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Examiners' Report
June 2012

GCE Biology 6BI04 01

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Introduction

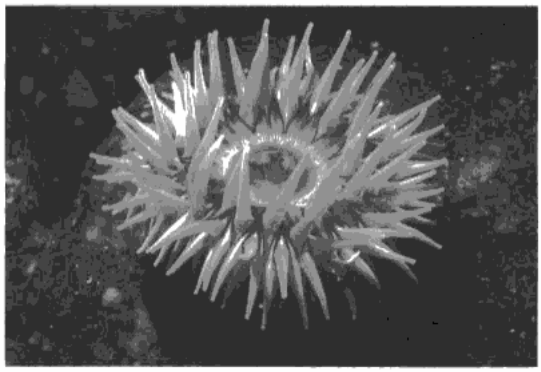
The paper as a whole yielded a wide range of responses, with different questions challenging different candidates. All points on the mark scheme were seen. Candidates found the multiple choice questions less challenging, especially 5a, where almost all candidates selected the correct response. It was very apparent that the majority of marks were being lost for one of two reasons. Candidates are not identifying the question command words correctly, especially when two are used in one question. Secondly, answers are not being applied to the context of the question. Both of these problems have been highlighted throughout this report.

Insufficient time to complete the paper was a concern raised by some centres. After undertaking a comparison of the word count of the Summer 2011 and Summer 2012 papers, reading time did not seem to be an issue. There was also no evidence of an unusual amount of blank spaces on the question paper to suggest that candidates did not have sufficient time to complete the paper. However, in the light of candidates' responses seen during the marking, it was judged that the 2012 paper required slightly more thinking time, given the nature of the data used for some of the questions. The mark scheme was reviewed at the standardisation meeting to take account of this to ensure that candidates were not disadvantaged.

Question 1 (a)

This question was poorly answered as many candidates simply repeated the information that had been given in the stem of the question. Many candidates told us what the anemone was doing or what was happening to it, rather than describing its actual role. A number of candidates thought that the sea anemone was a plant, despite being told that it feeds on small invertebrates!

1 The sea anemone, *Anthopleura elegantissima*, occupies a niche at the secondary and tertiary consumer levels in a food web on the shores of North America.



Neil G. Mcdaniel / Science Photo Library

Sea anemone Magnification ×1

At high tide, the sea anemone is active and feeds on a variety of small invertebrate animals and fish. It paralyses its prey using stinging cells on tentacles. The food is then passed into the gut of the sea anemone for digestion by enzymes. The anemones also form the food of various carnivores.

At low tide, the anemones are exposed on the rocks of the shore where they remain stationary until the water returns at high tide.
During this exposure, the tentacles and body of each anemone are contracted into a rounded mass.

(a) Explain what is meant by the term **niche**, using the sea anemone *Anthopleura elegantissima* as an example.

(3)

The role of a species within its habitat and ecosystem and the way it exploits it. The A. elegantissima feeds on fish, keeping fish populations down and it is food for various carnivores.

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Examiner Comments

This is a good answer. The candidate clearly knows that niche refers to the role of the organism and that it's role is to keep down the population of its prey or to be a source of food.

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Examiner Tip

Try not to repeat the information that is given in the stem of the question - you need to use it to answer the question.

(a) Explain what is meant by the term **niche**, using the sea anemone *Anthopleura elegantissima* as an example.

(3)

- Niche - The role of an organism within its environment.
- The role of the Anthopleura elegantissima is to feed on small invertebrate animals and fish, which are its prey. It
- The means the A. elegantissima gains energy which is passed along the food chain when A. elegantissima is eaten by its predators (various carnivores).
- Its role is to digest energy and pass it along the food chain when eaten by predators.

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Examiner Comments

This is an example where the candidate has repeated the information given in the question. They are told that the anemone feeds on small invertebrates and that it is eaten by predators. This only describes what the sea anemone does / what happens to it - not what its role is.

(a) Explain what is meant by the term **niche**, using the sea anemone *Anthopleura elegantissima* as an example.

(3)

A niche is a position in an ecosystem where an organism fills a specific role; the sea anemone's niche is as a consumer of small invertebrate and fish and prey of larger carnivores and its location on rocks near the shore.

ResultsPlus
Examiner Comments

A number of candidates thought like this candidate, that niche means position.

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Examiner Tip

Learn your definitions very accurately.

Question 1 (b)

Some good attempts were made at this question, but some candidates had clearly seen last year's 6BIO5 question on sea slugs, as there were a number of responses relating to habituation. This did not prevent the mark scheme being applied and marks being awarded where appropriate.

(b) Suggest and explain why the anemones contract when exposed at low tide.

(3)

It may be as a form of protection or a way of hiding from predators. It may also be because, if it only using its tentacles for paralysing prey and its prey can only be found when the anemone is underwater (at high tide), it would be a waste of energy to expose its tentacles for feeding unnecessarily when no food is avaible. It could also be because the tentacles must be kept moist and would dry out were they exposed to the sun + wind, or become damaged by wind + rain.

ResultsPlus
Examiner Comments

This is an example of some of the very good responses that we did see in answer to this question.

(b) Suggest and explain why the anemones contract when exposed at low tide.

(3)

- they may contract to avoid drying out.
- they would loose water thru evaporatin if they did not contract as they would be exposed to be air
- by contracting they prevent the water from being lost meanin they wont dry ont and die

ResultsPlus
Examiner Comments

This candidate has attempted this question, but only repeated the same comment in different ways.

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Examiner Tip

When there are two command words you must tailor your answer to meet both requirements. Use the marks available for the question to help you decide how many points to make; you will not get 3 marks for making the same point several times.

Question 1 (c) (ii)

Candidates frequently picked up either one or two marks for describing the effects of the abiotic factors. These descriptions were frequently extensive. Fewer candidates scored mark points 3, 4 or 5 as they did not suggest an explanation for their descriptions.

(ii) Describe and suggest explanations for the effects of these two abiotic factors on the distribution of *A. elegantissima* on this shore.

(3)

The mean rock temperature does not appear to have much effect on the distribution of the A. elegantissima, as the mean temperature does not vary by more than a couple of degrees, whereas the distribution varies considerably. The mean height above Low water mark has a noticeable effect on the distribution of the anemones, with the heighest number being recorded between 1.7-2.4m above low water mark, generally decreasing above and below here.

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Examiner Comments

This is a typical response seen for this question; both description marks were awarded, but no explanation is offered.

ResultsPlus
Examiner Tip

If there are two command words, then the response must address both of them to access full marks. Very rarely can full marks be accessed if the whole question is not attempted.

(3)

Qudrat number 11 had the highest mean number of A. elegantissima at the highest temperature but had one of the lower heights. The higher the qudrat, the lower the mean number of A. elegantissima, after 2.5 m. Between 0m and 1.7m the mean number steadily increased, even with varied temperatures. This may be due to the amount of sunlight absorbed dependant on the location of the plant.

(iii) Suggest how these data could be analysed to assess the relationship

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Examiner Comments

This is a very confusing response. At the very end it becomes evident that this candidate thought that a sea anemone was a plant; this was not uncommon.

