

# ResultsPlus

## Examiners' Report January 2011

### GCE Biology 6BI07 01

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## Introduction

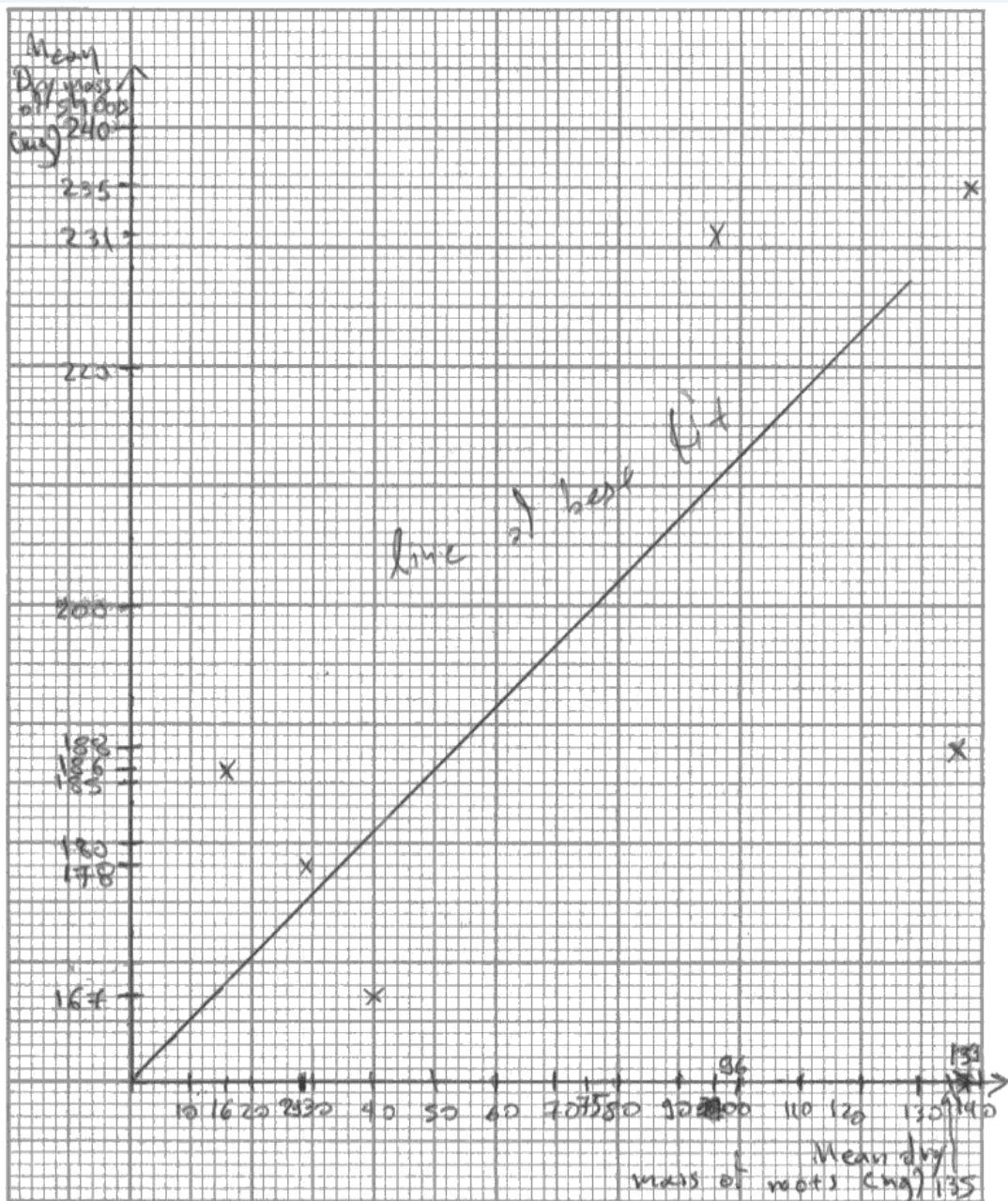
Lack of familiarity with the particular practical examined has been the main problem in the previous three papers of this type. This was still somewhat evident this time, but the relative novelty of the approach made it less of a problem. On this occasion, the candidates who struggled did so firstly because they did not have a good enough understanding of some of the basics of experimental design and secondly because they did not study the stem carefully enough.

