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Examiners' Report
June 2015

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 1aii, 1bii, 1ci and 2c. Detailed comments on these are made in this report. 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).

Question 1 (a) (i)

This was a relatively easy question although fewer than 80% of candidates got the mark.

A single plant was placed in a Petri dish containing 20 cm^3 of deionised water.

Another plant was placed in a Petri dish containing 20 cm^3 of a solution with all mineral ions present.

This procedure was repeated for a further seven Petri dishes containing solutions with one mineral ion missing. These are shown in the table below.

Mineral ion missing
calcium
iron
potassium
magnesium
nitrate
phosphate
sulfate

(a) (i) Name the **independent** variable in this investigation.

(1)

Water Carbon dioxide.

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Examiner Comments

A worrying number of candidates simply guessed, or at least the answer they gave suggested that this is what they were doing.

A single plant was placed in a Petri dish containing 20 cm^3 of deionised water.

Another plant was placed in a Petri dish containing 20 cm^3 of a solution with all mineral ions present.

This procedure was repeated for a further seven Petri dishes containing solutions with one mineral ion missing. These are shown in the table below.

Mineral ion missing
calcium
iron
potassium
magnesium
nitrate
phosphate
sulfate

(a) (i) Name the **independent** variable in this investigation.

(1)

Mineral ion missing / Volume of solution.

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Examiner Comments

Most candidates were able to give an answer worded in such a way as to gain the mark, as here.

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Examiner Tip

Do not give two answers to a one mark question, as here. This candidate was lucky and got the mark, but volume of solution is incorrect so this is a dangerous tactic.

Question 1 (a) (ii)

Candidates are generally good at knowing which variables to identify but not so good at knowing how to control them. Temperature was the most commonly identified variable with light a close second. Water bath is inadequately detailed for a control method for temperature. Similarly, just using the same bulb is not adequate for light intensity, which was also commonly chosen. The same bulb will not do the job unless all the plants are at the same distance from it. A light bank is designed to have both these factors, so was an acceptable answer here.

(ii) Suggest **two** variables that should be kept constant in this investigation and describe how each variable could be controlled.

(4)

Variable The volume of ~~water~~ solution added to each of the petridishes. $20cm^3$ of mineral ion solution
The volume can be measured using a measuring cylinder and then added to the petridishes

Variable The initial number of duckweed plants of same mass ~~added~~ placed in each petridish. ~~It can count the~~ The same number of duckweed plant should be added to each petridish. The mass can be measured using a balance.

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Examiner Comments

A very muddled answer which gained no marks. For some plants floating in it, it does not matter if the volume below them is large or small. The second part is especially muddled as there appears to be an intention to count out plants by weighing them. The suggestion is not mark worthy anyway, as the stem clearly states that the experiment started with a single plant.

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Examiner Tip

Read the entire stem very carefully, all the information that is given is there for a purpose.

(ii) Suggest **two** variables that should be kept constant in this investigation and describe how each variable could be controlled.

(4)

Variable Light intensity.

a the petri dishes can be placed under a light bank.

Variable pH of the mineral ions.

A buffer can be used to keep the pH constant

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Examiner Comments

A clear full mark answer.

(ii) Suggest **two** variables that should be kept constant in this investigation and describe how each variable could be controlled.

(4)

Variable Temperature of solution may be kept constant using a water bath.

Temperature of solution will affect rate of growth of plant

Variable ~~Amount of Sunlight~~ Same type of plant

Buying all the plants to the same supplier.

Some type of plants may grow more than others.

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Examiner Comments

Temperature is correct but a water bath is no use for controlling it unless it is a thermostatically controlled one.

Type of plant is far too vague at this level. If type equals species then this is incorrect as the stem specifies that. If the candidate had written about genetically identical plants and mentioned cloning (the stem says that *Lemna* reproduce vegetatively) then marks could have been awarded.

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Examiner Tip

Try to use proper scientific terms in your answers. Type here is not such a term, species would be (although wrong in this context).

Question 1 (a) (iii)

Most did well on this, although about a third of candidates only managed one mark, usually for the idea of a control.

(iii) Explain why deionised water and the solution containing all the mineral ions are included in this investigation.