ResultsPlus
Examiner Tip

Read the question very carefully. All information given in the question has been included to help you; do not simply jump to the actual question itself.

(3)

As the mean height above the low water mark increases the mean number of A. elegantissima decreases. Between 0 m above the low water mark and 3.9 metres there is a difference of 21 A. elegantissima. This may be because the organisms that live very high high above the low water mark dry out and cannot survive there. The temperature of the rocks does not really vary very much so we can't say that it affects the distribution.

ResultsPlus
Examiner Comments

This is an example of a good response, where both description marks were awarded and one explanation mark.

ResultsPlus
Examiner Tip

Use the mark allocation to help you with your response. With two command words, two abiotic factors and three marks available the chances are, there is a description mark for each factor and then at least one explanation. If there is only one mark for each description, you do not need to write pages.

Question 1 (c) (iii)

The key word in this question was 'data'. Many candidates misinterpreted the question and either repeated what they had written in part (ii) or described further investigations that could be performed.

(iii) Suggest how these data could be analysed to assess the relationship between the two abiotic factors, shown in the table, and the distribution of *A. elegantissima* on this shore.

(2)

– plot the data on a ~~line~~ Scatter graph to reveal any possible correlation

– work out the averages of the data

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Examiner Comments

Although this candidate had the right idea of plotting a graph, they failed to state what data would be plotted and as a result could not be awarded mark point 1.

ResultsPlus
Examiner Tip

Always state the independent and dependent variables that you are plotting on a graph. This advice also applies to questions where we ask you to describe investigations.

(iii) Suggest how these data could be analysed to assess the relationship between the two abiotic factors, shown in the table, and the distribution of *A. elegantissima* on this shore.

(2)

By using a statistical test, most likely Spearmans Rank for this data, to find if there is a correlation, and then by plotting the results in a line graph with the number of A. elegantissima on the ~~y~~ x-axis, and the two abiotic factors on the y-axis. Colour coding can be used to differentiate between the two abiotic variables

ResultsPlus
Examiner Comments

This response illustrates the last point; the candidate has told us that both abiotics are going to be plotted against distribution.

(iii) Suggest how these data could be analysed to assess the relationship between the two abiotic factors, shown in the table, and the distribution of *A. elegantissima* on this shore.

(2)

There doesn't seem ~~to be much of a relationship~~ to be and relationship between the two abiotic factors as the mean rock temperature is relatively constant, ~~by~~ ~~rats~~ ~~the~~ between the mean height above low water ~~mark their is a positive cone relationship~~ between has a positive relationship between 0.6 and 1.7m with the abundance of A. ~~eleg~~ elegantissima

ResultsPlus
Examiner Comments

This is a typical response made by candidates who had misinterpreted the question and repeated what they should have answered in part (ii).

Question 2 (b)

This question is another example where candidates need to use the mark allocation to help them to decide what is required. Only making one suggestion, even if it is written in three different ways, is only going to score one mark. In addition, the information given in the stem of the question was not read carefully enough as a number of candidates did not realise that the bacteria that they were being asked about were the resident bacteria that produce the cellulase.

(b) Suggest why these bacteria need to have special adaptations to live in the stomach of a cow.

(3)

The stomach of a cow is a hard place to live due to the stomach acid present and lack of oxygen. This extreme environment would require special adaptations for the bacteria to be able to respire anaerobically and survive in an environment with such a low pH.

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Examiner Comments

This response is typical of the better answers seen. The vast majority of candidates identified that the stomach has a very low pH. Low oxygen levels or possibly different temperature range were fairly common suggestions.

Question 2 (c) (i)

This calculation caused lots of problems, as did identifying the correct units.

(c) On a farm in Wales, an investigation was carried out to assess the effect of diet on the milk yield and methane production of cows.

A herd of cows was divided into two groups, A and B. The cows in group A were fed a traditional diet and those in group B were fed the same diet with a mixture of chopped hay and straw added.

The table below shows the results of this investigation.

Group	Diet	Mean milk yield per cow / dm^3 day^{-1}	Methane emission for each dm^3 milk produced / dm^3
A	Traditional with no added material	24.0	30.0
B	Traditional with added chopped hay and straw	27.6	24.0

(i) Using the information in the table, calculate the rate of methane production per cow on each of the two diets.

(2)

A = 24/30 = 0.8 30/24 = 1.25

B = 27.6/24 24/27.6 = 0.87

Group A = 0.8 1.25

Group B = 1.15 0.87

ResultsPlus
Examiner Comments

This was the calculation frequently seen. No units were suggested.

ResultsPlus
Examiner Tip

Always check to see if we have given you the units. If there are no units shown at the end of your answer line when there should be, you need to state them.

(i) Using the information in the table, calculate the rate of methane production per cow on each of the two diets.

(2)

$1 dm^3$ milk

$24 dm^3$

A $24 \times 30 = 720$

$27.6 \times 24.0 = 662.4$

Group A = 720

Group B = 662.4

ResultsPlus

Examiner Comments

The calculation did get worked out correctly by a number of candidates, but even the better candidates did not offer units.

(i) Using the information in the table, calculate the rate of methane production per cow on each of the two diets.

(2)

$\frac{30}{24} = 1.25 \, dm^3 \, day^{-1}$

$\frac{24}{27.6} = 0.87 \, dm^3 \, day^{-1}$

Group A = $1.25 \, dm^3 \, day^{-1}$

Group B = $0.87 \, dm^3 \, day^{-1}$

ResultsPlus

Examiner Comments

As there was a separate mark for the units, this mark could be awarded even if the calculation was incorrect.

Question 2 (c) (ii)

Most candidates can give an account of the causes of global warming, but many are still not using the correct wording for marks to be awarded. A number of candidates talked about the sunlight being absorbed or trapped and simply referred to the earth warming up and not the earth's surface or atmosphere.

Some candidates just gave an account of global warming, without applying their knowledge to the context of the question but marks could still be awarded where appropriate.

This was a QWC question and although, there were very few poorly spelt words, the most frequently misspelt word was gases (misspelt as gasses). Candidates can still score full marks with a misspelling provided they have given five other correct points.

