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AS and A LEVEL
Exemplar Candidate Work

BIOLOGY A & B (ADVANCING BIOLOGY)

H020/H420 and H022/H422
For first teaching in 2015

OCR GCE Biology A and Biology B (Advancing Biology) – Exemplar Learner Responses to Level of Response Questions – 2015 Specifications H020 and H022

Version 1

www.ocr.org.uk/biology

Contents

Introduction - General Commentary

General Commentary:

Level of Response (LoR) questions have been used in OCR GCSE Biology examinations since 2011, and will be used in the reformed OCR GCE Biology examinations from 2016 onwards. This resource has been designed to aid teachers and learners in preparing for answering this style of question in GCE Biology examinations.

LoR questions allow students to be credited for demonstrating,

- their scientific knowledge and understanding and their ability to apply these to familiar and unfamiliar situations,
- their ability to communicate in a clear, coherent and logical manner.

Mark schemes for LoR questions therefore detail both the 'indicative science content' and the 'communication skills' that learners are expected to demonstrate.

LoR questions are indicated in question papers with an asterisk (*) after the question number. These questions can generally be answered in many possible and equally credit-worthy ways, and therefore give learners a flexible opportunity to demonstrate their skills. As such, the indicative scientific points that are included in mark schemes are neither exhaustive nor a list of all of the scientific points that have to be included in an answer to gain a particular mark. Indeed, the mark schemes that are used to assess candidates' responses in live examinations are finalised only after examiners have looked at and discussed a wide range of candidates' responses. This is a key aspect of ensuring that the marks and final grades awarded to candidates are fair and credit-worthy. The senior examiner commentary included within this resource should therefore be seen within this context.

Further senior examiner commentary and guidance on answering different styles of questions is made available in Examiner's Reports (via www.ocr.org.uk) and in CPD materials (available securely to teachers via www.cpdhub.ocr.org.uk) published following each series of examinations.

In this resource, learners' responses to three LoR questions from the AS Biology Paper 2 Sample Question Papers (H020/02 and H022/02) have been marked and commented on by senior examiners. For each question, seven responses have been selected, exemplifying performance at Level 3, Level 2, Level 1 and 0 marks. Commentary is provided on why the Level was selected and the mark awarded within the Level.

When assessing a learner's response, the following process is used (taken from the Marking Instructions for the H020/02 and H022/02 Sample Assessments):

- Read through the whole answer from start to finish, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance.
- Using a 'best-fit' approach based on the science content of the answer, first decide which set of Level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer using the guidelines described in the Level descriptors in the mark scheme.
- Once the Level is located, award the higher or lower mark.
- The higher mark should be awarded where the Level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.
- The lower mark should be awarded where the Level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.
- In summary:
    - The science content determines the Level.
    - The communication statement determines the mark within a Level.

When answering LoR questions, learners might find these tips useful:

- Read the question carefully to make sure your answer will address the question asked - underlining/circling keywords and phrases can be helpful.
- Think about whether the question includes any information/data to use in your answer.
- Think about the biological knowledge and understanding that is required to answer the question – making brief notes can be helpful.
- Make your answer as logical and coherent as possible, thinking about the order in which you present your points. Diagrams and/or bullet points can be used if they help to communicate your answer(s) clearly.

The number of dotted lines given in examination papers for the answers is indicative of the length of answer expected for the question. Learners can use the extra space provided within a paper if necessary. They should, however, be cautious about writing very long answers, as this can increase the possibility of contradicting themselves and can reduce the clarity and coherence of their answers.

Question 1 (with mark scheme)

FIRST QUESTION:

AS Level Biology B

H022/02 Biology in depth

Sample Question Paper

Question 2(c)

(c)* Explain a possible mechanism for the loading and transport of sugars in the phloem.

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..... [6]

The question indicates that both loading and transport need to be addressed in the candidate's response. The command word is 'explain'; therefore, detail of the mechanism should be included, thus providing the evidence that contributes to the communication mark. In this case, the line of reasoning and flow of the answer are the means of assessing communication.

