



Examiners' Report

June 2022

IAL Biology WBI14 01

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Introduction

This paper was fairly typical of previous series with a range of questions on some frequently tested topics and some less frequently covered specification points.

Some of the more frequently tested topics did appear in slightly different context in this series. In responses to the more frequently covered topics, there was evidence that candidates had been well prepared for the exam.

A range of responses were seen to the two levels-based questions, with some candidates clearly well prepared on how to approach this style of question. There were the statutory nine multiple choice questions which saw a range of responses.

The paper also contained the minimum statutory number of maths marks. Candidates appeared to be better prepared for these questions as there were signs of improvements compared to previous series.

Question 1 (a)

This question was testing candidates on a familiar part of the specification. The majority of candidates knew that a bactericidal antibiotic killed bacteria but there were a significant number of responses which did not state that it was a substance of some description.

1 Bacteriostatic and bactericidal antibiotics are used to treat bacterial infections.

(a) Give the meaning of the term **bactericidal antibiotic**.

(1)

A chemical that kills ^{or destroys the} bacteria completely



ResultsPlus
Examiner Comments

This response illustrates both parts of the mark point and it was awarded the 1 mark.



ResultsPlus
Examiner Tip

Make sure you do not confuse antibiotics with antibodies, which is a fairly common mistake.

Question 1 (b)

This question was essentially testing candidates on differences between prokaryotic and eukaryotic cells.

(b) State why antibiotics affect bacteria and usually not the person taking them.

(1)

enzymes are different in bacteria

Bacteria has 70s ribosomes, while person body cells have 80s ribosomes



This response was awarded the 1 mark. Candidates were credited for the use of the terms prokaryotic and eukaryotic, or for a named difference to be given, as illustrated in this response.

(b) State why antibiotics affect bacteria and usually not the person taking them.

(1)

This is because antibiotics have specific receptors

for detecting bacteria. Bacteria has non self antigens.



This is an example of a response that was awarded zero marks as there was confusion between antibodies and antibiotics.

Question 1 (c)

This question tested a familiar topic of the specification. The context was slightly different to previous series but the knowledge required was the same. Candidates were required to comment on advice given to patients. The command word in this question was 'describe' and candidates who read the question properly limited their responses to the advice given to patients.

(c) Codes of practice advise doctors and patients about the use of antibiotics.

Describe **two** pieces of advice given to patients.

(2)

Patients should have finished the whole treatment of antibiotics in order to kill and eradicate all the bacteria and avoiding them develop resistance. Secondly, patients should take in standard dose, not taking excess or less than required because the dose calculated by doctors is the best way to eradicate bacteria without developing resistance.



ResultsPlus
Examiner Comments

This response was awarded the full 2 marks as it illustrates the two points that could have been made. The explanation given was not necessary as the command word in the question was 'describe' and not 'explain'.



ResultsPlus
Examiner Tip

The command word 'describe' does not require a reason to be given. You will not lose marks for giving a reason but it could use up valuable time.

(c) Codes of practice advise doctors and patients about the use of antibiotics.

Describe **two** pieces of advice given to patients.

(2)

- We should complete full course of antibiotic.
- Not to use/take antibiotic when he has any infection.



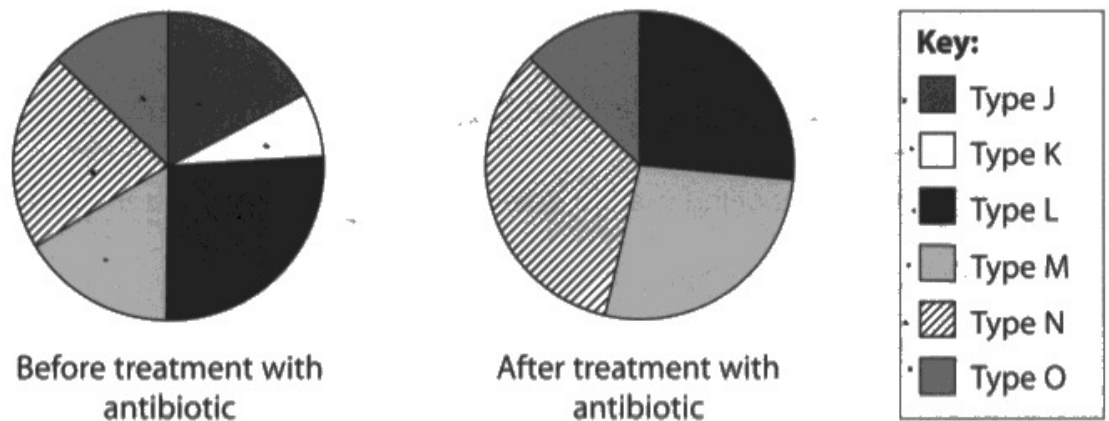
ResultsPlus
Examiner Comments

This response was awarded 1 mark. The candidate started the response in the context of the question but then gave a piece of advice that would not have been given to the patient.

Question 1 (d)

Overall, candidates made a good attempt at answering this question. Some of the weaker response demonstrated a misinterpretation of the question. They tended to describe what the charts showed about the change in proportion of the types of bacteria, rather than in the context of the effect of the antibiotics.

(d) The charts show the types of bacteria present in the throat of a patient, before and after treatment with an antibiotic.



Describe the effects of this antibiotic on the bacteria present in the throat.

(3)

Kills (removes) 2 types of bacteria (Type K and Type J)
increases percentage (proportion) of Type N and Type M
decreases number of types of bacteria in the throat from 6 to 4
No effect on Type L and Type O (or minimal effect)
Overall less bacteria present in throat



This is an example of a response that was awarded the full 3 marks.

Question 2 (b)

This question proved challenging for most candidates. Some of the weaker responses described how to seal the dishes but without giving an explanation, whereas other such responses described sealing the plate but without mentioning with what. The aspect of sealing the dish was in the stem of the question.

(b) Explain how the Petri dish should have been sealed after the mixture was spread onto the agar.

(2)

Sealed with tape to prevent contamination. Petri dish should not be sealed completely, so no anaerobic conditions will be created. ~~Pre~~ This prevents the growth of anaerobic ^{bacteria} pathogens, which are often pathogenic.