(2)

~~The~~ We use the solution with all minerals as a control to compare against other ~~de-ionised~~ Plants ~~water~~ to see the affect the minerals have on the plant

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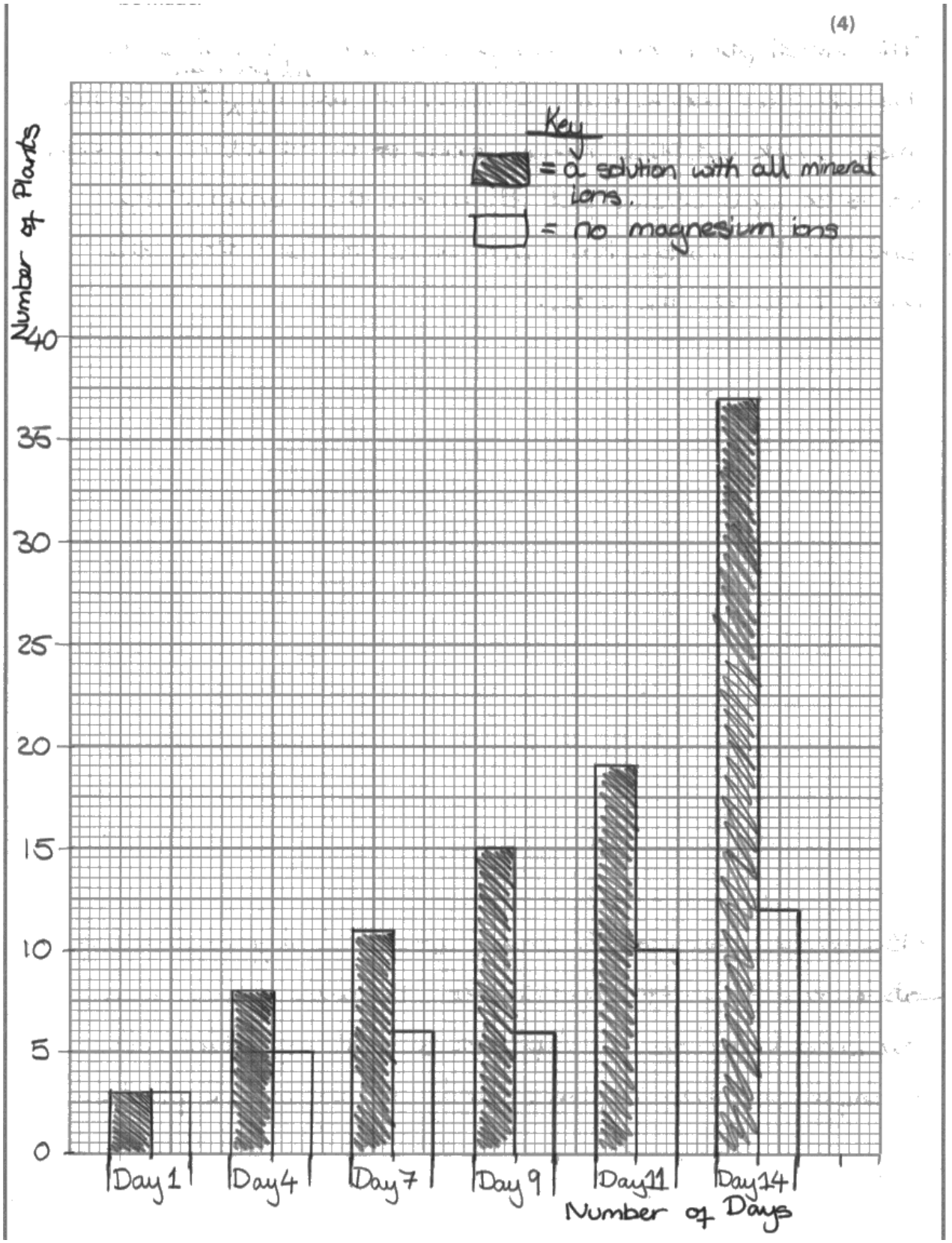
Examiner Comments

A straightforward answer in which the ideas of a control and a comparison are clearly stated.

Question 1 (b) (i)

The graph question is usually well handled, although there are still many inappropriate bar charts drawn. For this reason fewer than 40% gained 4/4, but most of the remaining candidates got 3.



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Examiner Comments

Everything is fine on this graph, except the x-axis. As was the case for most of the bar charts drawn, this is non-linear and thus inappropriate for this data, where number of days must be shown on a linear axis.