In Question 2, teachers are reminded again that the skills being tested are those detailed in the specification of Page 80.

**Question 1 (a) (i)**

This question was done well by most. The main error was candidates who added up the root and shoot biomasses. This does not allow of a proper comparison, which is what the question asked for.

(a) (i) Plot the data from the table, in a suitable graphical form, to compare the mean dry masses of shoots and roots in each of the solutions.



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Examiner Comments

A plot of root dry masses against shoot dry masses does not allow the comparison asked for in the question. This answer was worth no marks.



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Examiner Tip

Ensure that you read *exactly* what the graph is supposed to be showing before you decide what to plot. Data can be displayed graphically in a number of different ways for different purposes.

**Question 1 (a) (ii)**

About a third of candidates found this an easy question but there were some misinterpretations, the commonest of which is shown below.

- (ii) Calculate the dry mass of all plant material from the seedlings grown in the solution without magnesium.  
Show your working.

$$\begin{aligned} \text{Dry mass of all plant material} &= \frac{207}{9} && (2) \\ \text{from solution without} & && \\ \text{magnesium} &= 23 \text{ mg} && \end{aligned}$$

Answer ..... 23 ..... mg



**ResultsPlus**

Examiner Comments

This answer shows a common mistake in which the candidate has not realised that the mean of all nine plants has already been taken and is 207 mg. In the past we have asked for means to be calculated. This question turned that exercise on its head and caught quite a few out.



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Examiner Tip

You must always read the specific question being asked very carefully. You can learn a lot from doing past papers but do not expect it to be exactly the same. Each paper is unique in precisely what it tests.

- (ii) Calculate the dry mass of all plant material from the seedlings grown in the solution without magnesium.  
Show your working.

$$207 \times 9 = 1863 \text{ mg}$$

(2)

Answer ..... 1863 ..... mg



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Examiner Comments

A clear, uncluttered and correct answer for 2 marks.



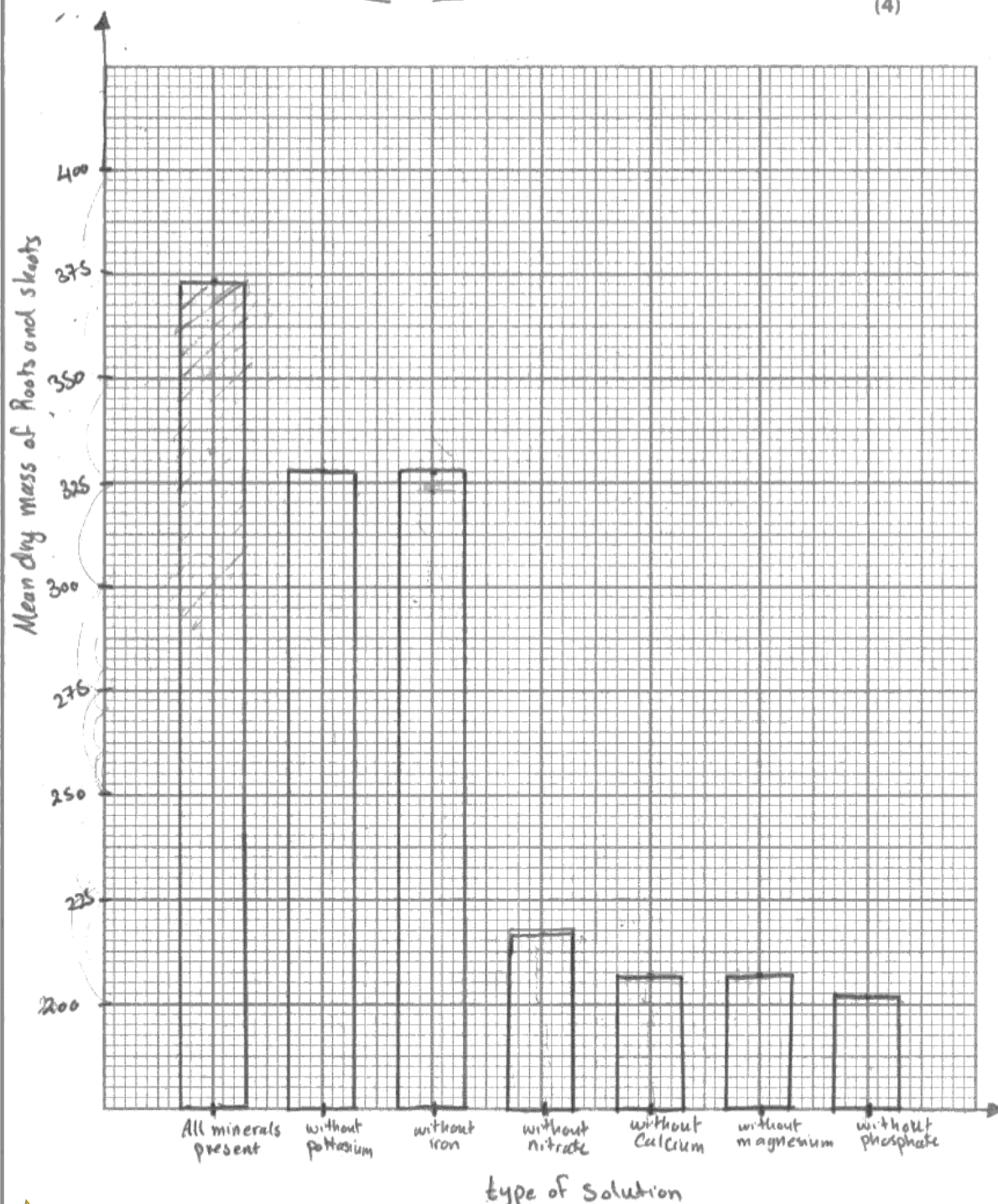
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Examiner Tip

