

Examiners' Report June 2016

IAL Biology WBI03 01

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Introduction

There were some difficult questions on this paper on which many struggled to score significant marks. This was notably the case for 2bii, 2c, 2e and 1c. Detailed comments on these are made in this report. The very accessible questions were 2biii, 1bi, and 2bi.

As ever, advice remains to make sure that candidates are thoroughly familiar with all of the nine core practicals. This means the basic practical, as carried out or seen, together with all of the background theory and data analysis. WBI03 is a skills-based paper but knowledge is still needed in these areas. For Q2, it is very important, again as always, to make sure candidates are familiar with the requirements of the domestic visit/issue report on page 80 of the specification (Issue 6). This is currently still available at http://qualifications.pearson.com/content/dam/pdf/A%20Level/Biology/2013/Specification%20and%20sample%20assessments/9781446910702_GCE_Lin_Biology_Issue_6.pdf

Question 1 (a)

Answers must follow right through and give a full explanation. So 'Daphnia is transparent' is a useful comment but incomplete as an answer. See the examples below.

1 A student wanted to investigate the effect of alcohol on heart rate. He used water fleas (*Daphnia*), which are crustaceans, because studying this in humans has ethical difficulties.

(a) Suggest **one** practical and **one** ethical reason why *Daphnia* was chosen for this investigation.

(2)

Practical

The heart of the Daphnia can be seen easily and clearly ~~in a~~ through a microscope, making it easy to count the heart rate

Ethical

~~Daphnia~~ is a simpler organism with less ~~a~~ developed and sensitive nervous system thus will feel less pain, if any.



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Examiner Comments

It is correct to say that the ease of seeing the heart is a practical reason for choosing *Daphnia*. However, it is even easier to see a mammal heart, not even a microscope would be needed in most cases. The point here is that *Daphnia* is transparent.

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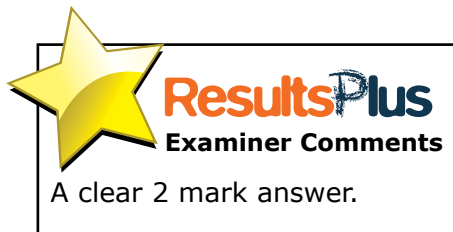
(2)

Practical

Daphnia is a transparent water flea so it is easy to see the heart rate and can take the results more easily.

Ethical

Daphnia does not have a ^{proper} nervous system so it does not feel any pain. So this is ethical.



1 A student wanted to investigate the effect of alcohol on heart rate. He used water fleas (*Daphnia*), which are crustaceans, because studying this in humans has ethical difficulties.

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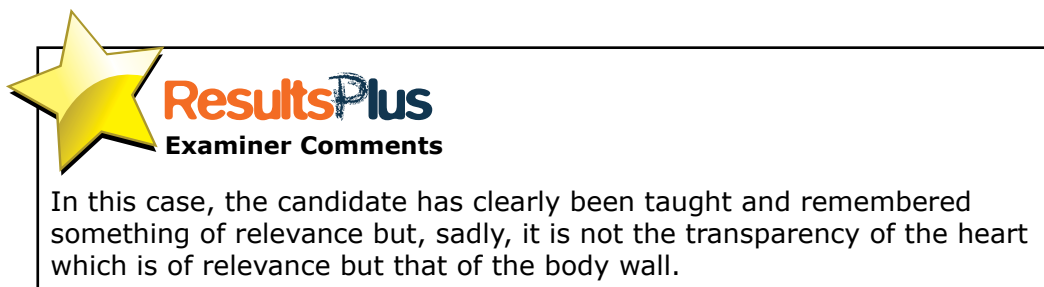
(2)

Practical

The heart of the daphnia is transparent and so easy to observe without the need for dissection. Daphnia is cheap.

Ethical

Daphnia is abundant in nature and also it is used as fish food and thus, anyway will die.



Question 1 (b) (i)

As mentioned in the general comments it is essential to read every word or every question carefully. For example 'Suggest a suitable temperature' means just that and suggesting a range will not do.

- (i) The student kept the temperature constant throughout the investigation.
Suggest a suitable temperature. Give an explanation for your answer.

