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June 2022

GCSE Combined Science 1SC0 1BF

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June 2022

Publications Code 1SC0_1BF_2206_ER

Introduction

Paper 1SC0_1BF is taken by candidates that have followed the GCSE Combined Science specification.

The paper consists of 60 marks assessed by a mixture of different question styles, including multiple-choice questions, short answer questions, calculations and one extended open response question. There were few examples of blank responses throughout the papers seen, which shows that the questions could all be answered within the allotted time of 1 hour 10 minutes. The extended open response question is identified by an asterisk (*) in the question paper to indicate that marks are also awarded for the ability to structure a response logically. The Combined Science Biology papers assess aspects of working scientifically and mathematical skills, the requirements of which are given in the specification.

This year, because of the disruption to education caused by Covid, advance information was supplied to allow candidates to focus their preparation on the main areas that were to be assessed. The advance information also included areas that would not be assessed. It was generally felt that for this paper, the advance information helped the candidates, as a greater amount of key words used in the correct context were seen in the responses when responding to questions.

The advance information was felt to be beneficial for many candidates with excellent detailed answers seen on responses to several questions including the six mark extended prose, the body's response to infection question. This was an early exam and it is possible that teachers used their revision time to cover several topics in detail.

The paper examined content from topic 1 as well as topics 2 to 5. This included, diseases, bacterial growth, STIs and the bodies response to disease, alcohol and cirrhosis of the liver, human evolution, inheritance growth and DNA.

There are six core practicals in the biology content which must be completed prior to sitting the examination. Questions assessing practical skills were based on core practical 1.10, investigating the effect of pH on enzyme activity.

There were several questions that tested candidates' ability to apply their knowledge to different situations. In all these questions, the information needed for candidates to respond was supplied in the stems of the questions. It was pleasing to see candidates clearly using the information although some, eg Q3(c)(ii), showed that more scaffolding should have been included to ensure that candidates knew what was required to gain credit.

In general, mathematical questions were answered well with candidates being able to extract the correct data to use and manipulate sufficiently to gain marks. The more straightforward questions, where marks could be gained by interpreting the given information were answered well and it was pleasing to see some excellent, coherent answers accurately applying relevant scientific terminology. It was encouraging that some candidates used the scaffolding provided to guide their responses. Even when candidates scored low or no marks there was clear use by a reasonable number of candidates of using the diagrams, graphs and information in the stem of the question in their answers.

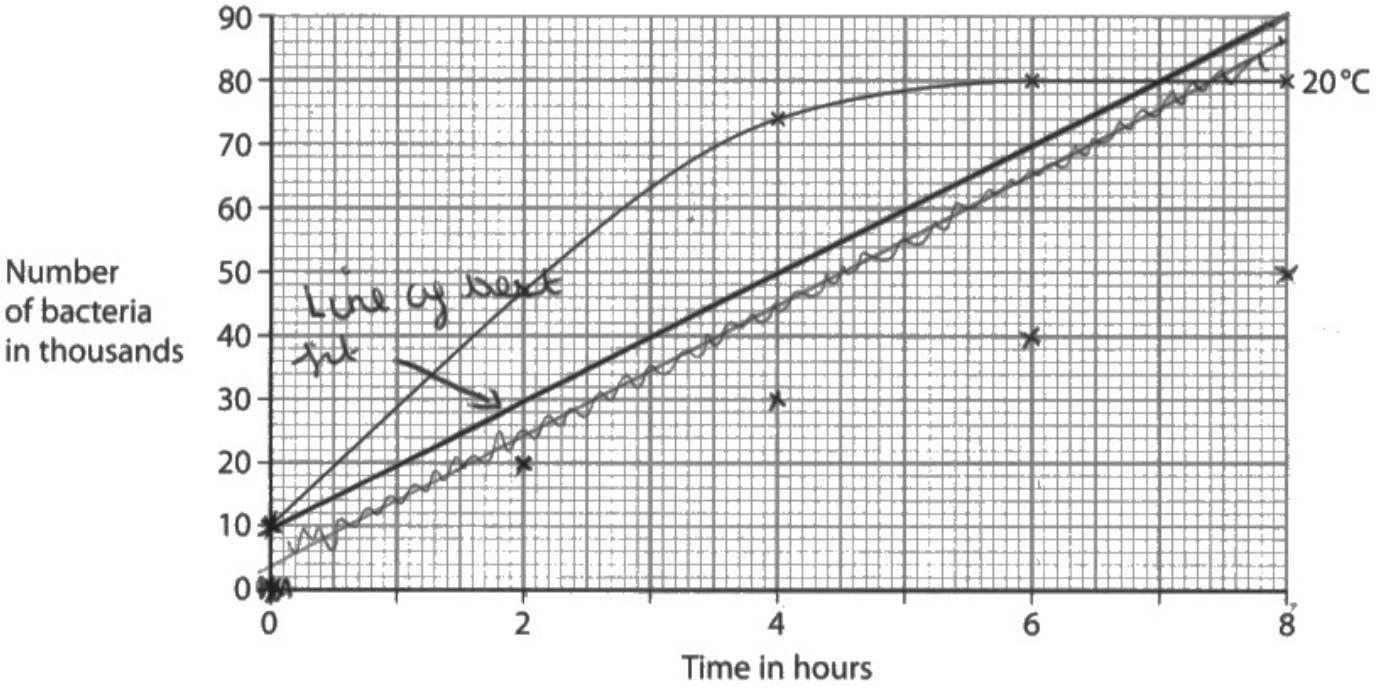
There were few examples seen of good examination practice, for example, underlining key words and writing key words by the extended response questions. As a result there was an increased number of examples where 'describe' and 'explain' were confused, with some candidates explaining every 'describe' question or just describing 'explain' question. There was also a marked reduction in several areas including the ability to plan an investigation and the use of correct measurements. It is possible that this is due to the disruption caused by Covid and that the disruption affected practical aspects of the course more than the theoretical ones.

Question 1 (b)

Q1(b) worked well, with good discrimination. It required the candidates to join the boxes for cholera and malaria to the boxes that showed the ways that each were spread. There was a marked increase in the number of candidates that drew multiple lines from each 'disease' box thereby gaining no marks. Over 50% of candidates gained both marks here. Those that only gained one mark tended to gain it from knowing that cholera is spread by water rather than malaria is spread by mosquitoes which was surprising.

Question 1 (c)(i)

This question required candidates to plot the last three points from the table onto the graph. This was a straightforward task aimed at a relatively low level with all three points being plotted on 'numbered' lines. Over 80% of candidates scored the mark available.



ResultsPlus
Examiner Comments

All three points are plotted correctly within the +/ – one small square tolerance so 1 mark awarded.

The line, which is the next question, was not credited as although straight and the candidate has clearly indicated which line to mark, it is a line of best fit for all the points and the instruction was to draw a line of best fit for 10^{o}C.