Always show your working clearly. This way you will get one mark even if you do the maths wrong.

(a) (i) Plot the data from the table, in a suitable graphical form, to compare the mean dry masses of shoots and roots in each of the solutions.

(4)



**ResultsPlus**  
Examiner Comments

This candidate has added up root and shoot dry masses and plotted those. This does not allow a comparison to be made. In addition, they have failed to put units on the y axis.



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Examiner Tip

Always fully label the axes of a graph with what it is showing and the units if applicable.

### Question 1 (a) (iii)

In the past, candidates have generally presented only descriptions of data when asked to describe *and* explain. On this occasion, the situation was reversed and there were many explanations with either no or very inadequate descriptions. Many made no attempt at description at all. Another group described only to the extent of saying that dry mass was less (either for shoots, roots or all plant material and for both ions missing). Yet another group extended their description, but only to the extent of quoting data, at this level qualitative descriptions such as 'dry mass was less' must be accompanied by data which has been manipulated to gain further marks. Another quite large group compared nitrogen deficiency with that of magnesium and tried to read something into these differences which the data were not adequate to allow. Finally, a very significant number of candidates ignored the data and the graph and limited their description to suggesting that leaves would be yellow and crinkly.

The role of Magnesium in the structure of chlorophyll was well known, but the effect this would have on final dry mass as a consequence of lowered photosynthetic rates was not well discussed by many.

Again, many knew the various roles of nitrate, but few could link this convincingly to plant growth and final dry mass in this investigation.

(iii) Describe and suggest an explanation for the effects of a deficiency of magnesium and nitrate on the growth of radish seedlings in this investigation.

(6)

The roots grew poorly in both solutions. Nitrate ions are needed for the formation of amino acids, because the solution was lacking nitrate the growth was stunted. Magnesium is required for the synthesis of chlorophyll, if magnesium is not present properly the leaves will be yellow and ~~the~~ the growth will be stunted.



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Examiner Comments

This answer demonstrates some common problems. Despite the fact that the previous part of the question presented a plethora of data to address the question 'Describe...the effects of a deficiency of....in *this investigation*' (italics mine) this answer does not use it. The candidate refers (as *many* did) to growth being 'stunted' (there are data which show just how 'stunted' and this is what was wanted). It also refers to the leaves being yellow, there are no data given which show this, but again a very large number of candidates wrote it.



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Examiner Tip

When asked to write an answer in a specific context such as, in this one, 'in this investigation', make sure that is what you do.

