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Examiners' Report June 2010

GCE Biology 6BI07

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Introduction

In this, the third of these alternative to coursework papers it was apparent again that some candidates are suffering through having little familiarity with the experimental work done, i.e. the core practicals. However, the general impression of examiners was that this problem was less widespread this time with this particular practical.

As the skills associated with the production of a visit/issue report are examined, teachers and students will become aware of what these skills are, but a quicker way would be to look at the criteria on page 80 of the specification (Issue 3). It was noticed by examiners that few knew much about writing a proper bibliography, hopefully from next year they will.

Question 1(a) (i)

This enzyme practical was reasonably well known by some but some of the more general aspects of experimental design and execution were not so solid.

(a) (i) A large proportion of candidates were able to gain all 4 marks on this relatively simple first question. A small minority had no idea what to put. A larger group suggested that enzyme concentration should be kept constant, when this is clearly the IV. What to write for a value is then became a problem, but some, like the one shown, ignored this problem and put a range.

By far the most common reason for loss of marks, though, was missing the specific instruction in the question to suggest a value, rendering a possible range of values (such as “between 8 and 12” or “over 7”) inappropriate.

Another difficulty was that a substantial number of candidates failed to notice that a specific temperature at which savinase worked best was given (55 C) and that the pH should be ‘alkaline’. Suggestions of “around 25 C”, “54-55” or “room temperature” did not score any marks.

(a) (i) Using the information given, name **two** variables that should be controlled in this experiment. For each, suggest a suitable value for the variable.

(4)

Variable 1 Temperature at which the enzyme is placed in should be controlled using a thermometer.

Value Between 54 - 55 °C

Variable 2 Amount of water should remain constant for each test to show accuracy. Pipette can be used for better accuracy.

Value 250 ml of water distilled.



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Examiner Comments

A range of values is not acceptable if the questions asks for ‘a suitable value’. The best value (55 C) is given in the stem.

(a) (i) Using the information given, name **two** variables that should be controlled in this experiment. For each, suggest a suitable value for the variable.

(4)

Variable 1 The temperature of the surroundings

Value 50°C

Variable 2 pH

Value 1-5



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Examiner Comments

This answer gives a range of values for pH, which also happen to be wrong (the stem states that the enzyme works best in alkaline conditions).



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Examiner Tip

Always read every detail of the information provided, it is there for a purpose. In addition, take note of the precise requirements of a question.

Question 1(a) (ii)

This question was quite well done with many gaining full marks. However, many candidates did not take notice of the information given and thus failed to discuss the possibility of savinase causing blisters or of the fact that problems of “enzyme dust” are addressed by coating it in wax. Therefore, answers tended to be rather unspecific in terms of the risk identified. Many thought that 55 C is a high enough temperature to warrant special precautions.

Question 1(b) (i)

The majority of candidates were able to calculate the correct answer here but quite a few then failed to quote their answer in a satisfactory way. Thus, the only acceptable answer was 236 as this is consistent with the means already given, that is, no decimal places.

Question 1(b) (ii)-(iii)

