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Examiners' Report
June 2014

IAL Biology WBI03 01

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June 2014

Publications Code IA038148

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).

Question 1 (a) (i)

There were still over 40% of candidates who could not correctly name the IV.

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

(1)

Different solvents used to prepare the extract.

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Examiner Comments

A straightforwardly correct answer.

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

(1)

Volume of extract /cm³

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Examiner Comments

This was a common wrong answer. The volume of extract is not varied. Also, it is not clear what volume the candidate refers to. It could be the quantity made or that added to the filter paper disc. The former would be in no way relevant, the latter might vary but would not effect the quantity of any active component from the Senna as this would be determined by the absorptive properties of the disc, which would not vary if the discs were all of the same paper and the same size.

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

(1)

antimicrobial properties of extracts.

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Examiner Comments

In this case the allusion is to the DV and not the IV as asked.

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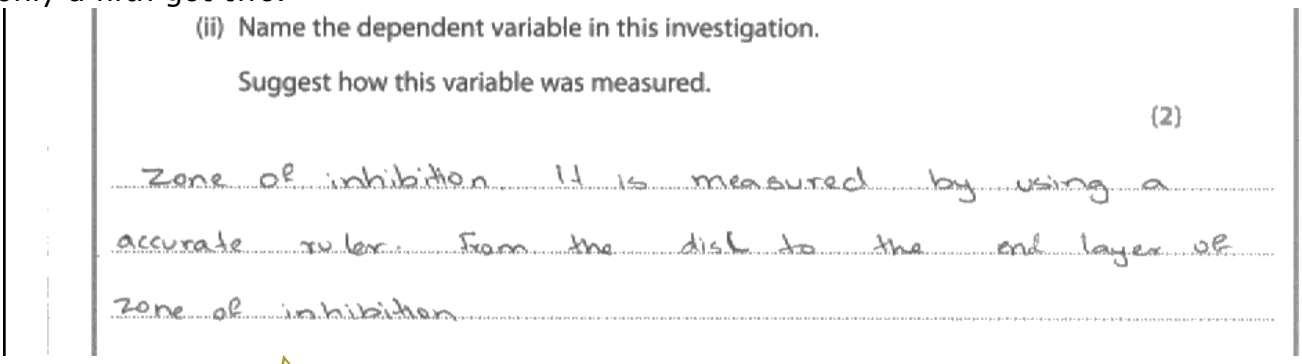
Examiner Tip

Make sure you are thoroughly familiar with the different types of variable in experiments; dependent, independent and those to be controlled or taken account of. In addition, you should review what each type is in the core practicals.

Question 1 (a) (ii)

There were three major issues for candidates on this question. Firstly, the DV was named as the 'zone of inhibition' but this is not something that can be measured. The correct response has to be some aspect of the size. Secondly, there is only one aspect of size that can be correct in this case, the diameter. This is clearly identified as the 'thing that was measured' in the last bullet point in which the method was described. Finally, and most worryingly, many who correctly identified the DV as 'the diameter of the zone of inhibition' went on to describe how they would measure its area. This suggests that they are writing down something which has been rote learnt rather than applying their learning to the situation at hand. These confusions are shown by the fact that about half got one mark but only a fifth got two.



(ii) Name the dependent variable in this investigation.

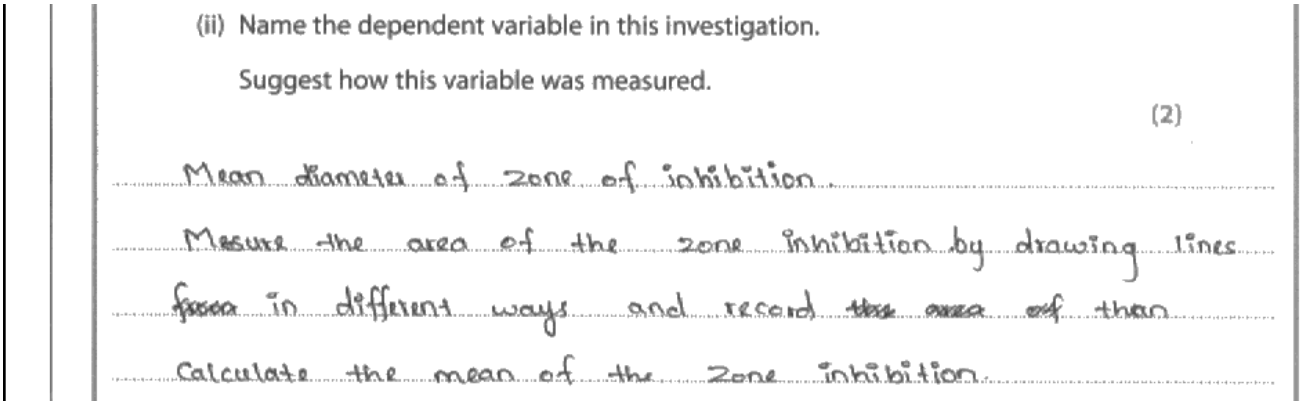
Suggest how this variable was measured.