(iii) Describe and suggest an explanation for the effects of a deficiency of magnesium and nitrate on the growth of radish seedlings in this investigation. (6)

As can be seen from the table 10 plants lacking nitrate survived until the final sample. However these final 10 radish seedlings had a mean dry mass of shoots 94mg less than the seedlings which had all the minerals. Also, the dry mass of roots of those that lack nitrate was 64mg below those seedlings that contained all minerals. There is some inefficient growth as nitrate helps plants to keep up straight and strong. What is more 9 plants survived in the final sample lacking magnesium however these plants contained a relatively high mass of shoots in comparison with roots as the difference in mass for shoots differed only 57mg<sup>less</sup> but the difference for roots was much larger, 110mg less than those containing all minerals. It can be deduced that magnesium is more responsible for the growth in shoots rather than roots. Lacking magnesium causes the leaves of a plant to turn yellowish.



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Examiner Comments

In this answer the candidate has given quite a good description and gets 3 marks for this. However, they have made very little attempt to explain the differences which have been pointed out.



**Question 1 (b) (i)**

Candidates are quite muddled about the concept that this question was addressing. Only about a third were able to make some direct or indirect reference to validity or to valid comparisons. Two thirds variously discussed reliability, accuracy, precision and other terms which they are clearly not at all sure about. The meanings of these terms need to be urgently addressed in teaching.

(b) (i) Suggest why it was important to make sure all the seeds were about the same mass at the start of this investigation.

In order to make valid comparisons for growth  
in terms of mass for different minerals. (1)



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Examiner Comments

In this answer the candidate talks about making valid comparisons, which is exactly what was wanted.

(b) (i) Suggest why it was important to make sure all the seeds were about the same mass at the start of this investigation.

In order for the experiment to be more reliable. (1)



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Examiner Comments

Many candidates, as this one, thought that the measure would make the results more reliable.

(b) (i) Suggest why it was important to make sure all the seeds were about the same mass at the start of this investigation.

If the initial mass of all the seedlings were not the same  
the comparison of final mass would not be accurate. (1)



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Examiner Comments

In this answer the candidate thinks that the measure will make things more accurate.



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Examiner Tip

Ensure that you understand the difference between accurate, reliable and valid. These terms are *not* interchangeable.

### Question 1 (b) (ii)

This question was relatively well done. However a significant minority (about a third) could not do it, which suggests problems with understanding of experimental design. A whole range of answers were given from such things as temperature, the dry mass of the seedlings (which was the DV) and the volume of sand.

Another group mentioned mineral concentration or volume of mineral solution. There were no marks for nutrients.

(ii) State the **independent** variable in this investigation.

(1)

Mineral concentration



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Examiner Comments

Unfortunately, although this answer mentions minerals (which was accepted) we did not vary concentration but presence/absence.

(ii) State the **independent** variable in this investigation.

(1)

Temperature



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Examiner Comments

Temperature is a control variable.

**Question 1 (b) (iii)**

Many candidates were able to achieve two marks for naming two appropriate variables but their suggestions for ensuring control were often rather weak or non-existent. So, when discussing the control of temperature of the surroundings, many simply said that the plants should be put in a room where the temperature did not vary. A simple suggestion about air conditioning would have gained the mark. Candidates should be reminded about the use of the word amount, which is rarely if ever appropriate, as in 'amount of light'.

Again, however, there was a worryingly large group who did not understand what was needed. So inappropriate variables were suggested.

(iii) State **two** variables, other than seed mass, that need to be controlled in this investigation.  
For each variable, describe how it could be controlled. (4)

Variable 1 Temperature of the surroundings

How it could be controlled The pots should be kept in the same area whereby the temperature can be kept constant at 30°C.

Variable 2 Light intensity

How it could be controlled The pots should be kept at the same area whereby the amount of light reached is consistent for all the 10 pots.



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Examiner Comments

Two perfectly sound answers but the weak controlling methods gain this answer 2/4.



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Examiner Tip

When asked how you would do something make sure you come up with a feasible method and not just repeat the question by saying that it should be done.

(iii) State **two** variables, other than seed mass, that need to be controlled in this investigation.  
For each variable, describe how it could be controlled.

