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June 2014

GCSE Biology 5BI3F 01

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June 2014

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Introduction

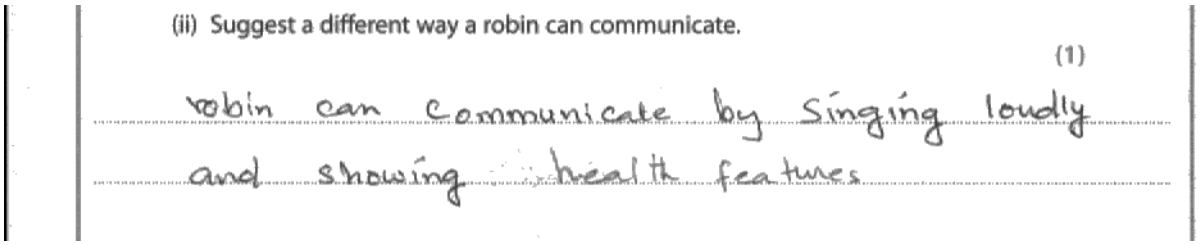
This paper consists of 60 marks aimed at covering a wide range of the specification content. Sixty minutes is allowed for completion of the paper. Specification content is tested using a variety of questions including multiple-choice, short answer questions and extended answer questions that are worth 6 marks each. The extended answer questions include an element that assesses the candidate's quality of written communication (QWC) and includes marks for work that uses good spelling, grammar and clarity.

The paper covers a broad range of material taken from all three topics of Unit B3: Using biology. These include courtship and survival behaviour, infertility, plant antibiotics, biotechnology (yogurt production and commercial use of enzymes), the kidney, sex-linkage, and human evolution.

Candidates accessed most of the paper with a good range of responses seen on many questions. The candidates performed very well on all calculation questions, including the substitution of values into a given formula and calculation of proportions. Candidates also demonstrated a very good level of knowledge and understanding on the last extended writing question - with some very good detailed descriptions of fossil evidence that supported human evolution. Many candidates relied on the information provided by other parts of the question, but the most able demonstrated the ability of including novel information as well. The topics of behaviour and infertility were particularly well answered, as was the effect of antiseptics on the growth of bacteria. Yogurt production was also well understood, but the inclusion of enzymes in washing powders sometimes confused candidates who often relied on non-scientific terminology. Photoperiodism was a topic that many candidates found very challenging, with many candidates confusing this with photosynthesis. Sex-linkage also proved to be a difficult area of the specification with few candidates able to correctly describe the genotypes of male and female individuals.

Question 1 (a)(ii)

This question tested the candidates' knowledge of communication methods. They were given 'singing' as a method and were required to select another. The vast majority of candidates did this correctly and gained full marks on this question, usually for selecting a visual method of communication such as display of feathers or colour, or flapping wings. A few candidates described the use of scent or even tapping/vibration and these were accepted.



(ii) Suggest a different way a robin can communicate.

(1)

robin can communicate by singing loudly and showing health features

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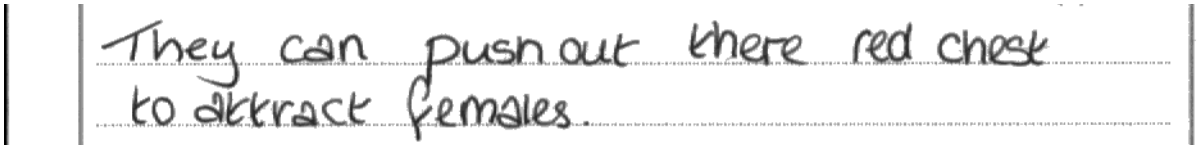
Examiner Comments

This candidate has successfully described a visual method of communication.



They can push out there red chest to attract females.

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Examiner Comments

This candidate has described singing – which is mentioned in the question.

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Examiner Tip

Candidates must ensure that they read the stem of the question carefully.

Question 1 (b)(i)

This question asked candidates to calculate the survival rate as a percentage. The majority of candidates correctly calculated 5/12 and either gave this as a decimal or correctly rounded up to get 42%. A significant number of candidates mistakenly divided 12 by 5 while a small number rounded down to get 41%.

Question 1 (b)(ii)

This question asked candidates to suggest how birds might care for their offspring. The majority of candidates performed well on this question and suggested feeding, protection from predators or incubation of eggs as three possibilities. Candidates lost marks for answers that were too vague, such as just 'protection' or 'building nests' without saying what the protection was against or what the nests were for. A fairly common misconception was that adult birds in some way taught their offspring to fly.

(ii) Suggest how robins care for their offspring.

(2)

they care for them by keeping them warm and making sure they have food to eat.

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Examiner Comments

This candidate has given a good description that includes both 'warmth' and 'feeding' for 2 marks. They could also have mentioned protection from predators.

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Examiner Tip

Look at the number of marks available for a question. If 2 marks are available, make sure that there are at least two valid points in the answer.

(2)

they bring them food while they cannot fly and hunt, and offer protection.