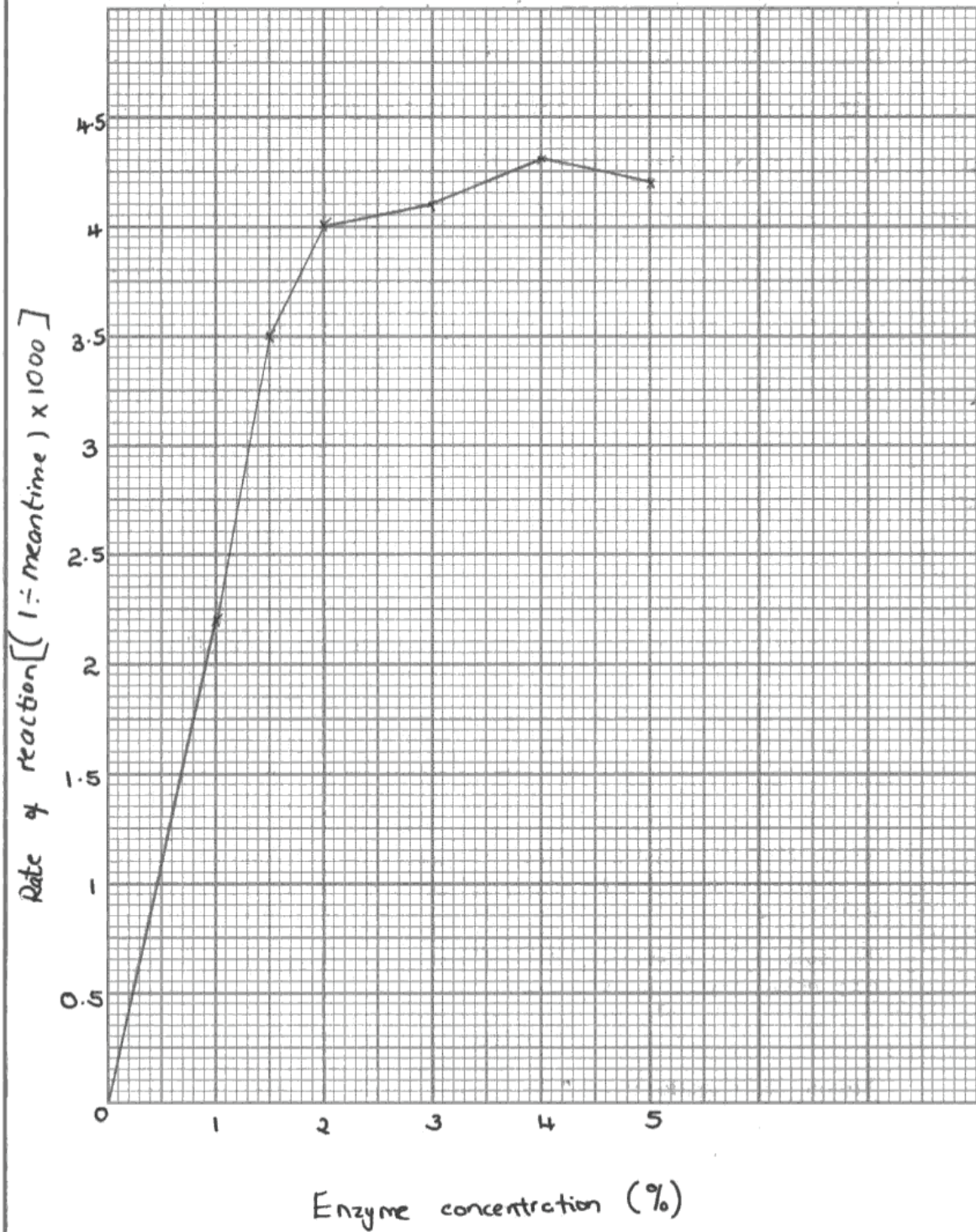
The graph was generally well plotted with hardly any bar charts. Axes were usually correctly labelled but units (for enzyme concentration it was % and for 'rate' $1/\text{mean time} \times 1000$) were quite often missed and this lost a mark. Plotting was usually accurate, but a substantial minority failed to realise that 0, 0 was to be plotted, a fact strongly hinted at in the stem.

When it comes to the line, many drew a dot to dot with a ruler which was accepted, as was a suitable line of best fit. The most common mistake here was to draw a hybrid between these two, dot to dot, but freehand.

Candidates should be urged to plot points clearly, preferably as an x, as it is often difficult to see if they just put a small dot, and then draw a line through it.

At an enzyme concentration of 0.0% the value for $1/\text{mean time}$ is 0.
Present this information and the data in Table 2 in a suitable graphical form.

(4)



(iii) Describe and explain the shape of the graph you have plotted in (b)(ii).

(3)

From 0 to 1.5% there is a rapid increase in the rate of reaction. From 1.5% to 2% the rate of reaction is still on an increase however it is ~~very~~ not very rapid. From 2% to 4% there is an increase in the rate of reaction however the increase is not as much as compared to 1.5% to 2%. From 4% to 5% there is a decrease in the rate of reaction as the enzymes are denatured.