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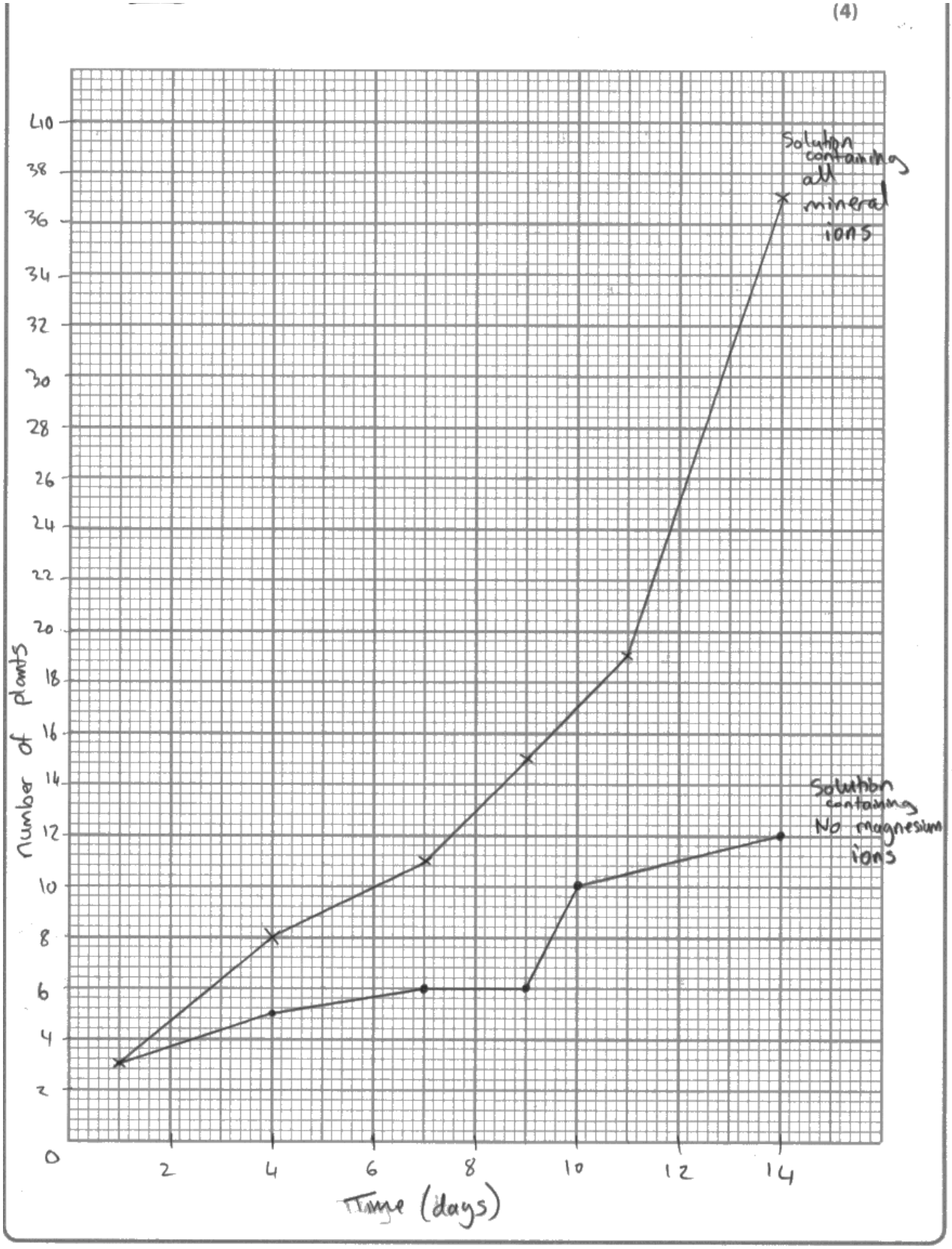
Examiner Tip

A bar chart is rarely the correct graph to draw. For it to be appropriate, the data must be discontinuous on the x-axis. For example if the number of *Lemna* on day 14 in each mineral had been asked for, a bar chart would be correct.

(4)



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Examiner Comments

An excellent 4 mark answer, in line with just under 40% of those seen.

