

Examiners' Report  
June 2013

GCE Biology 6BI07 01

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## Introduction

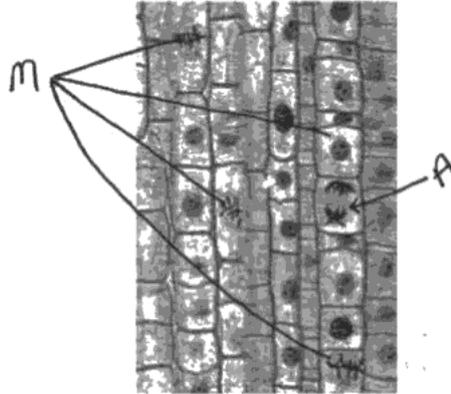
Candidates' performance in Summer 2013 was mainly good. Understanding of measures of variability, such as standard deviations and ranges, seemed to be much better. There was much less evidence of the use of past mark schemes than in previous series', although this was still evident, albeit in a minority of cases, for some question parts. The choice of graph type is still exercising a significant number of candidates, as evidenced in Q2 (b) (i).

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. 6BI07 is a skills-based paper but knowledge is still needed in these areas. For Q2, it is very important, again as always, to read the questions set, very carefully.

### Question 1 (b) (i)

Recognising the stages in mitosis is, of course, key to analysing what is being seen down the microscope in a root-tip squash practical. A surprising number of candidates showed a concerning lack of knowledge of the appearance of stages.

(b) Her teacher gave her the photograph below and asked her to identify cells undergoing mitosis.



(i) Draw lines to all the cells that are undergoing mitosis and label them **M**.

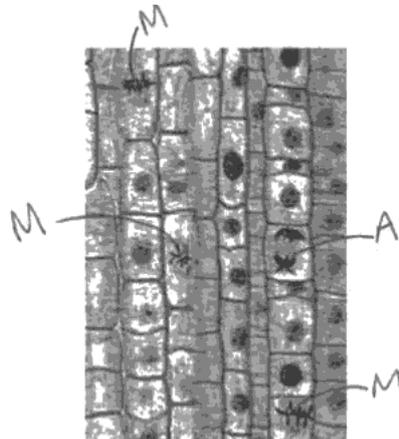
(2)



**ResultsPlus**

**Examiner Comments**

This error was seen surprisingly often. The candidate is indicating *Anaphase* correctly but not appreciating that it is a stage in mitosis.



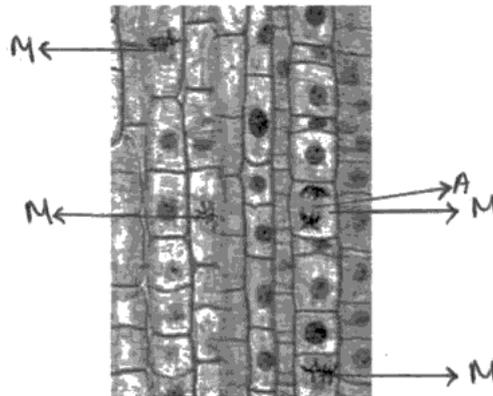
**ResultsPlus**

**Examiner Comments**

Another example of the same common error.

### Question 1 (b) (ii)

(b) Her teacher gave her the photograph below and asked her to identify cells undergoing mitosis.



(i) Draw lines to all the cells that are undergoing mitosis and label them **M**.

(2)

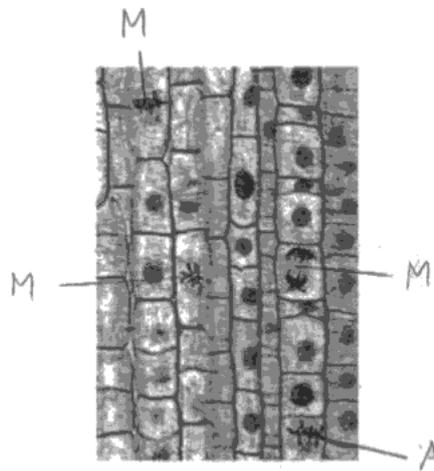
(ii) Draw a line to a cell which is in anaphase and label it **A**.