(4)

Variable 1 Temperature of the surrounding

How it could be controlled Place a thermometer in each pot <sup>and</sup> to check on the temperatures of each pot from time to time to ensure similar temperatures.

Variable 2 Presence of light

How it could be controlled All the pots are placed <sup>together</sup> at the same area.



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Examiner Comments

You cannot control a variable by measuring it. In this answer the candidate suggests controlling temperature with a thermometer. However, this would allow account to be taken of the variable.

### Question 1 (b) (iv)

Very few candidates seemed to have any idea about how to carry out this standard procedure for assessing plant growth as part of a required core practical. At this level, simple observation of leaf colour and general 'health' is not adequate.

(iv) The dry mass of shoots and roots was measured in this investigation.  
Describe how to find the dry mass of shoots and roots.

(2)

Cut the seedling to separate shoot and root. Weigh a crucible using an electronic weigh. Put a shoot onto the crucible and heat it in a microwave. Then, weigh it. Repeat the heating and weighing until a constant weight is achieved. Minus away the weight of the crucible to get the dry mass of shoot. Repeat the process for dry mass of root.



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Examiner Comments

Although the drying method here is not adequate, the suggestion to redry and weigh until there is no further change is sound.

(iv) The dry mass of shoots and roots was measured in this investigation.  
Describe how to find the dry mass of shoots and roots.

(2)

Shoots and roots are heated to a high temperature until all the water content in them ~~have been~~ removed are removed. ~~Weight~~ Weigh the mass of shoots ~~using~~ and roots separately. The weight is the dry mass.



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Examiner Comments

A vague statement such as high temperature will not suffice.



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Examiner Tip

When asked to describe practical details make sure you are specific about exactly what you would do. Think about someone reading your instructions, could they actually do what you are suggesting?

**Question (2) (a) (i)**

Many candidates were able to suggest a suitable location for Graph B with good reasons. However, the placement of Graph A did not prove to be so easy for candidates.

(a) (i) Suggest where in the report you would put graph A and graph B. State the line number and give reasons for your choice for each graph.

(4)

I would insert **Graph A** in the report at line number 2.

Reason ~~is~~ It shows that the atmosphere has more carbon dioxide and as a result the oceans are absorbing as the years are increasing.

I would insert **Graph B** in the report at line number 7-8

Reason This is because the line shows that the oceans ~~are becoming~~ PH is decreasing by 0.1 as the years are increasing and more acidic and ~~that's what the graph is showing.~~ and that's what the graph is showing.



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Examiner Comments

This candidate makes a mistake repeated by many. They suggest putting Graph A early in the report, where in fact *changes* in atmospheric carbon dioxide are not discussed, although both carbon dioxide and the atmosphere are mentioned.

I would insert **Graph A** in the report at line number ~~2~~ line 10

Reason Because in line 10 we are told that global emission of CO<sub>2</sub> from human activity continue to rise. This statement is supported by graph A as it shows increasing amount of CO<sub>2</sub> in atmosphere.

I would insert **Graph B** in the report at line number line 8

Reason in line 8 ~~we~~ they are telling us that intake of CO<sub>2</sub> has lead to a reduction ~~of~~ of the pH of the ocean surface of 0.1 units.

This statement is supported by graph B as it shows decreasing PH ~~over~~ over the years.



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Examiner Comments

This a good four mark answer with correct lines and reasons given in both parts.

### Question 2 (a) (ii)

A number of candidates did quite well on this question, but too many others failed to take an analytical approach and therefore did not get very far or very many marks. The statement needed to be broken down, each part of it set against the graphs given and then a synthetic comment made at the end.

The first part of the statement is about carbon dioxide absorption by the oceans and so a graph of its level in the atmosphere gives no support. The second part of the statement is about falling pH levels in the oceans and gained support from Graph B. These two points were rarely clearly made. However, a good number of candidates pleasingly discussed the correlation between A and B, and went on to say the graphs give no evidence of the causality of this relationship.

Few commented on the restricted geographical range of the data given or its variability, especially in relation to oceanic pH.

(ii) The student's report states that "the oceans are absorbing too much carbon dioxide from the atmosphere. As a result the oceans are becoming more acidic".

To what extent do graphs A and B support this statement?  
Explain your answer.