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Examiner Comments

In this response the candidate has gained a mark for 'feeding' but 'protection' needs to go further and refer to what the offspring are being protected against.

Question 1 (c)

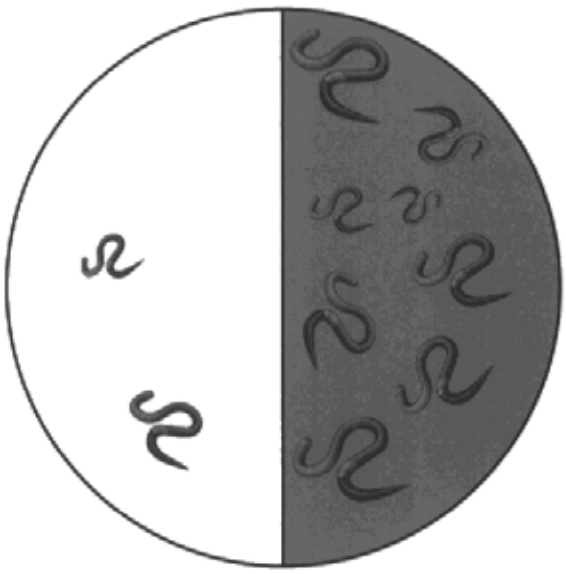
This question replicated the results from a choice chamber in which worms were shown to show a preference for the dark. Candidates were asked to explain this in terms of survival. Most candidates gained full marks on this question and identified that the worms would not be seen so easily in the dark and therefore would be protected from predation (or a named predator). Some candidates lost marks due to answers that lacked sufficient detail, saying simply that the worms 'preferred' the dark or were more likely to survive but failing to say why. A mistake that was seen on occasions was to confuse **predator** with **prey**.

(c) Robins eat worms.

10 worms were placed in the centre of a choice chamber.

Half the chamber was in the light and half the chamber was in the dark.

The diagram shows the position of the worms after one hour.



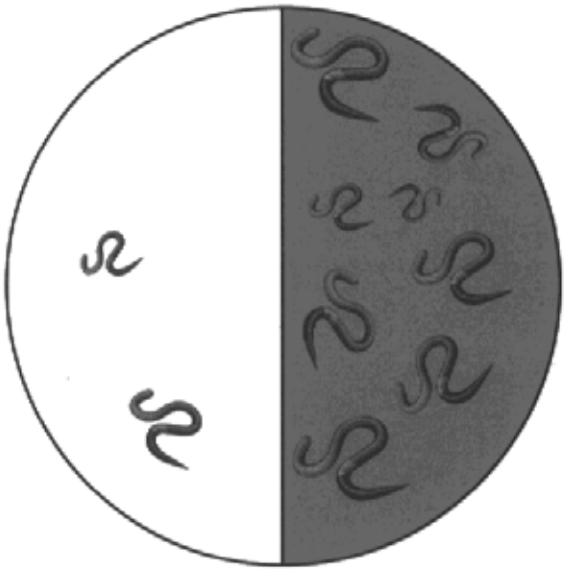
Explain how this behaviour helps the worms to survive.

(2)

It helps the worms to survive because in the dark predators cannot see them.

ResultsPlus
Examiner Comments

This response gains both marks as they have referred to predators and have included the idea that the worms cannot be seen or spotted.



key

= worm

Explain how this behaviour helps the worms to survive.

(2)

This is a innate behaviour. The worm move toward the dark side because they're harder to find therefore it's safer. ~~They can~~ This increase chance of servucial. They can also find more food in the darker area.

(Total for Question 1 = 8 marks)

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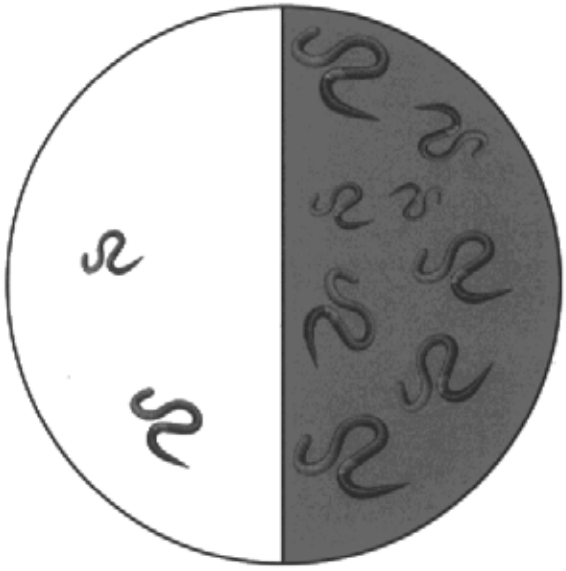
Examiner Comments

Here the candidate has identified that the worms will be hidden in some way and so gained 1 mark, but 'safer' needs to be clarified (such as safer from predators).



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(Total for Question 1 = 8 marks)

ResultsPlus
Examiner Comments

Here, 'more likely to survive' is not enough for any marks - the candidate needs to explain how the behaviour helps the worms to survive.