(1)



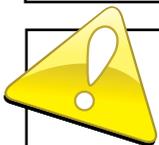
#### ResultsPlus Examiner Comments

A good, clear answer - but an unusual way to draw label lines, which should be avoided.



#### ResultsPlus Examiner Comments

Candidates lost marks on this easy knowledge question. Although the primary aim of 6BI07 is not to test knowledge, some will be needed because skills cannot be tested in isolation.



#### ResultsPlus Examiner Tip

Be sure to make yourself familiar with the theoretical biology associated with all of the core practicals, in preparation for this paper.

### Question 1 (b) (iii)

(iii) Give **one** reason why you chose this cell.

(1)

~~chromosomes are seen~~ recoiled chromosomes take up  
stain and can be seen



#### ResultsPlus Examiner Comments

As in this example, quite a number of candidates did not address the question asked. The question wanted to know why candidates thought that this was anaphase.



#### ResultsPlus Examiner Tip

Make sure that you can recognise all of the stages of mitosis, however they are presented - photographs, diagrams or even a written description.

(iii) Give **one** reason why you chose this cell.

(1)

Because most of the mitotic divisions happen  
in the root tip of a cell of cells.



#### ResultsPlus Examiner Comments

A similar example that, again, does not answer the question asked.

## Question 1 (c) (i)

- (i) In class, she had prepared a root tip squash.  
To see the chromosomes in the cells, she had to stain them and observe them  
using a microscope.

Name a suitable stain for observing chromosomes.

(1)

*Methylene blue*



**ResultsPlus**

**Examiner Comments**

This was a well-answered question, knowledge of one appropriate stain being widespread. The most common wrong answer was methylene blue.



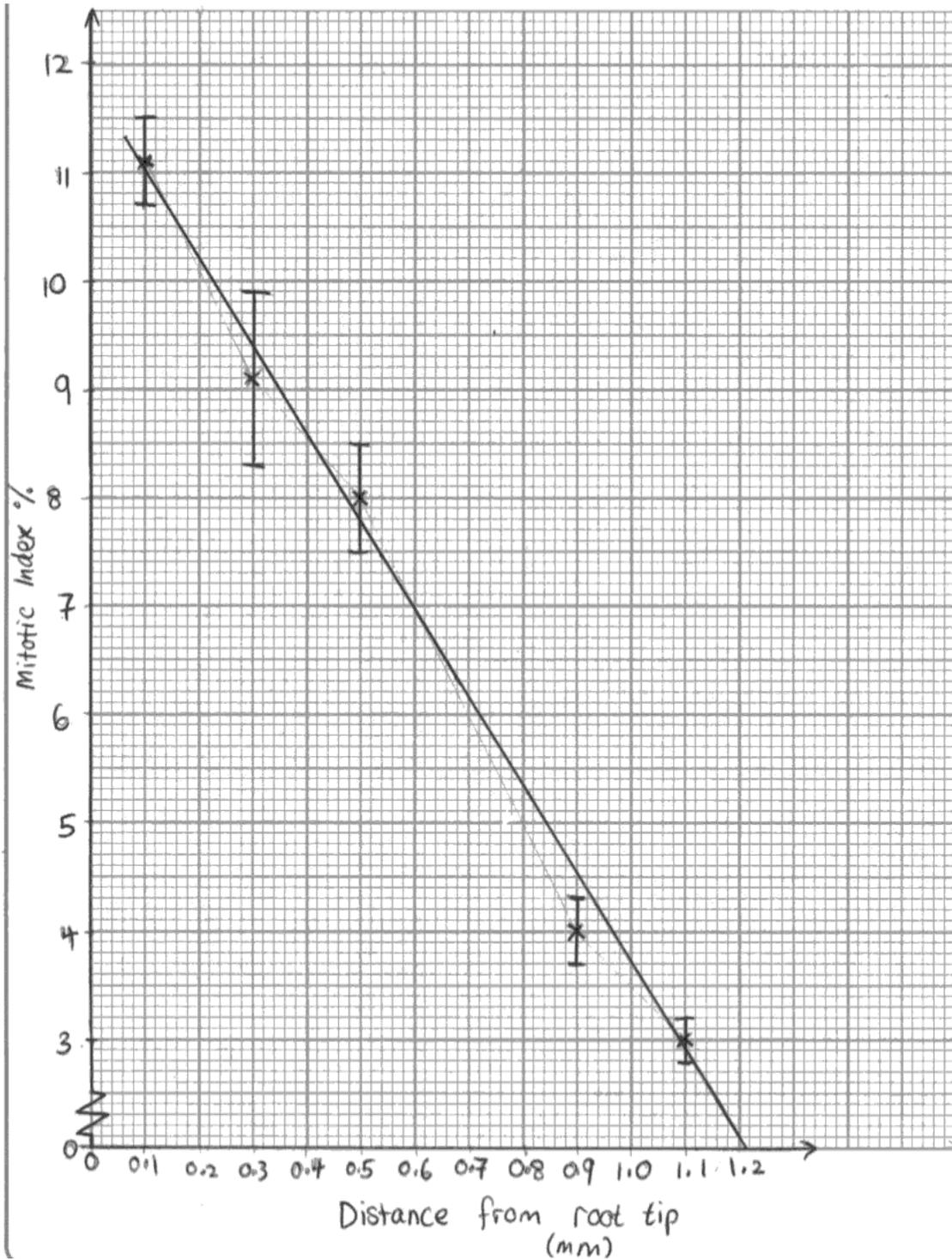
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**Examiner Tip**