Question 1 (b) (ii)

Performance on questions about error and reliability has steadily improved over time on this paper. In the past, answers about doing the experiment more often would have been given here, this was rare on this occasion. Having said that, a good proportion did flounder on this item. Those who started discussing SD in great detail lost out on MPs 1 + 2. Some did not even hint that SD went on the graph.

(ii) Suggest how the method for this investigation could be modified so that the reliability of the data could be shown on the graph.

(3)

The experiment can be repeated for each petridish lacking the mineral ions and the petridishes with all mineral ions and no mineral ions and a mean value can be taken for each day. Also the standard deviation could have been calculated and error bars could have been drawn.

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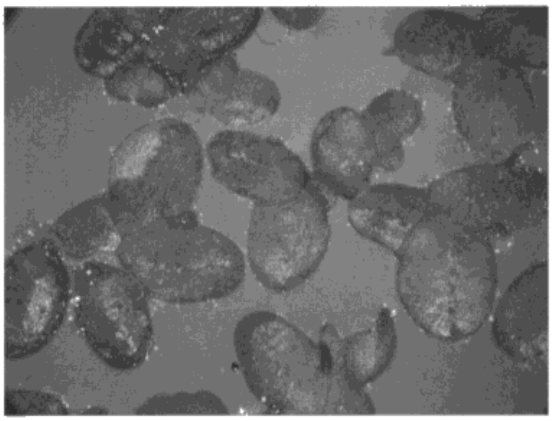
Examiner Comments

This is a clearly worded 3 mark answer with repetition, calculation of mean and plotting of standard deviation all included. It mirrors about 40% of the responses seen. Where marks were lost it was usually for not stating that the SD would be displayed on the graph. It was hoped that the stem wording would elicit this response.

Question 1 (c) (i)

This was one of the most poorly answered questions on the paper; nearly 80% achieved zero marks. The most common mistake was to discuss the issues that might arise when trying to count the leaves in this photograph, without actually being able to move anything. This was not what was asked for.



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Magnification ×2

(i) Using the information in the photograph, suggest why counting plants will give an inaccurate result for the growth rate of duckweed.

(1)

① Different parts of the plant are of different size. All plants are not of the same size, so counting them will be wrong

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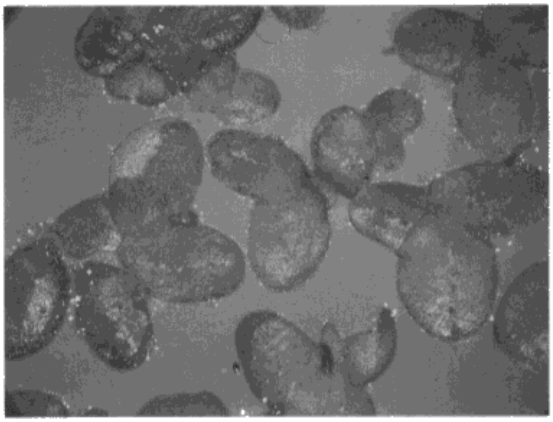
Examiner Comments

A straightforward correct answer which both uses the photograph and derives the relevant information from it.



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Magnification ×2

(i) Using the information in the photograph, suggest why counting plants will give an inaccurate result for the growth rate of duckweed.

(1)

Because while counting from the magnification, human error is so likely to take place, for example if we miss one plant, it will affect the accuracy in measuring the growth rate of duckweed.

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Examiner Comments

This answer makes no use of the photograph.

Question 1 (c) (ii)

Many were able to suggest mass as a better way to measure growth than plant count, but few went on to mention any time element to address the rate asked for in the question.

(ii) Suggest an alternative method for measuring the growth rate of duckweed.

(2)

You could measure the growth rate by measuring the increase in mass of the duckweed. To do this, you should weigh the petri dishes containing the plants and solutions at the start and every few days e.g. every 3-5 days, recording the total increase in mass.

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Examiner Comments

One of the rare two mark answers.