ResultsPlus
Examiner Tip

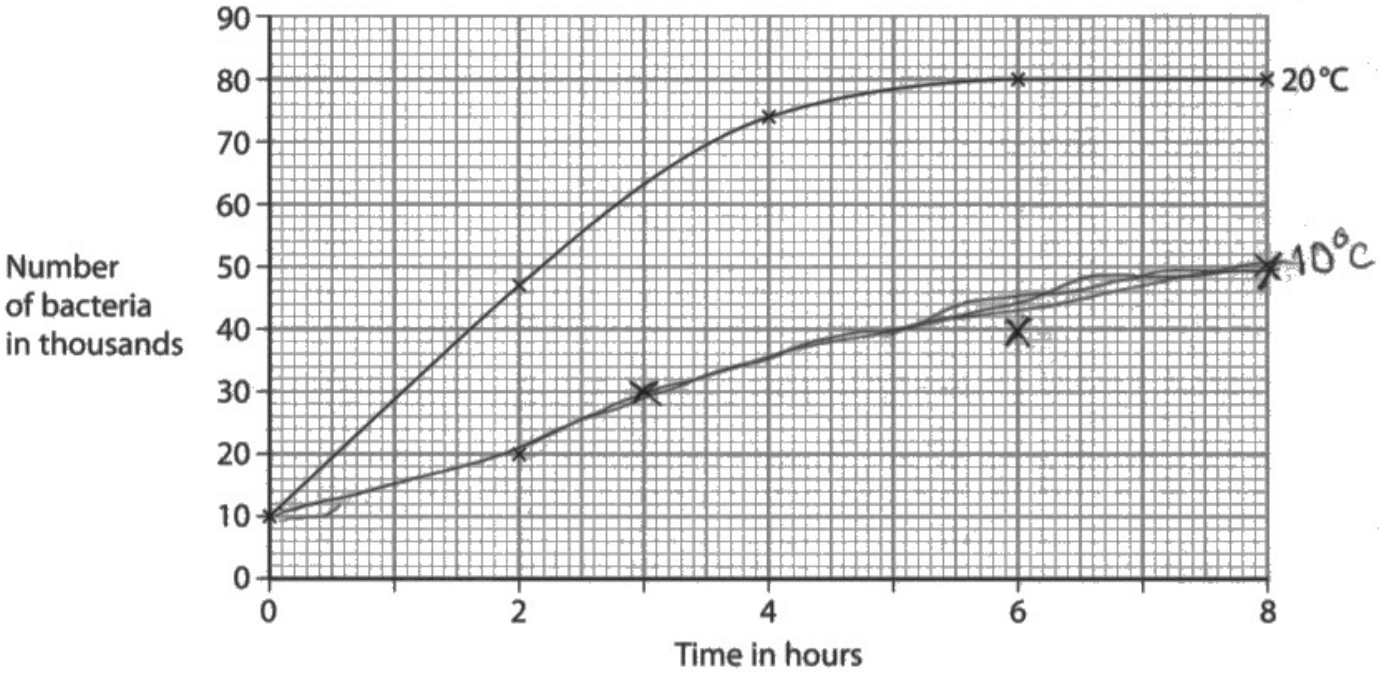
When asked to plot points there is a very small tolerance so use a sharp pencil and take care to be very accurate.

Question 1 (c)(ii)

To gain credit the candidate was required to draw a line of best fit through their plotted points. When plotted correctly, the line is straight going through (0, 10) and (8, 50). This could be awarded if the points were incorrectly plotted but the line still had to be straight or be a smooth curve and show the trend plotted. A freehand line was credited if it was a good attempt at being straight. Less than 50% of candidates scored here with many of those not scoring through drawing sketchy lines, including tramlines, or forcing the line through the origin.

Figure 1

Figure 2 shows a graph of the results at 20 °C.

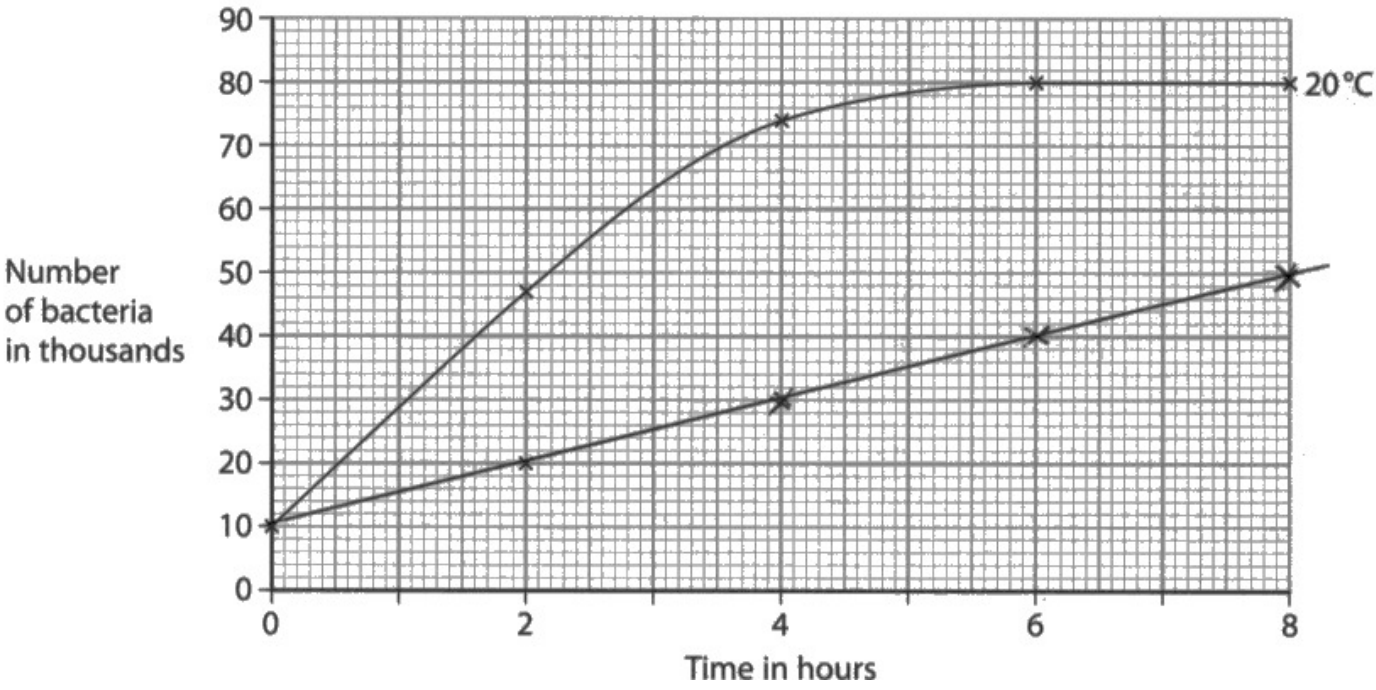


ResultsPlus
Examiner Comments

This candidate has not plotted the first of the three points correctly which has made drawing the line of best fit as instructed more difficult. The candidate is not awarded the mark available for two reasons: it had to be a straight line with no 'tramlines'.