Try to learn all of the details of all of the core practicals.

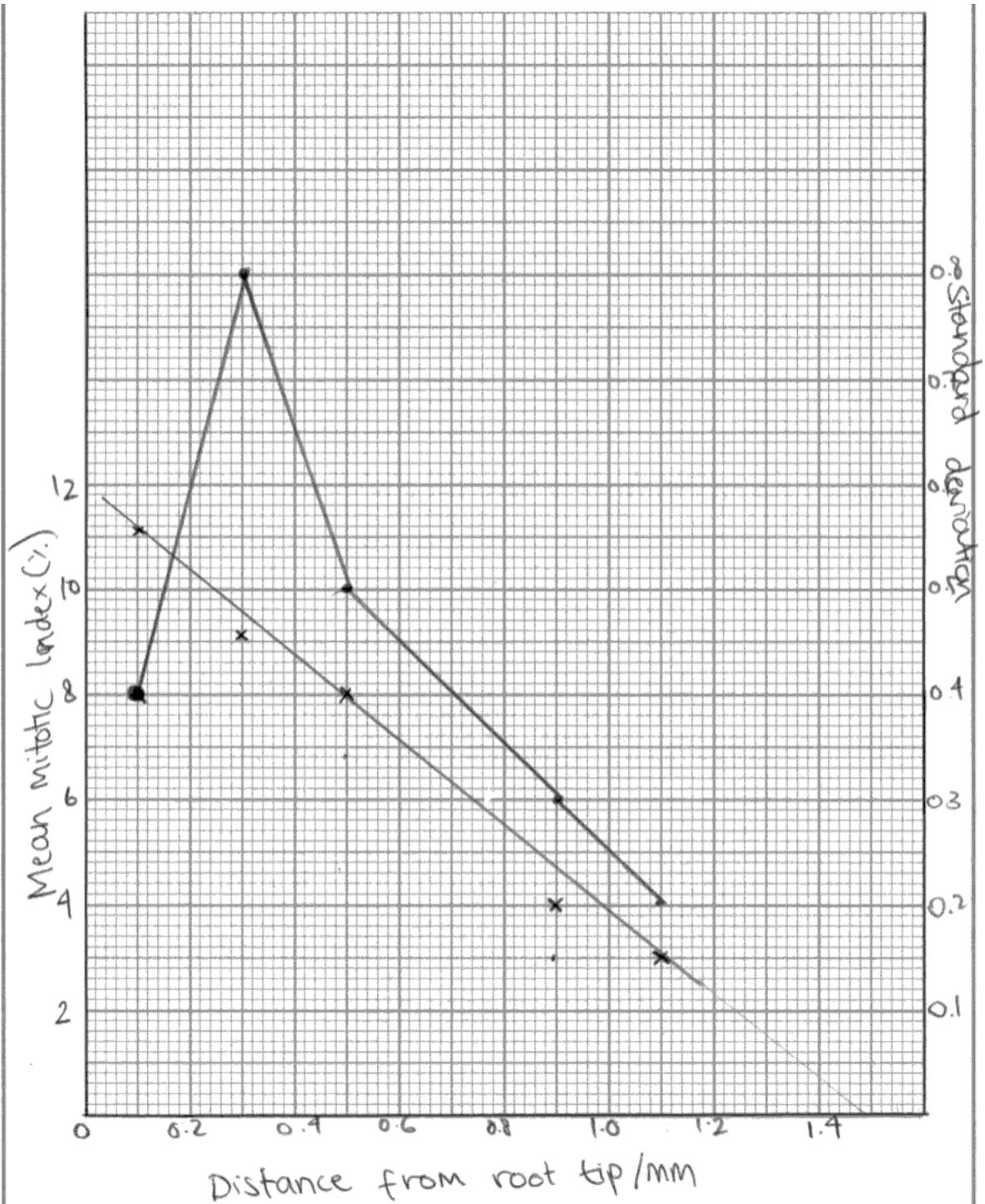
### Question 1 (d) (i)

