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# Examiners' Report

## June 2017

IAL Biology WBI03 01

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## Introduction

There were some quite challenging questions on this paper where some candidates struggled to score significant marks. This was notably the case for Question 1(b)(ii) and Question 1(c). Detailed comments on these are made in this report. The more accessible questions were Question 2(a) and Question 2(d).

As ever for Question 1, it is important 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 Question 2, it is essential that 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 [https://qualifications.pearson.com/content/dam/pdf/A%20Level/Biology/2013/Specification%20and%20sample%20assessments/9781446910702\\_GCE\\_Lin\\_Biology\\_Issue\\_6.pdf](https://qualifications.pearson.com/content/dam/pdf/A%20Level/Biology/2013/Specification%20and%20sample%20assessments/9781446910702_GCE_Lin_Biology_Issue_6.pdf)

However, this specification will not be used after this summer so centres are advised to download the document as soon as possible.

### Question 1 (a) (i)

A wide range of dyes can be used to stain chromosomes. Those most likely to be available in schools are orcein and toluidine blue, but the mark scheme allowed for other possibilities.

(a) (i) Name a suitable stain for observing chromosomes in a root tip squash.

(1)

Toluidine



#### ResultsPlus Examiner Comments

Only the name of the stain was needed and examiners were quite generous on spelling, as illustrated here where the mark was given.



#### ResultsPlus Examiner Tip

Try to make sure you can spell technical terms correctly. Make sure you know the key part of the name of substances in which the name has more than one word, although in this case benefit of the doubt was given, but see the next example.

Acetic acid



#### ResultsPlus Examiner Comments

In this example the 'unimportant' part of the name has been given, and the candidate has quoted a substance which is NOT a stain at all. The orcein (in acetic or ethanoic orcein) is the stain. Orcein on its own was awarded the mark.

### Question 1 (a) (ii)

In any scientific procedure, a number of variables may be involved. However, questions may be asking for candidates to choose from a sub set which has specific importance. In this question, variables which 'could affect the number of dividing cells' were what was required. Many candidates did not recognise this and so chose variables which might be relevant in the wider procedure but not in this narrower sense. This was the cause of many lost marks here.

(ii) There are variables that could affect the number of dividing cells.

Give **two** variables that would need to be controlled. Describe how each variable could be controlled.

(4)

Variable 1 The variety of the germinating seeds.

How it could be controlled The seeds should be collected from

one source, so as to get the same type and age of seeds.

Variable 2 ~~The temperature~~ The amount of Acetic Orcein.

How it could be controlled The amount or volume of Acetic Orcein added to the root tips should be the same.



### ResultsPlus Examiner Comments

Here, the first variable is fine. The second one, amount of orcein, may have an effect but it will not be on the number of dividing cells, but rather, maybe, on the intensity of the staining of the chromosomes. The answer scored 2 marks.



### ResultsPlus Examiner Tip

Always read everything in a question very carefully and structure your answer accordingly.

## Question 1 (a) (iii)

Many candidates provided stock answers to 'why replicate?', such as 'to find the mean' or to 'ensure reliability'. Neither of these is correct and therefore the majority of candidates achieved no marks on this question.

(iii) Explain why five root tips were chosen for each sample.

(2)

So that a mean could be calculated and ~~variance~~ in variation of data can be observed. Outliers can also be identified.



### ResultsPlus Examiner Comments

This is a rare example of a correct answer which gained 1 mark for its suggestion about outliers, which could, however, be better referred to as anomalies. The idea of *observing* variation was close to a second mark, which it would have got had the candidate written *measured*.

- This is so that the experiment can be repeated
- Repeated experiments improve the reliability of the results.
- Repeating for each sample means that an average can be calculated, therefore the average value is reliable.
- Root tips can also get damaged easily, so if one gets damaged another can be used.



**ResultsPlus**  
Examiner Comments

This answer attempts to get marks using the two stock, but incorrect, responses about averages and reliability.

### Question 1 (a) (iv)

Ideas about random sampling proved problematic for the candidates. The majority of candidates did not score any marks on this question.

(iv) Describe how a random sample of five root tips could have been chosen.

(2)

Obtain root tips that have a firm white  
~~the~~ rounded end. Cut about 5 mm from the  
root tips.



**ResultsPlus**  
Examiner Comments

There is no reference to randomisation in this answer. Many candidates really had little idea what to write here.