ResultsPlus
Examiner Tip

Make sure that you have and also use a ruler for drawing straight lines.



ResultsPlus
Examiner Comments

An example of a good, clean straight line going through all points that gained credit.

Question 1 (c)(iii)

This question discriminated well with roughly half of the candidates scoring 1 mark and a quarter scoring 2 marks.

To score, candidates had to describe how the two growth lines, at 10^{o}C and 20^{o}C, were different. The obvious difference that almost all candidate that scored stated was that growth was faster at 20^{o}C than 10^{o}C.

This was a comparative question and so just stating that 20^{o}C was fast was not credited without also saying at 10^{o}C it was slow. However, candidates would score if they said growth at 20^{o}C was faster as they had to be referring to faster than 10^{o}C.

Candidates that scored the second available point mainly did so by referring to 10^{o}C being straight / linear and 20^{o}C levelling off, with a few scoring by manipulating data.

This is a commonly seen response credited with one mark.

(iii) Describe how the growth of bacteria at 10 °C was different from the growth of bacteria at 20 °C.

(2)

The number of growth at 10°C was lower whereas the growth at 20°C was higher in number.

ResultsPlus
Examiner Comments

There are 2 marks available here and it is possible that candidates that stated this type of response did not notice the two marks or thought that 10^{o}C was slower and 20^{o}C was higher were two separate marks.

ResultsPlus
Examiner Tip

Make sure that you give two differences when there are 2 marks available.

A is higher and B is lower are the same marking point, so you need to look for another type of difference to gain full credit.

(iii) Describe how the growth of bacteria at 10 °C was different from the growth of bacteria at 20 °C.

(2)

It was warmer so they grew Quicker than 10°C because thats Cooler and will take more time

ResultsPlus
Examiner Comments

This candidate scored one mark as it is clear that they are referring to faster growth at 20^{o}C than 10^{o}C.

ResultsPlus
Examiner Tip

Make sure that in a question like this you make it clear to which line you are referring.

The easiest way to do this is to use the 'tags' that the question use, here they are at 10^{o}C and at 20^{o}C.

(iii) Describe how the growth of bacteria at 10 °C was different from the growth of bacteria at 20 °C.

(2)

The bacteria grew more at 20°c than it did at 10°c. At 20°c the backeria stopped growing when it reached 80,000, yet in the experiment the bacteria at 10°c was still growing.

ResultsPlus
Examiner Comments

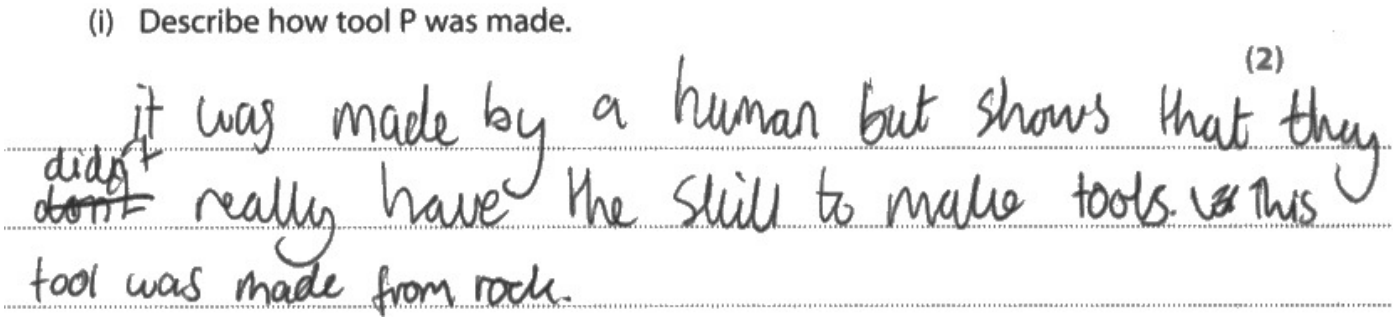
A good clear two mark response that refers not only to levelling off for the second mark but quantifies where levelling off occurs.

Question 2 (a)(i)

Q2(a) presented candidates with two images of stone tools used by our human ancestors. This question asks candidates to describe how stone tool P was made.

This question discriminated well, however, in this case more candidates were credited with both marks than with just one.

Those that gained one marked tended to do so by stating that stone tool P was made by hitting it, although many alternatives for hitting were accepted. Most candidates that stated this went on to say with another rock, although again alternatives such as 'with something hard' were credited. The most common error was based on the rock being formed like this in the ground.


(i) Describe how tool P was made.

(2)

it was made by a human but shows that they didn't really have the skill to make tools. ✗ This tool was made from rock.

ResultsPlus Examiner Comments

This response is not awarded any marks. Although the candidate states that it was made by a human and that it was made from rock, they did not answer the question as to how it was made.

ResultsPlus Examiner Tip

Read the question carefully, underline the command word(s) ('describe how') and the key words ('was made').

Then make sure that you answer the question set.

(i) Describe how tool P was made.

(2)

tool P was made by a not so evolved creature but a creature that still knew how to do it. it was made by rubbing two stones together to create sharper

ResultsPlus
Examiner Comments

This gets one mark for 'two stones together'. However 'rubbing' is not close enough to 'hitting' to award the other marking point available.

Question 2 (a)(iii)

Q2(a)(iii) asked candidates to choose the correct words from the box to complete the sentences about evolution.

Most candidates scored both marks here which was pleasing to see, with most of those dropping a mark choosing human instead of natural to precede selection, or, that genes migrate instead of mutate.

Question 2 (b)

This question, which again delivered good discrimination between candidates, asked candidates to describe two ways that the stone tools or fossils found could be dated. There was a lack of understanding of the time scale for when stone tools were used by a small but significant number of candidates, with reference to makers marks from the last century and Victorians seen.

Some good answers were also seen, taking how deep in the ground they were found to explain that the deeper in the ground, the older the fossils were and saying that you had to be careful with this as the soil layers are not all the same thickness. Radioactive dating was also a common creditable response. References to using carbon dating were credited with carbon being ignored as we would not expect these candidates to distinguish between the different sorts of radioactive dating that are actually used for stone tools and fossils.

(b) Fossils were also found in the soil around tool Q.

Describe **two** ways that stone tools and fossils can be dated to find out how old they are.

(2)

1 they way they look.

2 how there been made

ResultsPlus
Examiner Comments

This answer is a good start but not creditworthy as it stands. Candidates need to develop their answers, in this case to describe, how the basic idea is used.

ResultsPlus
Examiner Tip

Underline the key words in the question to help focus the answer and ensure that the response covers what is being asked to gain marks.

(b) Fossils were also found in the soil around tool Q.

Describe **two** ways that stone tools and fossils can be dated to find out how old they are.

(2)

1 The deeper into the ground they are means there older. ~~They Could Compare with the tools they have found.~~

2 They Could Compare with tools they already have dates for and if there more advance there more recent if there not advance then there older.

