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.
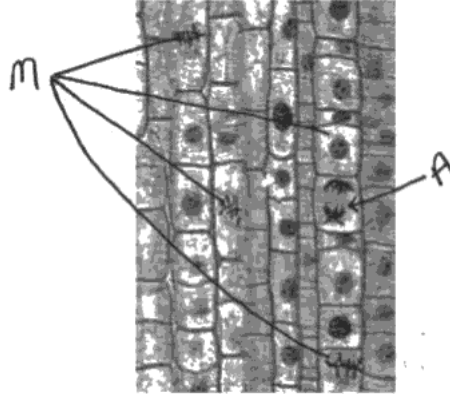
(i) Draw lines to all the cells that are undergoing mitosis and label them **M**.
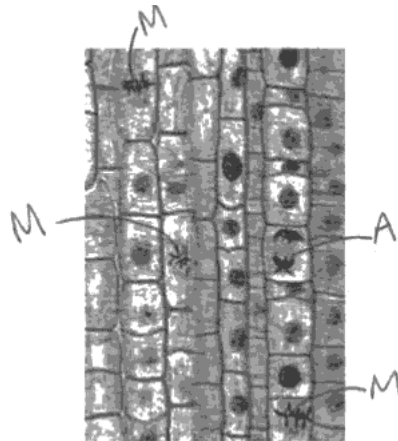
(2)

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Examiner Comments

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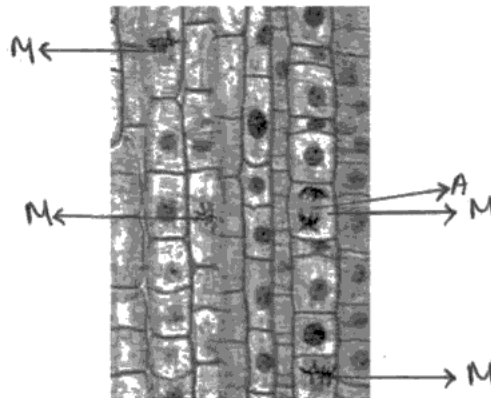

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Examiner Comments

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**.
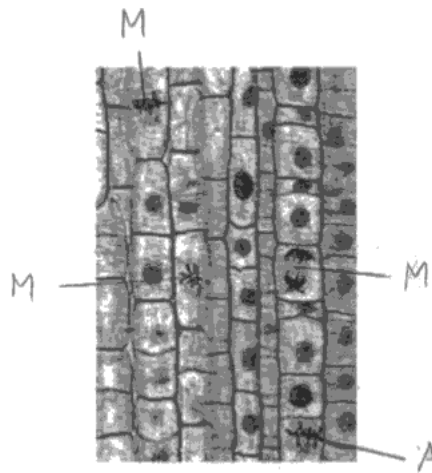
(2)

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

(1)

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

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

(1)

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

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)