This response was awarded the full 2 marks as it is a good illustration of both of the marking points.



The command word 'explain' means that a reason must be given. The answer must give more information than is in the stem of the question.

Use the mark allocation to help judge how much to write. This question was assigned two marks which would indicate that two explanations are needed to access full marks.

Question 2 (c)(iii)

This was a challenging mathematical question for candidates.

- (iii) Calculate the growth rate constant (k) of these bacteria between 4 hours and 10 hours.

(2)

Use the equation: $k = \frac{\log_{10} N_t - \log_{10} N_0}{0.301 \times t}$

Give your answer to two decimal places.

$$K = \frac{6.5 - 2}{0.301 \times 6}$$

Answer 2.49



ResultsPlus
Examiner Comments

This response was awarded the full 2 marks. The candidate has shown their values substitution in the equation and given their answer correctly to two decimal places.

(iii) Calculate the growth rate constant (k) of these bacteria between 4 hours and 10 hours.

(2)

Use the equation: $k = \frac{\log_{10} N_t - \log_{10} N_0}{0.301 \times t}$

Give your answer to two decimal places.

$$k = \frac{\log_{10} 6.50 - \log_{10} 2}{0.301 \times 6}$$
$$= 0.2834$$

Answer 0.28 cm³ hr⁻¹



ResultsPlus
Examiner Comments

This response was awarded 1 mark. It is an example of a common error made by candidates where the values are logged. In this response, the candidate has demonstrated the ability to read values from a graph, substitute some correct values into the equation and express their answer to two decimal places.



ResultsPlus
Examiner Tip

Show your workings as marks can be awarded for the workings even if the final answer is not correct.

If you are reading values from a log graph, do not log the values as they are already logged.

(iii) Calculate the growth rate constant (k) of these bacteria between 4 hours and 10 hours.

(2)

Use the equation: $k = \frac{\log_{10} N_t - \log_{10} N_0}{0.301 \times t}$

Give your answer to two decimal places.

$$k = \frac{6.5 - 2}{0.301 \times 10} = 1.4950$$

Answer 1.50



This response was awarded 1 mark. The time value inserted into the denominator is incorrect.

Question 3 (a)(i)

This question tested candidates' knowledge and understanding of skin flora and how it protects the body from infection. The command word in this question is 'describe'.

3 The presence of skin flora is one way that the skin protects the body from infection.

(a) (i) Describe how skin flora protect the body from infection.

(2)

skin flora compete with pathogenic bacteria with nutrient.

Also, produces toxin which destroys pathogenic bacteria



ResultsPlus
Examiner Comments

This response was awarded the full 2 marks.



ResultsPlus
Examiner Tip

If an answer requires you to write about competition, always state what is being competed for.

Question 3 (a)(ii)

This question allowed candidates to expand on their knowledge and understanding of skin flora to consider other ways the skin is able to protect the body from infection. Overall, this question was generally well-answered by candidates.

(ii) Give **one** other way in which the skin protects the body from infection.

Skin contains ~~the~~ the protein keratin ^{and secretes sebum which} ~~that~~ provides a defense against pathogens not allowing them to enter the body. (1)



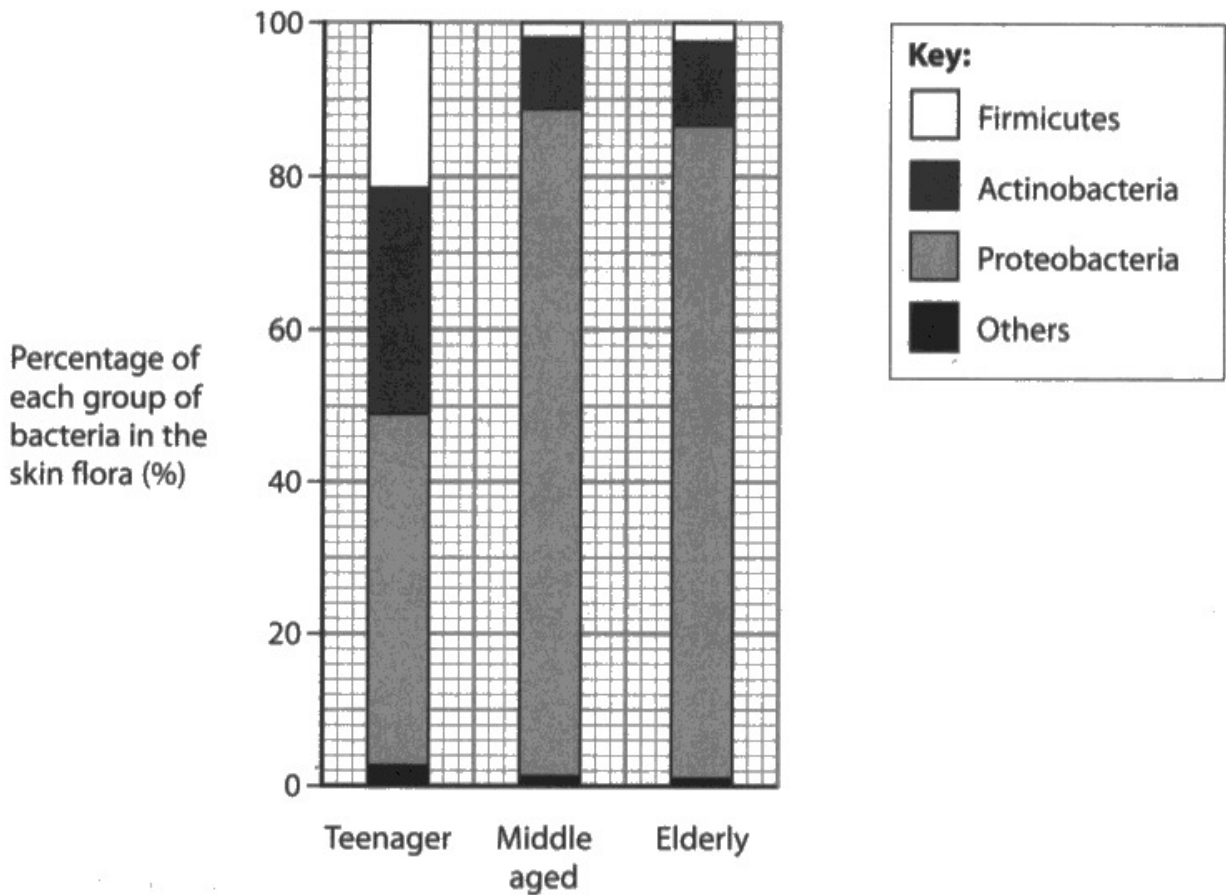
This is an example of a response that was awarded the 1 mark.