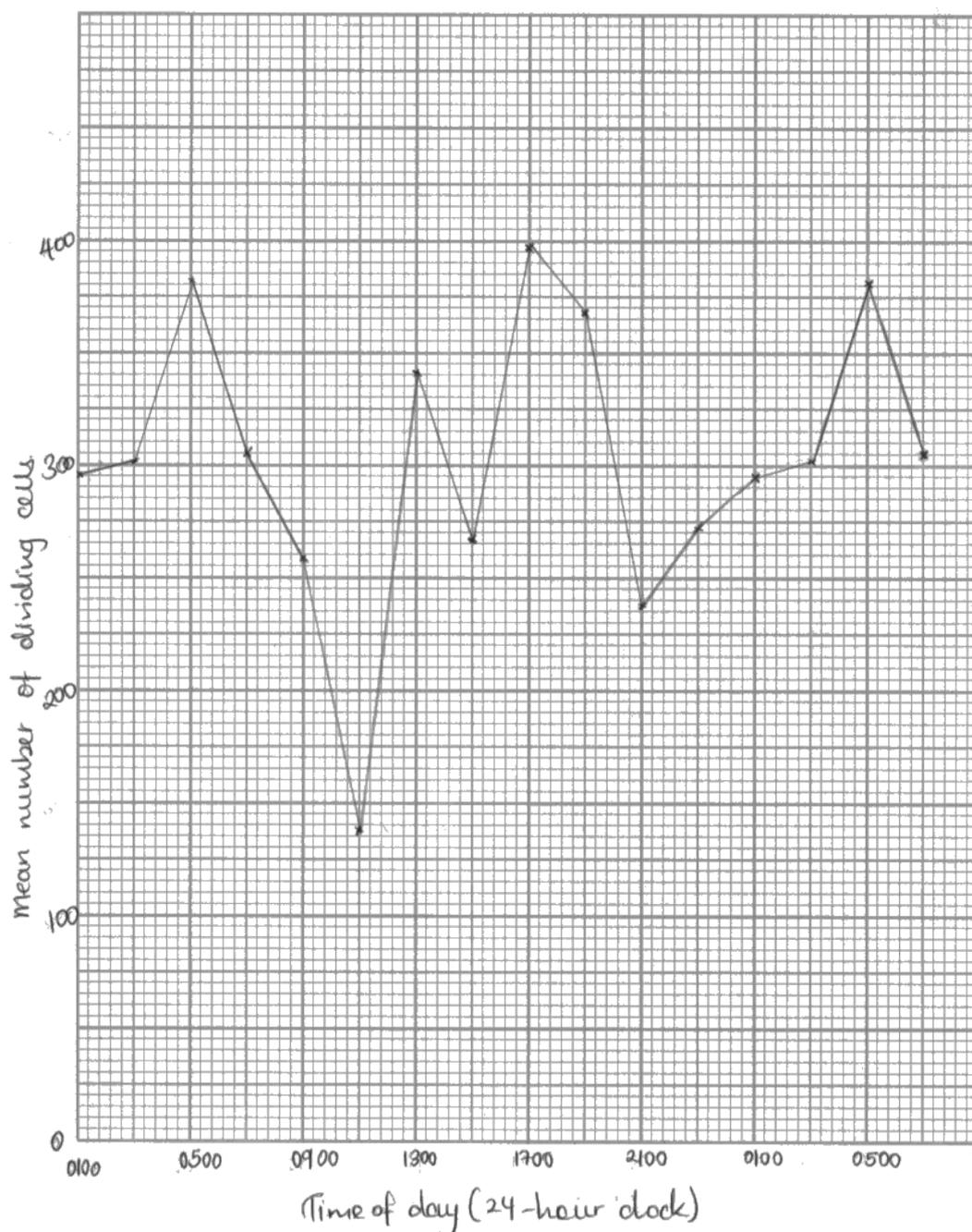
### Question 1 (b) (i)

Nearly two-thirds of the candidates achieved full marks in this graph plotting exercise. However, the x axis did prove challenging for some. Sometimes the label was missing the '24 hour clock' part, which was in the data table and this needed to be in the axis label. More commonly, a mark was lost by those who started the axis at midnight; which they took to be zero on the axis.

(i) Plot a line graph using the data in the table.

Join the points with ruled straight lines.