My Xelate blue

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Examiner Comments

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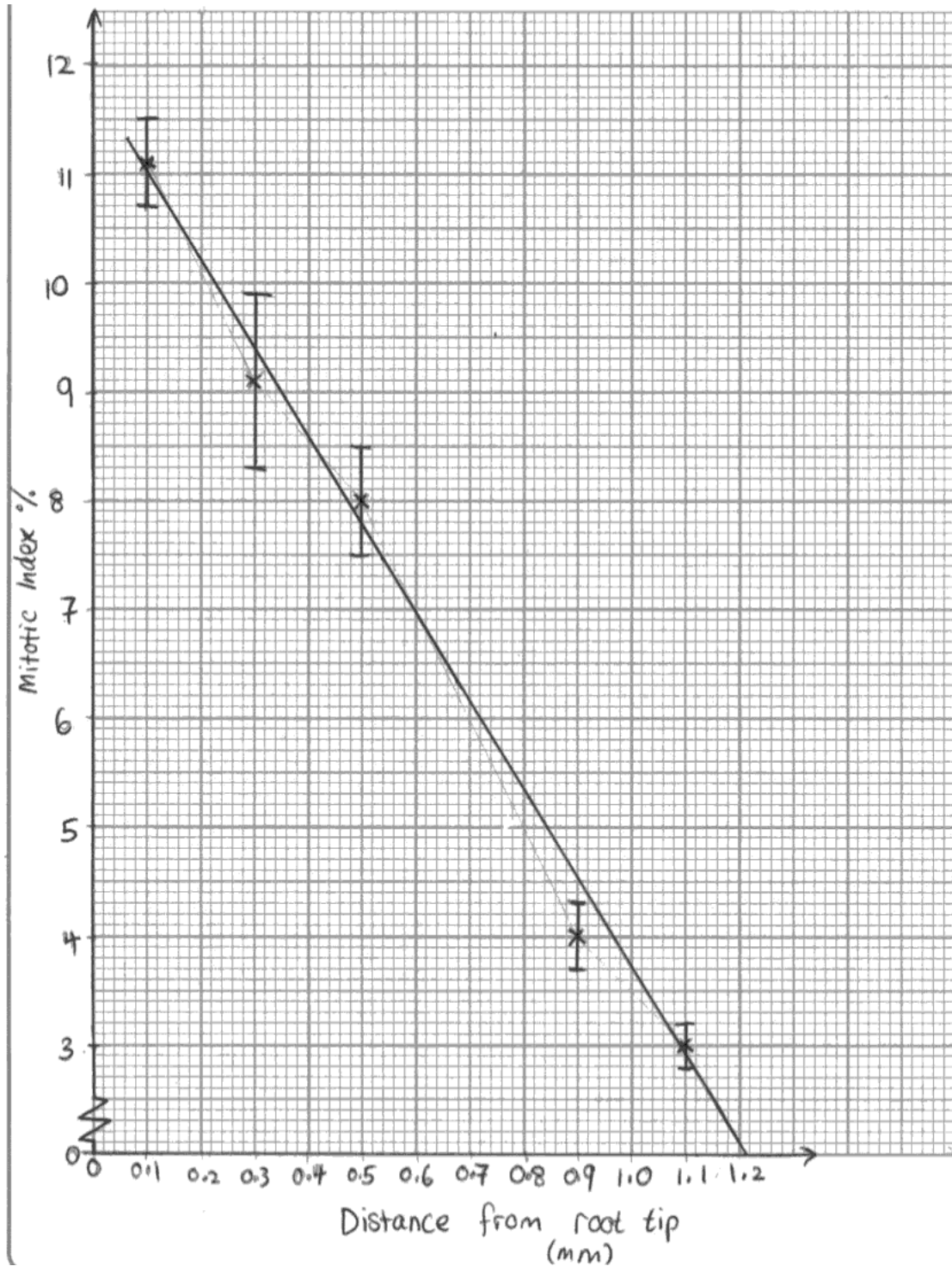
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Examiner Tip

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.