LoR Mark Scheme Qu2(c) AS Level Biology B, H022/02

Question			Answer	Marks	Guidance
	(c)*		**Level 3 (5–6 marks)** A detailed explanation of both loading and movement by mass flow, including reference to sources and sinks and the features and roles of the sieve tube elements and companion cells. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** A partial explanation of both loading and movement by mass flow. Includes reference to sources and sinks or the features or roles of the sieve tube elements or companion cells. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.* **Level 1 (1–2 marks)** An explanation of either loading or movement. *The information is basic and communicated in an unstructured way. The information is supported be limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.	**6**	**Examples of relevant material could include the following:** *Loading* • loading into companion cells • location of companion cells at a source or named source • active loading of sucrose (using ATP) • mitochondria presence in companion cells • description of mechanism of H+ gradient and co-transport • movement via plasmodesmata into sieve tube elements *Movement* • mass flow from source to sink • ref to high hydrostatic pressure at source • ref to inflow of water by osmosis at the source (creating the pressure) • ref to passage through sieve plates or cytoplasmic connections • ref to low hydrostatic pressure at the sink • ref to unloading at the sink **ALLOW** use of annotated diagrams

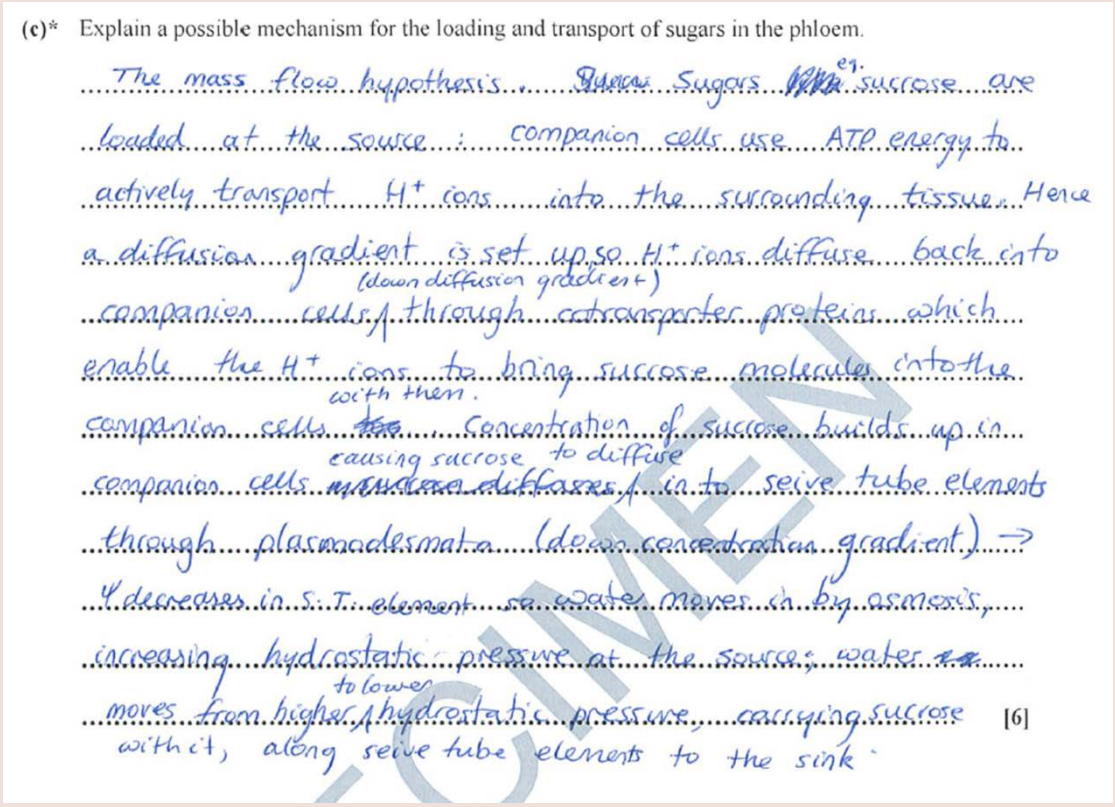
The layout and structure of LoR Mark Schemes is shown in the first example above. The left-hand column details each of the three Level descriptors (starting with Level 3 and proceeding down to 0 marks). The marks available in each Level are shown in brackets. There is a quality of written communication statement incorporated into each Level, which is shown in italics.