(4)  
In Graph A we see the rise in  $\text{CO}_2$  in the atmosphere.  
# However, there is no evidence of  $\text{CO}_2$  being absorbed by the oceans. Therefore the graph A does not fully support the statement.

Graph B is showing a reduction in pH of the ocean around Hawaii, which supports the statement. However, this graph proves the statement right only for one particular ocean around Hawaii and not any other oceans. Therefore graph B supports the statement only for the ocean around Hawaii.



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Examiner Comments

This is a good answer in relation to Graph A. It gives no information about absorption of carbon dioxide into the oceans and therefore does not support the student's statement. This is worth two marks. It goes on to correctly observe that Graph B does support the student statement, but that there are limitations imposed by the localised nature of the data (Hawaiian ocean only). This is worth another two marks.

It does not, however, point out the correlation between carbon dioxide rise and pH fall, or go on to say that this in itself would not indicate causality

- (ii) The student's report states that "the oceans are absorbing too much carbon dioxide from the atmosphere. As a result the oceans are becoming more acidic".

To what extent do graphs A and B support this statement?

Explain your answer.

There is an overall increase in the concentration of atmospheric carbon dioxide as shown in graph A. From 1960 to 2000, there is a change of 5.5 arbitrary units. This means that the concentration has increased to a great extent and this can cut off the oxygen supply to the marine species at Mauna Lau in Hawaii. (4)

In graph B, there is constant fluctuation in the pH level. In 1987, the pH was 8.10, whereas, in 2005 the pH is 8.045. The pH has decreased by 0.055. This means that the water is getting acidic due to absorbing too much carbon dioxide, as carbon dioxide is an acidic gas.



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Examiner Comments

There is a lot wrong with this answer but its main problem is that it simply does not address the question. The candidate makes no reference anywhere to the statement in the stem which they are supposed to be discussing.



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Examiner Tip

When answering a question keep referring back to the stem to ensure that you are really addressing what is asked



**Question 2 (b)**

This was one of the easier questions on the paper with a third gaining full marks. The four terms listed need to be thoroughly understood by candidates in the future.

(b) A visit or issue report is expected to address two of the following implications: ethical, social, economic or environmental. Identify, using line numbers, one social implication and one economic implication in this report.

Explain why you have chosen each implication.

(4)

**Social implication**

Line number ~~25~~ 30.

Explanation As a result of unstable coastal reefs, peoples lives will be threatened as they will not be offered protection<sup>ed</sup> of their homes and their lifestyles will eventually change.

**Economic implication**

Line number 27.

Explanation A reduced number of tourists visiting the coastal area will lead to a reduction in the economy of that country and the people will not be earning enough money.



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Examiner Comments

This a good 4 mark answer.



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Examiner Tip

Make sure you understand what is meant by the terms economic, environmental, social and ethical.

(b) A visit or issue report is expected to address two of the following implications: ethical, social, economic or environmental. Identify, using line numbers, one social implication and one economic implication in this report.

Explain why you have chosen each implication.

(4)

**Social implication**

Line number 30

Explanation Line 30 refers to the effect of destabilised ocean acidification on the stability of coral reefs that protect the <sup>coast.</sup> ~~shoreline~~ from

**Economic implication**

Line number 25

Explanation Line 25 refers to the effect of ~~of~~ ocean acidification on the coral reefs causing a lower number of tourists visiting the area.



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Examiner Comments

This answer loses sight of what is being asked. It correctly refers to line 25 in the economic section but does not refer to anything economic in its explanation. It cannot be assumed that a low number of tourists will lead to an economic implication.

**Question 2 (c) (i)**

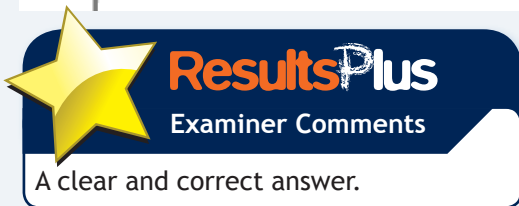
This question presented no problems for the vast majority. Where there was an error it was by candidates who saw five reefs rather than six in the table.