ResultsPlus
Examiner Tip

Look carefully at the words used in each question. A 'describe' question will have a very different answer to an 'explain' question.

Question 2

This question asked candidates to identify two treatments for infertility, which most managed to do very well. The most frequent answers included IVF (or a description) and surrogacy. Quite a few candidates mentioned either sperm or egg donation, but a few lost marks for simply saying ‘donors’ and a significant number mentioned adoption.

Question 2 (c)(i)(A)

A large number of candidates failed to identify the acrosome (using the label 'head' instead).

Question 2 (c)(i)(B)

The majority of candidates were able to recognise and label the nucleus, although a significant number thought that this was a mitochondrion, possibly being influenced by part (c)(ii) of the question.

Question 2 (c)(ii)

This question asked candidates to describe the function of mitochondria in cells. Many scored at least one mark for recognising that they are involved in movement of the sperm and quite a few scored a second mark for the mention of energy. Candidates need to ensure that they don't describe energy as being 'produced' or 'created' as this lost them a mark. Some candidates gained full marks by also identifying the mitochondria as the site of respiration in cells. A common misconception appears to be the link between mitochondria and the functions of the nucleus. One assumes that this is due to the mention of mitochondrial DNA in the evolution topic.

(ii) Explain why mitochondria are important for the correct functioning of the sperm. (3)

mitochondria are important as sperm need energy to swim toward the egg. This energy come from respiration. This happen in the mitochondria. AS sperm need to move.

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Examiner Comments

This is a very good answer that covers all three marking points.

~~mito cho~~ Mitochondria produce energy for the sperm so it can continue to swim to towards the egg.

ResultsPlus
Examiner Comments

This has gained one mark for the idea of the mitochondria being needed for the sperm to swim towards the egg, but the candidate has lost a mark for saying that energy is being 'produced'.

ResultsPlus
Examiner Tip

Remember that energy can never be created or destroyed. 'Released' is a good alternative word to use in this sort of question.

Question 3 (a)

This question asks candidates to link the antiseptics being produced by a plant with its antibacterial effects. Most students managed to identify that the bacteria were being killed by the antiseptic, although a significant number said that it prevented bacterial growth, which was accepted.

Question 3 (b)(i)

This question gave the formula for the area of a circle and asked candidates to substitute in the value or r. Most candidates managed this well, either by using the value of pi given, or by using their calculators. The most frequent errors were the failure to square the value 'r' or to square the value (3.14 x 50).

Question 3 (b)(ii)

This question asked candidates to compare the properties of the plant extracts. Many candidates simply described the size of the circles and failed to give a comparison. Many others made a comparison that identified only one of the extracts. An answer that gained full marks was one in which the order CAB could be elucidated.

(ii) Compare the antiseptic properties of plant extracts **A**, **B** and **C**.

(2)

Plant extract B has a weak antiseptic compared to A and particularly C, which is the most effective against bacterial growth.

ResultsPlus
Examiner Comments

In this answer it is clear that B is less effective than A or C, and that C is most effective, giving the order C,A,B. This would gain 2 marks.

ResultsPlus
Examiner Tip

With any question that uses the command word 'compare' the answer must always have words such as 'larger', 'smaller', 'greatest' or 'least'. Try to avoid describing each treatment on its own and include comparative statements.

The antiseptic properties of plant extract C are much stronger than plant B. Plant extract C prevented the bacteria growing 35mm more than plant B.

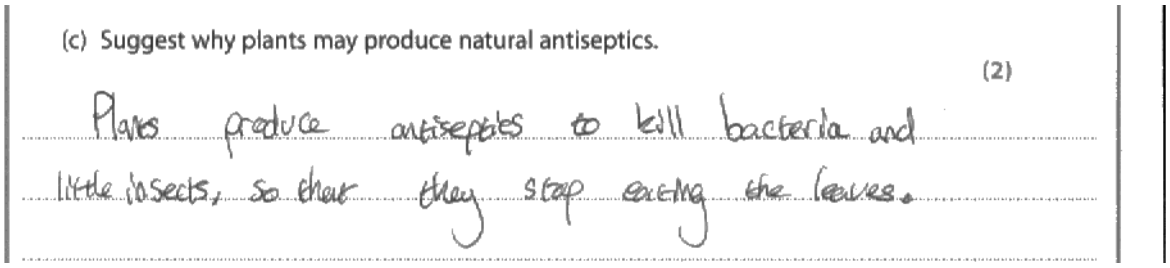
ResultsPlus
Examiner Comments
In this example the candidate tells us that C is more effective than B but does not tell us anything about the position of A, and so gains just 1 mark.

Plant extract A the total area with no bacteria was 1963 which was ~~bigger~~ smaller than plant extract B which was 707, however plant extract C was the biggest with 7850mm² of the total area with no bacteria.

ResultsPlus
Examiner Comments
In this example the candidate tells us that C is more effective than B but does not tell us anything about the position of A, and so gains just 1 mark.