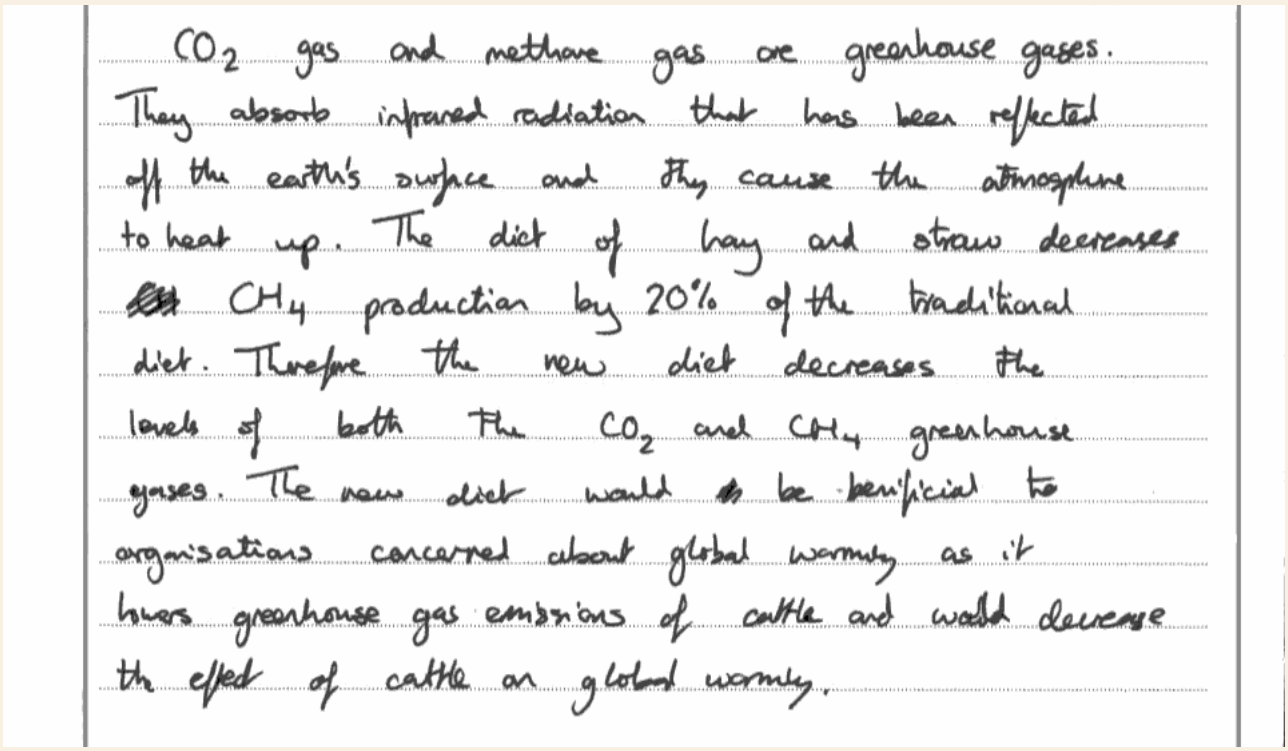
*(ii) Scientists have estimated that if all cattle in Britain were fed on a diet with added chopped hay and straw, there would also be an annual reduction of at least 1.6 million tonnes of carbon dioxide released into the atmosphere.

With reference to your answer in (c)(i) and the information on carbon dioxide release, suggest why the new diet may be supported by organisations that are concerned about global warming.

(5)

Both CO_2 and CH_4 are greenhouse gases. Group B ~~diet~~ ~~lessen~~ an ~~lowers~~ 8% lower CH_4 emission. CO_2 and CH_4 ~~methane~~ & absorb IR radiation reflected off by the Earth's surface and prevent it from escaping into space, thus increasing the ~~global~~ global atmospheric and Earth's surface temperature (leading to global warming). The company would want to promote this diet as it decreases CO_2 and CH_4 ~~emmis~~ emissions

ResultsPlus
Examiner Comments
This is an example of a very good, concise answer that was not infrequently seen.



ResultsPlus
Examiner Comments

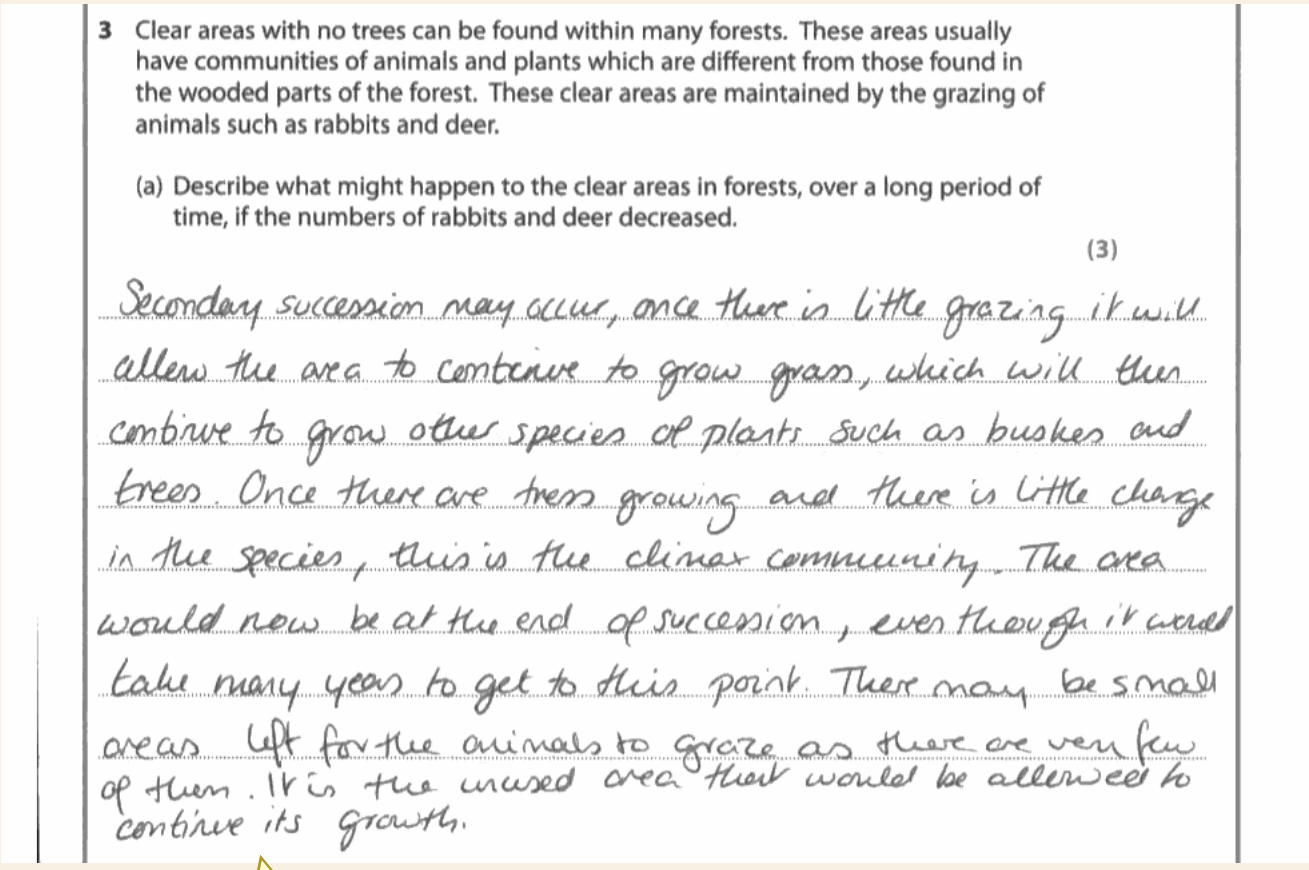
Another good answer. Formulae can be used instead of the names of chemicals, but they must be correct.

ResultsPlus
Examiner Tip

Unless you are absolutely certain that you are using the correct formula, DO NOT USE THEM. It may save you some time but will be false economy if you cannot be awarded the marks as they are not completely correct.

Question 3 (a)

This question was reasonably well-answered but many candidates simply wrote everything they knew about succession from bare rock, instead of giving their account in the context of the forest.