Question 3 (b)(i)

This question required candidates to analyse a graph and to give three conclusions about the data. The most common error in this question was to write several descriptions rather than identifying overall trends in the data.

(b) The groups of bacteria present on the skin of men of different ages was investigated.

The graph shows some of the results of this investigation.



(i) Describe **three** conclusions that could be made from this graph.

(3)

All ages of men have all ~~three~~ four types of bacteria present.

As men get older the amount of Proteobacteria on their skin increases.

Teenagers have the highest amounts of Firmicutes, Actinobacteria and others.

Proteobacteria is the highest bacteria in number that men have on their skin.



This response was awarded 3 of the 4 marks available. The candidate's second statement is not actually correct but can be ignored as it does not contradict anything that they have written.



When describing conclusions you should write about general trends in the data.

Question 3 (b)(ii)

This question required candidates to describe how the study should have been designed to collect valid data. Candidates found this question challenging as they struggled with establishing ideas that related to the study. Most responses referred to large sample sizes and calculating means.

(ii) Describe how this study should have been designed to collect valid data.

(2)

Collect data from a large group of teenager, middle aged and elderly men, so that average value can be obtained to eliminate extreme values. Ensure the ~~men have similar habits, such that they don't~~ men don't have skin diseases, which acts as a factor that has to be controlled. Ensure the men all have clean habits and shower and wash hands regularly. Collect the samples of bacteria from the same area of skin.



ResultsPlus
Examiner Comments

This is an example of response that was awarded the full 2 marks. However, the second marking point was not achieved as the candidate has not specifically stated that the clean habits, showering and washing hands should all be carried out in the same way.



ResultsPlus
Examiner Tip

Read both the question and your response very carefully. Check that you have identified the correct context of the question and that you have written what you meant to write.

Question 3 (c)

This was a two-part question to test candidates' knowledge and understanding of immunology.

In part (i) there was some confusion between lysosomes and lysozymes. Quite a few candidates wrote about antigen presentation to T helper cells. Although this was not a requirement of the question, it was creditworthy but could have taken up valuable time.

In part (ii) some candidates repeated what they had written in part (i) but with some reference to antigen presentation. Very few candidates wrote about the role of the macrophages in phagocytosis following opsonisation. Some weaker response demonstrated a confusion with T killer cells.

Although the mark scheme did not penalise candidates, it was clear that candidates did not appreciate when the non-specific response ends and the immune response starts, or that the macrophages play a phagocytic role in the immune response.

(c) Some bacteria can get through the skin.

(i) Describe the role of macrophages in the non-specific response of the body to these bacteria.

(2)

macrophages engulf the bacteria by phagocytosis where lysozymes will break down the bacteria. Macrophages then will release cytokines in order to signal other phagocytes to come to the infection place.

(ii) Describe the role of macrophages in the immune response of the body to these bacteria.

(2)

~~macrophages will release cytokines to signal other phagocytes to come to the infected place.~~

They will engulf the bacteria and present ~~antigen~~ and produce an antigen presenting cell that binds to T helper cells forming active T helper cells and T memory cells.



ResultsPlus
Examiner Comments

This is an example of a response that was awarded the full 4 marks.

Question 4 (a)(i)

Part (a) of question 4 was a new context of questioning to elicit candidates' understanding of a study of the regent honeyeater. There were a whole range of responses to this question indicating that candidates coped well with an unfamiliar question format.

4 The photograph shows a regent honeyeater.



(Source: © Dave Watts / Alamy Stock Photo)

(a) Regent honeyeaters are critically endangered, with fewer than 300 birds left in the wild.

A study found that a large proportion of the male birds no longer sing the characteristic songs of their own species.

Some of the birds had learnt the songs of other species.

(i) Suggest why a large proportion of these male birds no longer sing the characteristic songs of regent honeyeaters.

(1)

~~This is~~ due to low population its unlikely for the birds to learn the song from its own species, (no one to learn it from), ~~not~~



This is an example of a response that was awarded the 1 mark.

4 The photograph shows a regent honeyeater.



(Source: © Dave Watts / Alamy Stock Photo)

- (a) Regent honeyeaters are critically endangered, with fewer than 300 birds left in the wild.

A study found that a large proportion of the male birds no longer sing the characteristic songs of their own species.

Some of the birds had learnt the songs of other species.

- (i) Suggest why a large proportion of these male birds no longer sing the characteristic songs of regent honeyeaters.

(1)

The characteristic song would have attracted
the prey predators.



This response was awarded zero marks. It is an example of a common response to this question which was not creditworthy.

Question 4 (a)(ii)

This question allowed candidates to expand on their understanding of the study of the regent honeyeater. Unfortunately, many candidates referred to allopatric speciation and reproductive isolation. Some weaker responses were very concise but often not relevant to the question.

(ii) Explain the effect that this could have on the future of this species.

The ^{regent honeyeater} male birds will no longer mate with the ^{(3) regent honeyeater} female birds resulting in the extinction of the regent honeyeater. This is because the songs sometimes act as a mating ritual for the birds. ~~the~~ Without the songs, the female birds will not be able to recognise the male birds.



ResultsPlus
Examiner Comments

This response was awarded the full 3 marks.



ResultsPlus
Examiner Tip

If a question asks about the future of this species then it is unlikely that writing about speciation is going to be relevant as if this had occurred then another, new species, will be formed.

Question 4 (a)(iii)

Candidates enjoy learning about animal conservation methods and have a good knowledge and understanding of many of the methods used. Overall, candidates coped well with this question. However, some weaker responses were very generic referring to stud books, increasing the number of birds and then releasing them back into the wild.