Question 3 (c)

This question asked candidates not only to identify the function of antiseptics in plants (to kill or deter pests) but also to link this with the benefit to the plant (to prevent damage or death of the plant). On the whole, candidates did quite well, scoring at least 1 mark. Fewer candidates described both aspects however.

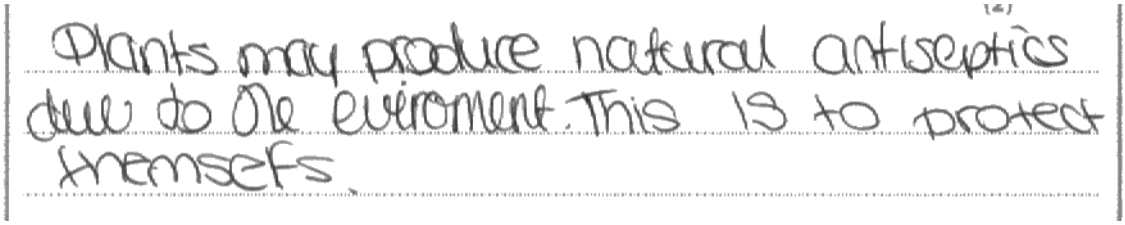

(c) Suggest why plants may produce natural antiseptics.

(2)

Plants produce antiseptics to kill bacteria and little insects, so that they stop eating the leaves.

ResultsPlus
Examiner Comments

Here 2 marks were awarded. The candidate has described how antiseptics are working (killing pests) and why they work (to prevent the plant being eaten).


Plants may produce natural antiseptics due to the eviroment. This is to protect themsefs.

ResultsPlus
Examiner Comments

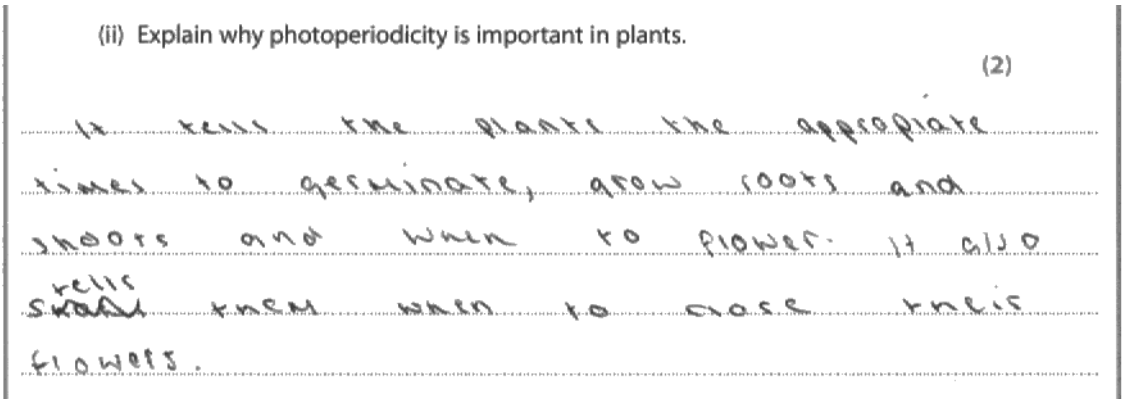
Here the candidate has mentioned protection, but not clarified this as protection from being eaten/ damaged by pests (they could mean protection from frost for example).

Question 3 (d)(i)

The majority of candidates recognised that 'photo' was something to do with light and so performed well on this question. 'Sun', 'daylight', or any other aspect of light or dark were also acceptable answers.

Question 3 (d)(ii)

This question asked candidates to explain the importance of photoperiodism. It was evident that very few of the candidates were aware of what photoperiodism was, and even fewer were able to describe its importance. Many recognised that it had something to do with light (for which they gained a mark in part 3(d)(i)) but most then went on to describe the importance of photosynthesis to plants. A few candidates linked photoperiodism to germination and flowering.



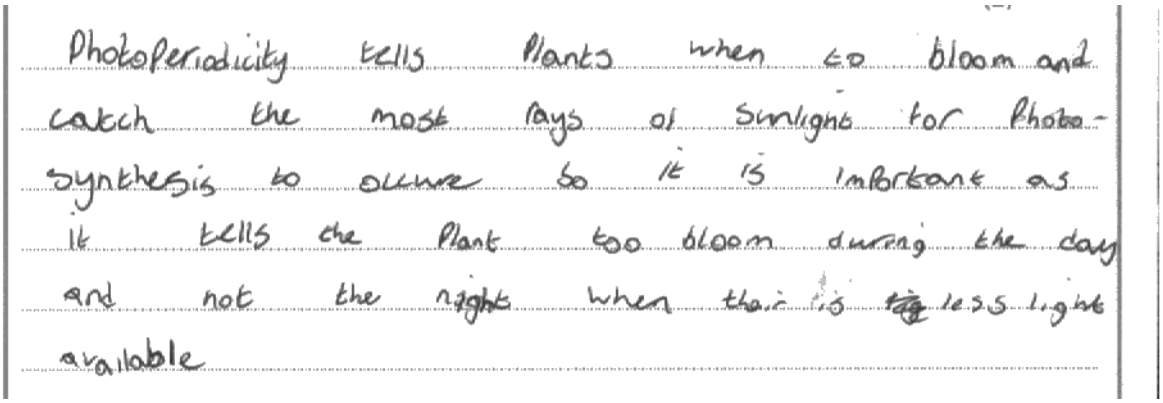
(ii) Explain why photoperiodicity is important in plants.