(2)

Zone of inhibition It is measured by using a accurate ruler from the disk to the end layer of zone of inhibition

ResultsPlus
Examiner Comments

This candidate clearly has a good idea of what is needed but a combination of a sloppy idea of the DV and a vague method actually got no marks.



(ii) Name the dependent variable in this investigation.

Suggest how this variable was measured.

(2)

Mean diameter of zone of inhibition.

Measure the area of the zone inhibition by drawing lines from in different ways and record ~~the~~ area ~~of~~ then Calculate the mean of the zone inhibition.

ResultsPlus
Examiner Comments

Here the DV is correctly named but the method to measure it is exceedingly confused and gains nothing.

ResultsPlus
Examiner Tip

Make sure you take account of all the information you are given in a question. In addition, you should have knowledge, including the methodology, of all core practicals. However you are being asked to use one or the other, or maybe both in these questions.

Question 1 (a) (iii)

A majority of candidates were able to name a relevant variable, but far fewer to say how it could be controlled.

(iii) Name **one** variable that should have been controlled in this investigation.

Describe how this variable could be controlled.

(2)

~~Se~~ Temperature / °C

Measuring the temperature continuously using a thermometer.

ResultsPlus
Examiner Comments

It is an elementary but, sadly, common error for candidates to think they can control a variable by measuring it, as here.

(iii) Name **one** variable that should have been controlled in this investigation.

Describe how this variable could be controlled.

(2)

~~Temperature~~ The concentration of the solutions used. Then only we will know the real effect of that solution. So it's better to use the same concentration, so the results will be more accurate.

ResultsPlus
Examiner Comments

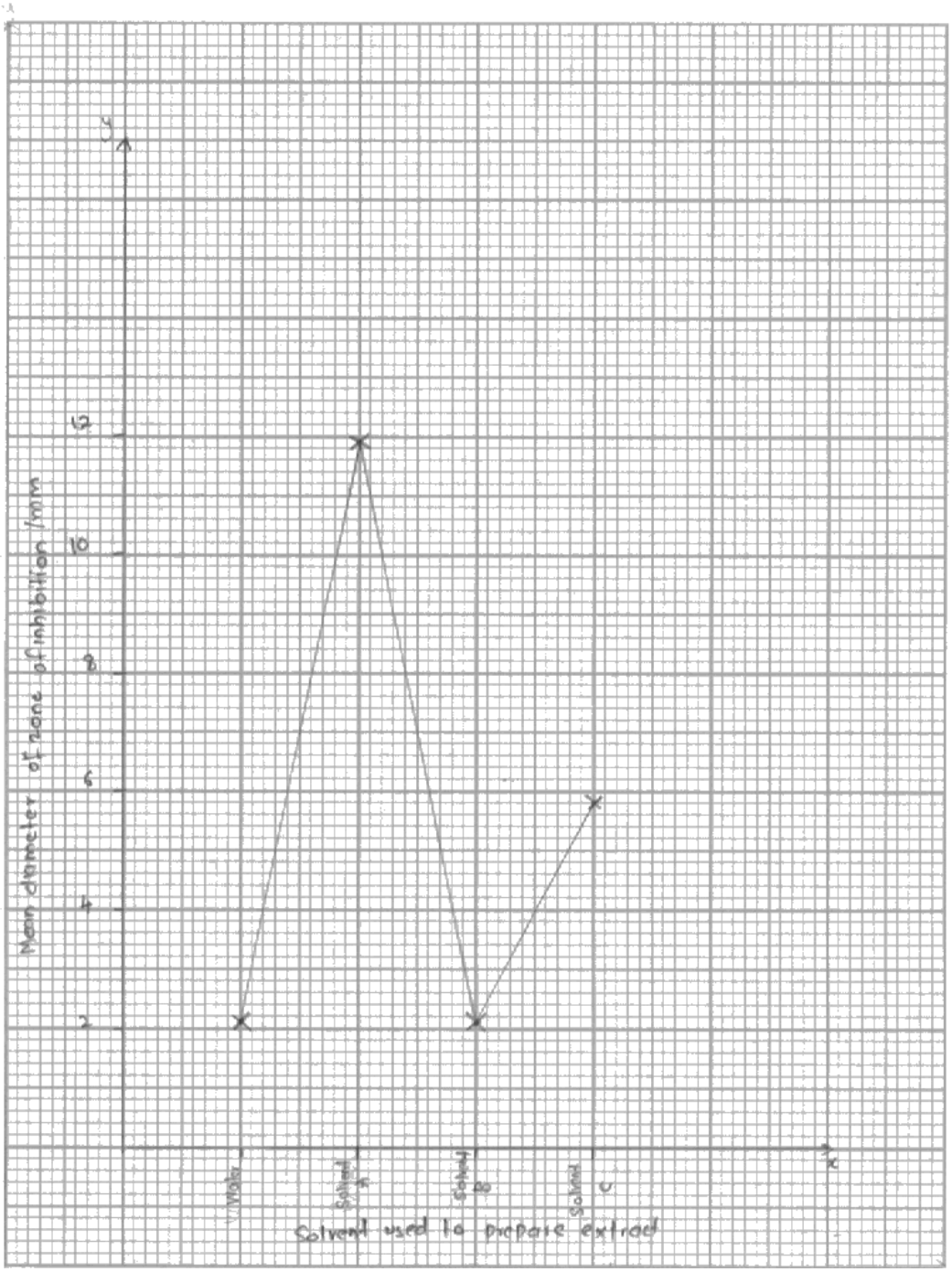
A lot of writing in this answer, but nothing that is worth any marks. The concentration is, effectively, the essence of the DV. This answer shows that this candidate has not understood this question at all. They go on to try to say why it would be necessary to do this which, even if correct, is not what was asked for.