(iii) Suggest how zoos could increase the number of birds in the wild that can sing the songs characteristic of this species.

(2)

Zoos can play the characteristic songs on speakers to encourage and teach the birds to start singing. Then, once the birds start singing again, they should be released into the wild.



ResultsPlus
Examiner Comments

This is a response that was awarded the full 2 marks.



ResultsPlus
Examiner Tip

Even if a question is about a topic that you have good knowledge, do not launch into writing everything you know about the topic. Pause, check the context of the question, and then use your knowledge to answer the specific question.

Question 4 (b)

Overall, candidates performed very well on this question. It demonstrates that candidates have excellent knowledge of PCR and gel electrophoresis. However, some of the better responses tended to include excessive information about the two procedures.

(b) Genetic studies indicate that the regent honeyeater is related to wattlebirds.

Describe how genetic studies could show this.

(4)

From the feathers of ~~birds~~ ^{birds}
~~skin~~ cells, from these two types of birds are collected. The DNA
from these skin cells are extracted and amplified separately
using PCR. For PCR, the enzyme Taq polymerase, primers,
pH buffer solution, free excess ~~deoxyribose~~ ^{deoxyribonucleotides} along with DNA sample
is used. Once the DNA sample is amplified, Restriction endonuclea
ses enzyme is used to cut the DNA into fragments at specific
sites called recognition sites. Then gel electrophoresis is done. The
DNA samples are added to two different wells along with agarose gel.
The current is onned, and the DNA ~~ban~~ will start to move towards the
anode at different speeds depending on the size of DNA fragments.
UV light is used to illuminate DNA bands. The DNA band patterns,
size, width, number and position between the two birds
are compared. The more similarities are present betwe in the
DNA bands, ~~the~~ the more closely related the ~~bands~~ 2 species of
birds are. This process can be repeated (Total for Question 4 = 10 marks)
Several times to look for similarities in findings.



ResultsPlus
Examiner Comments

This response was awarded the full 4 marks. Although excessive in detail, the information needed to access the full range of the mark scheme was evident.



Consider the number of marks allocated to a question before writing your response.

In this response, there are about eight points relating to the method of PCR and gel electrophoresis which do not answer the question and take up valuable time.

Question 5 (a)(iii)

This question required candidates to carry out a mathematical calculation to express values in ratios. Overall, candidates performed well and it demonstrated an improvement in this skill than in previous series.

(iii) Calculate the ratio of the energy contents shown in these trophic levels:

$$\begin{array}{l} \text{trophic level 1 : trophic level 2 : trophic level 3} \\ 90480 : 8825 : 920 \\ \hline 920 : \frac{8825}{920} : \frac{920}{920} \\ 98 : 9.6 : 1 \end{array} \quad (1)$$

Answer $98 : \overset{10}{9.6} : 1$



ResultsPlus
Examiner Comments

This response was awarded the 1 mark. Regarding the mark scheme, expressing this ratio as 98 : 10 : 1 is the preferred method.



ResultsPlus
Examiner Tip

However you decide to express a ratio, one value must always be a 1.

(iii) Calculate the ratio of the energy contents shown in these trophic levels:

trophic level 1 : trophic level 2 : trophic level 3

(1)

$$\begin{aligned} &90480 : 8825 : 920 \dots \\ &= 98.3 : 9.59 : 1 \end{aligned}$$

Answer 98.3 : 9.59 : 1



ResultsPlus
Examiner Comments

This is an example of a response that was awarded zero marks. Given the data, expressing the ratio to more than one decimal place was irrelevant, except for when the value for trophic level 1 was expressed as a 1, (ie, 1 : 0.1 : 0.01).



ResultsPlus
Examiner Tip

If the question does not specify how many decimal places or significant figures to give your answer to, then you have to decide what is reasonable.

Question 5 (a)(iv)

This question allowed candidates to expand on their knowledge of this theme by explaining why there is no fourth trophic level in the food chain. Overall, candidates performed well and it demonstrated an improvement than in previous series.

(iv) Explain why there is no fourth trophic level in this food chain.

(2)

not enough energy to sustain a fourth
energy runs out

~~to much~~ to the 3 trophic levels consume
energy content



ResultsPlus
Examiner Comments

This response was awarded the full 2 marks. The mark scheme provides two different approaches to answer this question, of which this is one.

(iv) Explain why there is no fourth trophic level in this food chain.

(2)

The energy is used up for photo respiration, therefore there won't be enough energy to be passed on to another trophic level. The energy transfer is not 100% efficient, energy is lost between trophic levels, therefore there won't be enough energy to be passed onto a fourth trophic level.



ResultsPlus
Examiner Comments

This response was awarded the full 2 marks. The mark scheme provides two different approaches to answer this question. This is the alternative to the previous example.

Question 5 (a)(v)

Decomposition and the role of microorganisms in the recycling of carbon is another topic area where candidates have demonstrated good knowledge and understanding in this qualification.

- (v) Describe the role of microorganisms in recycling carbon present in this food chain.

(3)

microorganisms as bacteria and fungi act as decomposers where they grow on dead plants and animals and release extracellular enzymes as carbohydrase that break down glycogen into glucose and cellulase that break down cellulose in cell wall into glucose glucose is absorbed by diffusion and used as respiratory substrate by microorganisms where they respire releasing carbon dioxide into atmosphere which will be absorbed by other plants in photosynthesis. Carbon maybe locked in bodies of dead animals.



This is a very accurate and well-articulated response and it was awarded the full 3 marks.

Question 5 (b)

This question was the first of the two levels-based questions. Overall, candidates performed very well in this question. There were some good responses and very few candidates left this question blank.

The three marking levels were determined according to the extent that the information in the pictures and tables were used and the detail in the evolution process given.

There was a tendency for candidates to not appreciate the difference between allopatric speciation and sympatric speciation. There were many responses which referred to allopatric speciation, although the better responses referred to this context as being an example of sympatric speciation.

Gerenuk and springbok evolved from a common ancestor.

Deduce how the gerenuk evolved to occupy a different niche from a springbok.

Use the information in the table and the photographs to support your answer.