(2)

it tells the plants the appropriate times to germinate, grow roots and shoots and when to flower. it also tells them when to close their flowers.

ResultsPlus
Examiner Comments

Here the candidate has recognised that photoperiodism is not only linked to flowering and germination, but also that it involves things occurring at the appropriate times.



Photoperiodicity tells Plants when to bloom and catch the most rays of Sunlight for Photo-synthesis to occure so it is Imbrtant as it tells the Plant too bloom during the day and not the night when there is less light available

ResultsPlus
Examiner Comments

In this example the term 'bloom' is acceptable for flowering and so gains 1 mark.

Question 4 (a)(i)

Candidates performed well on this question with a large number gaining full marks. Many of the others correctly identified that enzymes were involved but failed to link these with the optimum temperature, while others identified that this was an optimum temperature but did not refer to enzymes. Quite a number confused this stage with pasteurisation and explained how this temperature would kill bacteria.

(a) (i) Explain why the milk is kept at a temperature of 40 °C during fermentation.

(2)

This is because the enzymes in the milk like that temperature. If it is too high, the enzymes denature and dont work. 40°c is the optimun temperature for the enzymes to work at.

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Examiner Comments

Apart from enzymes 'liking' the temperature, the candidate has gained full marks for mentioning not only the optimum temperature but also the fact that enzymes denature at high temperatures.

Because 37°C is optimum temperature for milk which can can cause properly for milk to change in yogurt.

ResultsPlus
Examiner Comments

Here the candidate has identified that it is the optimum temperature but not mentioned enzymes so scores just 1 mark.

Question 4 (a)(ii)

Nearly all candidates gained full marks on this question, with just a few getting lactose mixed up with glucose.

Question 4 (a)(iii)

This question asked students to describe the significance of pasteurisation in terms of killing bacteria. Many performed well here and gained 2 marks, but a significant number gave vague answers such as 'cleaning the yogurt'.

Question 4 (c)

This question asked candidates to explain why enzymes are sometimes put into washing powders and a range of responses were seen. Many gave answers that were too vague and reflected the language used in advertising (such as lifting stains and brighter whites). A good number of candidates successfully identified the type of stain and even gave examples of the enzymes likely to be found in washing powders. The stronger candidates also recognised the link between enzyme powders and lower temperature washes.

(c) Enzymes can also be used in washing powders.

Explain why enzymes are used in washing powders.

(3)

A gets taught stains out by breaking them down (eg lipases break down fats into fatty acids + glycerol) so they come out and can also work at lower temperatures making them cheaper.

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Examiner Comments

Here the candidate mentions the type of enzyme together with the biological stain it works on. They also recognise that 'biological washing powders' wash at lower temperatures and so save money/energy.

Enzymes are used in washing powders to get rid of stains. The bio washing powders contain more enzymes which makes it better for getting rid of stains than the non-bio. The enzymes contain chemicals which means the stains go.

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Examiner Comments

This answer was too vague to gain marks - with no reference to a specific enzyme or stain.

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Examiner Tip

Be as specific as possible when answering questions and try to use scientific terminology whenever possible.

Question 5 (a)

In this question, candidates were asked to find the definitions of renal artery and ureter. A large number of candidates found this quite difficult with obvious confusion with the definitions of urethra and renal vein.

Question 5 (c)(i)

In this question candidates were asked to calculate a third of 3600, which the vast majority did perfectly well. A few seem to regard one third as 30%.

Question 5(c)(ii)

This question asked candidates why kidney donations are more common from living individuals that, say, heart donations. The majority of all candidates gained a mark on this question, recognising that we have two kidneys and can survive with just one. A significant number of candidates focused on the issue of patient consent, while others focused on the health of the kidney - neither of which answered the question.

Question 5 (d)

This question tested the candidates understanding of haemophilia and sex linkage, but also tested their understanding of what is meant by 'heterozygous' and how sex is determined, giving a wider access to the marks available. It was also an assessment of the candidate's ability to write in a clear manner with good spelling and grammar.

Most candidates found the question a challenge, but a significant number accessed level one by identifying at least one of the parent's genotypes (usually the heterozygous female Hh). Far fewer managed to give the correct male genotype – and therefore were unable to describe the outcome of a genetic cross and so were unable to progress beyond level one. Stronger candidates showed a good level of understanding of sex-linkage and gained full marks on this question.

*(d) Haemophilia is a sex-linked genetic disorder of the blood.