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Examiner Comments

This graph is correct and gains all 4 marks, however, it suffers from the fact that the device used to plot a point is a dot (in some cases) which is hard to see. Candidates should be urged to plot points using a cross or, if they use a dot, to circle it.

In biii the answer gives a rambling, blow-by-blow account of the graph plotted which gains no marks. No explanation is given.



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Examiner Tip

When describing graphs always look for the 'big picture' and do not talk about every minor detail. Do not interpret small changes (like the minor fall at the end here) as to do with anything other than experimental error unless you think there is definite biological reason for it.

Question 1(b) (iv)

This was badly done. The most common mistake was to think that repetition improves reliability rather than allowing one to get a measure of it. 'These data were reliable because they were repeated 12 times' and 'one concentration was not so reliable as it was only repeated 9' were very common, but erroneous, ideas.

In the same vein, many think that calculating a mean average somehow leads to reliability. Another misconception was that the range of enzyme concentrations somehow affected reliability. Some thought there were too few, some thought the fact that the intervals between concentrations were not equal was of relevance here.

Many wrote about accuracy and validity without any reference to the subject of the question, reliability.

Thus, few commented on the wide range of data in the replicates at all concentrations (indicating rather low reliability), but the smaller range at some (indicating greater reliability of data in some cases) and the relatively smaller number of measures at one (which makes the measure of reliability at this concentration slightly less useful). Comments about anomalies or outliers were also credited but were rarely seen.

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(iv) Using the information in Table 1, comment on the reliability of these data.

(2)

The reliability is very good, since the experiment was carried out twelve times (12) and the mean time value was calculated, this ensured accuracy in the experiment.



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Examiner Comments

This is an example of a common type of answer in which reliability is thought to come from repetition rather than being measured by it, that the calculation of an average helps us assess reliability and that accuracy is somehow involved.



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Examiner Tip

Repeating a measurement does not make it more reliable (or accurate or precise for that matter) but allows one to get an idea of how reliable the measurements are.

Question 1(b) (v)

This question proved to be very challenging, although a generous mark scheme ensured that quite a few candidates achieved one for stating that there was a best concentration. Many, however, still failed this simple test and stated that more enzyme gives a better result.

It was worrying that a good number of candidates did not seem to realise that all the information that they had just worked through should be brought to bear on this final question, even though the stem makes this very clear.

- (v) Suggest conclusions that the student could make about efficiency and cost effectiveness when using this enzyme in a biological washing powder.

(2)

The student should use a concentration of the enzyme at 4% as it gives the highest rate of reaction, ^{which is more efficient.} Also she should not use 5% as the rate of reaction is slightly lesser than in 4%. So it would be cheaper too to use 4% concentration and obtain the highest rate of reaction which is the effectiveness..

(Total for Question 1 = 20 marks)



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Examiner Comments

This is a good answer making the point that after 4% concentration of enzyme there will be extra cost but no improved performance. It was awarded full marks.

- (v) Suggest conclusions that the student could make about efficiency and cost effectiveness when using this enzyme in a biological washing powder.

(2)

The efficiency is more than the cost effectiveness when using this enzyme in a biological washing powder. The biological washing powder ~~will~~ might not be much costly, but the time spend to make it harmless and more effective is more.

(Total for Question 1 = 20 marks)



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Examiner Comments

This answer ignores all the data given in the previous parts of the question and just writes something very general about enzymes, as if this was a theory paper.

Question 2(a) (i)

This question followed a now established pattern with a passage which was an incomplete and flawed Visit/Issue report. Questions on the placing of information, the implications of the biology reported on, bibliographic conventions and data presentation techniques should be expected, amongst others.

(a) (i) This was done badly by a surprisingly large number of candidates, who fell, broadly, into two groups. There were those who tried to come up with a newspaper type headline, which will always be inappropriate in a science paper. Then there those who were too vague about the years covered by the table and did not include it clearly in the title they devised. The example below falls foul of both errors.