(6)

This is an example of sympatric speciation: where members of this common ancestor occupied different areas of the habitat. Ancestors of Gerenuk lived in tree areas. Being taller (greater height) was a polygenic attribute, members that were taller reached the leaves and had less competition, they experienced less competition and survived to reproduce passing down those alleles. Springboks didn't need to be that tall as they ate grasses and so that allele frequency didn't increase. The water in the leaves was enough to maintain gerenuk survival but springbok needed to adapt behaviorally to seek water. Colour of fur is another polygenic factor. Gerenuks live in areas of trees, tree trunks tend to be dark in colour. Gerenuks with dark fur were better at camouflage and were not eaten by predators and survived to reproduce, passing down those alleles. Springboks live on savanna open land where grass tends to be dry and light in colour. Members with more white spots camouflaged better and so survived to reproduce (not eaten by predators) and passed down those alleles. Length of horns is another polygenic feature. Gerenuks where hidden by trees, they didn't need to fight predators off. Springboks horns are used for courtship displays. Springboks are in the open, larger antlers = better at fighting off predators = survival to reproduce. Differences in courtship display lead to reproductive isolation and speciation. Gerenuk occupies niche of leaf eater while springbok occupies niche of grass eater.



This response was awarded the full 6 marks. The candidate has given some excellent details about speciation, using appropriate terminology and has discussed a significant amount of the information given in the table and photographs.

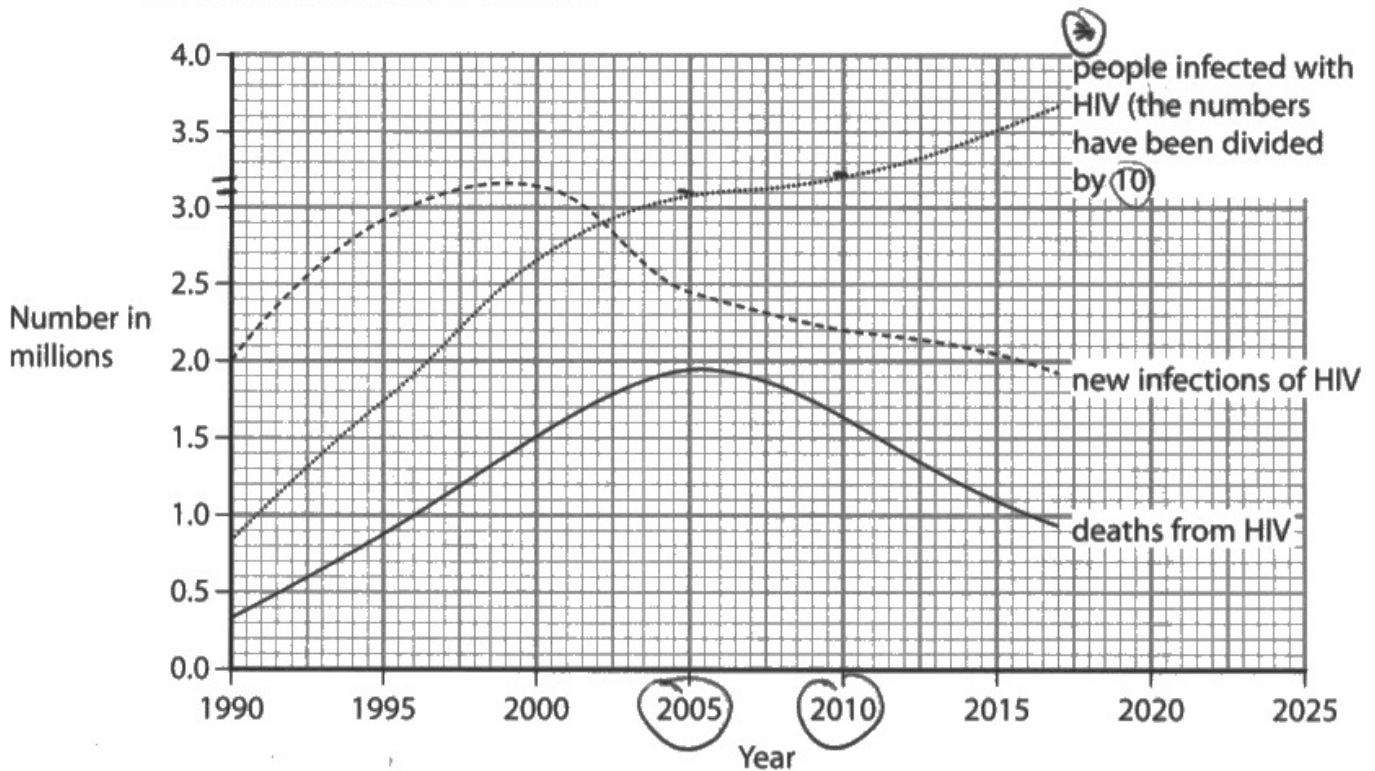


To score well in levels-based questions you have to cover all aspects of the question and use the information from all the tables/photographs/graphs that have been included in the question.

Question 6 (b)(i)

This was a new format of questioning to elicit candidates' understanding of data represented in a graph. The majority of candidates attempted this question but there were discrepancies with the clarity of expression.

(b) The graph shows the number of HIV infections and the number of deaths from HIV in the world from 1990 to 2017.



(i) The data plotted for the number of people infected with HIV has been divided by 10.

Explain why these numbers were divided by 10.

(2)

As the number of people infected with HIV in billions while number of new infections & deaths from HIV in millions. So, numbers of people infected divided by 10 so all data can be plot in same graph to ease comparison.



This is an example of a good response that was awarded the full 2 marks.

Question 6 (b)(ii)

This was a standard gradient calculation question. Candidates were required to express their answer in standard form to an appropriate number of significant figures.

- (ii) Calculate the mean rate of increase in the number of people infected with HIV from 2005 to 2010.

Express your answer in standard form to an appropriate number of significant figures.

$$\frac{3.2 \times 10^7 - 3.1 \times 10^7}{5} = \frac{0.1 \times 10^7}{5} = 200000 \quad (2)$$

Answer 2.0×10^5 mean number of infections year⁻¹



ResultsPlus
Examiner Comments

This is a response that was awarded the full 2 marks.