(2)

Temperature $10^{\circ}-30^{\circ}\text{C}$

Explanation It is an ideal temperature, which is not too high or low, higher than ~~it~~ is considered the normal temperature for achieving the accurate heart rate. Above 30°C is considered Extreme below 10°C is very low.



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Examiner Comments

This answer gives a range of temperatures, which is not what was asked for.

- (i) The student kept the temperature constant throughout the investigation. Suggest a suitable temperature. Give an explanation for your answer.

(2)

Temperature 37°C

Explanation To make sure heart rate activity is constant through maintain a constant heart rate through out the investigation.



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Examiner Comments

37 °C is within the acceptable range on the mark scheme. However, the reason given is clearly not sensible as the whole point of the investigation is to look at changes in heart rate.

Question 1 (b) (ii)

Most candidates could come up with a sensible confounding variable, but fewer could suggest how to deal with it. A fairly common error was to suggest volume of solution as a variable.

- (ii) Name **one** variable, other than temperature, that should be controlled.

Describe how this variable could be controlled.

(2)

Variable

Age of Daphnia

How the variable could be controlled obtain the daphnia from one batch



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Examiner Comments

Age of Daphnia is fine, but the idea of "one batch" is too vague

(ii) Name **one** variable, other than temperature, that should be controlled.

Describe how this variable could be controlled.

(2)

Variable

~~PH~~ PH

How the variable could be controlled using a buffer



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Examiner Comments

Although brief, this is a perfectly acceptable 2 mark answer.

Question 1 (b) (iii)

This question was not at all well answered. It was simply about the idea of a control having to be in place and that the control must mirror all the features of the experimental treatment, apart from the IV.

(iii) Explain why *Daphnia* in the control group were transferred into fresh pond water after 30 minutes.

(2)

As the control group they have to follow the same experiment steps as the other group, in order to offer a valid comparison of results. They have to follow it under the same conditions.



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Examiner Comments

This is a rare 2 mark answer, only 6% of the entry achieved 2. The reference to comparisons and the idea of the same steps in both groups are there, although not well expressed.

(iii) Explain why *Daphnia* in the control group were transferred into fresh pond water after 30 minutes.

(2)

Daphnia in alcohol were also transferred into fresh pond water after 30 minutes. For a valid comparison, only one factor should be changed, which is the alcohol, thus all the *Daphnia* ~~should~~^{would} be treated in the same way except the factor being under demonstration.



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Examiner Comments

Another good, but rare, 2 mark answer.

(iii) Explain why *Daphnia* in the control group were transferred into fresh pond water after 30 minutes.

(2)

Because fresh pond water is their natural habitat ~~so they can return to their basal heart rate.~~ ~~so their basal heart rate can be counted as a control.~~ Fresh pond water does not change their basal heart rate so it is control. Also their ~~stress~~ stress reduced ^{in pond water.} ~~and also~~