Question 1 (b) (i)

As is the case in most years, the graph plotting question is well answered with over 60% gaining full marks. The examples show a couple of common errors that were seen.

(i) Plot the information about the solvent used to prepare the extract and the mean diameter of the zone of inhibition in a suitable graphical form.

(4)



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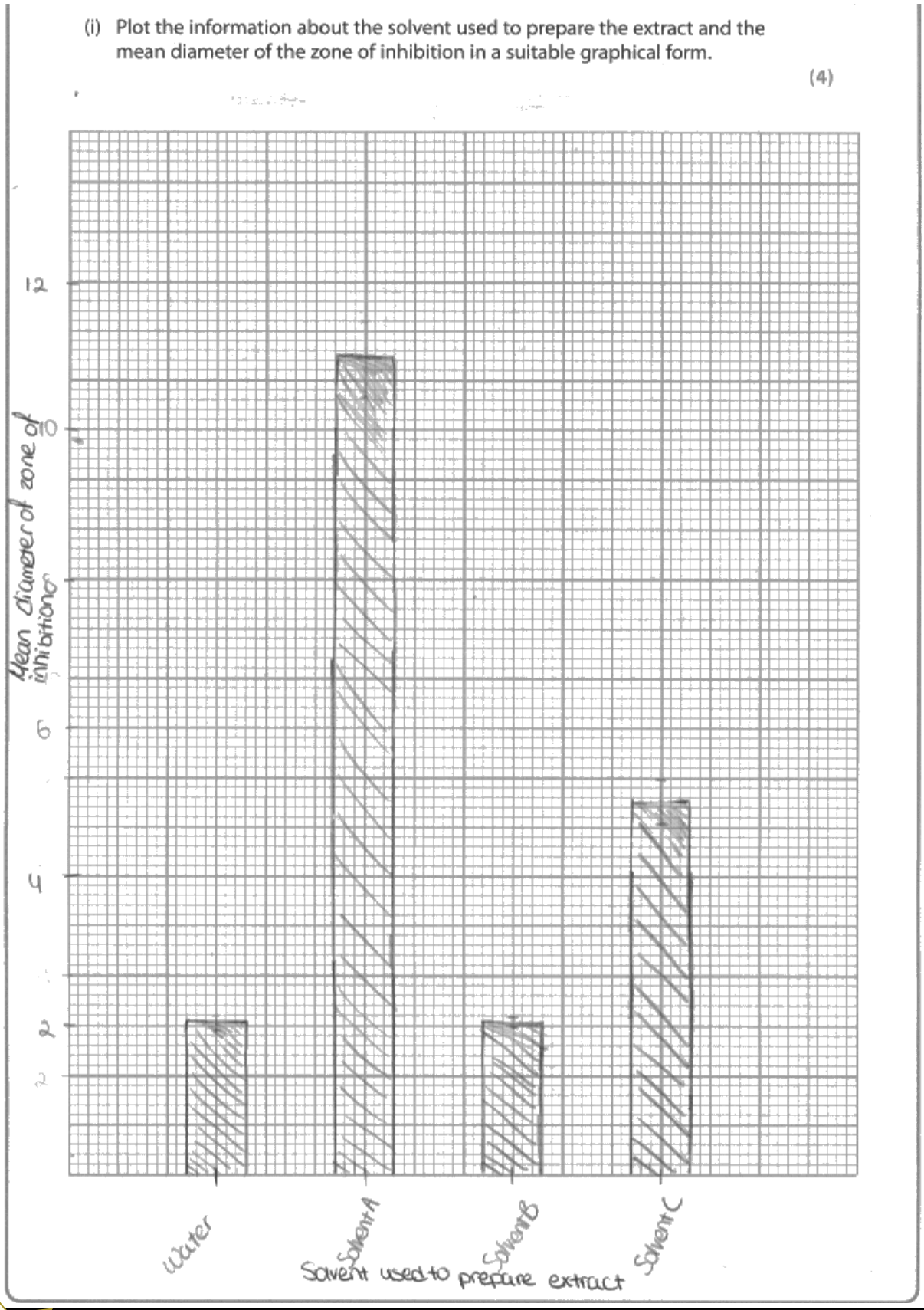
Examiner Comments

