) Appropriate structure, with informative title, contents page and page numbers.	1/1	
	(b) References cited in the text and listed using a Harvard or Vancouver referencing system.	0/1	A Harvard referencing system has been used. Three references are cited but only the first is listed correctly. The other two are missing some of the required information. A number of correctly listed references are not cited in the report. **1/2**
			Total 24/30