(Total for Question 2 = 7 marks)

ResultsPlus
Examiner Comments

A good, clear detailed response that gained both marks available.

Question 3 (b)(i)

This mathematical skills question required candidates to read the relative risk of developing cirrhosis of the liver for people drinking 28 units of alcohol drunk with a meal or drunk on its own. Once the two values were taken from the graph the candidate had to calculate the difference between the two groups of people. The first mark was for the relatively easier mark of reading the risk as 3 / 3.0 and the second for the harder graph skill of reading 1.8. Most candidates then sensibly calculated the difference by subtracting the smaller value 1.8 from 3.0 to give 1.2. A few candidates divided 3.0 by 1.8 which was also credited.

There was no tolerance on reading 3.0 but if the candidate read the second as 1.7 or 1.9 then the 3 and the difference mark could be awarded. Roughly half the candidates scored all three marks here with a significant minority gaining 1 or 2 marks.

(i) Person A drinks alcohol on its own.

Person B drinks alcohol with their meals.

Calculate the difference in risk for these two people when each one drinks 28 units of alcohol per week.

(3)

$3 - 1.8 = 1.2$

1.2

ResultsPlus
Examiner Comments

A clear, full mark response.

(i) Person A drinks alcohol on its own.

Person B drinks alcohol with their meals.

Calculate the difference in risk for these two people when each one drinks 28 units of alcohol per week.

(3)

Person B → 1·8 relative risk

Person A → 3 relative risk

3 - 1·8 = 1·2

1·2

ResultsPlus
Examiner Comments

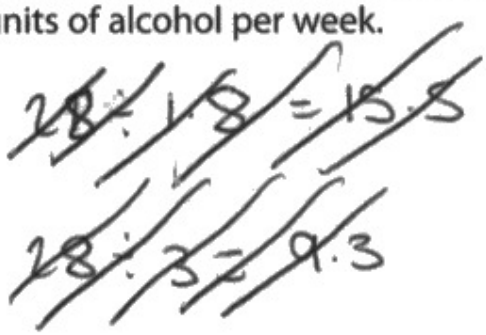
An excellent, clear 3 mark response.

(i) Person A drinks alcohol on its own.

Person B drinks alcohol with their meals.

Calculate the difference in risk for these two people when each one drinks 28 units of alcohol per week.

(3)



ResultsPlus
Examiner Comments

We mark crossed out work if there is no other writing. If there is other writing, we take it to mean do not mark the crossed out work, mark the other uncrossed out response.

Here the candidate has clearly read the 3.0 and the 1.8 correctly from the graph. They have then incorrectly divided the number of units of alcohol by the relative risk.

2 marks awarded.

ResultsPlus
Examiner Tip

If candidates have written something and then decided it is wrong, only cross the response out if it is to be replaced by an alternative. If a response is to be crossed out, do so by using a single straight line. There may be something in the crossed out answer that can still be credited.

Question 3 (b)(ii)

Following on from calculating the difference in risk between drinking alcohol with and without a meal, candidates were asked to state two pieces of advice for people about drinking alcohol. The question stated that they should use evidence from figure 5.

Over half of the candidates gained both marks here with a further significant number gaining just 1. Reduce the number of units drunk was the commonest creditable response seen, often stated as just drink less alcohol. If you do drink, then only drink with a meal was also regularly seen. A few candidates just stated eg 14 units a week, which did not answer the question with a few losing marks from incorrect use of language, eg every time you have a meal drink alcohol.

(ii) Using evidence from Figure 5, state **two** pieces of health advice for people about drinking alcohol.

(2)

1 when drinking alcohol they should have a meal with it to reduce risk of Cirrhosis.

2 If drinking alcohol on its own you should limit the amount in a week.

ResultsPlus
Examiner Comments

A good 2 mark response clarifying the statements to show that they clearly understand what is being asked.

(ii) Using evidence from Figure 5, state **two** pieces of health advice for people about drinking alcohol.

(2)

1 Drink alcohol with meals.

2 Don't drink alcohol on its own

ResultsPlus
Examiner Comments

This candidate has given a correct response and then the antithesis of it as the second point, so it only gains one of the two marks available.

ResultsPlus
Examiner Tip

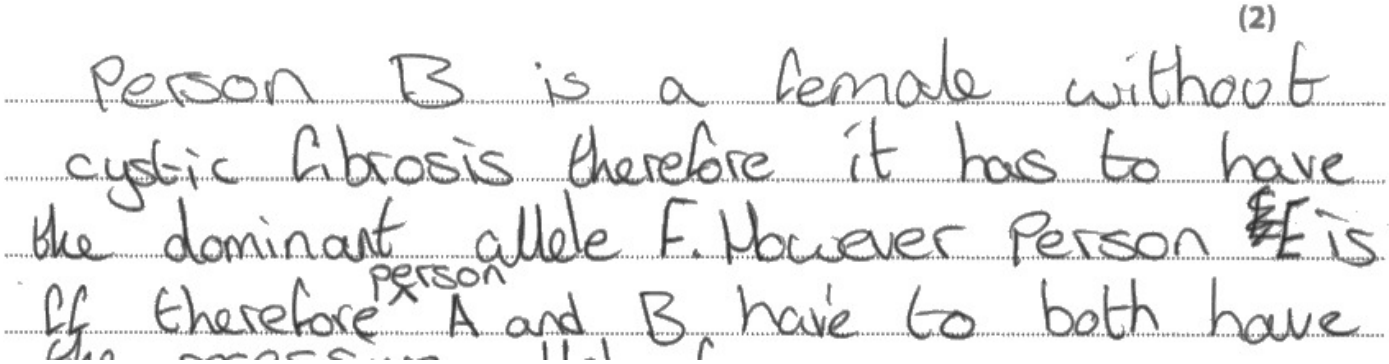
Where candidates are asked to make two statements / differences / points, they should take care that the second point made covers a different area of the content that is being examined.

Question 3 (c)(i)

This was a straightforward question asking candidates to state where genes are found in cells. Roughly three quarters of the candidates gained the available mark. As expected, the majority of creditable responses were 'in the nucleus', 'on DNA', and 'on chromosomes'. 'In mitochondria' was also relatively frequently seen. A few candidates wrote 'in cells' which was not credited because in cells was stated in the stem of the question.

Question 3 (c)(ii)

This question did not work as well as expected with just about a quarter scoring one mark and very few scoring both marks available. Responses for those candidates that did score 1 mark were roughly evenly spread between person B not having cystic fibrosis (so had to have an F allele) and person E has ff and so must have got one f allele from person B. We accept that candidates need more scaffolding to help them access what was required.