The commonest error, to draw a line graph, loses a minimum of one mark, as here.

(i) Plot the information about the solvent used to prepare the extract and the mean diameter of the zone of inhibition in a suitable graphical form.

(4)



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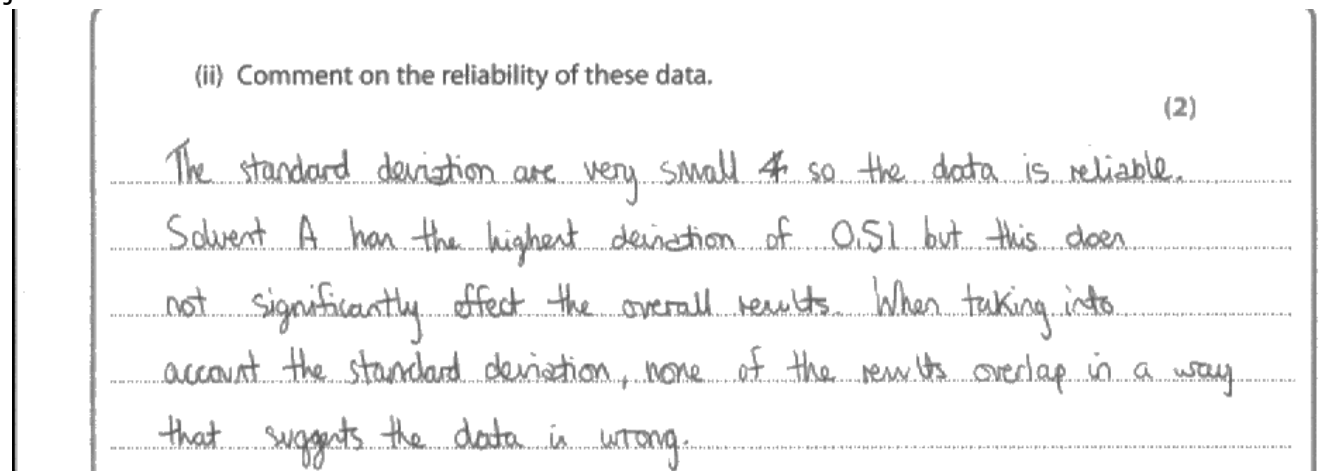
Examiner Comments

One the common difficulties candidates do have with the graph question is when they choose an inappropriate scale. This is the case here, 15 small squares to represent 2 mm is not an easy scale to use. The graph fails when attempting to plot 5.8 for Solvent C, this should be represented by 43.5 small squares on this scale but has been plotted at 37.5. This, added to the lack of units on the y-axis, restricts it to 2 marks.

Question 1 (b) (ii)

Candidates tended to comment at length in a 'blow by blow' way when all that was required was a simple statement that reliability is likely to be high as all SDs are low. This is a good example of where much more attention should be given to the number of marks available, just two in this case.



(ii) Comment on the reliability of these data.

(2)

The standard deviation are very small ~~4~~ so the data is reliable. Solvent A has the highest deviation of 0.51 but this does not significantly effect the overall results. When taking into account the standard deviation, none of the results overlap in a way that suggests the data is wrong.