ResultsPlus
Examiner Tip

If the question does not specify the number of decimal places or significant figures to express your answer in, then you must look at the data supplied and make that decision for yourself.

Question 6 (b)(iii)

Most candidates found the interpretation of this question challenging. Some of the weaker responses referred to latency, lack of symptoms and ways of avoiding contracting HIV.

(iii) Explain why the number of people infected with HIV is going up although the number of new infections and deaths is going down, after 2005.

(2)

Number of people infected with HIV goes up as the population increases. However, number of new infections go down as more safety precautions are being implemented in recent times, as well as the number of deaths going down due to the improvement in science, which led to new, more efficient treatments ^{being} given to the patients.



ResultsPlus
Examiner Comments

This response was awarded the full 2 marks.



ResultsPlus
Examiner Tip

Always read the question through a couple of times before you answer it to make sure you know exactly what it is asking and what is expected of you in your response.

Question 6 (b)(iv)

This is a standard question format to elicit candidates' knowledge and understanding of extrapolation. Overall, candidates performed well on this question.

(iv) State how the graph can be used to estimate the number of deaths in 2025.

(1)

By drawing a best fit line ^{upto} till 2025



This response was awarded the 1 mark. The candidate qualified their answer by indicating that the line of best fit needed to be extended to 2025.

Question 6 (b)(v)

This is a familiar topic for this question related to vaccines and it has been quite topical in recent months. The majority of candidates performed well on this question with many achieving high marks for their responses. Many responses referred to 'herd immunity', which was creditworthy used in the correct context, even though this term is not on the specification.

(v) Explain why this estimate would be lower if a vaccine for HIV became available in 2023.

(3)

The vaccine will contain the dead pathogen of HIV. The body would have already produced T and B memory cells. Therefore, when there is an active pathogen of HIV, there will be a greater immune response as more antibodies will be released before the body starts to show up the symptoms and before the virus weakens the immune system. As a result, the death for HIV will decrease. Also giving vaccines will create ~~herd~~ herd immunity so the new infections number will also decrease. Since HIV targets T-helper cell, due to vaccine, the T-helper cell might have mutated and be resistant so that when the active HIV enters it won't bind to ~~surf~~ cell surface receptors of T-helper cells.



ResultsPlus
Examiner Comments

This response was awarded the full 3 marks. This was a clear response except for the reference to HIV as a dead pathogen. As this reference did not contradict any of the marking points, it did not negate the answer.



ResultsPlus
Examiner Tip

Viruses are non-living. Therefore they cannot be dead, they cannot die and they cannot be killed. Be very careful to avoid statements such as these as they can negate marking points in certain contexts.

Question 7 (a)

This was a straightforward percentage increase calculation question. Candidate would need to decide on a sensible number of decimal places which, as a rule of thumb for a percentage, is no more than two.

7 The photograph shows a Tasmanian devil.



(Source: © Walter 64 / Alamy Stock Photo)

Tasmanian devils are found in Tasmania.

The population of Tasmanian devils has fallen drastically due to a fatal cancer. This cancer first appeared in the mid-1990s.

There are only a few regions in Tasmania left where healthy Tasmanian devils can still be found.

(a) The number of Tasmanian devils is estimated to have fallen from 150 000 in the mid-1990s to 25 000 in 2020.

Calculate the percentage decrease in the number of Tasmanian devils from the mid-1990s to 2020.

(1)

$$\begin{array}{r} \cancel{25000} - 150000 \\ \cancel{150000} - 25000 \\ \hline 150000 - 25000 \quad \times 100 \\ \hline 150000 \end{array}$$

$= 83.3\%$
 $\approx 83.4\%$

Answer 83.4 %



This is an example of a response that was awarded zero marks. The candidate has incorrectly rounded on a number of occasions. The candidate has also expressed the answer as a recurring value of 3.

Question 7 (b)(i)

This was the second of the levels-based questions. In this question, the candidates were presented with two sets of data which they were asked to explain. It is worth noting that candidates are become confident with this style of question. There were many responses where candidates had commented on both sets of data. The weaker responses tended to describe the data whereas the better responses identified the command word and offered some explanation.

* (i) Explain the results of these two studies.

Use the information in the table and the graph to support your answer.

(6)

The table shows that the proportion of time the scavengers spent cancerous tasmanian devils spent feeding on carcass dropped by 0.5 compared to the healthy tasmanian devils.

The graph shows that the proportion of time spent by ^{table} forest raven and spotted-tailed quoll and Ferel cat where ^{feeding on carcass} ~~are~~ significantly lower in the region with cancerous Tasmanian devils than in healthy region of healthy Tasmanian devil. This suggests because the healthy Tasmanian devils had more energy to scare off the other scavengers, however, the Tasmanian devils with cancer did not have enough energy to scare away ^{scavengers} predators as they were sick and weak and in these regions there were only few healthy Tasmanian Devils. The graph shows that the carcass was decomposed faster ~~and~~ ^{in regions} in regions with healthy Tasmanian devils than ~~with~~ ^{where} cancer were common in Tasmanian devils.

This again due to the fact that the ~~we~~ Tasmanian devils which had cancer could not feed on the carcass as they were too weak ~~of~~ and in these regions only a few healthy Tasmanian Devils were present to eat the carcass. Although in these regions (where cancer was common) there ~~were~~ ^{more} was a greater proportion of other scavengers, the ~~de~~ carcass was still not eaten quickly, which indicates that Tasmanian Devils are the organisms which are able to eat the dead bodies quicker as they are larger ~~and~~ than the other scavengers.

In the healthy regions, the Tasmanian Devils had enough energy to travel and find dead organisms to feed on, and they also had enough energy for reproduction, so the number of healthy tasmanian devils in this region where high. Whereas the region with ~~as cancers~~ ^{many} cancerous Tasmanian devils, it meant that the cancerous organisms ~~didn't~~ didn't have enough energy to find dead organisms / ~~to~~ to feed on them. They didn't have enough energy to reproduce and died quickly. The ones which did reproduce increased the chances of cancers developing in their offsprings thus increasing the frequencies of cancer in this population, so the number of cancerous Tasmanian devils increased ~~and~~ in this region.