Generally, the graph-plotting question proved to be a rich source of marks for most candidates. What to do with error bars is still the biggest single issue for many.



**ResultsPlus**  
Examiner Comments

By far the commonest reason for mark-loss on this question was extrapolation, either to or toward the y-axis. This response demonstrates another error, which was not penalised here but often leads to a loss of marks in the next question. The candidate has put a discontinuity in the y-axis. This can be a suitable way to proceed but in this case, it is not. An extrapolation is required for the next question and this will be wrong, with a y-axis discontinuity.



**ResultsPlus**  
Examiner Comments

A significant number of candidates is still not clear how standard deviations, range bars, or error bars, should be included on a graph. A large number of candidates did not plot them at all and another sub-set plotted them separately, as here.

### Question 1 (d) (ii)

This was a somewhat unusual question, asking candidates to derive information from a graph.

This is one example of where extrapolation is acceptable and it was interesting to see how candidates approached it.

As mentioned in relation to the previous question, extrapolation at both ends was often their solution.

- (ii) Use your line of best fit to predict the distance from the tip at which there will be no mitosis. Write your prediction below.

(1)

Answer = 1.21 mm



#### ResultsPlus Examiner Comments

The biggest problem on this question arose not because of not knowing what to do in terms of extrapolating, but because of having chosen an inappropriate y-axis, previously. The main way in which this exemplified itself was in relation to those candidates who chose to have a split y-axis, with a discontinuity between the origin and the first actual data point. This was not penalised in question 1(d) (i), if it was done correctly. It penalised itself here, as such a choice of y-axis will not allow this extrapolation to give the correct answer.



#### ResultsPlus Examiner Tip

Be very clear about the purpose of the graph you are plotting. It may not be enough when thinking about scales on the x and y axes, just to ensure that you can fit the data in.

### Question 1 (d) (iii)

(iii) State the relationship between mean mitotic index and distance from the root tip. The further away the cells from the root tip are, they are least likely to ~~go~~ go through mitosis. (1)  
~~The graph shows that the further away from the root tip~~



**ResultsPlus**

**Examiner Comments**

This is an example of an answer with some truth in it, which, even so, does not receive a mark because it does not answer the question. Candidates were asked to comment specifically on the mean mitotic index and not to write an interpretation of what that might mean - as, unfortunately, is the case here.