(2)

Person B is a female without cystic fibrosis therefore it has to have the dominant allele F. However person E is ff therefore person A and B have to both have

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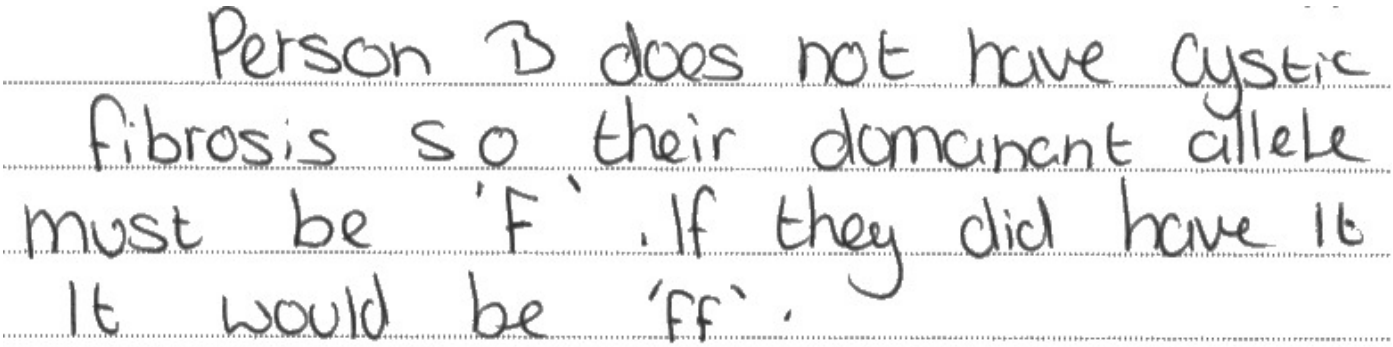
A good, if relatively rare, response showing excellent understanding of the question.



Person B does not have cystic fibrosis so their domanant alleLe must be 'F'. If they did have it It would be 'ff'.

ResultsPlus Examiner Comments

A more common, if clear response explaining why person B has to have an f allele.

Question 3 (c)(iii)

Q3(c)(iii) required candidates to state the genotype of person C. It was pleasing to see that the vast majority of candidates understood the term genotype by stating FF, Ff or ff.

Roughly half the candidates gained this mark by correctly stating ff.

One problem seen was candidates writing their F and f similarly. Where this occurred, we were as lenient as we could be.

Question 4 (a)(ii)

For credit, we were looking for an idea of percentile charts being used to monitor growth / to track how someone is growing here for credit, with many specifying the type of growth measured, with responses such as to track how tall you are each year. Well over half of the candidates scored the one mark available here. Common errors included to see how tall you are, to see if you are above or below average.

(ii) State how percentile charts are used.

(1)

Percentile charts are used to measure growth and see if a person is growing enough/properly.

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Examiner Comments

A good standard response showing understanding of how percentile charts are used.

(ii) State how percentile charts are used.

(1)

The height and age X and Y axis' meeting point will be on a line which clearly reads the percentile.

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Examiner Comments

A significant minority of candidates misinterpreted the question here and stated how to use the chart rather than how percentile charts are used. This may be partly due to the preceding question asking them to find which percentile a 10-year old boy was that had a height of 140cm.

ResultsPlus
Examiner Tip

Candidates should practice answering the question as stated and should not turn the question around, as this often results in marking points being missed.

Question 4 (b)(i)

Q4(b)(i) showed a detailed image of a sperm cell showing structures including mitochondria, the nucleus and the acrosome to help candidates focus on the requirements of the question. As expected, the commonest response credited was 'has a tail' (usually qualified by to swim to the egg). The question asks candidates to describe how they are specialised, so marks were awarded for correct structures and functions ignored. If the head was used as a specialisation, then how it was shaped needed to be clearly stated. For example, a candidate could gain credit for saying the head has a pointy shape although it was pleasing to see candidates stating streamlined here as well. Marks were not credited where candidates gave general statements about all cells, for example, the sperm contains DNA / genes.

Describe **two** ways that the sperm cell is specialised.

(2)

1 it can swim with its tail

2 ~~it can produce more eggs~~ the acrosome can fertilise

ResultsPlus
Examiner Comments

Two marks awarded here for (swim with its) tail and acrosome (can fertilise).

Describe **two** ways that the sperm cell is specialised.

(2)

1 It has a long tail called a flagium to swim to the egg.

2 The neck of the sperm is longer meaning it can swim faster to the egg.

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Examiner Comments

1 mark here for tail / flagellum. This would have been awarded for the label on the diagram.

ResultsPlus
Examiner Tip

Where candidates are supplied with a diagram and are asked to 'state' / 'describe' / 'explain', encourage them to add labels/notes and descriptions to the diagram as:

- we do look at the diagrams to see if there is any creditable information there.
- it helps to focus the candidate's mind on what the question is asking.

Question 4 (b)(ii)

This question required candidates to complete a table showing the number of cells produced and the number of chromosomes in the cells made from both mitosis and meiosis. To aid the candidates, they were told that human body cells apart from gametes have 23 pairs of chromosomes. This has been asked before in different formats and has been relatively high scoring. This year, however, almost one third of candidates failed to score any marks and although good discrimination was shown with fairly even percentages generated for 1, 2, 3 and 4 mark responses. It is possible that asking for both the number of cells and the number of chromosomes in the same question confused some candidates as although most gave smaller numbers for number of cells than number of chromosomes, plenty of examples were seen with these numbers reversed. Some candidates seem to have missed the 'pairs' additional statement provided as they had 23 in the meiosis number of chromosomes space and then halved them to 11.5 in the mitosis space and some even continued to divide by 2 to complete the number of cells spaces.

(ii) Complete the table to show the results when a cell divides by mitosis or meiosis in humans.

Human body cells, except gametes, have 23 pairs of chromosomes.

(4)

	mitosis	meiosis
number of daughter cells produced	46	23
number of chromosomes in each daughter cell	46	23

ResultsPlus
Examiner Comments

It was not uncommon to see correct numbers in both correct boxes as well as in incorrect boxes.

Here the candidate gains 2 marks for the lower two boxes, but no credit for the upper two boxes.

A significant number of candidates scored full marks as shown here which was pleasing to see.

(ii) Complete the table to show the results when a cell divides by mitosis or meiosis in humans.

Human body cells, except gametes, have 23 pairs of chromosomes.

(4)

	mitosis	meiosis
number of daughter cells produced	2	4
number of chromosomes in each daughter cell	46	23

ResultsPlus
Examiner Comments

Candidates should take care to ensure that numbers and letters are clear. Here there is no doubt that the two '4's' are both four, but they are not too far away from causing doubt. Every year candidates are not credited marks due to poor letter formation and illegible handwriting. Candidates can check this aspect of their work if they finish early.

Question 4 (c)(ii)

Candidates were told that plant roots contain an enzyme that joins glucose molecules together to make starch molecules. The task was to devise a plan to investigate the effect of pH on the activity of this enzyme. The vast majority of candidates read the introduction and question and the terms 'enzymes' and 'starch' triggered them to give, often excellent, descriptions of the starch amylase digestion investigation. As both involved starch and regular testing, some candidates picked up a mark for using iodine to determine the presence of starch and/or testing the solution regularly, eg test one drop of solution every 15 seconds until there is a colour change. Very few candidates scored all three marks available here.