This response was awarded the full 6 marks. The candidate has structured their answer to cover each set of data separately with an explanation linked to both sets.



Before you start writing your response to a levels-based question, quickly plan out what you need to cover. The following is an example of a plan:

Table

- Description
- Explanation

Graph

- Description
- Explanation

Put side-headings in your answer if this helps to write a clearer response.

With only two sources of data, you need to plan to write a more detailed explanation to access the higher marks.

Question 7 (b)(ii)

This question was designed to test candidates' knowledge and understanding of the biotic factors affecting the Tasmanian devils. However, a significant number of candidates wrote about abiotic factors instead.

- (ii) Explain what other **biotic** factors could have affected the results from the two different regions of Tasmania, in the second investigation.

(4)

Predation ~~is~~ is one factor that could have affected the number of carcasses found in each region and also the number of other scavengers available. If less scavengers are available, it will take more time for carcasses to be eaten. Another factor is parasitism and disease. If other scavengers are also suffering from a disease outbreak, it could potentially increase time taken to eat the carcasses, especially since the Tasmania devil is already under an active outbreak of cancer.



ResultsPlus
Examiner Comments

This response was awarded 2 marks of the 4 marks available. The candidate has identified two biotic factors and has explained how they could affect the results of this investigation.



ResultsPlus
Examiner Tip

Always check the number of marks allocated to a question and consider how the marks could be allocated. In this example, if only two biotic factors have been explained then it is very unlikely that full marks will be gained. Four marks is much more likely to mean four factors need explaining.

Question 8 (a)(i)

Candidates are familiar with the sequence of events that occur in the colonisation of an area, such as bare rock. However, this question took a slightly different approach and asked candidates for the characteristics of pioneer species. Many weaker responses focussed on the role of these species, which did not address the expectation of the question.

8 The eruption of a volcano can devastate the surrounding countryside and cause climate change.

(a) The photograph shows the devastation that can result from a volcanic eruption.



(Source: © Zoonar GmbH/Alamy Stock Photo)

Succession occurs in the devastated areas.

Pioneer species are the first to colonise these areas.

Several stages follow, which may result in a climax community.

(i) Describe **three** characteristics of pioneer species.

(3)

They are the first organisms to colonise an area during succession. They are able to adapt to harsh abiotic conditions, for example desertification (dryness), low nutrient levels (i.e. low ^{levels of} Mg^{2+} ions), extremes of temperature, and ^{like} high light intensity. Also, they secrete acids that dissolve the rocks and break up the rock, where organic material can be trapped in ~~the~~ ^{the} soil causing small granules of rock, creating a very basic soil called humus.



This response was awarded the full 3 marks. The candidate addressed the question, as well as describing the role, which was creditworthy.

Question 8 (a)(ii)

This is another question which took a slightly different approach to previous questions on succession. Candidates clearly understood the expectation of the question but often struggled with expressing their answers clearly. The mark scheme allowed candidates to gain marks for illustrating their ideas with specific examples.

(ii) Explain why succession occurs in stages.

(2)

Because ecological succession is a lengthy process. If soil is not formed it can not support grasses and if soil is not enriched enough it won't support trees and large plants. So at first only pioneer species, eg, fungi can live and survive then after some time, herbs, grasses, then

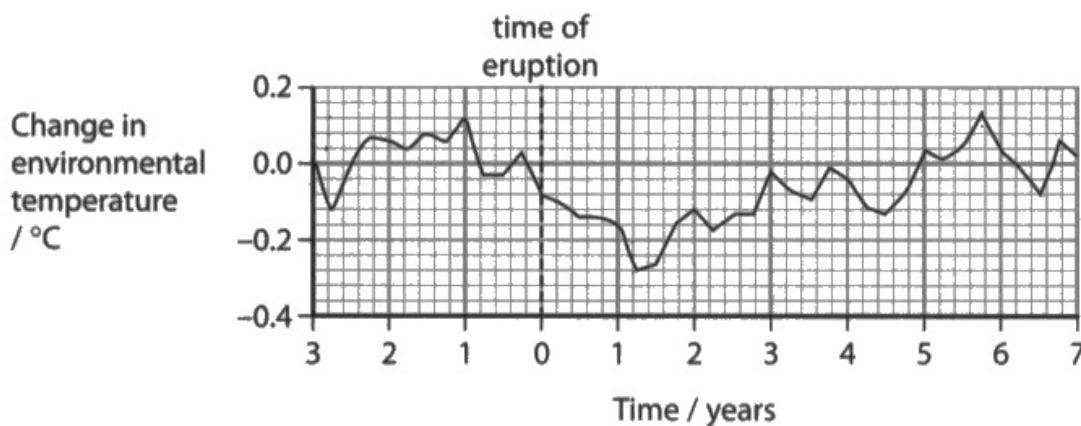


This is an example of a response that was awarded the full 2 marks. The candidate has given a specific example to answer the question.

Question 8 (b)(i)

This question required candidates to determine the effect of a volcanic eruption on environmental temperature. The majority of candidates were able to describe the changes in environmental temperature throughout the ten-year time period shown in the graph and gained the first marking point for the drop in temperature following the eruption. Very few candidates did a calculation of temperature change which was necessary for the second mark.

(b) (i) The graph shows the changes in environmental temperature before and after a volcanic eruption.



Determine the effect of the volcanic eruption on environmental temperature.

Use the information in the graph to support your answer.

(2)
Before eruption, the highest temperature change is 0.125°C . The temperature ~~change~~ ^{started to} decreased gradually from the time of eruption and continued to decrease till the lowest temperature change, -0.275°C , after the first year of eruption. The temperature ~~qu~~ gradually increased again after 1.2 years. After eruption the highest temperature change was at ~~0.15^{\circ}\text{C}~~ 0.15°C in the in 5.7 years.



This response was awarded the full 2 marks. The candidate clearly understood that the command word 'determine' requires a calculation to be made for full marks to be awarded.



Learn the meaning of all the command words used in this qualification and always check the command word at the beginning of the question. Full marks cannot be gained for a question with the command word 'determine' if a calculation has not been included.