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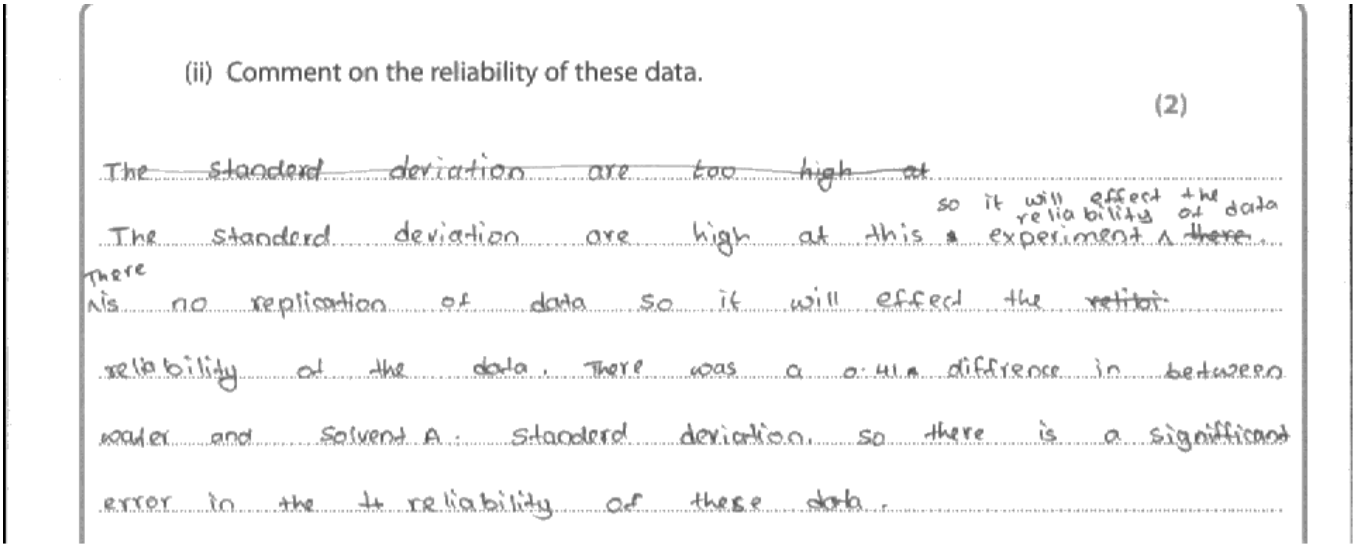
Examiner Comments

This is a two mark answer, although these are gained in the first sentence.



(ii) Comment on the reliability of these data.

(2)

~~The standard deviation are too high at~~ The standard deviation are high at this so it will effect the reliability of data experiment ~~there~~. There is no replication of data so it will effect the ~~relibi~~ reliability of the data. There was a 0.41 difference in between water and Solvent A standard deviation so there is a significant error in the ~~it~~ reliability of these data.

ResultsPlus
Examiner Comments

This is a detailed answer but unfortunately does not get to the simple point required. The fact that there is no replication does not affect reliability it simply does not allow us to measure it. In addition, it is not true that there is no replication.

Question 1 (b) (iii)

This is good example of a question in which the number of marks gave a guide to what was needed. A simple statement of which solvent, A, was most effective was not enough for even one mark, this had to be coupled with why it was that one. The first point is that A has the largest diameter zone of inhibition, the second is that the zone size is a measure of effectiveness of killing/inhibition of bacteria. Then a third mark is still available and the obvious route to this is to manipulate the data to support the conclusion about A.

(iii) Explain which solvent produces the most effective antimicrobial extract.

(3)

Solvent A. Because the mean diameter of zone of inhibition is ~~the~~ highest for solvent A zone of inhibition will tell us how effective the antimicrobial extract is. for solvent A If it is ~~more effective~~ the mean diameter of zone of inhibition is 11-9 mm but other solvents have 2.1mm and 5.8mm. So solvent A ~~is effective than other solvents extracts~~ produces the most effective solvents extract.

ResultsPlus
Examiner Comments

This answer gains the first mark, by choosing solvent A and giving the correct reason for the choice. This type of answer was very common. Many candidates were, however, as here

Question 1 (c)

The subtlety of what was required escaped many candidates. To be awarded marks, it had to be clear that the comparisons made were between the second set of data presented in part c, for Streptococcus aeruginosaEscherichia coli and Staphylococcus aureus and that from earlier, for Salmonella typhi.

Suggest how these data support the validity of the investigation using *Salmonella typhi*.

(2)

No standard deviation, should need more information about how the studies were done via experiment. volume of extract used or concentration. time of incubation concentration of solvents

ResultsPlus
Examiner Comments

This answer is clearly attempting to get marks without any real reference to the information given, but by making general points about what the candidate thinks is needed for validity.

ResultsPlus
Examiner Tip

Many questions will ask you to use your knowledge in a specific context, not just display it.

Suggest how these data support the validity of the investigation using *Salmonella typhi*.

(2)

Both tables show that solvent A has the largest mean diameter of inhibition zone compared to the other solvents. Therefore solvent A is the most effective plant. for any Also, the values for species of bacterium used.