(4)



**ResultsPlus**  
Examiner Comments

This answer shows one of the commonest errors made by candidates who seemed to think all x-axes must start at 0. In this case 0 (midnight) was not when the experiment began and thus not the appropriate first point to plot. 3 marks were scored for the rest of the answer.

### Question 1 (b) (ii)

Only the strongest candidates scored full marks on this question. However, marks were accessible across the ability range with approximately two-thirds gaining one mark or more.

(ii) A second set of pea seeds was germinated, starting at 1400 instead of 0900.

These seeds were treated in the same way as the first set.

The maximum numbers of dividing cells in this second set were observed at 1800 and 2200 on the first day and at 1000 on the next day.

Using these two sets of data, the students made the following conclusion:

*"The number of dividing cells does not depend on the time of day but it does depend on the length of time after germination started."*

Explain how these two sets of data support this conclusion.

(4)

In the first set of data, as time of the day increased from 0900 to 1300, the mean number of dividing cells increased by from ~~138 cells~~ 82 cells. This increase happened over a 4 hours. In the second set of data, the maximum number of dividing cells were observed at 1800, which is also 4 hours away from 14:00. This shows there is a significant difference in the number of dividing cells, due to the length of time after germination started.



#### ResultsPlus Examiner Comments

This response gained marking points 3 and 4 for its statements about maxima being reached within 4 hours of the start in both sets of data. The statement about 1300 for set 1 was not clear enough for marking point 2.

The fact that in the second set the maximum numbers of dividing cells <sup>in the first day → 1800 & 2200</sup> were at a different time than the next day <sup>1000</sup> shows that it does not depend on the time of day. The fact that eight hours after the starting time in set 2 of the pea seed which is 2200 produced the maximum numbers is also the same in the first set which is 1700 which also produced the maximum numbers. This proves that the numbers depend on the length of time after germination started.



**ResultsPlus**  
Examiner Comments

This 3 mark answer shows that candidates did sometimes gain some of the marks rather by chance. It gained marking points 2, 3 and 4.

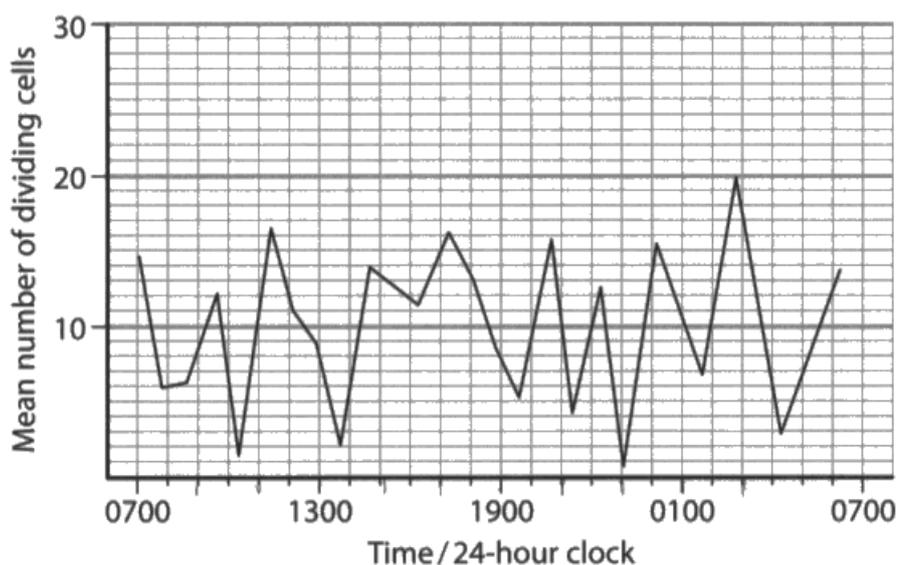
### Question 1 (c)

Full marks for this question were gained only by the strongest candidates. However, less than approximately 40% gained no marks, showing that it was accessible at some level to the majority of the candidates.

- (c) To check the validity of their study, the students looked for information in the literature about patterns of cell division in other plants.

They found the graph below in a peer-reviewed journal.

The graph shows the effect of time of day on cell division in the shoot tips of a species of grass.



Compare these results with the results for cell division in germinating pea seeds.

(3)

In both results, the trend goes up and down irregularly.

In both results, after the first hour, the number of dividing cells decreases.

In the first results, the highest number of dividing cells was found after the first 8h, in the second graph, just before 20h had past, with a mean of 20.