- (a) The student's teacher suggested that the report needed some data and graphs to illustrate some of the points. The student did a web search and found two sources of information: the International Union for the Conservation of Nature (IUCN) and Wikipedia.

He put this information in the following table.

Year	Number of species threatened worldwide	Source of information
1990	4477	IUCN red list 1996
1994	5929	IUCN red list 1996
1996	5205	IUCN red list 1996
2006	16118	Wikipedia article
2007	16306	Wikipedia article
2008	16928	IUCN leaflet released 2008

- (i) Suggest a suitable title for this table.

(1)

Threatened species worldwide



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Examiner Comments

This answer mentions neither the years over which the data were collected, nor is it very scientific.



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Examiner Tip

A paper will almost always mean a peer reviewed, scientific paper in a recognised journal, not a newspaper, which are not generally good sources of scientific information, nor the medium of choice for its initial reporting.

Question 2(a) (ii)

This question was frequently misread as saying 'evaluate these sources' and candidates were keen to point out the deficiencies of Wikipedia. Such discussions gained no marks. There is a wide range of possible ways to evaluate published sources listed in the mark scheme but answers which gained credit were almost entirely restricted to those which discussed cross checking. There was hardly any reference to peer review, which should be taught as part of How Science Works (specification, Issue 3, page 14, criterion 11).

(ii) Suggest how you would investigate the validity of these sources of information.

(2)

The information gained by the IUCN will be reliable as it is an international body which is responsible. Although the information can be cross-checked by visiting the IUCN website or by contacting an official.

The results obtained from Wikipedia is not reliable as it is an open source website where anybody can post articles. It could be cross checked by visiting Wikipedia and consulting the admins on reliability.



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Examiner Comments

This answer evaluates Wikipedia and the IUCN website, which was not asked for. The idea of cross checking did get it one mark but the idea of doing this via 'an official' was not worth the second mark.

Question 2(a) (iii)

Most were able to gain two marks here, by saying that, no it did not support the statements on the lines, as it shows a rise in the number, whereas the passage discusses the idea that the work of Branston and zoos like it has lead to a drop. The third mark, for pointing out the fall in some of the years that the data covers was rarely given.

- (a) The student's teacher suggested that the report needed some data and graphs to illustrate some of the points. The student did a web search and found two sources of information: the International Union for the Conservation of Nature (IUCN) and Wikipedia.