ResultsPlus
Examiner Comments

This gains just one mark for its comment about Solvent A in relation to both tables. The reference to solvent A being the most effective plant was ignored.

Suggest how these data support the validity of the investigation using *Salmonella typhi*.

(2)

The data support the investigation as the mean diameter of zone of ~~this~~ inhibitation of solvent A is the largest for all 3 species of bacterium. The data for mean diameter of zone of ~~the~~ inhibitation for water and solvent be ~~the~~ is almost the same for all 3 species of bacterium exept Streptococcus aeruginosa.

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Examiner Comments

Sadly, although this answer makes some sensible points about solvent A and water, it very clearly does so for all **three** species of bacteria and is thus making no attempt to compare the data in c with that for *Salmonella typhi* and thus cannot be awarded any marks.

Question 1 (d)

A generally well answered question.

Suggest the advantages and disadvantages of using Senna extract instead of Ofloxacin to treat infections caused by *Escherichia coli*.

(4)

The advantages of using Senna extract than using ofloxacin, is that Senna is not expensive to extract make. It require less time to obtain it. The bacteria might still not be resistent to it. Disadvantages are it can cause unknown side effects since there is no clinical trials done on it. It might damage the ecosystem, if a lot of plants are extracted.

(Total for Question 1 = 20 marks)

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Examiner Comments

This is a typical example of a very good answer. Having been asked to list advantages and disadvantages for four marks it sensibly attempts to do two of each. In this it succeeds, gaining a mark for the reference to Senna being cheap, there being no evidence of resistance to it as yet, not having been through clinical trials and, therefore, there is the possibility of side-effects which are unknown.

ResultsPlus
Examiner Tip

If two things are asked for, here advantages and disadvantages, then full marks will not be gained by discussing only one.

Suggest the advantages and disadvantages of using Senna extract instead of Ofloxacin to treat infections caused by *Escherichia coli*.

(4)

Senna obtusifolia plant from which senna extract is made is a common plant which can be easily obtained. It also treats a lot of bacterial infections, not only Escherichia coli. However, its highest mean diameter of zone of inhibition is only 10mm while Ofloxacin produces 12mm. Although Ofloxacin is expensive, it is ready made and easy

ResultsPlus
Examiner Comments

Another good answer although this time gaining three marks instead of four. It suggests that Senna is readily available, that it is less effective in experiments than the antibiotic and, by implication, that it is cheap.

Suggest the advantages and disadvantages of using Senna extract instead of Ofloxacin to treat infections caused by *Escherichia coli*.

(4)

The bacteria Escherichia coli will not become resistance towards the extract of sennal, but it will become resistant towards the ofloxacin antibiotic. But, it is hard to get the extract of sennal and the concentration of the extract might be low lowering the antibiotic properties

ResultsPlus
Examiner Comments

This answer makes a common mistake, that bacteria cannot or will not become resistant to Senna. Many went on to say that this was because Senna is natural and antibiotics are not.

ResultsPlus
Examiner Tip

Do not fall in to the trap of thinking that what is perceived as a natural 'cure' is better than what is perceived as an 'artificial' one.

Question 2 (a)

Candidates were split half and half on this question. Those who got 0 usually did so either because of the vagueness of their title or because it did not address the question; 'state the problem identified in this extract'.

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

State the problem identified in this extract.

(1)

Colony collapse disorder of honey bees caused by the mite, Varrao destructor.

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Examiner Comments

This answer has all the elements required, the problem is a decline in honeybee populations (here expressed as colony collapse disorder) caused by the mite.

ResultsPlus
Examiner Tip

Be aware that solutions to the main problem may themselves cause problems, but these would not be the problem first identified.

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

State the problem identified in this extract.

(1)

A disorder for honey bees that decreases their population.

ResultsPlus
Examiner Comments

On the other hand, here the answer identifies population decline but not the specific cause which this report is about solving.