3 Clear areas with no trees can be found within many forests. These areas usually have communities of animals and plants which are different from those found in the wooded parts of the forest. These clear areas are maintained by the grazing of animals such as rabbits and deer.

(a) Describe what might happen to the clear areas in forests, over a long period of time, if the numbers of rabbits and deer decreased.

(3)

Secondary succession may occur, once there is little grazing it will allow the area to continue to grow grass, which will then continue to grow other species of plants such as bushes and trees. Once there are trees growing and there is little change in the species, this is the climax community. The area would now be at the end of succession, even though it would take many years to get to this point. There may be small areas left for the animals to graze as there are very few of them. It is the unused area that would be allowed to continue its growth.

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Examiner Comments

This is an example of one of the better answers that we saw; the description has been written in the context of the question.

Succession may occur, more specifically secondary succession. Firstly, as nutrients and soil are already there pioneer species will colonise the area e.g mosses & lichens. Then as they die out, the soil becomes more nutrient rich and larger species eg plant with complex root systems will arrive, outcompeting the smaller plants. As the soil becomes more nutrient rich more and more larger plants will inhabit the area until a climax community is reached, where the biodiversity remains constant. Each stage is called a seral stage

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Examiner Comments

This is an example of a typical response that was seen frequently. Although the response has not been entirely written in the context of the question, the candidate could still score well.

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Examiner Tip

At A2 in particular, answers must be applied to the context of the question.

Question 3 (b) (i)

Candidates who read the question carefully and identified what was required scored all three marks very easily. The majority of candidates selected light intensity as an abiotic factor, although responses about pH, minerals and water availability were also seen. The mark scheme accommodated for any appropriate abiotic factor. A small number of candidates wrote about a biotic factor and could only access mark point 2.

(b) The butterfly *Boloria selene* (Small Pearl-bordered Fritillary) can be found in many of the clear areas of British forests.

Small Pearl-bordered Fritillary Magnification ×1.5

This butterfly lays its eggs on low-growing plants such as *Viola riviniana* (Dog Violet), on which the caterpillars feed when they hatch.

The adult butterflies feed on nectar from plants such as *Ajuga reptans* (Bugle) and other low-growing species.

Since the plants on which the butterfly depends are able to grow only in forest clearings, small reproductively-isolated populations of *B. selene* can be identified in many forests.

(i) The distribution of plants in a forest is affected by many abiotic factors.

Name **one** of these factors and suggest how this factor could affect the distribution of the low-growing plants within the clear areas of a forest.

(3)

Light intensity, where there is canopy cover there will be lower light intensity these means that plants ~~will be able~~ won't be abe to do as much photosynthesis and produce energy so plants won't grow as well there so they will be more abundant in areas where there is high light intensity as the photosynthesise better, grow and reproduce.

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Examiner Comments

This response is typical of ones written about light intensity. Comments on abundance as well as distribution were credited.

pH of the soil. The pH may not be the ideal for the plant to thrive in a certain area. This may cause the plant to grow at a slower rate or not grow at all which will lead to less abundance of the species.

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Examiner Comments

This response identifies pH as the abiotic factor. We expected some comment on enzymes to award the third mark point.

An example of an abiotic factor would be soil pH. In order for chemical reactions including enzyme reactions to occur there must be a specific ~~oregano~~ pH. If the pH is too low the reactions will not occur. If the pH is too high the cells will denature. Extra Either way the plant will not grow and be distributed in the clear areas of the forest.

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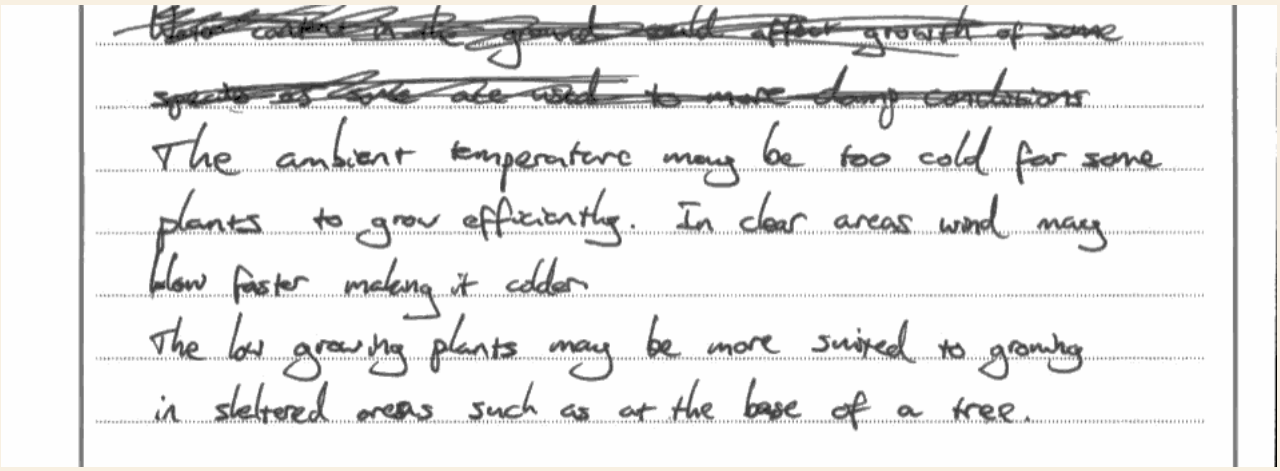
Examiner Comments

This response did discuss enzyme activity in relation to pH so scored the third mark that the previous response did not.



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Examiner Comments

For the third mark in the context of temperature we again expected a comment about enzyme activity.

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Examiner Tip

This response would answer a question worded: Name one abiotic factor and suggest what effect it has on the distribution of the low growing plants (2). The clues are the key word 'how' and the mark allocation (3).

Question 3 (b) (ii)

We saw extensive accounts of speciation for this question, often not written in the context of the question. Candidates had clearly seen our January paper as there were frequent references to water separating the butterflies. Candidates could still access most of the marks even if they had written about speciation. However, any reference to 'fertile offspring' negated the first mark point.

(ii) Explain what is meant by the term **reproductively-isolated populations** of *B. selene*.

(3)

Two populations of B. selene that cannot reproduce to produce fertile offspring. Reproductive isolation could come about if two populations of B. selene are geographically isolated and then evolve into new species due to random mutations and a change in allele frequency. This is present in different forest clearings.

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Examiner Comments

This is an example of a fairly typical response. The candidate was awarded mark point 2 only. Mark point 1 was not awarded because of the reference to fertile offspring. Mark point 5 was not awarded as there is no indication that the alleles or mutations would be different in each population.

Reproductive isolation is where the species can no longer mate together. This could be due to a change in genitalia so that they no longer fit together to reproduce. Fertility times might change, so the isolated populations might become fertile at different times. Mating rituals might change, making some individuals of the ~~separated~~ separate populations less attractive to each other so less likely to mate.

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Examiner Comments

This candidate has a far better understanding of the term reproductively-isolated populations.

ResultsPlus
Examiner Tip

Read through your specification and list all the biological terms so that you can write yourself a glossary of terms.