An excellent account of an investigation, unfortunately in this case to investigate the effect of concentration on osmosis in potato cylinders.

potatoes)

(ii) Plant root cells contain an enzyme that joins glucose molecules together to make starch.

Devise a plan to investigate the effect of pH on the activity of this enzyme.

(3)

- First peel the potato as the skin of the potato can affect osmosis.
- Then using a cork borer make 3 cylinders of potatoes. The cork borer will make all 3 cylinders have the same diameter
- Then using a trim the cylinders so they are all the same length (around 3cm)
- Measure the length(cm) of the cylinders using a ruler and the mass(kg) using a balance
- Put/Place the cylinders into 3 different test tubes.
- Add 10cm³ of 0.5 molar of sugar solution to the first test tube
- Add 10cm³ of 0.25 molar sugar solution to the second test tube
- Add 10cm³ of distilled water into the third test tube.
- Leave the cylinders in the test tubes overnight
- Take the cylinders out of the test tube gently and using a paper towel dry them so there is no moisture
- Re measure the length and mass using a ruler and balance
- Find out the percentage change using the formula change in amount /

(Total for Question 4 = 12 marks)

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Examiner Comments

When asked to devise a plan to investigate a factor, candidates need to be trained to underline this factor in the stem of the question, and then state that this is what they are going to change. Then they should state that they will have three different values for this factor.

Then they should state something that they will keep the same eg keep the volume / concentration of starch solution the same for each different pH.

Then describe how they will test to know what has happened. Often this can be coupled with time, eg test for starch every minute for 10 minutes.

Add a safety point where relevant.

Lastly, state that the investigation should be repeated at each pH two more times.

(ii) Plant root cells contain an enzyme that joins glucose molecules together to make starch.

Devise a plan to investigate the effect of pH on the activity of this enzyme.

(3)

Firstly you could put iodine in a testing circle. Then you can place the enzyme and glucose in a testing tube in a water bath. Which is heated by a bunsen burner. Then you could add numerous different pH's to test how much longer or shorter it takes to make starch. Once the iodine has been placed in the circle once it has turned brown. It means that it's been fully catalysed. Then the solutions can be put in. And ~~whether it turns orange or no~~ the time it takes for the solution to turn orange determines the time it takes to make starch.

ResultsPlus
Examiner Comments

Although this needs heating up, the basic elements of a correct plan to investigate the effect of pH on the activity of the enzyme in question are included and therefore this response receives 3 marks.

Question 5 (a)

Many candidates misunderstood the question and wrote about the DNA strand being joined together during DNA replication in cell division. For example, the base pairs are bonded together by an enzyme during mitosis.

Weak, hydrogen bonds and A-T/C-G were regularly seen in scripts that received credit here, with just under half the candidates scoring at least one mark.

5 (a) DNA molecules contain base pairs.

Describe how the base pairs are bonded together in a DNA molecule.

(2)

They are bonded together by the substrate and the active site.

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Examiner Comments

Many candidates answered 'what bonds the bases together' instead of 'how are the base pairs bonded together'.

ResultsPlus
Examiner Tip

Read the question carefully, underlining the key words to help focus your answer to the question.

Question 5 (b)(i)

It is a standard part of teaching DNA that base A pairs with base T and base C pairs with base G. It was disappointing thereby to see so many candidates not score on this question which required candidates to write the corresponding bases to those given in a strand of DNA. Just over one third of the candidates scored here and due to the nature of the question almost all of these scored both marks available. No pattern was seen in the non-scoring responses with A's, T's, C's and G's being written in what seemed to be a fairly random pattern.

Here the candidate has just copied the letters above into the boxes below. No marks awarded.

(b) Figure 9 shows part of a DNA molecule.

T	T	G	A	T	T	G	C	G	T	A	A

ResultsPlus
Examiner Comments

The question asks the candidate to write the complimentary code and presuming that 'complimentary' is familiar to the candidates as it is used in several places, for example, with enzymes and substrates, it is likely that different letters match to each of the four given and that they would match up consistently.

It is, therefore, unlikely that in a question like this there would be no pattern or as shown here, the same letters would be paired to themselves although the latter is a little more logical.

(b) Figure 9 shows part of a DNA molecule.

T	T	G	A	T	T	G	C	G	T	A	A

A	A	C	T	A	A	C	G	C	A	T	T

ResultsPlus
Examiner Comments

A good 2 mark response correctly matching the A's and T's as well as the C's and G's consistently.

Question 5 (c)(i)

Q5(c) tested the candidates knowledge on how to extract DNA from fruit. Although not a core practical, it is a specification statement and a minority of candidates demonstrated that they had carried out, or at least observed this as a practical by the way that they wrote their responses. Unfortunately the vast majority of candidates failed to score any marks here. This was a little surprising as even if they are unfamiliar with the practical they should have covered the role of protease to digest proteins in unit one which was the first marking point. Most candidates that did score knew that the protease was added to digest the cell / nuclear membrane thus releasing the DNA.

(c) A student wanted to extract the DNA from fresh peas.

The student crushed the peas and added washing up liquid and water.

The enzyme protease was then added to this mixture.

(i) Explain why the enzyme protease was added to the mixture.

(2)

Do it would speed up the breaking down process

ResultsPlus
Examiner Comments

Here the candidate sensibly applies their knowledge about proteins as 'biological catalysts'. Unfortunately it was not enough to score on this question, which is an early cross-over question with the higher paper.

(c) A student wanted to extract the DNA from fresh peas.

The student crushed the peas and added washing up liquid and water.

The enzyme protease was then added to this mixture.

(i) Explain why the enzyme protease was added to the mixture.

(2)

Protease allows an easier extraction by seperating the main solution and the DNA from one another.

ResultsPlus
Examiner Comments

A good attempt at a generalisation for this investigation. Again this is not specific enough for credit.

(c) A student wanted to extract the DNA from fresh peas.

The student crushed the peas and added washing up liquid and water.

The enzyme protease was then added to this mixture.

(i) Explain why the enzyme protease was added to the mixture.

(2)

Protease is used to break up the protein So that the membrane will break up and you can extract just the DNA without other substances.

ResultsPlus
Examiner Comments

A good, specific response that gains both available marks.

Question 5 (c)(ii)

This question continued with testing the understanding of candidates' knowledge of the extraction of DNA from fruit by asking why ice cold ethanol was poured down the side of the test tube onto the filtrate. This was slightly better answered, possibly because the appearance of white strands of DNA in the ice cold ethanol is more memorable. Even so, still only about a quarter of candidates scored here.

(ii) The mixture was then heated and filtered.

Finally, the student poured the filtrate into a test tube and ice-cold ethanol was poured down the side of the test tube into the filtrate.

State why ice-cold ethanol was poured into the filtrate.

(1)

• To precipitate the DNA.

A good answer gaining the available mark.

(ii) The mixture was then heated and filtered.

Finally, the student poured the filtrate into a test tube and ice-cold ethanol was poured down the side of the test tube into the filtrate.