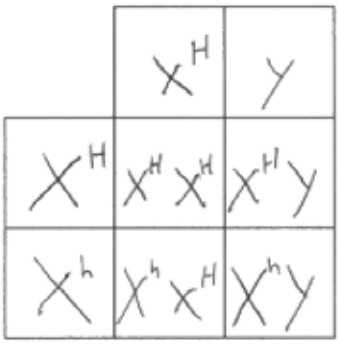
The allele for haemophilia is recessive and is located on the **X** chromosome.

A female heterozygous for haemophilia and an unaffected male have children.

Use a genetic diagram to help explain what the genotypes and phenotypes of their children could be.

Use the letter **h** for the haemophilia allele.

(6)



They have a 1/4 chance of producing a child with this disorder and 3/4 chance they won't. The child that has the disorder will be male whereas they could also produce a female carrier. There is 1/2 a chance their child will be unaffected or not a carrier of haemophillia. There is a female and a male that won't be affected by it.

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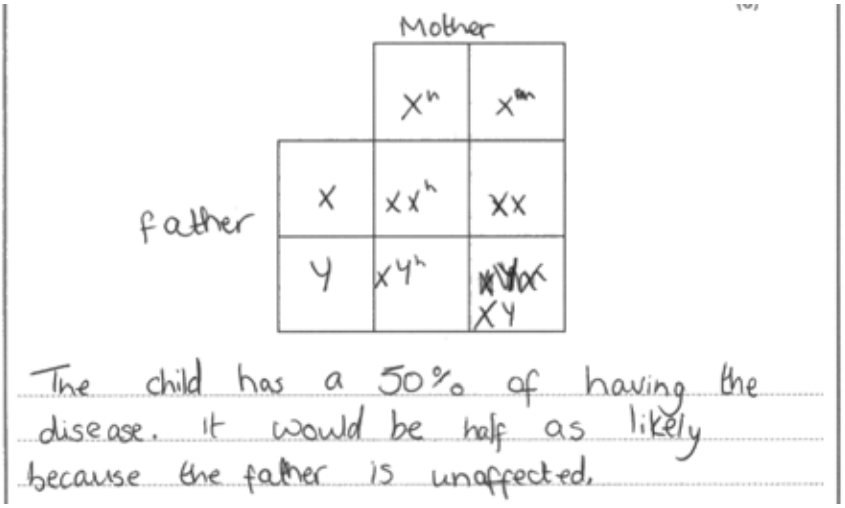
Examiner Comments

In this response the candidate has correctly identified the male and female genotypes, including correct X and Y chromosomes (although ideally they would be labelled male and female). They have completed a correct genetic cross and explained the proportions correctly. This gains full marks (level 3, 6 marks).



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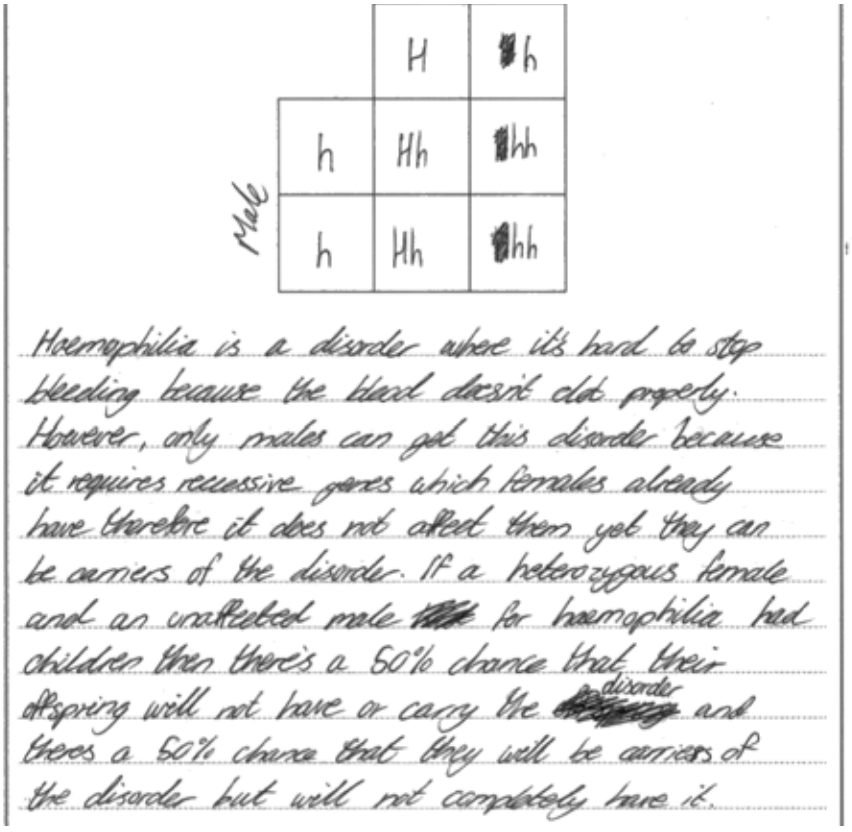
Examiner Comments

Here the candidate has correctly drawn the male and female genotypes (not adding the dominant H is accepted here but does not help the candidate). The description that follows is wrong however and so only gains level 2 (for 4 marks). The SPG mark is fine here.