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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.
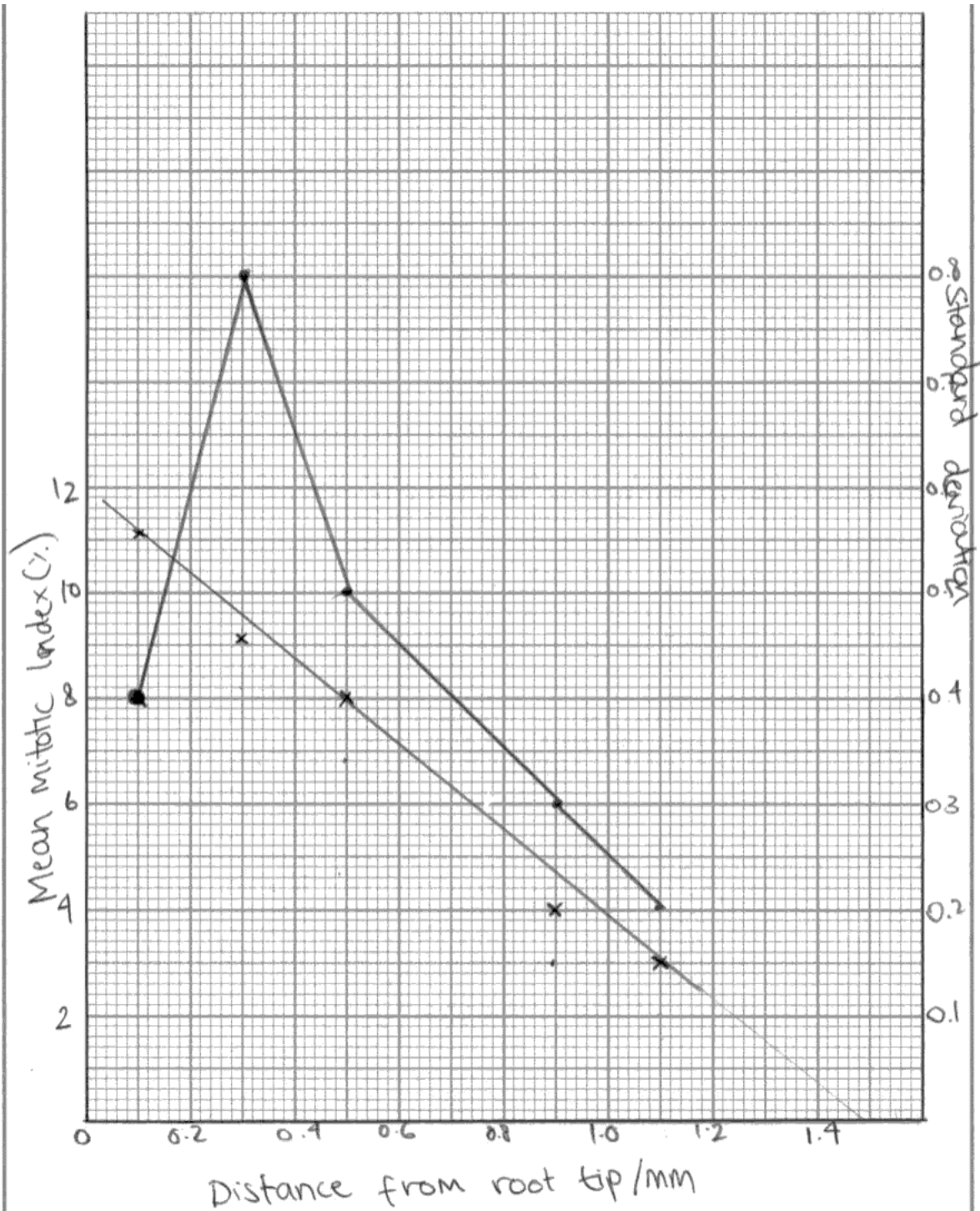
The graph shows "Mean mitotic Index (%)" on the left y-axis (values 2, 4, 6, 8, 10, 12), "Standard deviation" on the right y-axis (values 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8), and "Distance from root tip /mm" on the x-axis (values 0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4).

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

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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.

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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. The graph shows that the ^further away from the root tip* (1)

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

(1)

increases
The mitotic Index ~~decrease~~ as the distance from the root tip increases.

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 the 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 never overlap each other, this explains why the student was confident in the difference between the two measurements.

However, for measure distance from root tip(mm) 0.3(±0.8) and 0.5

with mean mitotic index 9.1 (±0.8) and 8.0(±0.5), when comparing the two, we can see that both values overlap, when 0.3mm has an mitotic index of (9.1-0.8)= 8.3% which overlaps with 0.5m when it has a mean mitotic index of (8±0.5)= 8.5%, explaining why she was not confident that there is a difference between 0.5mm and 0.3 mm

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

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

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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.