State why ice-cold ethanol was poured into the filtrate.

(1)

so the white strands of DNA could be visible

ResultsPlus
Examiner Comments

So that the DNA can be seen is one of the acceptable alternative ways of saying to separate the DNA from the filtrate. Just saying 'to see white strands' would have been insufficient for credit.

ResultsPlus
Examiner Tip

If a question is about an investigation it is probable that the last stages will be to do with obtaining the result. Therefore apply this to answering a question that is similar to this one.

Question 5 (c)(iii)

This showed reasonable discrimination between the lower and higher levels for foundation candidates with over one third of candidates scoring 1 or 2 marks. This should have been much higher as candidates understood what was being asked but fell down through their use of terminology. This question is towards the end of the paper and so we are stricter on what we would credit. A large number of candidates stated, for example, keep the amount of enzyme solution the same. We would not say measure out an amount of enzyme solution in a science lesson so likewise here we insist on using the same 'volume' or using an example, eg 5cm^3 of enzyme solution, to gain credit. This had steadily been improving but the Covid disruption has allowed this generalisation to be used much more often.

(iii) The student wanted to compare the mass of DNA found in fresh peas with the mass of DNA found in fresh beans.

Give **two** variables the student would need to control to make this a valid comparison.

(2)

1 They should extract DNA in the exact same way. (technique)

2 Mass of the peas and beans should be the same.

ResultsPlus
Examiner Comments

There is no mark for a generic statement saying do things the same way, however mass is an acceptable way to measure the peas and beans so 1 mark is awarded for the candidate's second response.

ResultsPlus
Examiner Tip

When answering questions be specific as it is too easy to just say do everything else the same. Pick out a specific part of the investigation eg how the peas and beans are crushed and state that the peas and beans should be crushed in the same way / for the same time / until they are the same consistency.

Question 6 (a)(i)

Most candidates knew that the median is the middle value of a set of numbers. A few candidates did not order these first and came up with 0.6 and genital herpes as the sexually transmitted infection that had the median number of cases in 2017.

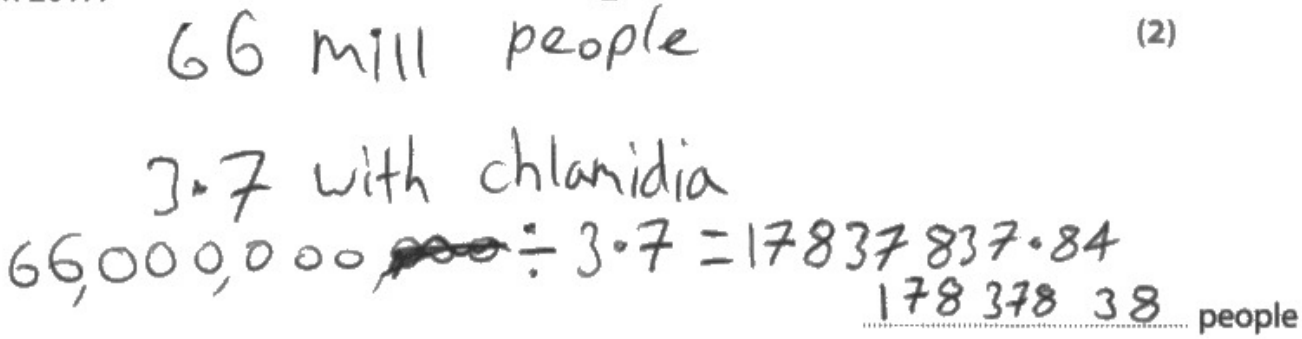
Some candidates that ordered the numbers correctly came to 0.8 but then lost sight of what the question was asking and gave that number as their answer. However this question was answered correctly by about half the candidates, making it a good discriminator.

Question 6 (a)(ii)

This mathematical skills based question asked candidates to calculate the number of people diagnosed with chlamydia in the UK in 2017. The table showed that 3.7 people out of a thousand head of population had chlamydia and that the UK population in 2017 was 66 million. There are three creditable ways of calculating the correct answer of 244 200 but most candidates derived this by dividing 66 million by 1000 and then multiplying the answer by 3.7. There were error carried forward (ecf) marks available, for example multiplying an incorrect number by 3.7 that gave an answer that was a correct order of magnitude of 244 200. Over one third of candidates scored at least 1 mark here with the split between 1 and 2 marks showing good discrimination. Candidates that did not score, often extracted the correct figures but then, for example, divided by 3.7 instead of multiplying.

(ii) The population of the UK in 2017 was 66 million people.

Calculate the total number of people diagnosed with chlamydia in the UK in 2017.



(2)

ResultsPlus Examiner Comments

This candidate has selected 3.7 from the table and used 66 000 000. However they have not realised that the 3.7 is per 1000 head of population and has divided 66 million by 3.7 instead of multiplied. No marks awarded.

ResultsPlus Examiner Tip

When extracting numbers from a table, check the column heading to see if the number in the table is 'per thousand' or 'in thousands' before you do your calculation.

(ii) The population of the UK in 2017 was 66 million people.

Calculate the total number of people diagnosed with chlamydia in the UK in 2017.

(2)

66,000,000 = 66,000,000 / 1000 = 66,000

66,000 / 3.7 = 17837.8

17837.8 people

ResultsPlus
Examiner Comments

Here the candidate has done two calculations – one is correct for 1 mark. The candidate has chosen the incorrect calculation and written that answer on the line. We mark the answer on the line as the candidate's chosen answer and in this case – no mark can be awarded.

Question 6 (a)(iii)

This question has been asked several times in past exams, albeit in different formats and it was pleasing to see many candidates giving a more full, creditable, answer qualifying 'it can be passed' with 'from one person to another'. As the context of this question was for chlamydia, through sexual intercourse was also a creditable answer on the grounds that is how chlamydia is transferred from one person to another.

(iii) State why chlamydia can be described as a communicable disease.

(1)

Because it can be easily spread.

ResultsPlus
Examiner Comments

Just easily spread is not creditworthy.

ResultsPlus
Examiner Tip

Lots of things can be easily spread, make sure that you qualify your answer, spread from what to what?

Question 6 (a)(iv)

Candidates were asked to give one way that the transmission of chlamydia can be prevented. As with the previous question, candidates lost marks for not being specific enough, eg 'use protection' could include wear a crash helmet so was not specific enough for credit. Wear protection when having sex was enough to tip the balance in favour of the candidate and award the mark although most candidates were even better stating wear a condom. Although still only one mark, some candidates went one better by stating use a barrier method of contraception, for example use a condom. Other creditable responses regularly seen included get checked and treated regularly to make sure you haven't got chlamydia so then you can't pass it on. The candidates were knowledgeable about this topic, with three quarters of candidates gaining credit.

(iv) Give **one** way the transmission of chlamydia can be prevented.

(1)

using a physical sexual barrier such as a condom or a femidom.

ResultsPlus
Examiner Comments

A good, detailed, clear, creditable answer.

(iv) Give **one** way the transmission of chlamydia can be prevented.