Question 1 (d) (i)

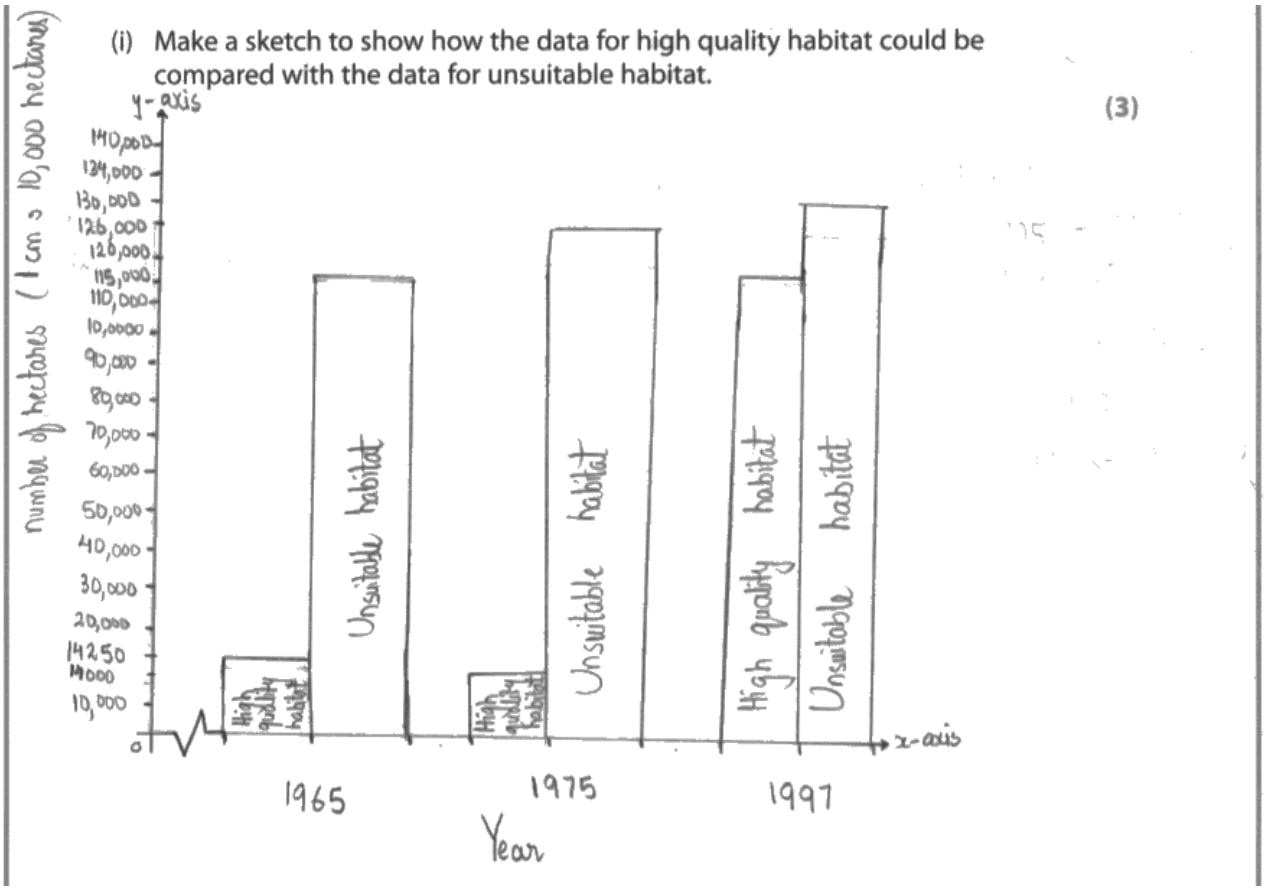
Over 80% of candidates obtained this mark.

Question 1 (d) (ii)

Those who wrote nitrate usually gained a further mark for a mention of its role in the synthesis of amino acids, proteins and a range of other correct chemicals. Unfortunately, few were able to go on and discuss the role of their stated substance in *Lemna* growth.

Question 2 (a) (i)

This question was very well answered with over half of candidates gaining all 3 marks.



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Examiner Comments

A satisfactory full mark answer.

Question 2 (a) (ii)

Generally, another well answered question with the vast majority gaining both marks.

(ii) State the number of the paragraph in the report where this sketch would support the information given and explain why.

(2)

Paragraph number 6

It mentions how human activity has decreased the number of suitable habitats for pandas and between 1973 - 1984.

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Examiner Comments

A typical 2 mark answer.

Question 2 (b) (i)

Again, a good majority got this right. The most common wrong answers quoted solutions rather than the actual problem.

(i) State the problem that this extract identifies.