ResultsPlus
Examiner Tip

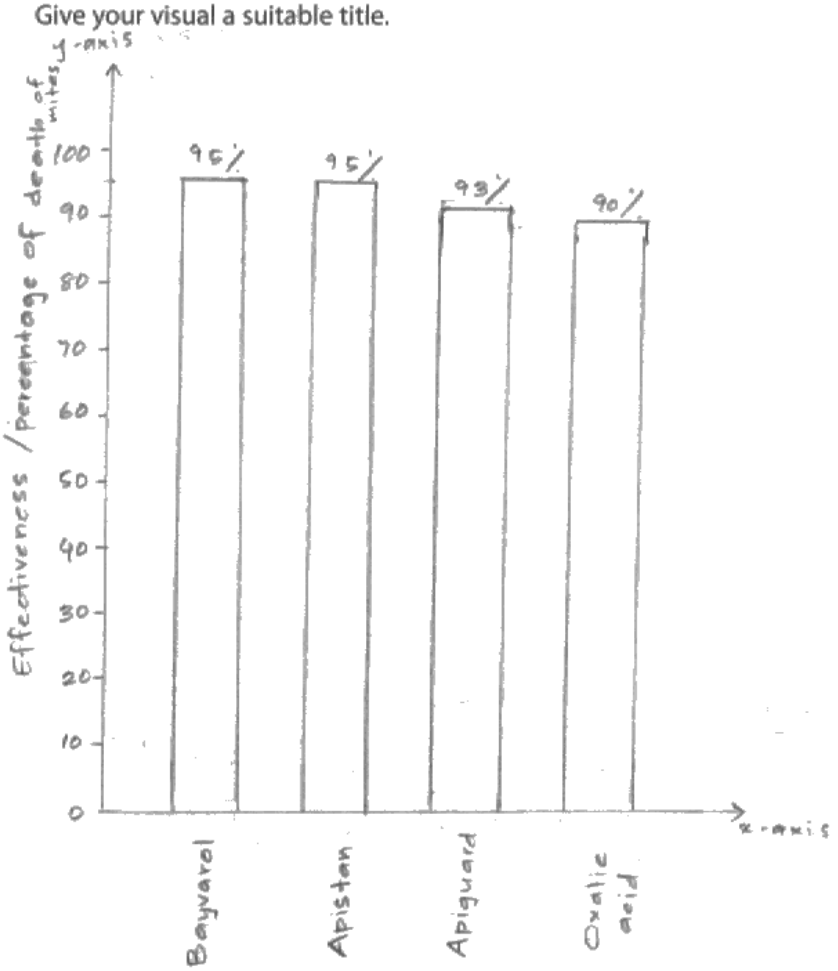
Make sure you understand the difference between a problem and a solution to a problem. These reports will contain both.

Question 2 (b) (i)

This question proved to be accessible to most, over 70% gaining 3/3. Where marks were not gained it was usually due to an inadequate title.

(b) (i) In the space below, present the information in paragraph 9 in a visual form.

Give your visual a suitable title. (3)



Title The graph shows the effectiveness of the four types of varroacide on Varroa mite by its percentage of death of the mites.

ResultsPlus
Examiner Comments
A typical three mark answer.

Question 2 (b) (ii)

There is no doubt that this was the most demanding question on the paper, only 7% of candidates managed to get full marks, with over 50% achieving zero.

Paragraph 10 states that *"Only a few treatments are required per year."*

Explain how the information in this graph and paragraphs 9 and 10 support this statement.

(3)

The table shows that after varroacide is applied the number of mites drop to 0-200. It takes about 110 days for mites number to increase to 1000, when 90% effective varroacide is applied. All the varroacides mentioned in paragraph 9 are above 90% effective. The number of mites should only be kept below 1000 thus, if 90% effective varroacide treatment is required only 3-4 times. 80% effective varroacide requires 4-5 treatments per year.

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Examiner Comments

This is a rare three mark answer. It points out that a 90% effective varroacide would give protection for 110 days (mark point 2) by stating that this is how long it takes for the population to get back to 1000 (implying mark point 1, which is stated more clearly later in the answer). It then gives the fact that all the varroacides mentioned in paragraph nine are 90%, or better, effective (mark point 4). It then finishes off by saying this implies 3/4 treatments (if 90%) or 4/5 if 80% (mark point 3).

Question 2 (b) (iii)

Over 90% got this right.

Question 2 (c)

Reference writing rules still do not seem to be solid for many candidates, they are unvarying so can be learned once and applied in all situations. References to books (as required here) should include author, date, title, publisher, town in that order. The marks here were for inclusion of these (and only these) elements and the second one for the correct order.

Use these two pieces of information to write a complete reference for this book.

(2)

Schacker M, ~~A Spring without Bees~~ (2008), A Spring without Bees - How Colony collapse disorder has endangered our food supply, The Globe Pequot press, CO 06437, P.O Box 480.

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Examiner Comments

In this case a mark was lost for the inclusion of extraneous material.

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Examiner Tip

There are very strict, but simple, rules about the way references are written. Make sure you know them!

Use these two pieces of information to write a complete reference for this book.

(2)

Michael Schacker, ~~2008,~~ 'A Spring without Bees - How colony collapse disorder has endangered our food supply' 2008 Copyright © 2008 by michael Schacker.

ResultsPlus
Examiner Comments

Here extraneous material is included, losing mark point 1 and then the order is wrong losing mark point 2.

Use these two pieces of information to write a complete reference for this book.