(1)

No sexual intercourse or wear protection.

ResultsPlus
Examiner Comments

This candidate is awarded the mark for the 'no' – avoid – sexual intercourse – not the wear protection, which on its own would not gain credit.

Question 6 (a)(v)

Q6(a)(v) asked candidates to explain why chlamydia can be treated with antibiotics. This was well answered by about one fifth of the candidates who explained that chlamydia was caused by bacteria and antibiotics can only be used to treat bacterial infections. Almost a third scored just 1 mark though with many having stated that antibiotics can be used for chlamydia then found it hard to express because antibiotics kill bacteria. It is thought that this is possibly because they thought that they had already covered that point in their first part of the statement. Candidates that stated antibiotics kill bacteria were far more likely to continue on to say and chlamydia is caused by a bacteria.

(v) Explain why chlamydia can be treated with antibiotics.

(2)

because is bactria and you can treat baktria ~~with~~ with antibiotc

ResultsPlus Examiner Comments

A good response that gains two marks.

(v) Explain why chlamydia can be treated with antibiotics.

(2)

Chlamydia is a bacteria which means it can be treated with ~~antibio~~ antibiotics.

ResultsPlus Examiner Comments

Here only one mark is given as 'treated with bacteria' is in the stem of the question. To gain the second mark the candidate could have said the antibiotics kill the bacteria or slow the growth of the bacteria, so the immune system kills them quicker than they grow.

Question 6 (b)

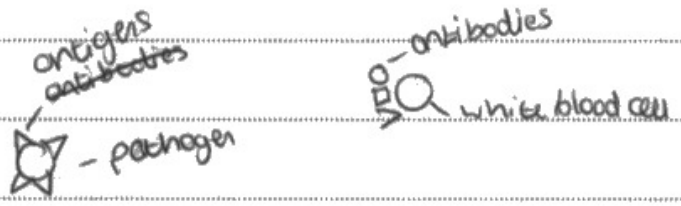
Question *6(b) has an asterisk by it to indicate that it is the extended prose six mark question and so is marked holistically. The question required candidates to explain how the immune system responds to an infection caused by bacteria. This phrasing means that the bacteria is already causing an infection and so there were no marks available for writing about the skin being a barrier. Over 8% of candidates accessed level 3 with about 18% accessing level 2 and almost half accessing level 3. In some ways it was disappointing that about 30% of candidates could not access a basic point such as white blood cells fight the bacteria. This question showed discrimination though with some excellent answers describing phagocytes and the roles of B cells and T cells, although to gain level 3 and full marks did not require that degree of complexity of answer. The indicative content was split into three areas, Area A covered initial reactions to an infection with the most common part seen in candidate's responses being white blood cells engulfing bacteria with antigens on bacteria being detected. Area B covered lymphocytes and antibodies whilst Area 3 covered memory cells and the faster immune response if infected a second time by the same bacteria. The question was testing the immune response so candidates were not penalised if they used pathogens or microorganisms or viruses as their disease causing organism. To gain level 3, all three areas had to be covered with a degree of detail required to gain all six available marks.

*(b) When a person is infected with a disease, the immune system will respond to protect their body.

Explain how the immune system will respond to an infection caused by bacteria.

(6)

When a pathogen enters the body the white blood cells respond by sending out antibodies which fight against the pathogens antigens. Pathogens have a specific antigen with a unique shape meaning ~~et~~ the white blood cell has to use the correctly shaped antibodies to fight it. Once the pathogen has been killed by the ~~antigen~~ antibodies the phagocyte engulfs the pathogen. This whole process produces Memory Lymphocytes which can immediately identify and neutralise the same pathogen next time.



ResultsPlus
Examiner Comments

A good 6 mark question covering all three areas of indicative content with some in sufficient detail to award all 6 available marks.

ResultsPlus
Examiner Tip

If you can't remember all the names and / or how to put your ideas into words, draw a diagram. Here the diagram is good enough to show white blood cells producing antibodies with at least one matching the antigens on the pathogen.

*(b) When a person is infected with a disease, the immune system will respond to protect their body.

Explain how the immune system will respond to an infection caused by bacteria.

(6)

- white blood cells will find the pathogen
- A white blood cell will ~~eaten~~ ~~eff~~ try to eat the dangerous bacteria
- A white blood cell will create anti pathogen to enter the bacteria and kill it
- White blood cells will remember this pathogen so if it enters again the immune system will be able to get rid of it faster increasing your immune response

ResultsPlus
Examiner Comments

3 marks are gained here, Areas A and B are covered but with little detail. The reference to white blood cells creating antipathogens was not considered to be good enough to credit Area B. Therefore two areas of indicative content are covered so level 2, the response is not detailed so 3 marks awarded.

Use bullet points if they help you write your ideas and organise your thoughts.

*(b) When a person is infected with a disease, the immune system will respond to protect their body.

Explain how the immune system will respond to an infection caused by bacteria.

(6)

• When the pathogen/bacteria enters, the white blood cells will try to identify what it is, so number of WBC are increased by this point.

• B lymphocytes will make a complimentery shape of antibodies that will stick to the bacteria.

• White blood cells will then engulf or digest the bacteria.

• Then memory lymphocytes will remember the bacteria and the ~~shape~~ shape is the person gets infected again, so next time the immune system will respond much quicker.

• The person may have a ~~temperature~~ high temperature or fever while infected ~~as~~ because bacteria can't live past a certain temperature so the immune response raises the body's temperature in order to kill it.

ResultsPlus
Examiner Comments

An excellent, detailed response covering all three areas of indicative content allowing access to level 3 with more than enough detail to award 6 marks.

ResultsPlus
Examiner Tip

This response uses bullet points that have allowed the candidate to organise their thoughts and the salient points that need to be made. Candidates should be trained to express their ideas using bullet points as it often helps them order their thoughts, especially, as in this case, when the response is sequential.

Paper Summary

Based on their performance on this paper, candidates should:

- recall that the command word 'describe' requires candidates to write an account of the subject in question or to say how data in a table or graph changes. This should include salient data from the graph to show where, for example, levelling off occurs.
- recall that the command word 'explain' requires linking the basic description made with additional scientific information to give a justification or a reason.
- underline key words in the stem of questions to help focus their responses so that it 'answers' the question.
- for practical based questions, eg designing an investigation, consider what we are changing, how are we going to change it, and what are we going to control / keep the same.
- note that when asked what should be controlled / kept the same for investigations, 'the same amount' and 'how much' are too vague and terms including 'volume', 'mass', 'number of' should be used to gain credit.
- extract the salient data required for mathematical questions and consider how to use that data to answer the question.
- realise that when mathematical questions ask 'what is the difference between', a simple subtraction will often be sufficient to answer and gain credit.
- always show the working for calculations, as if the answer is incorrect, marks can often still be gained, for example if the correct data is read off a graph.
- jot down some key words and then give some thought to the structure of your response so that it answers the question, particularly for the extended prose, six mark question.

Grade boundaries

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