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Examiner Comments

Here the candidate has recognised that as the female is heterozygous, her genotype is Hh. The XX and XY chromosomes are missing and the male genotype is incorrect so this is the minimum acceptable for level 1 (2 possible marks). The description is wrong in places and does not add anything further to the diagram, so the score remains at level 1. Spelling, grammar and clarity are adequate so this scores 2 marks.

Question 6 (a)(ii)

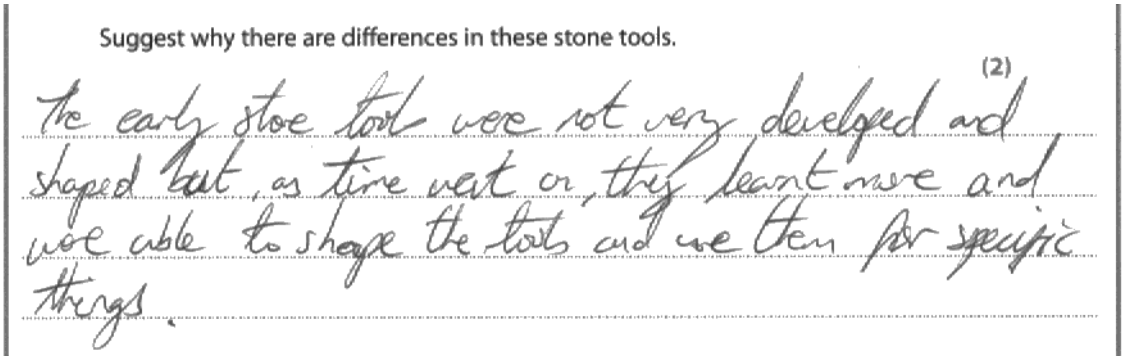
This answer was relatively straightforward with most candidates gaining the mark. Some described the brain as being more or less evolved or developed without referring to the size.

Question 6 (a)(iii)

This questioned asked for a structural difference and most candidates came up with a suitable example. Some were too vague and failed to specify which skull was being referred to, while others made reference to the cranium despite the question asking for another part.

Question 6 (b)

This question asked candidates to identify why differences exist between stone tools that are of different ages. Candidates were required to either link human development with a more sophisticated manufacturing method, or the increase in specialised tasks that the tools were being used for. Many students managed one of these and gained one mark. Others found it difficult to go beyond a description of the differences and failed to make the link with the methods used to make the tools.



Suggest why there are differences in these stone tools.

(2)

The early stoe tool wer not very developed and shaped but, as time went on, they learnt more and were able to shape the tools and we then for specific things.

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Examiner Comments

Here 2 marks were awarded. The candidate has linked learning with the manufacture of the tools, but has also mentioned that tools were used for specific things.

Question 6 (c)

This was the second 6-mark QWC question and the final question on the paper. Most students found the question very accessible and many produced answers that showed an excellent understanding of human change over time. The question asked candidates to describe fossil evidence for human evolution, with the inclusion of specific human fossil finds in their answer. The previous parts of the question set the scene and contained a great deal of information on which students were able to base their answer to 6c. In many cases this produced some excellent answers with well-constructed and concise descriptions based on several of the examples provided. Students who managed to include specific examples in their description of the fossil evidence gained level 2, while those that simply described the evidence without examples gained level 1. A significant number of candidates also included examples such as Ardi, Lucy or the Turkana boy in their descriptions, gaining them a level 3.

*(c) Describe the evidence for human evolution, based on fossils.

Include reference to specific early human fossils in your answer.

(6)

There is evidence for human evolution based on fossils we find. The three main examples are Ardi, Lucy and Homo erectus. Ardi is the oldest and suggests we were like humans but also like apes. It had short arms and long legs (like humans) and it ~~used~~ did not use its hands to walk on like apes do. But it did not have a large brain. Lucy however is ~~the~~ different to Ardi as it is closer to humans than apes. Lucy had a bigger brain than Ardi and did not have a curved big to like Ardi. Lucy suggest it walked upright and more like a human. The homo-erectus is the latest in human evolution. Homo-erectus has the biggest brain out of the three fossils and has similar features to a human rather than an ape.

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This candidate has described three examples of human fossil finds including those of Lucy and Ardi. The writing is concise yet very readable and covers the essentials of what was being asked. This gained full marks.

(6)

Fossils have been found that look very much like humans. This is a sign that over time humans have evolved more and more to fit their environment and living conditions. If you compared a fossil of the Australopithecus africanus to the humans around today you'd notice they have much longer jaws, smaller cranium and bigger teeth. This could be to do with what they ate or just how they survived everyday life. The may of eaten longer and stronger food which is why we now have smaller mouths.