(1)

Decrease in the number of ~~bambas~~ pandas

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Examiner Comments

A typical correct answer.

(i) State the problem that this extract identifies.

(1)

Breeding of giant pandas

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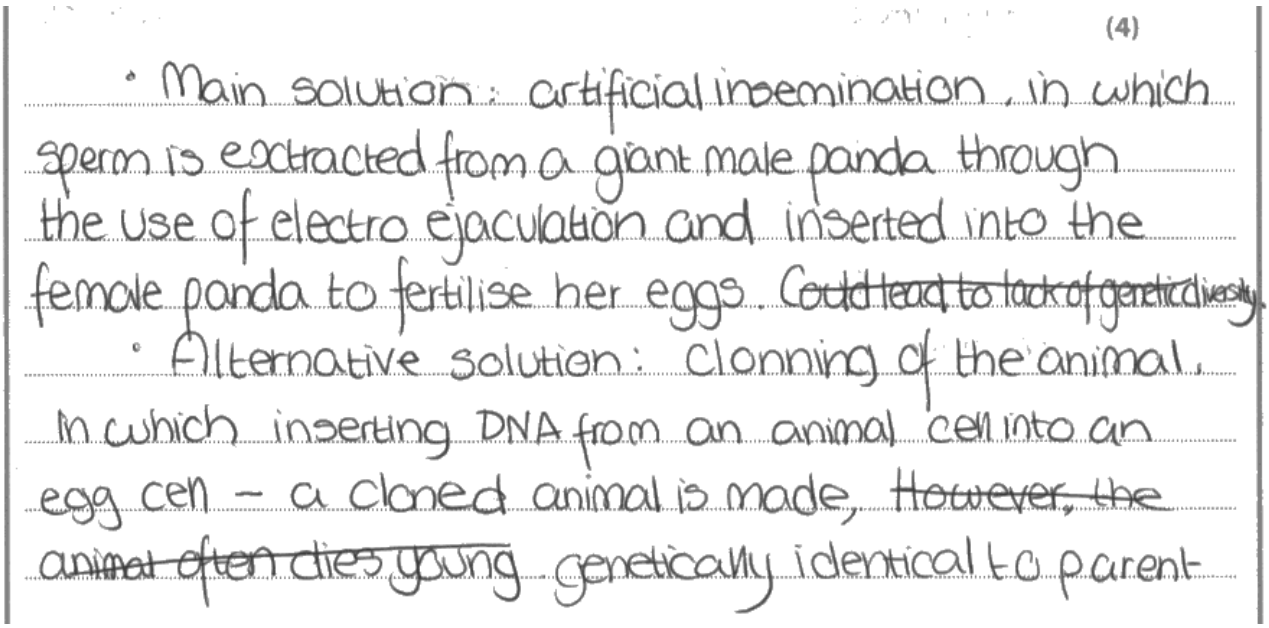
Examiner Comments

A solution to the problem rather than the problem.

Question 2 (b) (ii)

Many candidates clearly understood the passage very well and were able to gain 3 or 4 marks here.



(4)

• Main solution: artificial insemination, in which sperm is extracted from a giant male panda through the use of electro ejaculation and inserted into the female panda to fertilise her eggs. ~~Could lead to lack of genetic diversity.~~

• Alternative solution: Clonning of the animal. In which inserting DNA from an animal cell into an egg cell – a cloned animal is made, ~~However, the animal often dies young~~. genetically identical to parent

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A typical full mark answer.

Question 2 (b) (iii)

Again, due to impressive careful reading of the information provided 3 or 4 marks were common here.

(iii) Suggest the risks to giant panda populations of the use of these solutions.

(4)

Artificial insemination is performed by humans on pandas, so pandas who never bred naturally will have no idea how to reproduce naturally in the wild. They will not be able to breed and improve their popution number.

And Cloning shows a problem with mammels, they cloned mammal either dies after birth or sulfer from disease and die young.