They are inversely proportional.  
As the mean mitotic index decrease the distance from root tip increase



**ResultsPlus**

**Examiner Comments**

This answer was given the mark, although candidates should be encouraged to write about correlations in the likely causal direction. In this case, they should have been aware that it is the distance from the root-tip that is affecting the degree of mitosis, and not the reverse.

The mitotic index ~~decrease~~ <sup>increases</sup> as the distance from the root tip increases. (1)



**ResultsPlus**

**Examiner Comments**

Candidates rarely answered this question wrongly. When they did, it was in this way.

### Question 1 (d) (iv)

Questions about reliability, standard deviations, range bars and the significance of differences, have caused candidates difficulties in the past. It is good to be able to report, therefore, that this situation has improved this year.

Very few candidates gave 'stock' answers about high standard deviation indicating low reliability, and *vice versa*. Instead, they were able to discuss standard deviation overlap as an indication of some doubt about the significance of a difference between two datasets.

(iv) The student was confident that there is a difference between the mean mitotic index at 0.5 mm and the one at 0.9 mm. She was not confident that there is a difference between the mean mitotic index at 0.3 mm and the one at 0.5 mm.

Using the information in the table, suggest why she thought this.

(4)

Referring to <sup>the</sup> Standard deviation which shows us the spread of data around the mean, between 0.5m and 0.9 mm, their mean mitotic index are 8 and 4 respectively, with their S.D's 0.5 and 0.3 respectively, no matter how you compare their highest and lowest values, they will <sup>never</sup> overlap each other, this explains why the student was confident in the difference between the two measurements.

However, for <sup>distance from root tip (mm)</sup> measure ~~from mitotic index~~ 0.3 (~~±0.2~~) and <sup>0.5</sup> ~~±0.5~~ with mean mitotic index 9.1 (±0.6) and 8.0 (±0.5), when comparing the two, we can see that both values overlap, when 0.3mm has an <sup>mitotic</sup> index of  $(9.1 - 0.6) = 8.5\%$  which overlaps with 0.5mm when it has a mean mitotic index of  $(8 \pm 0.5) = 8.5\%$ , explaining why she was not confident that there is a difference between 0.5mm and 0.3mm.



#### ResultsPlus Examiner Comments

This is a good answer. It shows clearly that the candidate understands the importance of the idea that non-overlapping standard deviations tell us something important, in comparison with ones that do overlap. This level of understanding is a significant step to an understanding of inferential statistics at A2.

The student ~~was~~ thought that there ~~is~~<sup>was</sup> a difference between the mean mitotic index at 0.5 mm and at 0.9 mm because there was a significant difference between the two distances of 4%; where the 0.5 mm has a mean mitotic index of 8% and 0.9 mm has a mean mitotic index of 4%.

But she thought there was no difference between the mean mitotic index at 0.5 mm and at 0.3 mm because the difference between the two is not significant since its a difference of 1.1% only. Where the 0.5<sup>mm</sup> has a mean mitotic index of 8% and 0.3 mm has a mean mitotic index of 9.1%. That is why she wasn't confident that there was a difference.



### ResultsPlus Examiner Comments

This is an answer at the weaker end of the range, although still gaining some credit. The only point it makes is to compare the relatively small difference in means between 0.3 mm and 0.5 mm, with the much bigger difference between 0.5 mm and 0.9 mm.



### ResultsPlus Examiner Tip

Almost certainly, if you are given standard deviation data you should expect to use it in answer to the questions.

## Question 2 (a) (i)

This question was generally well-answered, indicating that most candidates understood the passage.

Rows 1 and 3 were the most common areas where candidates did not gain the mark. Row 4 was almost always awarded credit. Row 2 differentiated well between candidates.

## Question 2 (a) (ii)

This question was, again, generally well-answered, further demonstrating the:

- accessibility of the passage
- ability of candidates to understand it
- candidates' ability to select information that was relevant from it.

(ii) Suggest **two** further features of HBOCs and RBCs, given in the extract, that could be included in this comparative table.