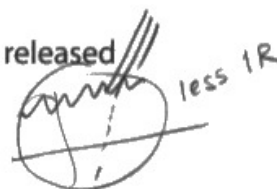
When reading values from a graph, always check the scale used on both axes and then read the values carefully. The values read must be as accurate as the scale allows.

Question 8 (b)(ii)

Candidates are used to explaining how UV light can penetrate the greenhouse gases, and IR radiation gets trapped, causing global warming. This question turned this concept around and asked what would happen to global temperatures if the UV light could not get through to the Earth's surface. Most candidates coped well with this question.

- (ii) When this volcano erupted, sulfur dioxide and particles of ash were released into the atmosphere.

Sulfur dioxide and particles of ash cause less light to pass through the atmosphere.



Explain the results shown in the graph.

(4)

As less light passes through the atmosphere due to SO_2 & ash particles ~~temperature~~ IR radiation is less reflected back onto the earth's surface which ~~it~~ reduces the environmental temp. as seen in the graph for approx. ^{1.5} 5-2 years. Afterwards, as SO_2 & ash particles ^{begin} receding the ^{amt of} light ^{passing} gradually increases ~~as usual~~ but as more IR is reflected back ^{to} earth's surface thereby warming it. Graphs portrays this: from 5-6 years after volcanic eruption temp before & after eruption seem to be the same.



ResultsPlus
Examiner Comments

This response was awarded the full 4 marks.



ResultsPlus
Examiner Tip

Candidates often get long wave and short wave radiation confused. Stick to UV and IR if it makes things easier, as these are acceptable.

Question 8 (b)(iii)

Candidates generally coped well with this calculation question, although they needed to be aware of values in standard form. However, the mark scheme allowed for either 700 or the answer in standard form.

(iii) The eruption of one volcano resulted in 5×10^7 metric tons of carbon dioxide entering the atmosphere in one year.

The mass of carbon dioxide released into the atmosphere in one year by anthropogenic activities was 3.5×10^{10} metric tons.

Calculate how many volcanic eruptions would need to occur, in one year, to produce as much carbon dioxide as anthropogenic activities.

$$\frac{3.5 \times 10^{10}}{5 \times 10^7} = 700$$

= 700 volcanic eruption

(1)

Answer



This is a response that was awarded the 1 mark. The candidate has clearly set out the calculation. However, the answer has not been written on the answer line provided but it is clear what the final answer is.

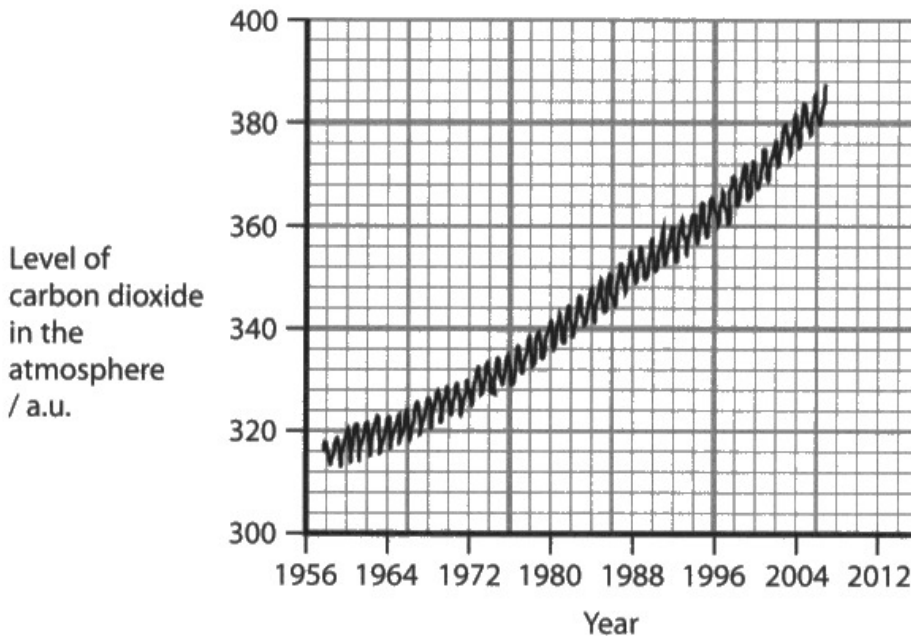


Answers in standard form should only have one figure to the left of the decimal place. 7×10^2 is correct standard form, 70×10^1 is not.

Question 8 (b)(iv)

(iv) The graph shows the levels of carbon dioxide in the atmosphere in one region of the world from 1958 to 2004.

During this period there were volcanic eruptions in 1963, 1980, 1982 and 1991, in this region.



Discuss the possible effects of volcanic eruptions on climate change.

Use all the information in part (b) to support your answer.

(3)

~~The~~ Volcanic eruptions could decrease the temperature of the environment because of the ash and sulfur dioxide blocking light, but it also releases CO_2 which is a green-house gas which could increase the temperature but there doesn't seem to be a significant increase of CO_2 in the environment after an eruption than the standard increase.



This is a response that was awarded the full 3 marks.



If you do not know the answer to a question and there is an instruction to use the information provided, don't panic. Go back and look at the information in the question and hopefully it will help you to figure out the answer.

Paper Summary

Overall, the paper worked as intended and some very good clear responses were seen. Centres are clearly using past paper mark schemes to prepare their candidates and are taking on the comments that are made in Principal Examiners' reports. The following points have been made in previous reports but still apply.

- Candidates need to read the question carefully to identify the command word and the various aspects that they need to cover in their answer.
- The mathematics appendix should be shared with candidates. The mathematical skills should be practised by candidates as part of their preparation for the exam.
- Careful consideration of the number of decimal places or significant figures in which to express an answer is necessary, particularly if the question does not specify. If the question does specify then the instruction must be followed for full marks to be accessed.
- Workings to calculations should be shown
- The marks allocated to a question should be used to judge how much to write.
- Levels-based responses should cover all aspects of the question and not focus on one small component.
- Diagrams should be drawn accurately to represent exactly what is being drawn.
- All questions should be attempted and avoid leaving blanks.

Grade boundaries

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

<https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html>