**ResultsPlus**  
Examiner Comments

This response gains marking point 1 for the idea of numbers going up and down in both sets of data.

## Question 2 (a)

This question proved very accessible for most candidates. However a lack of precision when referring to information in the report did lead to a loss of marks for some.

(a) The problem identified in this report is mercury poisoning.

Explain why mercury poisoning is a problem.

(3)

It ~~causes~~ causes Nerve damage, brain damage & uncontrollable behaviour. Nerve damage might need surgeries. In extreme cases it might cause death & it could be passed on to babies. Treatments have bad side effects or it could lead to infection and some such as pills are not effective. (Burning sensation, fever). Treatment takes long time and may be costly.

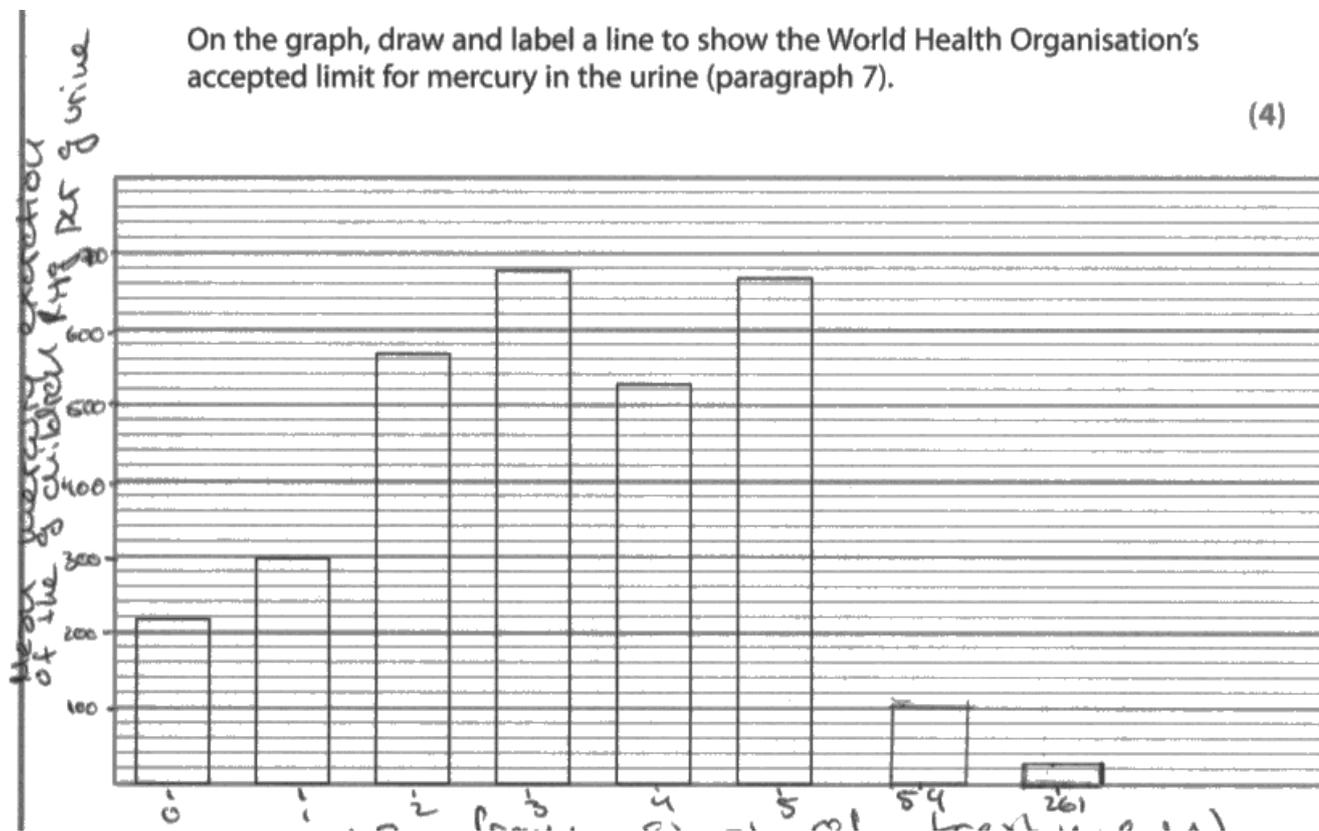


### ResultsPlus Examiner Comments

This is one of the few responses which did not gain full marks on this question. The main reason is due to a lack of the precision that was required by the mark scheme (uncontrollable shouting, which is in the report, as opposed to uncontrollable behaviour, which is not).