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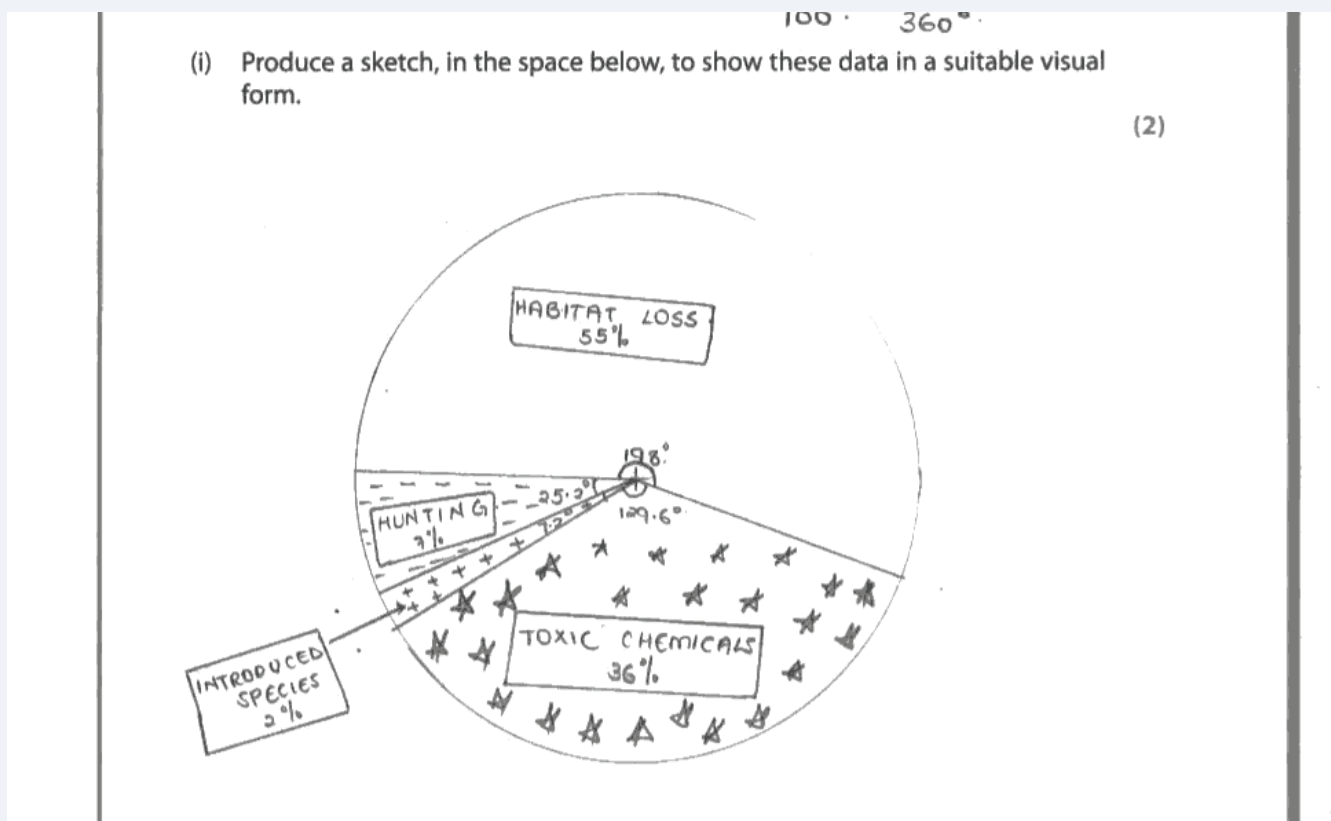
Examiner Comments

The candidate achieves all the marks here by commenting on the lack of a fit between the statements in the report and the table of data given. This was worth 2, but it goes on to point out that there was fall between certain years to gain the third mark.

Question 2(b) (i)

A not insignificant number of candidates took the word sketch to mean sketch a drawing rather than make a sketch graph. This is something they need to be helped with.

On the other hand, most candidates were able to gain both marks as a rough sketch of a pie graph or bar chart was all that was needed.

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Examiner Comments

A very clear pie chart, or bar chart, as here was all that was needed for two marks in this question.

Question 2(b) (ii)

Most students seemed to have the right idea here but some found it very difficult to express themselves clearly enough to gain all three marks.

Weaker answers tended to go on and discuss all the aspects of the suggestions made in lines 30-39, and compared them with the data in the table in question

- (ii) Does the information in the table on page 12 show that the majority of people would agree with the views expressed in lines 30-39? Explain your answer.

(3)

Yes. As many households of 55% said that the loss of species is due to loss of habitats. Also it states that most of the money is used to protect the habitats. And from line 35-39, the article states that money should be spent to protect habitats, fund anti-hunting patrols and etc. As a majority of people have said preserving habitats of 55% and another 7% of anti hunting, the majority of people would agree.



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Examiner Comments

This is one of the rarer three marks answers which clearly states that there is a case for agreement and goes on to point out that the data supports the view that the majority (i.e. 55%) would likely agree with the view:

'establishing protected reserves: animals should be kept as near as possible to their natural habitat' (from lines 33-34 of the report).

Question 2(c)

This question carried a high proportion of marks, reflecting the importance of the report writing skills tested in this question. Sadly it was quite badly done, considering that much of the information needed was in the earlier questions. All manner of interpretations were made, with many candidates trying to modify the existing bibliography rather than change it in the light of the new resources used. When it was understood that this was what was needed candidates still found difficulty in gaining marks as they were too imprecise in what they said. Reference to Wikipedia would not be enough, we would want to know the precise url (or web address), of the article, when it was visited, any authorship information etc. For the leaflet the nature of the resource and its date of publication were given in the table and we were looking for those to be included in the bibliography. Correct reference writing is an important skill under How Science Works and is clearly needed in a V/I report (Spec. Issue 3, page 80, assessment criterion 3). Many candidates thought a paper (referred to in Q 2) meant a newspaper, again the whole process of peer review and publication of papers in journals would seem to be a mystery to many.