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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
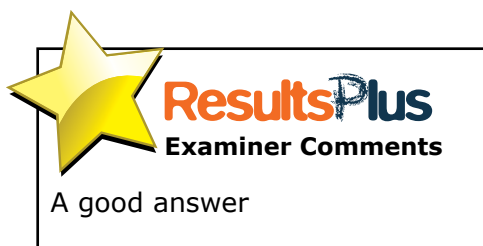
ResultsPlus Examiner Comments

A good answer

> (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.

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Some candidates, however, simply re-quote information from the original table, as in answer 1 in this example.
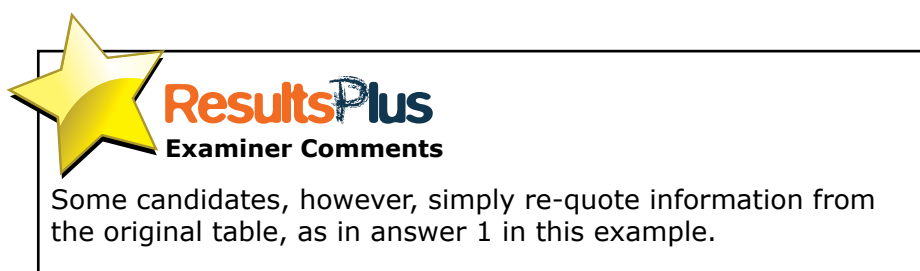
Question 2 (b) (i)

Make sure that you understand the difference between continuous and discontinuous data.

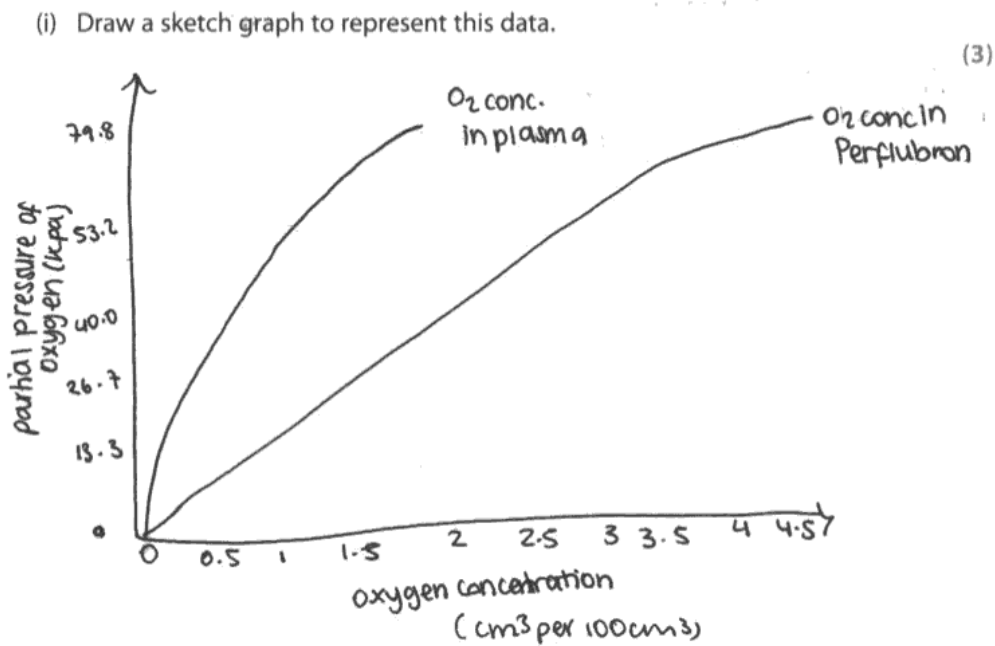You should also understand which graphical presentation is most suited to these two data-types.

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.

(i) Draw a sketch graph to represent this data.