(2)

1 Survival over wide ranges of storage temperature

2 Cross-matching to patients' blood types

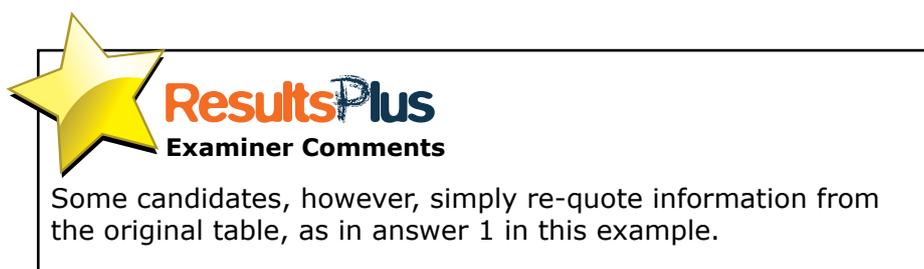


(ii) Suggest **two** further features of HBOCs and RBCs, given in the extract, that could be included in this comparative table.

(2)

1 The risk of viral infection; HBOCs manufacturing process virtually eliminates this risk.

2 Optimum temperature for survival and if refrigeration is required; HBOCs require no refrigeration.

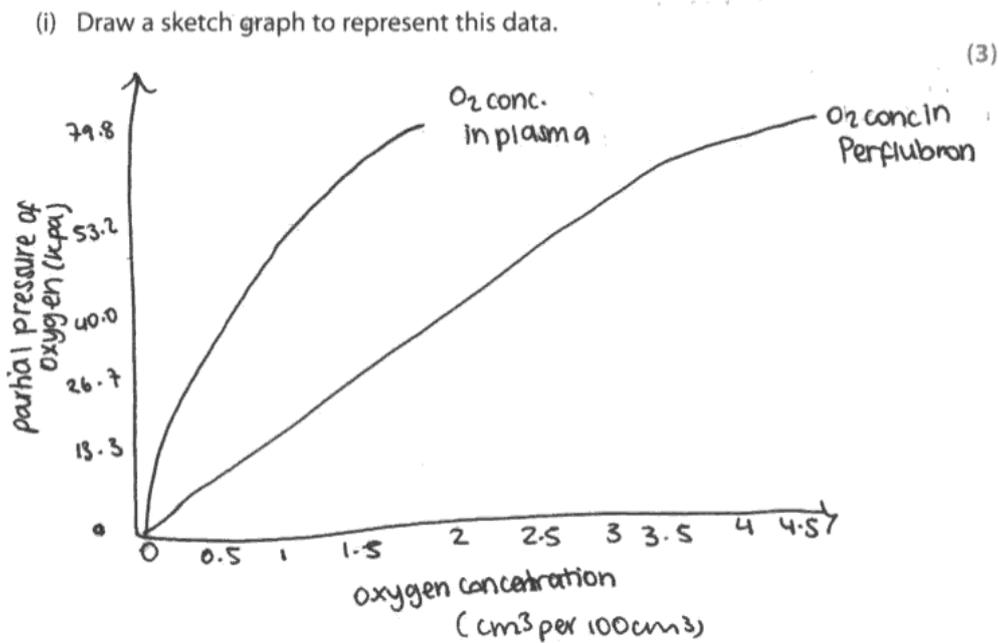


## Question 2 (b) (i)

Make sure that you understand the difference between continuous and discontinuous data. You should also understand which graphical presentation is most suited to these two data-types.

When plotting a line graph where a causal relationship is implied (as opposed to a scatter graph, where it is not), make sure that you know which is the dependent, and which is the independent, variable.

You should further understand that the independent variable goes on the x-axis and the dependent variable on the y-axis.