Question 3 (b) (iii)

This question did not cause too many problems except to candidates who thought that *B. selene* were a species of plant!

(iii) Suggest why it is unlikely that any individuals within a population of *B. selene* would survive if the numbers of rabbits and deer decreased.

(3)

If the number of rabbits and deer decreases, the deer area over time, will mature into a forest. Hence there will be no low growing plants for the B.selene to lay its eggs on. In addition the adult butterflies will also have no food source as the low growing plants will not survive. Thus over time, the B.selene will ~~decrease in~~ become extinct.

ResultsPlus
Examiner Comments

This is an example of a fairly typical response.

(iii) Suggest why it is unlikely that any individuals within a population of *B. selene* would survive if the numbers of rabbits and deer decreased.

(3)

Rabits and deers help seed disperal by or ~~carring~~ pollen fertilisation by carrying them in the fur. Seeds or pollen get caught on the animal and can be transported from one location to another. With a decrease in rabbits and dears, there will be a reduction in pollenation and seed disperal and the distribution and population of B. selene will fall.

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Examiner Comments

This response would have been very good if *B. selene* was a plant. Fortunately this misunderstanding was not too common.

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Examiner Tip

Read ALL the information given in the question. The information is there to help you answer the question, so it must all be read and used.

Question 4 (b) (i)

This two mark question caused majority of candidates problems. The most frequent suggestion seen was the idea of being able to control the levels of carbon dioxide in the solution. A surprisingly high number of candidates suggested that the cells could be put under a microscope and the levels of RuBP and GP observed!

Question 4 (b) (ii)

This was another poorly answered question, although many candidates did score marking point 2 for stating that high light intensity would eliminate light intensity from being a limiting factor. A high proportion of candidates simply talked about light being needed for photosynthesis, lacking the deepth of response expected at A2 level.

(ii) Suggest why it would be advisable to illuminate the cells at a high light intensity during this investigation.

(3)

This is to give the cells the maximum ~~also~~ amount of light that could be needed for the light dependent stage of photosynthesis, and to make sure that enough ATP and reduced NADP is produced for the light-independent stage.

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Examiner Comments

Some candidates did manage to answer this question in detail and scored 3 marks.

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Examiner Tip

Think about the detail that you have been taught at A2 and remember to include it in your answers. Simply writing facts that you knew at GCSE will not score you many marks.

- Light is required for the production of ATP and NADPH in the light dependent stage of photosynethises.
- If light intensity was low it would become a limiting factor and invalidate results.
- NADH and ATP for the reduction of GP into GALP and the regeneration of RuBP, in the Calvin Cycle.

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Examiner Comments

This is another good example of some of the clear responses that we did see.

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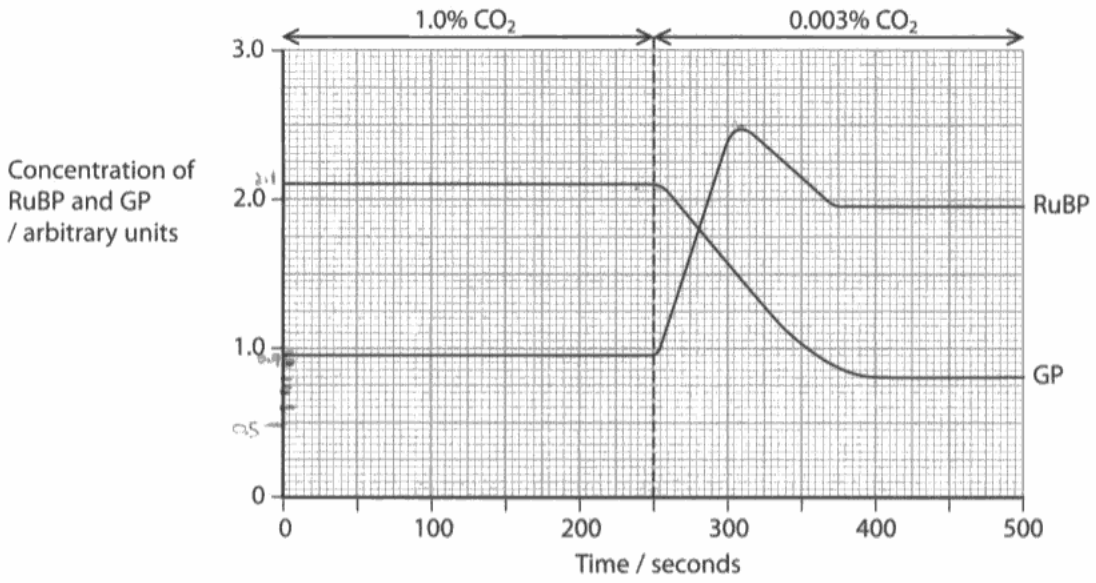
Examiner Tip

Writing individual statements as bullet points not only helps to make your answer clearer but will also help you to ensure that you are making enough statements to be awarded full marks.

Question 4 (b) (iii)

A range of responses was seen for this question; some candidates made a good attempt to describe the changes and then explain them but frequently we saw descriptions only or accounts of photosynthesis that were not linked to the changes shown in the graph.

*(iii) The graph below shows the results of the investigation.



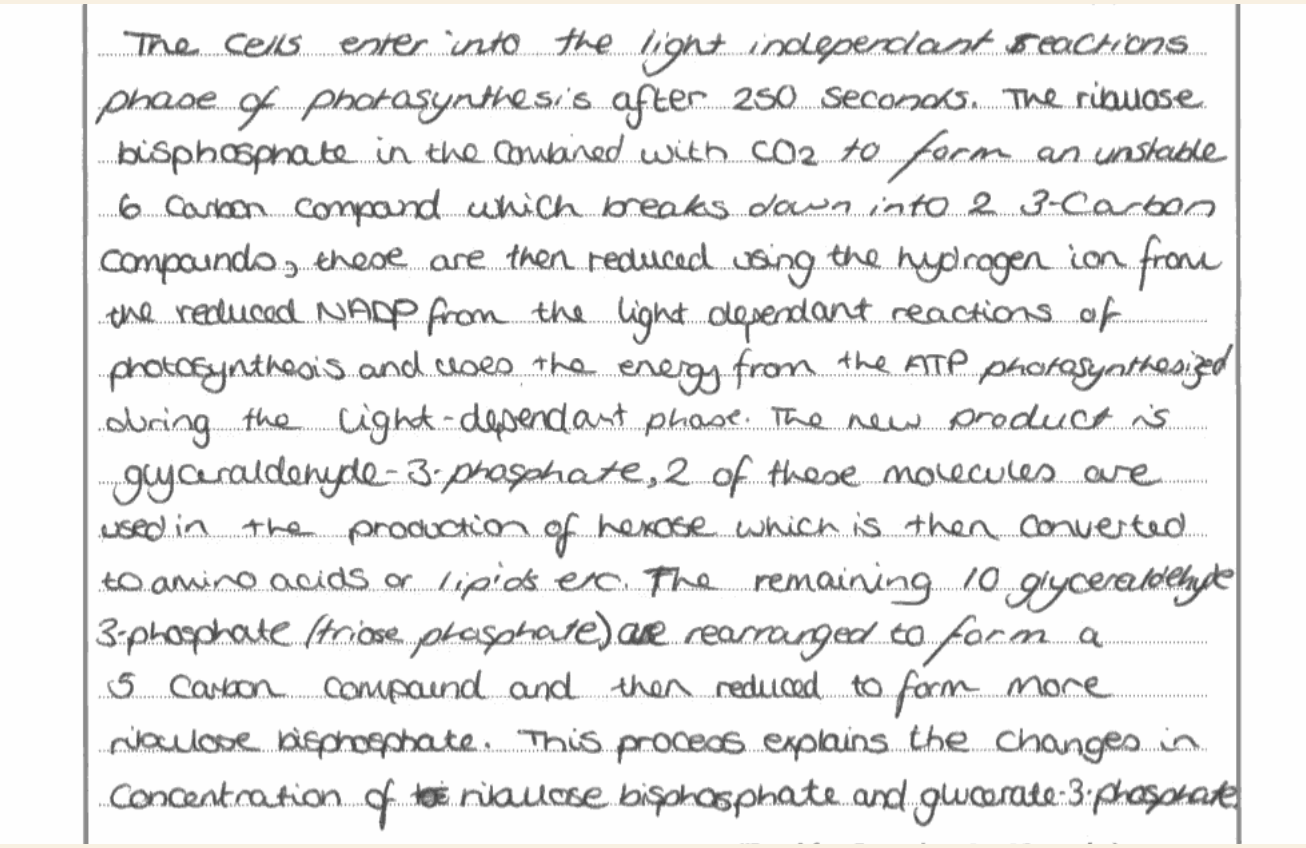
Describe and suggest an explanation for the changes in the concentrations of RuBP and GP shown in the graph.