## Question 2 (b) (i)

This question was worth 4 marks and thus some detail was needed. For this reason it discriminated very well. Most candidates gained at least one mark and then there was a good number getting 2, 3 and 4 marks, with a fifth achieving full marks. Marks were most commonly lost for incorrect plotting and/or labelling of the WHO line, or for plotting of the two missing pieces of data in a way which was outside the tolerance set.



### ResultsPlus Examiner Comments

Here, a mark was lost due to the lack of the required WHO recommended line.

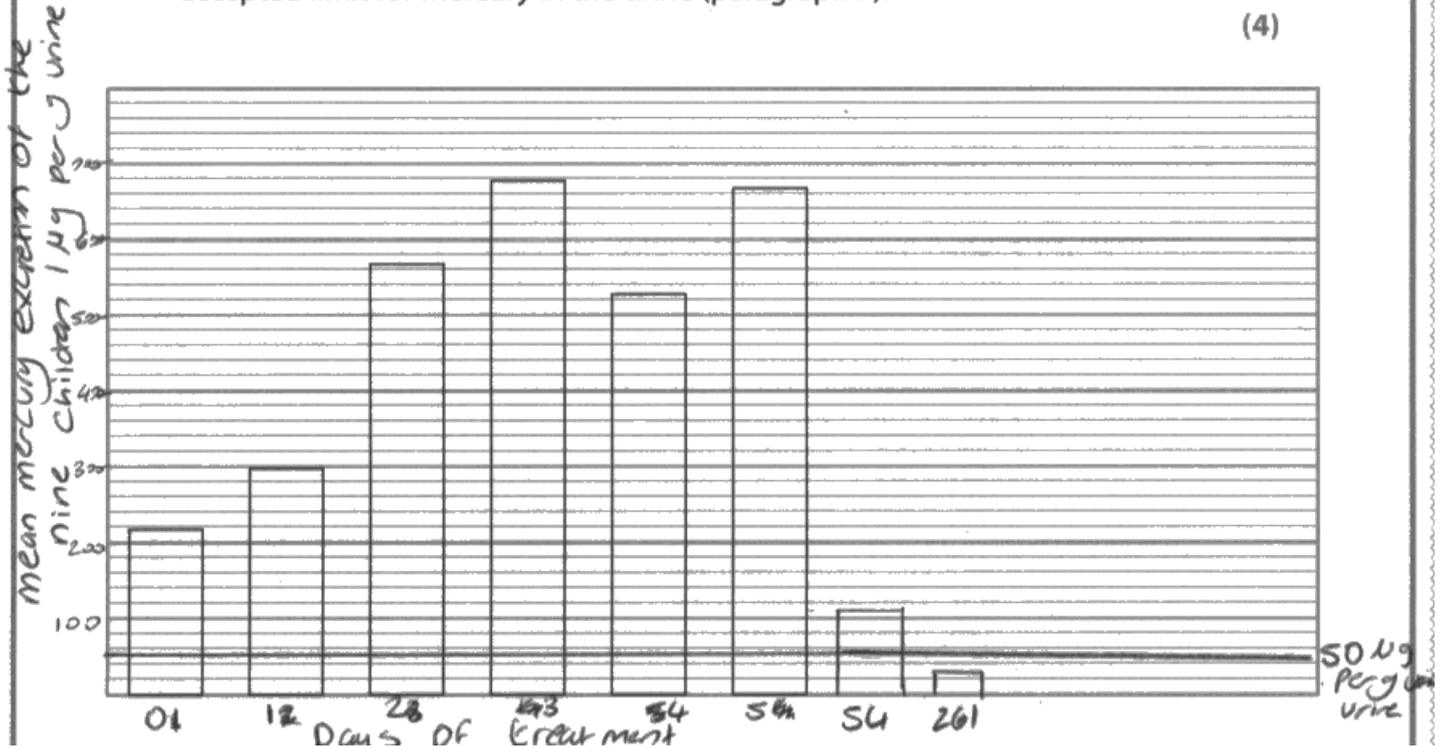


### ResultsPlus Examiner Tip

Make sure you address all the requirements of a question in your answer.