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Examiner Comments

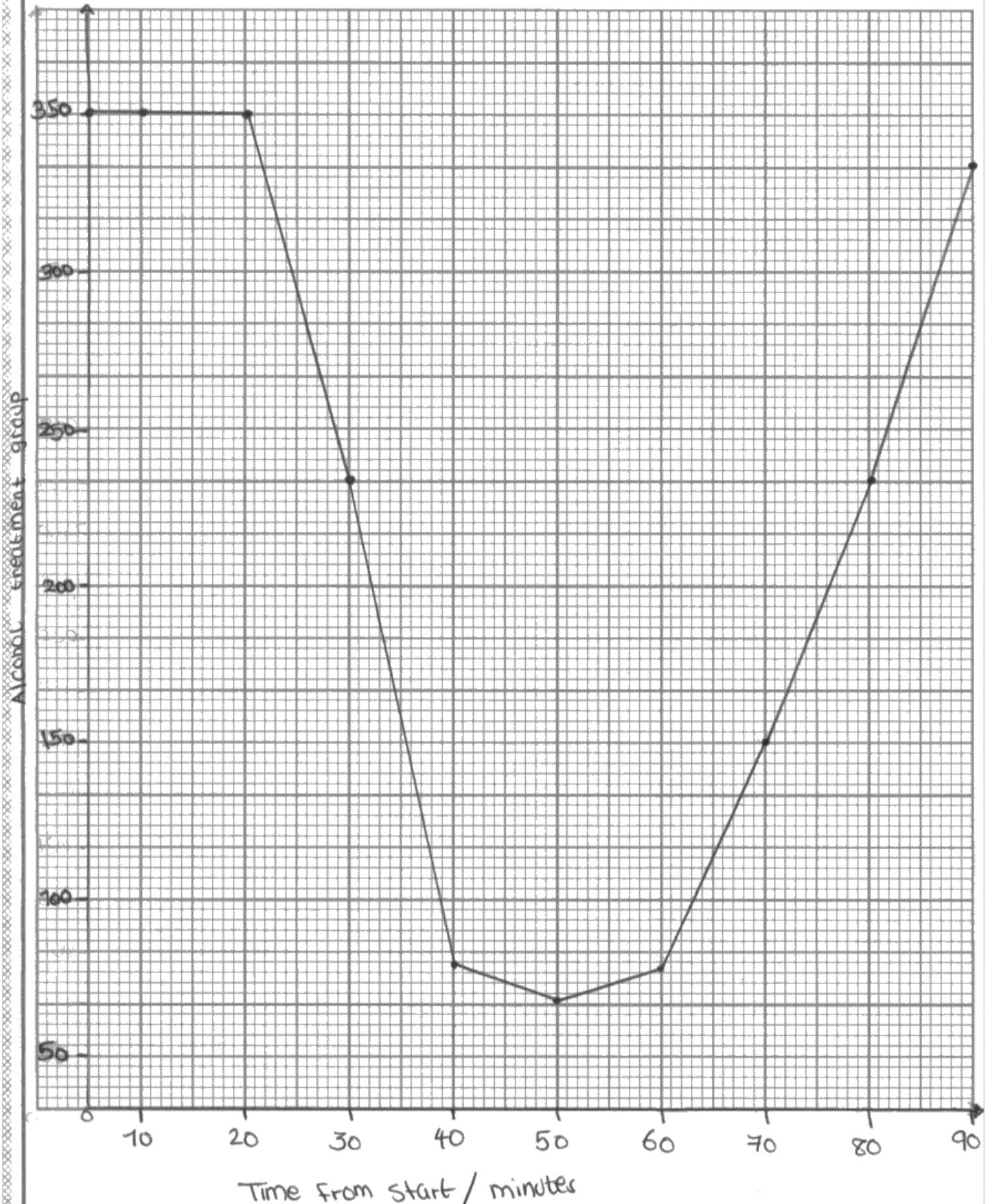
Quite a number of answers made vague guesses, as here.

Question 1 (c) (i)

This question was well answered with over 70% achieving 4 marks.

- (i) Plot a suitable graph to show all the data for the alcohol treatment group. Do not include the standard deviations. Join the points with ruled, straight lines.

(4)





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Examiner Comments

This question was well answered, over 70% achieving 4. Where mistakes were made they usually related to inappropriate y-axis labelling and/or scales. Both are shown in this example.

Question 1 (c) (ii)

This question was rather disappointingly answered. The SDs were included in the hope that candidates would use them to answer the question. In the event very few did. In recent series, the idea of overlapping SDs suggesting a lack of significance, and its corollary, have been used regularly. Candidates have tended to do quite well on these. This unusual context clearly threw them this time.

- (ii) The student concluded that there was no significant effect in the control group but there was in the alcohol treatment group. With reference to the data, explain why the student came to this conclusion.

(2)

In the controlled group the mean heart rate remained constant, whereas in the Alcohol treatment group it varied, some were low and some were high.



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Examiner Comments

This question was not well answered with fewer than 20% achieving 2 marks. The majority gained 1 for some recognition that alcohol group showed major changes whereas the control groups did not, as here.

- (ii) The student concluded that there was no significant effect in the control group but there was in the alcohol treatment group. With reference to the data, explain why the student came to this conclusion.

For the alcohol group the ^{maximum decrease in} mean heart rate ^{was} reduced from ⁽²⁾ 3 by 28.2 beats per minute, while in the control group it was 15, ~~Atmo~~ 18.8 times higher in alcohol group. Also the fluctuation of data in alcohol group varies a lot while in the control group it was limited. ~~thus~~ The student came to this conclusion due to these information.