(2)

Schaefer, M, 2008, 'A spring without Bees - How colony collapse disorder has endangered our food supply', The Globe Pequot Press.

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Examiner Comments

An accurate two mark answer, only 3.8% managed to achieve 2/2.

Question 2 (d) (i)

Economic implications and risk for humans seemed to be well understood.

(d) The student's report includes discussion of the risks and implications for humans and other organisms.

It also includes some alternative solutions to the problem.

(i) Give **one** economic implication and **one** risk for humans of using varroacides, identified in this report.

(2)

Economic implication It is very expensive

Risk for humans oxalic acid in varroacides dissolves in honey and itspoisonous to human .

ResultsPlus
Examiner Comments
Another good two mark response.

(d) The student's report includes discussion of the risks and implications for humans and other organisms.

It also includes some alternative solutions to the problem.

(i) Give **one** economic implication and **one** risk for humans of using varroacides, identified in this report.

(2)

Economic implication Cost of varroacides high.

Risk for humans Oxalic acid dissolve in honey
Poisionous to humans.

ResultsPlus
Examiner Comments
This is an excellent, concise and accurate two mark response.

(d) The student's report includes discussion of the risks and implications for humans and other organisms.

It also includes some alternative solutions to the problem.

(i) Give **one** economic implication and **one** risk for humans of using varroacides, identified in this report.

(2)

Economic implication cause about £4 to £5 per hive,

which is quite expensive for those who makes business of selling honey

Risk for humans high level of chemical in honey.

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Examiner Comments

This one mark response makes a common error of being far too vague for the 'risk for humans' mark. It does not specify which chemical or why it might be a problem if it is in honey in high levels.

Question 2 (d) (ii)

See example below.

(ii) Using information from the report, explain why an alternative solution to the use of varroacides to control the mites might be needed.

(3)

~~* The mites~~

* The report says mites may build resistance to varroacides.
* The report also says that some varroacides can affect the good taste of honey.
* The efficacy of varroacide can become less as varroacide resistant mites increase.

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Examiner Comments

Three clearly stated reasons; development of resistance, effects on honey taste and the problem of resistance development.

Question 2 (d) (iii)

This question was answered well with over one third gaining full marks.

(iii) Identify and explain **one** alternative solution to the use of varroacides discussed in this report.

(3)

use of organisms to control another. Fungi can kill mites inside the hive and will not have much of an effect on honeybees. Also, the use fungus wouldn't have any unknown effects on the environment since it is found in Britain.

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Examiner Comments

A clear three mark answer.

(iii) Identify and explain **one** alternative solution to the use of varroacides discussed in this report.

(3)

Rotating the treatment by using alternating varroacides, which have different active chemicals. This reduces the likelihood of resistant mites developing.

ResultsPlus
Examiner Comments

One of the commoner errors by candidates who did not do well on this question. Although what is said is correct, varroacides are still being used so it does not answer the question.

Question 2 (e)

This question was not well answered, with nearly half getting zero. The commonest problem was to find fault with the way the reference had been quoted, but this could not gain marks as candidates were given no information about this to comment on, the references were not given.

(e) Some information about two of the references quoted in this report is given below.

- Ref 12, from the website of Dadant who make the thymol-based Apiguard®, saying that pyrethroid resistance is widespread.
- Ref 23, which is a government agency website saying that pyrethroid resistance is widespread in the UK.

Comment on the validity of these references.

(2)

References are valid. One is a government agency and the other is a popular company producing pyrethroid products. Both are in agreement that pyrethroid resistance is widespread in UK.

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Examiner Comments

A relatively rare two mark answer (achieved just under 10%). This states clearly that both are likely to be valid as they agree with each other.

(e) Some information about two of the references quoted in this report is given below.

- Ref 12, from the website of Dadant who make the thymol-based Apiguard®, saying that pyrethroid resistance is widespread.
- Ref 23, which is a government agency website saying that pyrethroid resistance is widespread in the UK.

Comment on the validity of these references.

(2)

Some reference is missing. like, * article title, journal name, volume * number, issue number and page number.
→ reference of URL should be added.
* year published should be added.

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Examiner Comments

A typical zero mark answer which has simply not understood what was being asked for.

Paper Summary

- 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 skills that each helps to teach you. These are:
- Handling apparatus and materials correctly and safely.
- Working safely with due consideration for the wellbeing of living organisms & the environment
- Measuring and observing precisely and recording in a structured manner, identifying variables and justifying validity and reliability of results
- Identifying and explaining possible systematic or random errors in results
- Using appropriate methods to analyse results, presenting data and identifying trends or patterns
- Describing anomalies, evaluating methodology and making suggestions to improve or extend the investigation.
- 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 to journal articles, books and websites.

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