On the graph, draw and label a line to show the World Health Organisation's accepted limit for mercury in the urine (paragraph 7).

(4)



**ResultsPlus**

**Examiner Comments**

Here the plots are outside the tolerance set and the WHO line is unlabelled, a requirement clearly stated in the question. The candidate scored 2 marks.



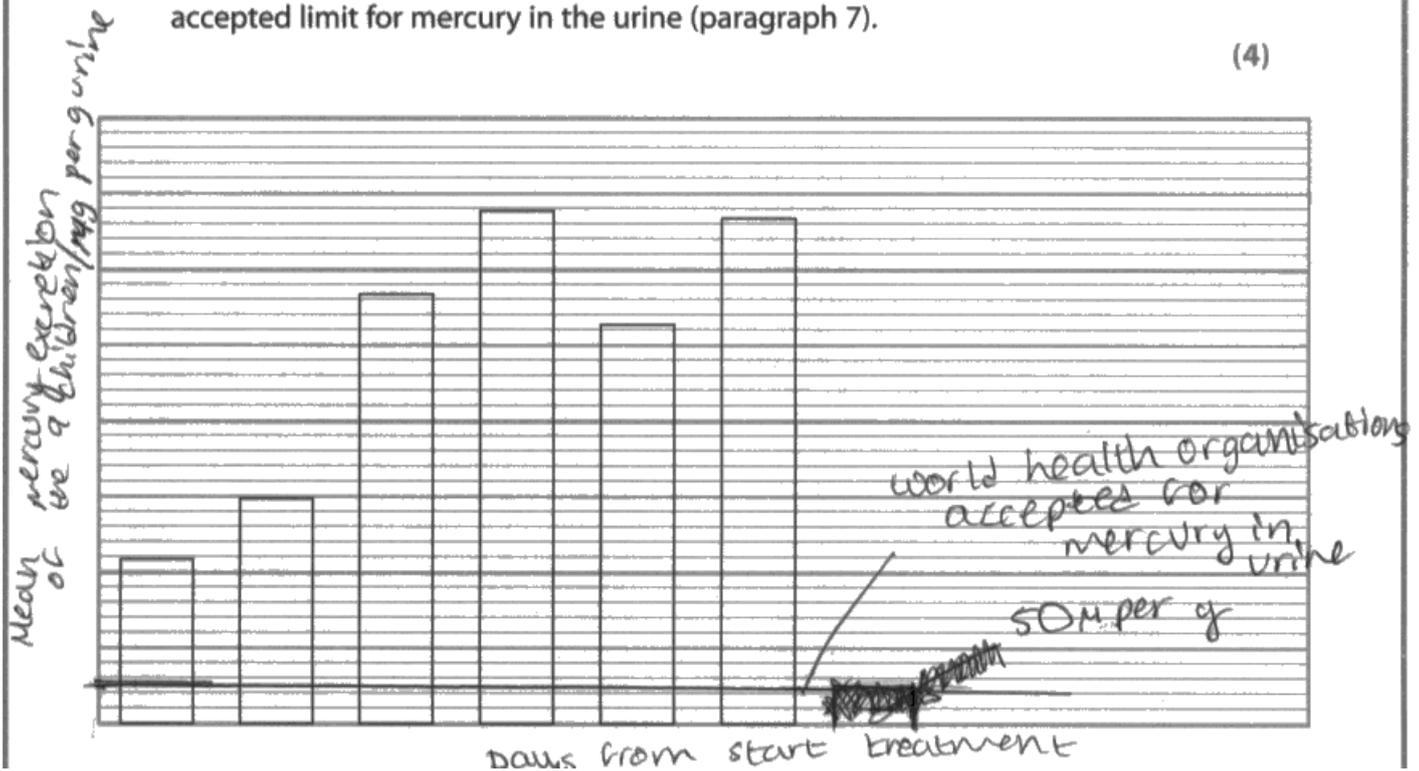
**ResultsPlus**

**Examiner Tip**

Again, make sure you meet all the requirements which the question sets out.

On the graph, draw and label a line to show the World Health Organisation's accepted limit for mercury in the urine (paragraph 7).

(4)



**ResultsPlus**  
Examiner Comments

Here, the missing data has not been plotted and there is no scale on the y-axis so again the candidate lost 2 potential marks.

**Question 2 (b) (ii)**

A good graph or figure title should include all the relevant details. Three quarters of the candidates realised this and gained the mark. Of the remaining quarter, the most common omission was any mention of the treatment being administered.