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Examiner Comments

A rare 2 mark answer in which the general point about the relative sizes of the changes in the two treatments is made together with some appropriate data manipulation.

Question 1 (d) (i)

Most candidates were able to do the calculation correctly but their incorrect application of the rules of rounding sometimes meant they lost a mark.

- (d) The student now wanted to see if there was any evidence that the data from *Daphnia* could help to suggest what effect alcohol has on human heart rate. ^{beats/min}

The student found the following data in a research paper on the effect of alcohol on human heart rate.

Heart rate without alcohol / bpm	59
Heart rate after drinking alcohol / bpm	66

- (i) Calculate the percentage change in the heart rate of a human after drinking alcohol.

Show your working.

$$\frac{66 - 59}{59} \times 100 = 11.86440678\%$$
$$\approx 11.86\% \text{ (2.d.p)}$$

(3)

Percentage change 11.86%.



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Examiner Comments

A clear, well laid out 3 mark answer typical of many seen.

Question 1 (d) (ii)

- (ii) Taking all the information into account, comment on the suggestion that the *Daphnia* heart might be a good model for suggesting the effect of alcohol on the human heart.

(3)

The daphnia's heart rate increased in the alcohol treatment after 50 minutes from start, also the human heart rate increases with consuming alcohol



ResultsPlus Examiner Comments

This was the third of the more demanding parts of question 1. Significantly fewer than half of candidates achieved three marks. Some simply quoted conclusions from data to support their argument. As here, though, those conclusions were incorrect.

- (ii) Taking all the information into account, comment on the suggestion that the *Daphnia* heart might be a good model for suggesting the effect of alcohol on the human heart.

(3)

It ~~is not~~ is not a good model, because the effect of alcohol on humans ~~was~~ was an increase in the heart rate, while the effect of alcohol on *Daphnia* was a decrease in the heart rate so effect of alcohol on both organisms differ,



ResultsPlus Examiner Comments

A simple and concise 3 mark answer.

Question 2 (a)

This is a regular question type on this paper and is generally well answered. However, there are still some issues addressed in the examples below.

(a) A visit or issue report requires a problem to be identified.

Identify the problem described in this extract.

(1)

~~Research to establish~~ How do increase the Przewalski's horses and maintaining their genetic diversity.



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This question was well answered by the majority but some, as here, gave a solution rather than the problem. The other common error was to give a consequence rather than the actual problem. The example does that as well.



ResultsPlus Examiner Tip

Make sure you understand the difference between a problem, a solution to a problem and the consequences of a problem or of one of its solutions. These reports may contain any of these.

Question 2 (b)

Most were adept at finding the relevant information in the passage and the question was very well answered.

- (b) These visit and issue reports are expected to identify **economic** implications of the issue being investigated.

The implications might be negative (costs) or positive (benefits).

Complete the table below by identifying **two** costs and **two** benefits of the Przewalski's horse captive breeding programmes.

(4)

Costs	Benefits
The cost of transportation of each horse is high i.e 15000 US\$	The horses act as attraction in 2005 thus more revers revenue is earned by the 2005.
Veterinary care during foaling is very high	Artificial insemination can be done which have reduced costs compared to horse transportation



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Examiner Comments

The most common error was not to develop the point into an economic one, as here in relation to veterinary care.

Question 2 (c)

This question was well answered but lack of precision sometimes lost marks.

(c) This unfinished report should include a graph.

Explain how you could make a graph of the data in the table in paragraph 3.

(3)

The data from the table could be ~~plotted~~ represented on a bar graph ~~with~~ with the number of horses on the y-axis and the ~~countries~~ on the x-axis. ~~The bar for~~ for each name of the countries on the x-axis. The bars should be colour-coded to make them easily distinguishable.



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Examiner Comments

This time, if an error was made, it was to label the y axis with the number of horses rather than the number of births. The example shows this error.

Question 2 (d) (i)

Many were able to gain one mark on this question, but only the very best could manage 2.

(i) Suggest an explanation for the data in the graph.