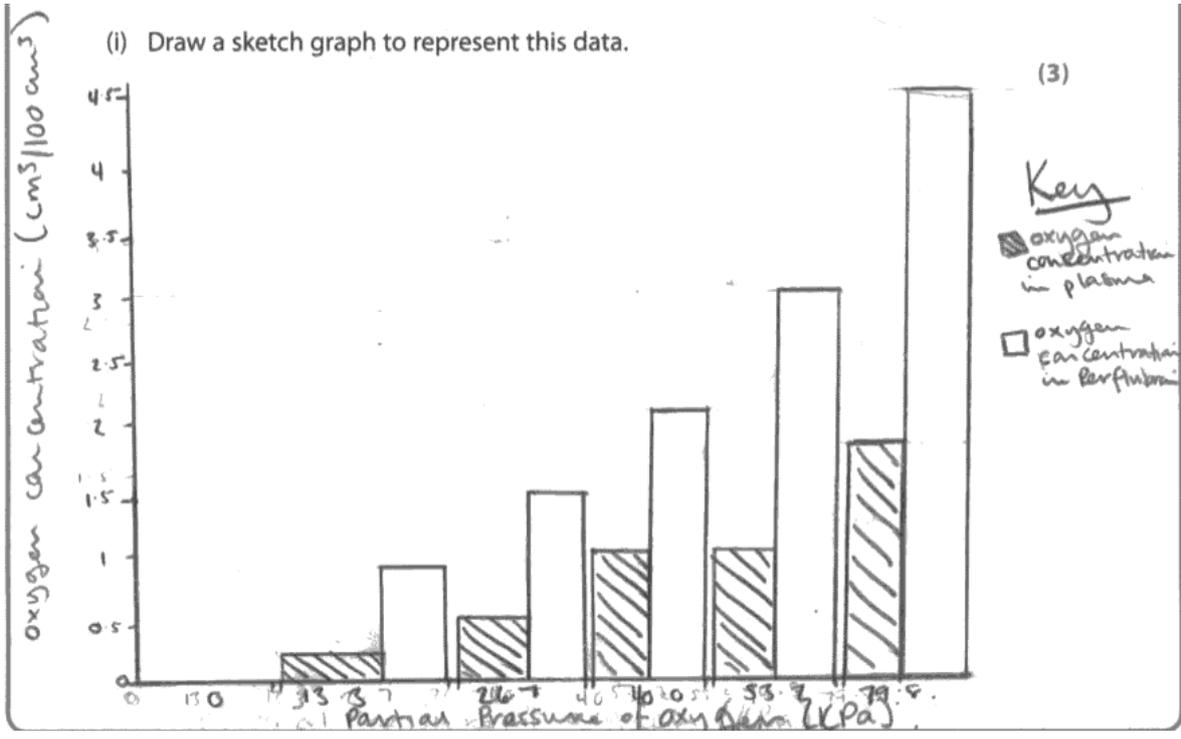
### ResultsPlus Examiner Comments

Most candidates chose to suggest that data should be displayed with a line graph, as here. Some, again as here, put the axes the wrong way round and thus lost a mark.



### ResultsPlus Examiner Tip

Know which type of graph to use - when and how



**ResultsPlus**  
 Examiner Comments

A significant number of candidates chose a bar chart or histogram as their suggestion for displaying the data in this question, even though neither is continuous.

## Question 2 (b) (ii)

This question proved to be very challenging.

Candidates were penalised by their poor comprehension, and lack of precision, by not focusing on the difference in the ability of plasma and Perflubron to carry oxygen.

Some candidates quoted extensively from the text, rather than focusing on the graph and tabulated data. Consequently, they failed to answer the question and did not earn marks.

Good candidates scored the maximum of four marks, but a small minority of candidates failed to identify correctly the paragraph in the report, or ignored that portion of the question.

Candidates often ignored the obvious. For example, many did not comment on the outright fallacious remark that "PFCs ... have the ability to dissolve 20 times more oxygen than plasma".

It was pleasing to note the large number of candidate that manipulated the data to find a relationship between the oxygen-carrying power of plasma and Perflubron.

The difficulty in this question, as in so many, is simply reading carefully what is being asked.

In this case, as distinct from previous years, candidates were asked to say how far the data with which they had been presented, supported the statements in the passage that they had read.

A very large number chose to answer the question as if it asked for a justification of their placement of the graph, something that has been asked in previous exams. This is quite a subtle point, in the sense that the information required is similar in both cases.