(c) Suggest how the bibliography should be changed if these two tables of data used by the student were now included in the report.

(4)

Since the topic says, "Bridgton zoological park" the title should be changed first. So it should give an idea about the whole world. According to the thoughts, for ~~these~~ ^{it} species, ~~the~~ should be inserted between the lines 30-39.

The table which gives the number of species threatened worldwide should be inserted between the lines 10-13. Also, it has to be mentioned, that the values have changed and reasons for it. Such as the number of species in the area and in the world.



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Examiner Comments

This answer has completely missed the point of the question.

(c) Suggest how the bibliography should be changed if these two tables of data used by the student were now included in the report.

(4)

Several additions will have to be made in the bibliography e.g

→ Web search (IUCN red list 1996, IUCN leaflet released 2008, wikipedia articles)

→ Interview with 2000 people asking them their reasons for loss of species



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Examiner Comments

This answer refers to other sites, so is getting there, but it suffers in that it is not addressing the specific requirement of the question which asks for changes required as a consequence of the addition of the two tables of data.

In this answer the suggestion that reference should be made to the IUCN red list of 1996 and an IUCN leaflet of 2008 gained two marks but a vague statement such as 'Wikipedia article' is not markworthy, and neither is a vague reference to an interview. What was required was something along the lines of 'the precise Url (or web address) of the article in Wikipedia which contained the data, together with some detail such as when it was accessed' and details of the paper in which interviews with 2000 people was reported (date, journal title, author(s).)

Question 2(d)

A large number of candidates were not comfortable with the idea of implications, again reflecting, it is felt, an unfamiliarity with V/I report criteria. Again teachers and students are referred to page 80 of the specification, this time Assessment Criterion 2, specially the first 'box'.

A good number did identify the implication in di as being economic and gave a suitable explanation, but many then went on to discuss another economic explanation dii (when the question explicitly asked for another implication (that is, not economic again)).

In dii many were challenged to link together an implication (which had to be from the list given, but not economic, many did not realise this) with a line number and an explanation. The example shows one of the relatively few who were successful.

(d) The suggestions in lines 20–30 address implications of the conservation breeding approach to saving species. A visit/issue report is expected to address two implications: ethical, social, economic or environmental.

- (i) Give the **one** implication addressed in lines 20–30.
Explain your answer.

(2)

The economical implication is discussed due to its inefficient use in zoos, which are limited, instead of investing in natural habitats which would be more effective according to line 26. Restocking the wild is costly to the economy, and so is maintaining them.



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Examiner Comments

A good clear answer which gains all three marks)

Overall, the paper seemed to go about the same as previous years. The most important points the examiners would like to make in summary are that:

1. It is crucial that candidates have good experience of all nine core practicals, including doing them, or watching them being done in a demonstration, writing them up including proper analysis any data generated, and then having a chance for detailed discussion of the implications in relation to relevant criteria from How Science Works on pages 13 and 14 of the specification, as well as in other places, such as the criteria for AS on page 115.

2. In a similar vein they must be thoroughly familiar with the requirements of good visit/issue report, the crucial documents here are the specification on page 80, the performance criteria again, the three tutor support booklets for Unit 3 (all available on the EdExcel website) and previous examiners' reports for 6BI07.

A range of values is not acceptable if the questions asks for 'a suitable value'. The best value (55 C) is given in the stem. This graph is correct and gains all 4 marks, however, it suffers from the fact that the device used to plot a point is a dot (in some cases) which is hard to see. Candidates should be urged to plot points using a cross or, if they use a dot, to circle it.

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Grade Boundaries

Grade	Max. Mark	A	B	C	D	E	N
Raw boundary mark	40	26	23	20	17	14	11
Uniform boundary mark	60	48	42	36	30	24	18

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