(2)

The graph shows the no. of births increasing and the inbreeding coefficient decreasing over the years. This shows that with higher inbreeding, there is a ^{lower} ~~less~~ rate of reproduction possibly due to faulty genetic composition of offspring and/or genetic diseases that may have wiped out vast numbers.



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Examiner Comments

This answer gives the relationship shown and a reason for it, thus gaining both marks.

(i) Suggest an explanation for the data in the graph.

(2)

The ^{amount} ~~amount~~ of inbreeding ^(inbreeding coefficient) has decreased from 1949 to 2003
while the no. of births has increased in that time period ⁽¹⁹⁴⁹⁻²⁰⁰³⁾.
The highest no. of births ^{are} seen in the years 1991 and 1994
and the least no. of inbreeding is seen ⁱⁿ the year 1997.
Zoo's has decreased the no. of inbreeding and increased the
no. of Przewalski's horses in the time period 1949 to 2003.



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Examiner Comments

This answer gives a lot of detail about the figures but does not offer an explanation of any sort. This means it cannot gain more than one mark.

Question 2 (d) (ii)

This question was well answered by the vast majority.

(ii) Write a caption for the graph and suggest where in the report it should be placed.

(3)

Caption Number of births and amount of inbreeding
per year.

Paragraph number 9



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Examiner Comments

The most common error was to suggest a wrong paragraph, as here.

(ii) Write a caption for the graph and suggest where in the report it should be placed.

Caption ⁽³⁾ The correlation between amount of inbreeding and number of births

Paragraph number 4



Question 2 (d) (iii)

This bibliography question requires attention to detail. A significant number of candidates do not do this and, as a consequence, lose marks.

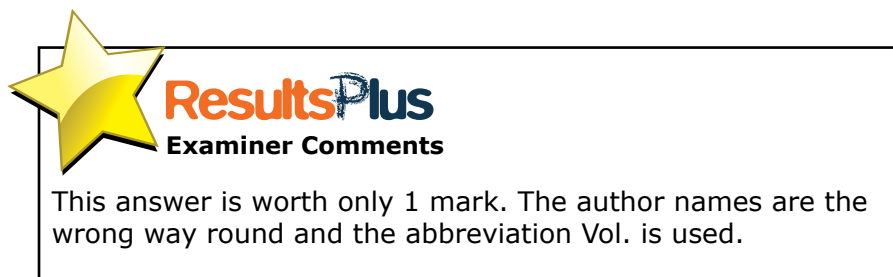
(iii) The graph was in a scientific paper referred to in the report as follows:

Inbreeding in captive bred Przewalski horses from local populations by A. Wolc, M. J. Nitka, P. Szablewski and T. Szwaczkowski in vol. 57 of Folia Zool. published in 2008 on pages 300–307.

Rewrite the reference in the correct way.

(3)

~~Inbreeding in cap~~ A. Wolc, M. J. Nitka, P. Szablewski
, T. Szwaczkowski, Folia Zool, ~~the~~ Inbreeding in
captive bred Przewalski horses from local populations
(vol. 57), 2008, pages 300-307.



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Rewrite the reference in the correct way.

(3)

Inbreeding in captive bred Przewalski horses from local populations, in Vol 57, pages 300–307 in Vol 57 of Folia Zool. written by A. Wolc, M. J. Nitka, P. Szablewski and T. Szwaczkowski in 2008 which was published in 2008.



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This answer contains all the information but gains none of the marks. It must be appreciated that it is the reference writing conventions which are being examined here. An answer, such as the one shown here, suggests that some candidates do not appreciate this.

Question 2 (e)

This question was very well answered indeed with the majority of candidates being able to pick the two methods and include points within the mark scheme.

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Read all of the information given in the questions very carefully: it is there for a purpose.
- For example, in question 1cii on this paper the information contained in the table about standard deviations was needed, but few actually used it.
- Thoroughly review all core practicals. Be clear about all of the details and the skills that each helps to teach you.
- Question 1 will always be based on one of these practicals.
- Review your understanding of basic experimental design. Be clear about the different types of variables (IV, DV and control variables).
- Make sure that you understand how to write references properly, this includes journal articles, books and websites.

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