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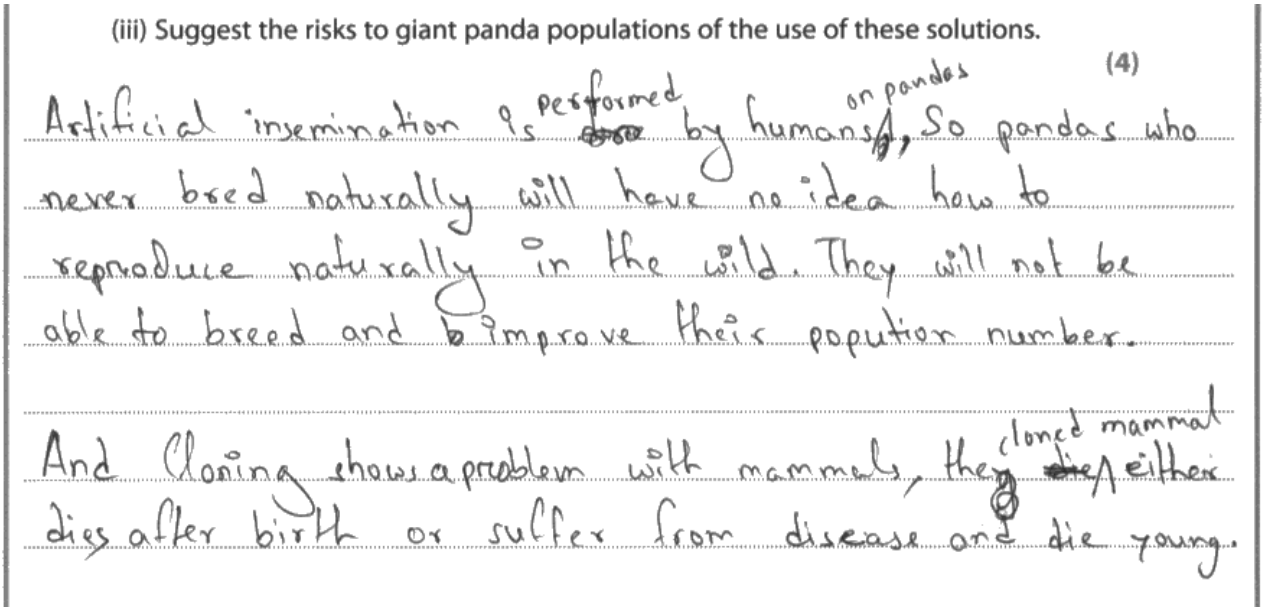
A clear 4 marks.

Question 2 (c)

This relatively simple calculation caused many candidates problems. About a third gained no marks and fewer than half gained all 3. Despite the evidence of careful reading of the passage in the previous two questions, this question showed that many are still prone to extracting incorrect information.



(iii) Suggest the risks to giant panda populations of the use of these solutions. (4)

Artificial insemination is performed by humans on pandas, So pandas who never bred naturally will have no idea how to reproduce naturally in the wild. They will not be able to breed and improve their popution number.

And Cloning shows a problem with mammels, the cloned mammal either dies after birth or suffer from disease and die young.

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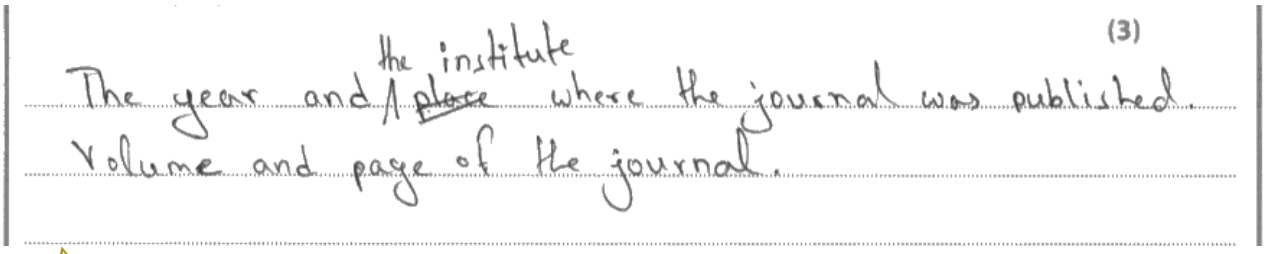
The incorrect number of pandas was chosen here, but then the correct manipulations were carried out.

Question 2 (d)

In this referencing question, about half were able to gain all 3 marks, but there were many who missed key aspects.



(3)

The year and the institute where the journal was published. Volume and page of the journal.

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A 2 mark answer.

(3)

The state of publication, the name or title of the article, the volume number or page number of this paper in the journal and the town in which it was published.

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A typical 3 mark answer.

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