(ii) Give a suitable title for this graph.

organisation's accepted limit (1)

Bar graph showing mean mercury excretion of 9 children from day 0 to day 261 along with accepted WHO limit



**ResultsPlus**  
Examiner Comments

This is a typical zero mark answer in which treatment is not mentioned.

The mean mercury excretion as the days passed



**ResultsPlus**  
Examiner Comments

Again, in this response there is no mention of treatment.

### Question 2 (c) (i)

This was known by most of the candidates, although nearly a quarter of the entry did not gain the mark.

(i) State the piece of information that is needed to complete this reference.

(1)

Publisher (town)



**ResultsPlus**  
Examiner Comments

The most common wrong answer to this question was given by those who did not spot that pages were missing and those who thought that a reference must mention the name of the publisher.

Author



**ResultsPlus**  
Examiner Comments

An answer like this seems inexplicable. No mark was awarded.

## Question 2 (c) (ii)

Candidates are generally good at converting the information given into a full and correctly formatted reference. However, the question still discriminates well, whilst giving most candidates a chance to get some marks. On this occasion, nearly a third of the candidates scored full marks, with less than a tenth scoring zero. The most common issue was incorrect handling of author names.

(ii) Write as full a reference to this paper as possible, to include in a bibliography.

(4)

Article <sup>title</sup> ~~name~~, writer name, date, publishing city, volume of papers.



### ResultsPlus Examiner Comments

This is an example of a rare response which gained no marks. It is a pity as the candidate has clearly remembered the features of a full reference but failed to apply this knowledge to the case in point.

## Question 2 (d)

This question was answered well by most, with the majority of candidates gaining full marks. As with most questions which simply require information to be found in the report, it must be quoted accurately and in full.

(d) State **four** side effects of chelation therapy.

(2)

1. ~~Risk of kidney failure~~ Burning sensation
2. Fever
3. ~~Headaches~~ Hypotension
4. Convulsions



### ResultsPlus Examiner Comments

Here a mark is lost due to a lack of the required precision in effectively quoting from the report. This was the most common issue, where a 'burning sensation' is too general an effect in view of the information given.



### ResultsPlus Examiner Tip

If you are quoting from the provided information, make sure you do so in full.

## Question 2 (e)

Of social, economic, ethical and environmental issues, social has been the least commonly asked about. In this case, well over half of the candidates could see that the basis of social problems would be brain damage and/ or its effect on learning ability or kidney failure. However, fewer candidates could say why this would have social implications.

(e) Describe **one** possible social implication of using chelating agents in cases of mercury poisoning.

(2)

~~If the patient suffers kidney failure it could have a big impact on his/her life.~~  
The chelating agents as a treatment can lead to lasting of the brain damage which can affect the learning ability and behavior of the patient.



**ResultsPlus**  
Examiner Comments

Here the implications are focussed on the individual and not on society, 1 mark was awarded.

The social implications of using chelating agents is that it causes a risk of kidney failure. and if the patient experiences kidney failure it would have a serious impact on their lives and <sup>all</sup> the people around them.



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Examiner Comments

This response scored both marks; all that was needed was a link to be drawn between brain damage, or similar, and its effects on people outside the directly affected.

## Question 2 (f)

This question was mainly well answered. However, fewer than half of the candidates were able to gain full marks. The issue was that either the answer was not written in a comparative way as requested, or comparisons were inappropriate or repetitious.

(f) Identify **one** alternative solution to the problem of mercury poisoning.

Compare this solution with chelation therapy.

(3)

Surgery: ~~peripheral nerve reconstruction~~  
Nerve grafting Surgery: repair large gaps in the  
peripheral ~~nerve~~ <sup>nerve</sup> by taking segments of nerve from another  
part of the body or man-made Nerve that are inserted ~~set it~~  
~~- it takes longer to heal~~ ~~costly~~ ~~costly~~ compared to  
Chelation therapy; ~~the cost of chelation therapy~~  
→ and some nerves never repair fully  
→ regeneration takes up to 12 months



### ResultsPlus Examiner Comments

Here, the correct alternative solution is given but only one clear comparative remark is made for a total of 2 marks.

## 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.
- 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.
- Be clear about the differences between social, ethical, environmental and economic implications of solutions to issues.

## Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

<http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx>



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