(6)

The ~~rates~~ concentrations of both RuBP and GP remain ~~th~~ constant at 1% CO_2 with GP at ~~2.0~~ 2.1 and RuBP at ~~2.0~~ 0.95. After 250 seconds the ~~rate~~ concentration of GP begins to decrease because there is limited amounts of CO_2 for the RuBP to react with in the Calvin cycle to produce GP, however the rate RuBP increases after 250 seconds because the remaining GP is being reduced into GALP which goes on to regenerate RuBP, if there is ~~no~~ limited CO_2 to react with the CO_2 there will be a build up of it in the stroma

ResultsPlus
Examiner Comments

This is an example of a good quality answer, where the explanation is clearly linked to the description.


The cells enter into the light independant reactions phase of photosynthesis after 250 seconds. The ribulose bisphosphate in the combined with CO_2 to form an unstable 6 carbon compound which breaks down into 2 3-Carbon compounds, these are then reduced using the hydrogen ion from the reduced NADP from the light dependant reactions of photosynthesis and uses the energy from the ATP photosynthesized during the light-dependant phase. The new product is glyceraldehyde-3-phosphate, 2 of these molecules are used in the production of hexose which is then converted to amino acids or lipids etc. The remaining 10 glyceraldehyde 3-phosphate (triose phosphate) are rearranged to form a 5 Carbon compound and then reduced to form more ribulose bisphosphate. This process explains the changes in concentration of ribulose bisphosphate and glycerate-3-phosphate

ResultsPlus
Examiner Comments

Some candidates did as this one and wrote everything that they knew about the light independent reaction without actually answering the question.

ResultsPlus
Examiner Tip

Your response must answer the question. If you are asked to explain a graph, it must be clear which part of the graph your explanation refers to.

Question 5 (b) (ii)

Candidates have clearly learnt the life cycle stages of insects. However, a number of candidates simply wrote an account of these life cycles and did not actually answer the question to explain how the actual information given could be used to estimate time of death.

(ii) Suggest how the pathologist might use the information in the table and the flow diagram to estimate the time of death of the young man.

(3)

The stages of he life cycle take a specific number of days. he pathologist can herefore look at he abundance of ~~st~~ he stages in he life cycle he blow flies are at to try and help investigate how long it was since he mans death. For example, from an egg into a larva it takes 22 hours. From a larva into a Pupa it takes 72 hours. herefore he pathologist adds up the hours it takes to come to he stage he life cycle and blow flies are in, and herefore counts back to find the time of death.

ResultsPlus
Examiner Comments

This candidate has scored mark point 4. Although they clearly know about forensic entomology, they have not used the information to answer the question.

ResultsPlus
Examiner Tip

You will not get any marks for simply writing out the information we have given you. You must apply the information to answer the question.

(ii) Suggest how the pathologist might use the information in the table and the flow diagram to estimate the time of death of the young man.

(3)

The life cycle ~~of~~ gives an idea of how much time has passed since death. ~~If there~~ The empty pupa cases shows that enough time has passed so that the adult has laid eggs which hatched larvae which formed pupa and flew away as adult flies. Beetles then laid eggs, ~~which~~ on the body which have ~~be~~ hatched larvae which have formed third stage skins. Necrobia rufipes ~~flew~~ then started to feed on the body after this. ~~All~~ Enough time has passed so that all these steps could occur ~~re~~ one after another, this ~~shows that a relatively~~ provides an estimate of how much time has passed ~~s~~ since death.

ResultsPlus
Examiner Comments

This response scored three marks as they did use the information given and applied it to the question. We were looking for some very simple applications e.g. the presence of empty pupa cases meant that the adult flies had emerged.

Question 5 (c) (i)

Candidates wrote all sorts of things for this question but many omitted to tell us that the temperature *dropped* after time of death. A significant number of candidates did not appreciate the transition in context between parts b and c, writing about the effect of temperature on the life cycle of the insects.

Question 5 (c) (ii)

A range of responses were seen for this question with the most common mistake being to refer to decomposition occurring in stages, without making it clear that the stages occur in a particular sequence. At the other extreme, some candidates were able to give us some very colourful and gruesome descriptions of the changes that take place.

(ii) State of decomposition

(2)

Signs of decomposition can also help determine time of death. The first sign of decomposition is when the skin turns green especially in the abdomen area, then turns red. This takes 36-72 hours. Then gases bloat the body and then deflate body as the gases are release. So by looking at these signs you can determine roughly how long the person has been dead for. As the deflated body stage takes about a week.

ResultsPlus
Examiner Comments

This is just one example of the vivid descriptions that we saw.

Question 6 (b) (iii)

The average mark for this question was low. Despite 'comparison' questions appearing in both AS and A2 papers and our feedback in examiner reports, candidates are still approaching questions of this type by writing two descriptions. At A2 we will not piece candidate's answers together - they have to write pairs of comparative statements to be awarded the marks.

(iii) Compare the changes in concentrations of PCV2 antibodies in the blood of the two groups of gilts during pregnancy.

(3)

The antibodies in the blood in both groups start at roughly the same point but they rapidly increase in group A by 2.9 units in the first 30 days whilst they increase very slowly in the group B.
Group A has consistently highe no. of antibodies in comparison to group B however the growth rapidly increases at 160 days whilst in group B it slightly falls.