The right-hand column of the mark scheme lists relevant scientific information that may be present in a good response. These points do not all have to be present to achieve full marks and they are not marking points. They are simply an indication of the type of information and detail that could be expected.

Question 1, Sample answers and commentary

This section includes seven candidate responses, which have been selected to show answers worthy of 6, 5, 4, 3, 2, 1 and 0 marks.

Level 3, 6 marks (Candidate 3)



(c)* Explain a possible mechanism for the loading and transport of sugars in the phloem.

The mass flow hypothesis... Sugars eg. sucrose are loaded at the source : companion cells use ATP energy to actively transport H^+ ions into the surrounding tissue. Here a diffusion gradient is set up so H^+ ions diffuse back into (down diffusion gradient) companion cells through cotransporter proteins which enable the H^+ ions to bring sucrose molecules into the (with them). companion cells. Concentration of sucrose builds up in companion cells causing sucrose to diffuse in to seive tube elements through plasmodesmata (down concentration gradient) → ψ decreases in S.T. element so water moves in by osmosis, increasing hydrostatic pressure at the source; water to lower moves from higher hydrostatic pressure, carrying sucrose with it, along seive tube elements to the sink. [6]

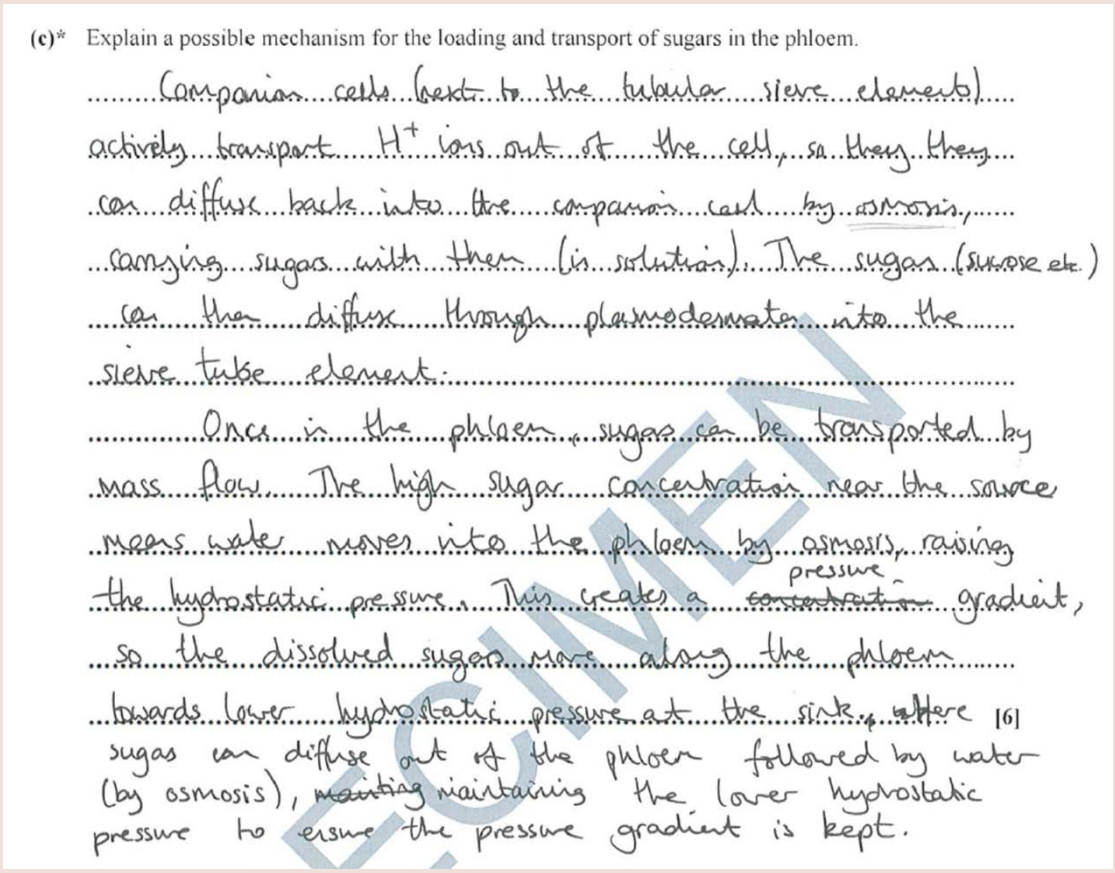
Examiner commentary

Candidate 3 **6 marks**

This candidate's response addresses all of the science content required for the Level 3 descriptor in the left hand column of the mark scheme and the science is correct.