(3)

O_2 conc. in plasma

O_2 conc in Perflubron

partial pressure of oxygen (kpa)

79.8
53.2
40.0
26.7
13.3
0

0   0.5   1   1.5   2   2.5   3   3.5   4   4.5
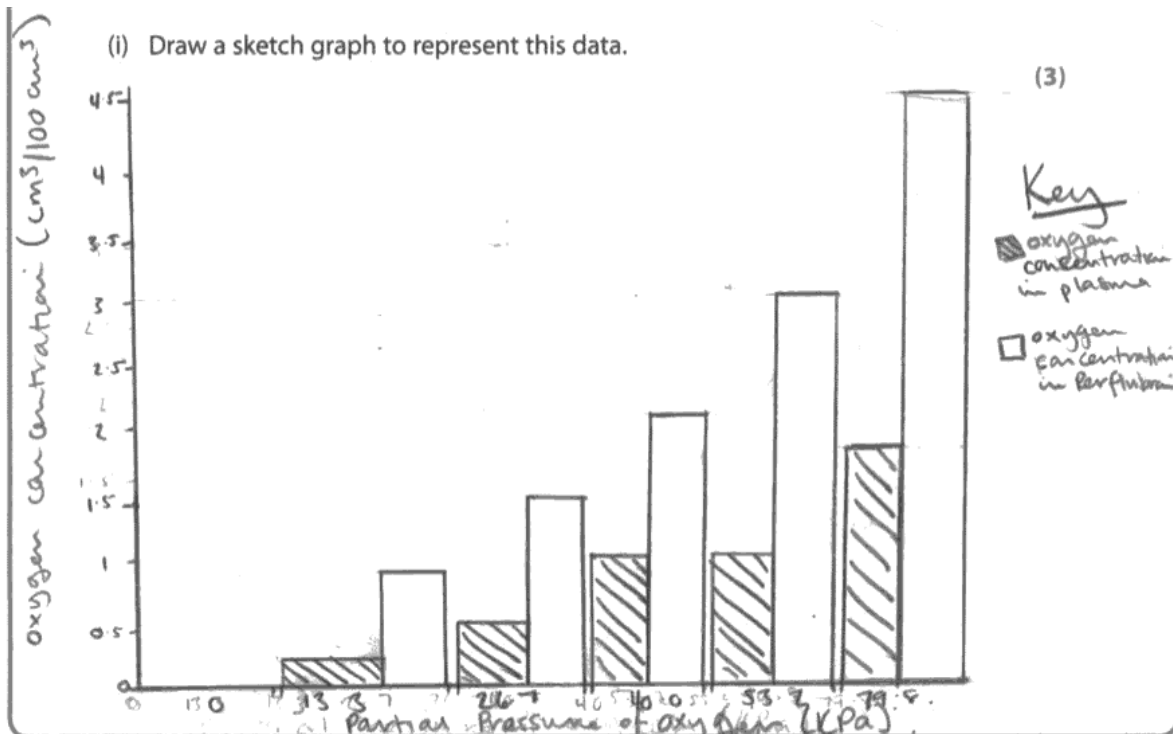
oxygen concentration (cm3 per 100cm3)

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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.

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Examiner Tip

Know which type of graph to use - when and how

(i) Draw a sketch graph to represent this data.

(3)

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 ^paragraph 9.

This is because, Paragraph 9 specificly speaks a bout Perfluban, oxygen with levels,

a form of PFCs being able to dissolve "2 to 3 folds comparing to depending on the oxygen portal pressure.

normal blood plasma^ Based on the graph, it is clear that in all partial pressure least

of oxygen, the Absorbtion of Oxygen concentration for perfluban is at least

2 times than that of plasma. Hence the ~~the~~ graph supports the extract. The general trend is that perflubon absorbs 2 times more oxygen than that of plasma, this is shown in at partial pressure of 79.8 kpa, perflubon is 4.6 cm³ per 100 cm³ and plasma is 1.8 cm³ per 100cm³ with an approximate 2.56 times more oxygen than that of plasma.

The graph ~~sad~~ should be placed in prograp ~~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 oxyge concentration in both plasma and perflubron.

After paragraph 9 because this is where ~~they~~ the student compares Perfluorocarbons (Perflubron) with oxygen. And this graph would make ~~peo~~ people see f 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 be observe

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.

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