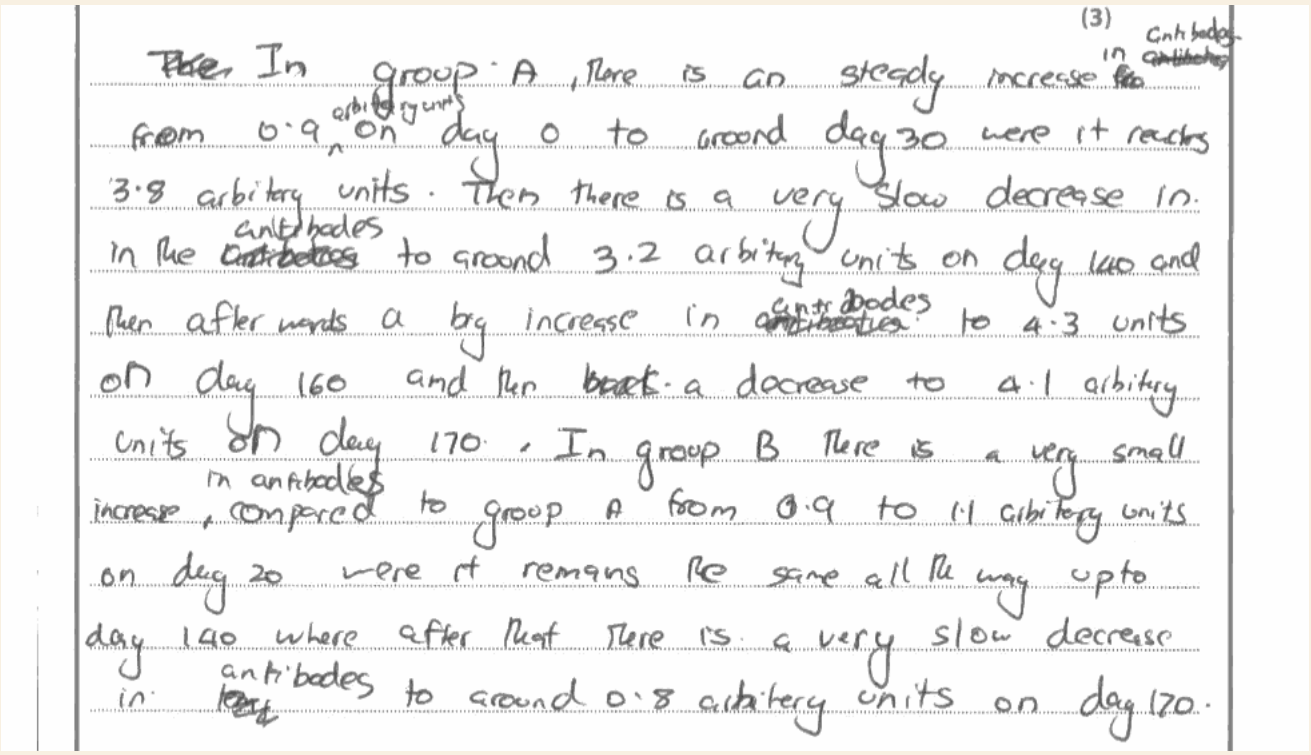
ResultsPlus
Examiner Comments

This candidate did attempt to write a comparison but could not be awarded some of the marks as values from the x axis were not read accurately enough.

ResultsPlus
Examiner Tip

You must quote values from the x axis in any description or comparison that you write, but they must be correct.

(3)



ResultsPlus
Examiner Comments

This response is typical of candidates who wrote two descriptions.

ResultsPlus
Examiner Tip

When answering a question where you are asked to compare something, you must write each sentence to include a matched piece of information for both things that you have been asked to compare. Do not write two descriptions.

On day zero both groups had 0.9 arbitary units of antibodies. Group A's antibodies then increase rapidly, by 2.9 arbitrary units whereas group B slightly risen in antibody number by 0.2 arbitary units up until day 20, whereas Group A's antibody count kept rising until day 30. Group B's antibody count then stayed constant until day 140 whereas Group A's mostly decreased up until day 140 when they recieved their final vacine which made their antibody number increase sharply whereas after day 140 group B's gradually decreased.

ResultsPlus
Examiner Comments
There were some good comparisons.

ResultsPlus
Examiner Tip
The use of the word 'whereas' is very useful in sentences that are making comparisons.

Question 6 (b) (i-ii)

Question 6(b)(i) was another question where candidates wrote everything they knew about the topic, initiating an immune response, without actually answering the question to tell us how vaccines work. Part (ii) saw a range of responses, but candidates rarely used the mark allocation for this question to give enough information to score all 3 marks.

(i) Describe how the vaccine gives **active immunity** against PWMS.

(3)

It is passive active immunity as the pigs ~~do not~~ develop the antibodies themselves however the immune system is stimulated to do so by a vaccine which has been injected

(ii) Apart from having no vaccine, suggest how group B should be treated during the test. Give reasons for your answer.

(3)

Group B should have been given placebos at the same times group A received the vaccine to increase validity and reduce observer bias, group B should have been fed the same food and be subjected to the same conditions as group A as a control factor to increase reliability.

ResultsPlus
Examiner Comments

Although part (ii) did score all 3 marks, this response illustrates how many candidates do not appreciate the meanings of reliability and validity.

ResultsPlus
Examiner Tip

You must use the terms reliability and validity correctly. It is no good writing both in the vague hope that one will be correct, as the wrong term will negate the mark for the correct one.

(i) Describe how the vaccine gives **active immunity** against PWMS.

(3)

• A dead form of the active virus is given to the gilt so antibodies can be produced and memory cells can recognise the antigen so if the virus or antigens occur again the antibody is known and can kill the antigen straight away, preventing a virus from occuring, therefore immunity.

(ii) Apart from having no vaccine, suggest how group B should be treated during the test. Give reasons for your answer.

(3)

• They should be treated normally and not be placed with the group A so they don't produce any antibodies.

• They should be put with the others in their group because if one had the virus then it would spread so they can be removed so results can stil be obtained.

ResultsPlus

Examiner Comments

A number of candidates referred to a *dead* virus being used.

ResultsPlus

Examiner Tip

Remember that viruses are non-living particles. If they are not living then they cannot be killed or be dead.

(i) Describe how the vaccine gives **active immunity** against PWMS.

(3)

The inactivated form of the desease trigers the body's immune system to make b memory and b memory cells as well as antibodies so if the same antigens are detected then the body's immune system can fight against it.

(ii) Apart from having no vaccine, suggest how group B should be treated during the test. Give reasons for your answer.

(3)

They should be treated in the exact same conditions as those with the vaccine. They need to be in a similar environment with the same food being given etc to ensure only one factor is changed ie if a vaccine is given or not.

ResultsPlus
Examiner Comments

This response illustrates another common mistake in expression. The vaccine contained the virus not the disease or the PWMS and certainly not the bacteria.

Question 6 (b) (iv)

Candidates who thought carefully about the data scored highly in this question. Unfortunately, many candidates failed to acknowledge the low levels of antibody in the newborn Group B piglets so did not appreciate that some antibodies must have been passed on to them from their mothers.

(iv) The table below shows the concentration of PCV2 antibodies detected in the piglets produced by the two groups of gilts, during the first 40 days after birth.