- (i) Calculate the mean percentage offshore wave energy reaching the coast for 2004.

$$\begin{aligned} \text{mean} &= \frac{2+16+13+10+9+10}{6} \\ &= 13 \end{aligned}$$

(1)

Answer .....13..... %



**Question 2 (c) (ii)**

Again, this proved quite easy marks for most (two thirds got 2/2).

- (ii) The student decided to present the data as a graph. Describe a suitable graphical form for the data.

(2)

A bar graph can be a suitable graphical form for the data. The x-axis will show the different percentage offshore wave energy reaching the coast and the reefs will be drawn as different bars. The y-axis will show the years, ~~in which~~

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Examiner Comments

This candidate has not got a clear picture of IV, DV and where each goes on a graph, although a bar chart is correct and worth one mark.

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Examiner Tip

Make an effort to learn the correct orientation of axes in a graph.

- (ii) The student decided to present the data as a graph. Describe a suitable graphical form for the data.

(2)

~~As the year increases~~ As the year increases the percent Mean offshore wave energy reaching the coast (%o) also increases. Year will ~~will~~ be in the x axis and %o offshore wave energy reaching the coast will be on the y axis.

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Examiner Comments

Although the second paragraph gains a mark, the candidate does not address the question at all in the first paragraph.

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Examiner Tip

Make sure you always read questions and only answer what is asked.

### Question 2 (c) (iii)

This question was not so easy with only a third getting 2/2. Candidates should be reminded of the need to do something, qualitative or quantitative, with data they are given

(iii) Describe the trend shown by the data.

(2)

The trend shows an increase of 5.2% of ~~the~~ offshore wave energy reaching the coast from 1994 to 2004 and a higher increase of 10.3% from the year 2004 to 2014.



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Examiner Comments

This is a good answer which points out both the general trend over the 20 years and has done some manipulation of data to come up with a further detail.

(iii) Describe the trend shown by the data.

(2)

In 2014 the ~~is~~ percentage of offshore wave energy reaching the coast is highest and in 1994 it is ~~total~~ lowest.



**ResultsPlus**

Examiner Comments

This is a poor answer which gained no marks although the candidate has spotted two key details. The problem is they have not described the trend as asked.

**Question 2 (c) (iv)**

A very high proportion were able to gain marks here, with nearly half achieving 2/2.

(iv) Suggest the risks to humans and other organisms, living on the coast, of this change in wave energy. (2)

as the wave energy increases, the current which flows offshore will damage the habitat of the organisms underwater.

as the wave energy increases, the current will also increase. This effect causes the waves on the shore to be closer to the habitat of the organisms, the current strength will increase, and ~~this~~ <sup>it can easily</sup> destroy ~~not~~ habitats of organisms living on the coast as a tsunami is more likely to happen.



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Examiner Comments

Although there are some correct ideas in this answer, it makes one serious error. The degradation of protective corals will not cause tsunamis but might make their effects greater due to the lack of the protection the coral formerly offered.



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Examiner Tip

Make sure you think very carefully about cause and effect when required to do so.

(iv) Suggest the risks to humans and other organisms, living on the coast, of this change in wave energy. (2)

Humans may be in danger as the wave energy that increases can potentially hit the houses on the coast and cause death.

Organisms may lose their habitat as well. There may be extinction to some already endangered species on coasts. Also, livelihood and income of populations near the coast may be adversely affected by wave energy.



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Examiner Comments

This is a good answer which addresses both humans and other organisms as asked.

**Question 2 (c) (v)**

This proved to be quite difficult with only about a third making a markworthy suggestion.

- (v) The wave energy data were produced from a mathematical model which estimated past and future wave effects.

Give **one** reason why the conclusions drawn from such a model should be viewed with caution.

(1)

Because countries on the coast will have to take an action towards this conclusions which will economically affect them & so this conclusions should be viewed with caution.



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Examiner Comments

This answer displays a very common misinterpretation, suggesting that the conclusions should be taken seriously, which is not what was asked

- (v) The wave energy data were produced from a mathematical model which estimated past and future wave effects.

Give **one** reason why the conclusions drawn from such a model should be viewed with caution.

(1)

There are many factors that effect the waves and not all these factors are taken into account by these models. Changes due to other factors could severely affect the results to be much different than that estimated by the model.



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Examiner Comments

This answer displays a good understanding of one of the shortcomings of modelling the future.

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