It is the way that the information is *used*, which is important. In this case, candidates were expected to discuss, for example, how the graph shows improvements in oxygen carriage of PFCs in the order of 2 to 3 times, rather than state that the chosen paragraph in the passage talks about this and, therefore, it would be a good place to put the graph.

Candidates also have difficulty with the idea of discussing the extent to which something happens, or is true. They still do not display good skills when asked to do this, always having a tendency to discuss one way or the other, and not both.

The best candidates were able to point out that the graph shows improved oxygen-carriage on the part of PFCs and that the improvement is in the order of 2x to 3x. They then go on to say that another part of the passage suggests improvements of 20x and that the graph does *not* support this.

Some were also able to point out that the graph was for Perflubron but that the passage was discussing PFCs in general.

(ii) Suggest where in the extract this graph should be placed and describe the extent to which the graph supports the information in the extract. (4)

below

The graph should be placed, after <sup>9</sup> paragraph 9.

This is because, paragraph 9 specifically speaks about ~~perflubron~~ Perflubron, a form of PFCs being able to dissolve <sup>2 to 3 folds</sup> 2 to 3 folds comparing to normal blood plasma, depending on the oxygen partial pressure.

Based on the graph, it is clear that in all partial pressure of oxygen, the absorption of oxygen concentration for perflubron is at least

2 times than that of plasma. Hence the ~~to~~ graph supports the extract.  
The general trend is that perflubron absorbs 2 times more oxygen than that of plasma, this is shown in at partial pressure of 79.8 kpa, perflubron is 4.6 cm<sup>3</sup> per 100cm<sup>3</sup> and plasma is 1.8 cm<sup>3</sup> per 100cm<sup>3</sup> with an approximate 2.56 times more oxygen than that of plasma.



### ResultsPlus Examiner Comments

This is a good answer. It displays considerable facility in relating the data that are given, to the passage the student had read.

The graph ~~and~~ should be placed in paragraph number 9.  
Some oxygen can dissolve in plasma but usually less than 1% of the total oxygen content in arterial blood. A major advantage of PFCs such as perflubron, is that they can increase ~~the~~ dissolved oxygen to between two to three fold over the norm, depending on the oxygen partial pressure. This ~~paragraph~~ ~~the~~ graph should be insert in this area to compare the oxygen concentration in both plasma and perflubron.



### ResultsPlus Examiner Comments

This answer is one that justifies the placement of the graph, rather than answering the question asked.

After paragraph 9 because this is where ~~they~~ the student compares perfluorocarbons (Perflubron) with oxygen. And this graph would make ~~pea~~ people see ~~a~~ and compare the differences very easily. And it also helps the

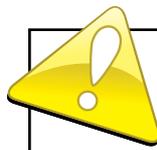
reader visualize how effective the  
perfluorocarbons are compared to  
Red Plasma. They could also observe



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**Examiner Comments**

A very basic answer, which would have received a mark had a previous year's questions been asked about the data but, again, does not answer the question this year.



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**Examiner Tip**

Always read very carefully what question is asking you to do and *never* rely on mark schemes for similar questions from past papers.

### **Question 2 (c)**

Most candidates were able to name a relevant paragraph, demonstrating that they understood what an economic issue is. Some did confuse it with ethical and, in rare cases, environmental, issues.

### **Question 2 (d) (i)**

The two questions about references, this one and the next, proved accessible for candidates.

## 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.
- Always consider manipulating data in questions where data are involved. This should be done to illustrate points that you are making about the data in your written answer.
- Make sure that any manipulation is mathematically correct and with units, if appropriate.
- Thoroughly review **all** core practicals. Be clear about all of the details and the implications of each. Question 1 will **always** be based on one of these.
- Review your understanding of basic experimental design. Be clear about the different types of variables (IV, DV etc.).
- Make sure that you understand how to write references properly.
- Be very clear that you understand what is meant by economic, environmental, social, and ethical, implications of biology.

## **Grade Boundaries**

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