Age of piglets / days	Concentration of PCV2 antibodies / arbitrary units	
	Group A piglets	Group B piglets
0	3.9	0.7
10	3.2	0.8
20	3.0	2.6
40	2.9	2.9

Suggest reasons for the changes in the concentrations of PCV2 antibodies in group A and group B piglets.

(3)

Group A piglets' antibodies decreases gradually, while group B increases gradually. It is because some of the antibodies are from mother for group A, and it drops back to normal at day 40. Group B piglets doesn't have any antibodies at birth, so it raises back to normal at day 40 also.

ResultsPlus
Examiner Comments

This response was typical of candidates who did not read the stem of the question carefully enough. We saw a number of descriptions of the data instead of explanations.

ResultsPlus
Examiner Tip

Before you start writing your answer, check that you have identified the question command word correctly.

Question 7 (a)

This question caused very little problem for the majority of candidates.

Question 7 (b) (i)

The majority of candidates coped well with two thirds of this table; the statement that saw the most incorrect answers was the second one.

Question 7 (c)

This question scored highly by those candidates that picked out both command words.

(c) Describe the changes in temperature shown in the graph.
Suggest explanations for these changes.

(4)

At first temperature increases to around 54°C within the first four weeks and from there it continues to decrease to around 18°C

ResultsPlus
Examiner Comments

This response was typical of the weaker students, who did not pick out both command words used in this question.

ResultsPlus
Examiner Tip

Always read the question very carefully and identify the command words used in the question. A2 papers frequently contain two command words within one question and you must answer both if you are to access full marks.

(4)

- Temperature steadily increases (55°C)
- Then decrease
- Reaches constant (18°C)

Respiration will affect temperature and cause it to increase.
Decomposers eventually leave and temperature lowers again.

ResultsPlus
Examiner Comments

Although this candidate did pick out both command words, they omitted to state the times at which the changes occurred.

ResultsPlus
Examiner Tip

Always make reference to values on the x axis i.e. the independent variable, when describing data. In this case, we needed to know the times that the changes occurred.

Question 7 (d)

A range of responses were seen for this question.

(d) Suggest why the student took temperature measurements by using **a long thermometer at several points.**

(3)

Because temperature was the independent variable. The student took measurement at several points to get more data. which improves the reliability and validity. ~~of the data~~

ResultsPlus
Examiner Comments

This response was too vague to score marking point 2. The confusion between validity and reliability meant that neither mark point 3 or 4 could be awarded.

ResultsPlus
Examiner Tip

Sort out the meanings of the terms validity and reliability and always double check that you have used the right term in the right place. Perhaps learn: validity of method and reliability of results. Or remember the 3 Rs rule : **R**eliable **R**esults are **R**epeated.

Question 8 (a)

Most candidates made a very good attempt at defining both parts of the term, describing 'double-stranded' separately from 'polynucleotide'.

8 DNA is found in chromosomes and consists of double-stranded polynucleotide molecules. The sequence of bases in DNA forms the basis of what is known as the genetic code.

(a) Explain why a molecule of DNA can be described as a **double-stranded polynucleotide**.

(3)

DNA consists of two strands of many nucleotides joined by phosphodiester bonds - these coil to form a double helix structure. Many nucleotides (a pentose sugar, phosphate group & base) form a polynucleotide, hence DNA is a double stranded polynucleotide.

ResultsPlus
Examiner Comments

This is an example of some of the excellent responses that we saw.

it is double stranded because there are two complementary strands, bonded together by hydrogen bonds. It is polynucleotide because there are four nucleotides present, cytosine, thymine, adenine and guanine, on a strand of DNA.

ResultsPlus
Examiner Comments

This candidate tried to define both parts, but unfortunately got confused between nucleotides and bases; this was not an uncommon mistake.

ResultsPlus
Examiner Tip

Make sure you understand the difference between a base and a nucleotide and then read your answer through carefully to make sure you have used the right term in the right place.

Question 8 (b)

Some excellent responses were seen for this question, with the better candidates scoring full marks easily. This was a QWC question focussing on the clarity of response, so we were looking for the information to be presented in a logical sequence. This caused few candidates any problem.

*(b) Describe how the sequence of bases in a DNA molecule would be used to form the primary structure of a protein.

(5)

Bkg: First transcription takes place which allows the sequence of bases on DNA molecule to be transcribed onto an mRNA molecule using complementary base pairing, and free nucleotides. This takes place in the nucleus. Then this mRNA leaves the nucleus and translation takes place in the cytoplasm of the cell. In translation the sequence of bases is read 3 at a time, called the triplet code. A tRNA molecule brings the correct amino acid that the codon codes for and the amino acids join by peptide bonds to form a polypeptide, then a protein. The primary structure is the chain of amino acids. The code is non-overlapping so each amino acid is read independently from another. Between transcription and translation, introns are removed from the strand of mRNA in a process called splicing. The coding exons are joined together and remain for translation. The sequence of bases is also degenerate so each codon can code for more than one amino acid.

ResultsPlus
Examiner Comments

This is an example of one of the excellent responses that we saw.

Sequence of bases show the order of an amino acid sequence that creates a protein. The bases created within DNA molecule are taken as DNA is unwinded by DNA polymerase so the 2 polynucleotide strands are seperated this creates al template antisense strand where free nucleotides with complementary base pairing me up and join with the antisense strand to make mRNA. Exons and introns are then sorted through Splicing, introns that dont code for amino acids are spliced leaving exon coding. These exon bases created several different forms of code, so different proteins from amino acids can be formed from just one set of exon bases. mRNA moves out of nucleus via nuclear pore and attaches to ribosome large subunit where TRNA attaches it's amino acid ~~also~~ anticodons on TRNA attach to mRNAs codons aligning the amino acids to create a peptide bond. TRNA moves away and through complementary base pairing the triplet codons are coded for by the ~~GA~~ base sequences ~~code for the~~ coding for the bonds formed in the protein creating the protein primary structure.

(Total for Question 8 = 8 marks)

ResultsPlus
Examiner Comments

This response also scored the full five marks, but was a better response as it included the A2 detail of post-transcriptional modification.

(5)

The sequence of bases in a DNA molecule would be used to form the primary structure of proteins due to the proteins forming the DNA being synthesised during protein synthesis. The DNA strand would be translated and transcribed using RNA to form a complimentary base pairs. The strands produced could then be synthesised into amino acids which will join together to form a polypeptide chain which is the primary form of a protein.

ResultsPlus
Examiner Comments

Not all responses were of such high quality.

ResultsPlus
Examiner Tip

Do not forget to thoroughly learn all your AS work, as you can be tested on any topic from either unit 1 or unit 2.

Paper Summary

Performance on a 6BI04 paper can be improved if candidates can sharpen up on the points below:

- write the answer in the context of the question, not in generic terms;
- identify the question command word or words. If two command words are used, they must both be addressed to access full marks;
- in describe and compare questions, always quote values for the independent variables in your answer and do a calculation (including units);
- when answering compare question, write sentences that include matched points about each component being compared. Do not write two descriptions;
- revise the AS unit content thoroughly;
- in questions that have been identified as QWC (*) check that your account is logical and that scientific terms have been spelt correctly.

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