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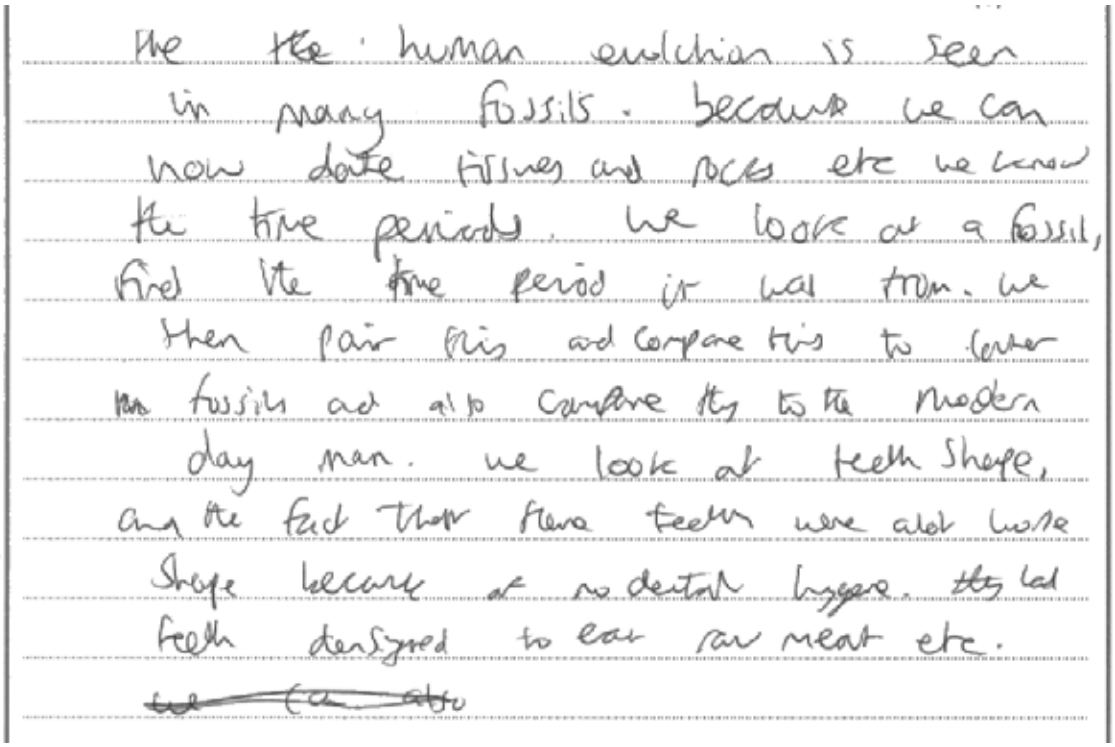
Examiner Comments

Here the candidate has written a very good descriptive piece taking *Australopithecus africanus* as an example that can be compared to modern humans. This is a good level 2 answer, gaining a total of 4 marks.


The the human evolution is seen in many fossils. because we can now date tissues and rocks etc we know the time periods. we look at a fossil, find the time period it was from. we then pair this and compare this to other fossils and also compare it to the modern day man. we look at teeth shape, and the fact that these teeth were also more sharp because of no dental hygene. they had teeth designed to eat raw meat etc.

~~we can also~~

ResultsPlus
Examiner Comments

This candidate has given a description of some of the fossil evidence and mentioned the idea of dating of fossils. They have not given any specific examples however so they are limited to level 1 (2 possible marks). Spelling, grammar and clarity are adequate to award 2 marks.

Paper Summary

All questions were attempted by the vast majority of candidates with very few leaving any question unanswered. Most candidates performed well on a wide range of questions that covered all three topics in this unit. These included the topics of behaviour, reproduction and fermentation. The topic of human evolution appeared to be very well covered by most students with some well written and thoughtful answers. It is clear that there are several areas of the core subject knowledge that many foundation candidates find challenging. These include photoperiodism and the inheritance of sex-linked characteristics, and many candidates performed poorly on these questions.

Mathematical skills were tested and the majority of candidates performed well on these questions, although a high proportion still fail to indicate any working and simply give a raw answer. Candidates should be encouraged to look carefully at the layout or structure of questions and pay attention to the command words being used. All too many candidates are writing one relevant fact for a two mark question or writing a description for a question that asks for an explanation. They should avoid the use of non-scientific or pseudo-scientific language as part of explanations such as the 'neutralisation' of bacteria or using terms such as 'germs'. Another area in which candidates lost marks on this paper was the use of language that was too vague. Candidates must ensure that they are specific in their answers, for example referring to 'the Homo erectus skull' rather than just 'the skull'.

On the basis of their performance on this paper candidates are offered the following advice.

Make sure you:

- Show all working in your calculations.
- Read questions careful to avoid including material already presented in the stem.
- Look out for and take note of the command word being used.
- Use scientific terminology wherever possible.
- Avoid generalisations and try to be as specific as possible.

Grade Boundaries

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

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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