The line of reasoning meets the guidelines in the communication statement (in italics) in the left hand column of the mark scheme – it flows and reads well, with clarity.

Level 3, 5 marks (Candidate 17)



(c)* Explain a possible mechanism for the loading and transport of sugars in the phloem.

Companion cells (next to the tubular sieve elements) actively transport H^+ ions out of the cell, so they then can diffuse back into the companion cell by osmosis, carrying sugars with them (in solution). The sugars (sucrose etc.) can then diffuse through plasmodesmata into the sieve tube element.

Once in the phloem, sugars can be transported by mass flow. The high sugar concentration near the source means water moves into the phloem by osmosis, raising the hydrostatic pressure. This creates a ~~concentration~~ pressure gradient, so the dissolved sugars move along the phloem towards lower hydrostatic pressure at the sink, where [6]
sugars can diffuse out of the phloem followed by water (by osmosis), ~~maintaining~~ maintaining the lower hydrostatic pressure to ensure the pressure gradient is kept.

Examiner commentary

Candidate 17 **5 marks**

This candidate's response addresses all of the science content required for the Level 3 descriptor in the left hand column of the mark scheme. There is one incorrect reference to osmosis but the mechanism of co-transport is otherwise correct. This answer is a best fit for Level 3.

The lower mark within this level is awarded because the term 'osmosis' is used incorrectly and detracts from the clarity of an otherwise well-communicated response.

Level 2, 4 marks (Candidate 1)

(c)* Explain a possible mechanism for the loading and transport of sugars in the phloem.

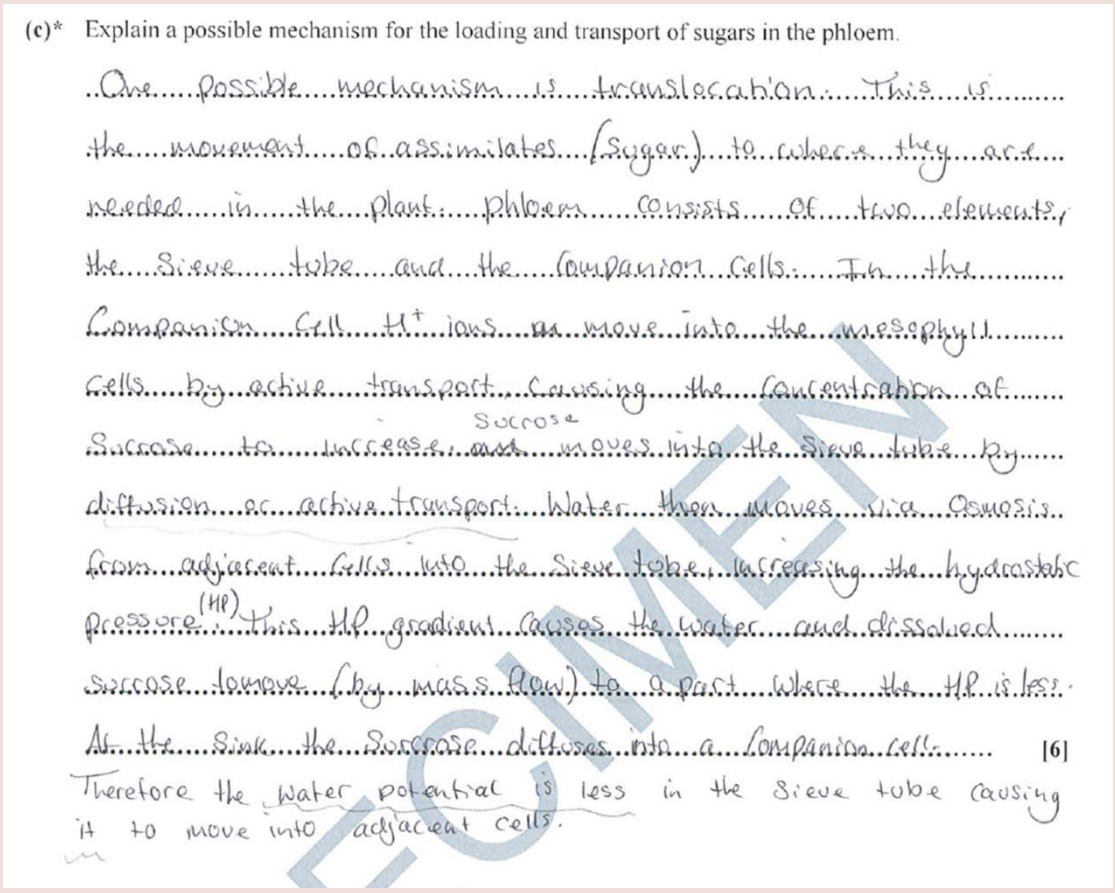
H+ ions actively transported out of companion cells to surrounding ... cells, then via co transportation sucrose and H+ ions diffuse back into the companion cells across the cell membrane and cell wall. This increases the concentration of sucrose inside companion cell which causes concentration gradient which leads to the diffusion of sucrose into the sieve cells this lowers the water potential causing water from companion and surrounding cells to move into the phloem by osmosis this movement causes a hydrostatic pressure gradient causing the solution to move from ... [6]
an region of high hydrostatic pressure to an region of low hydrostatic pressure towards the sink cells of the phloem. This process may be known as mass flow. translocation
* by mass flow.

Examiner commentary

Candidate 1 **4 marks**

This answer does not refer to or imply the presence of the source and so cannot meet the Level 3 requirements for science content. However, the answer is well structured, clear and easy to follow. The content is relevant and so easily meets the requirements of the communication statement.

Level 2, 3 marks (Candidate 6)



(c)* Explain a possible mechanism for the loading and transport of sugars in the phloem.

One possible mechanism is translocation. This is the movement of assimilates (sugar) to where they are needed in the plant. phloem consists of two elements, the Sieve tube and the companion cells. In the Companion cell H+ ions are move into the mesophyll cells by active transport causing the concentration of Sucrose to increase and moves into the Sieve tube by diffusion or active transport. Water then moves via Osmosis from adjacent cells into the Sieve tube increasing the hydrostatic pressure (HP). This HP gradient causes the water and dissolved sucrose to move (by mass flow) to a part where the HP is less. At the Sink the Sucrose diffuses into a companion cell. [6]

Therefore the water potential is less in the Sieve tube causing it to move into adjacent cells.

Examiner commentary

Candidate 6 **3 marks**

There are errors in the science content and so this response cannot meet the Level 3 requirements for science content; however, the science is sufficient to achieve Level 2.

The response lacks clarity, with unspecified reference to 'it', which is ambiguous, and contrasting terms being used to describe the movement of sucrose into sieve tubes, which is also ambiguous. These ambiguities and lack of clarity detract from the flow of the answer so it achieves the lower of the Level 2 marks.

Level 1, 2 marks (Candidate 10)

(c)* Explain a possible mechanism for the loading and transport of sugars in the phloem.

The mechanism is translocation.
Companion cells actively transport protons into surrounding tissues. A concentration gradient means H^+ ions diffuse back into companion cells carrying glucose through carrier proteins. The glucose then moves by diffusion through plasmodesmata into sieve-tube elements. Water follows by osmosis, creating hydrostatic pressure which forces sap along phloem.

[6]

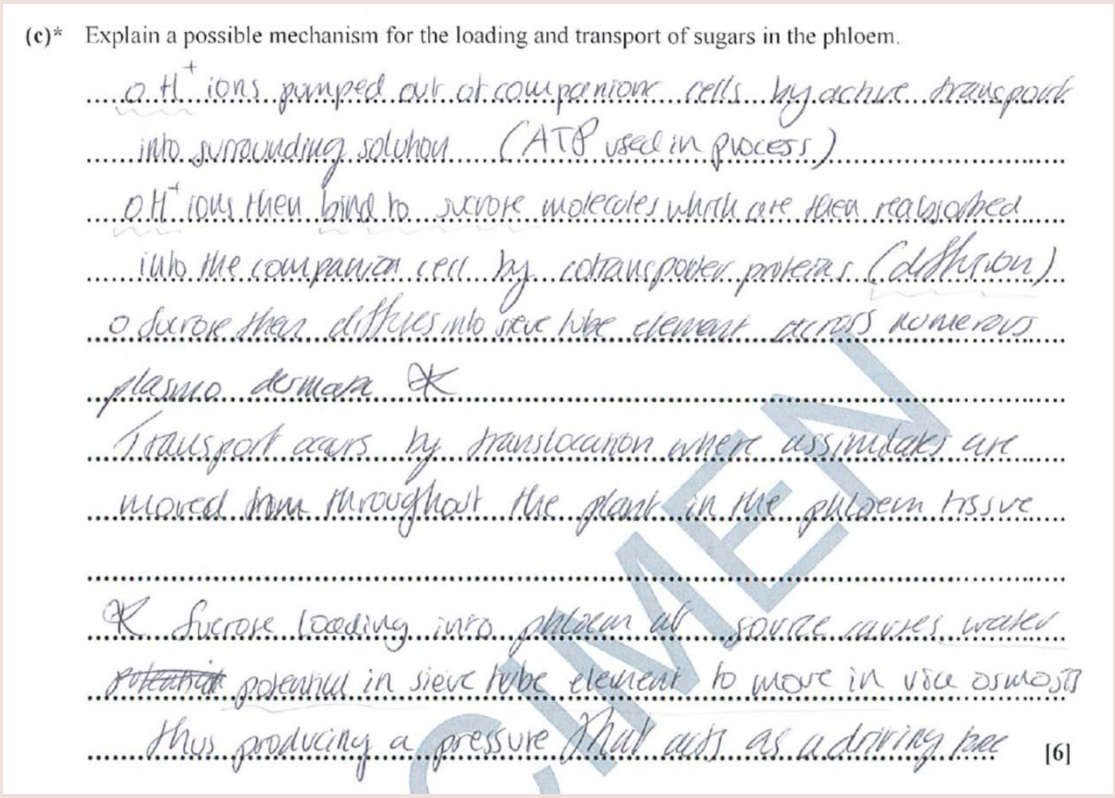
Examiner commentary

Candidate 10 **2 marks**

There is no mention of source or sink in this response, which excludes the awarding of Level 3. Even though loading and movement are described, the consistent use of the term 'glucose' is a scientific error. This does not constitute a partial explanation for loading and so the answer is a best fit for Level 1.

Although the explanation of movement is not detailed, it is coherent and easy to follow, so the higher mark for this level can be awarded.

Level 1, 1 mark (Candidate 11)



(c)* Explain a possible mechanism for the loading and transport of sugars in the phloem.

- H^+ ions pumped out of companion cells by active transport into surrounding solution (ATP used in process)
- H^+ ions then bind to sucrose molecules which are then reabsorbed into the companion cell by cotransporter proteins (diffusion)
- sucrose then diffuses into sieve tube element across numerous plasmodesmata *
- Transport occurs by translocation where assimilates are moved from throughout the plant in the phloem tissue
- * Sucrose loading into phloem at source makes water potential ~~potential~~ potential in sieve tube element to more in via osmosis thus producing a pressure that acts as a driving force [6]

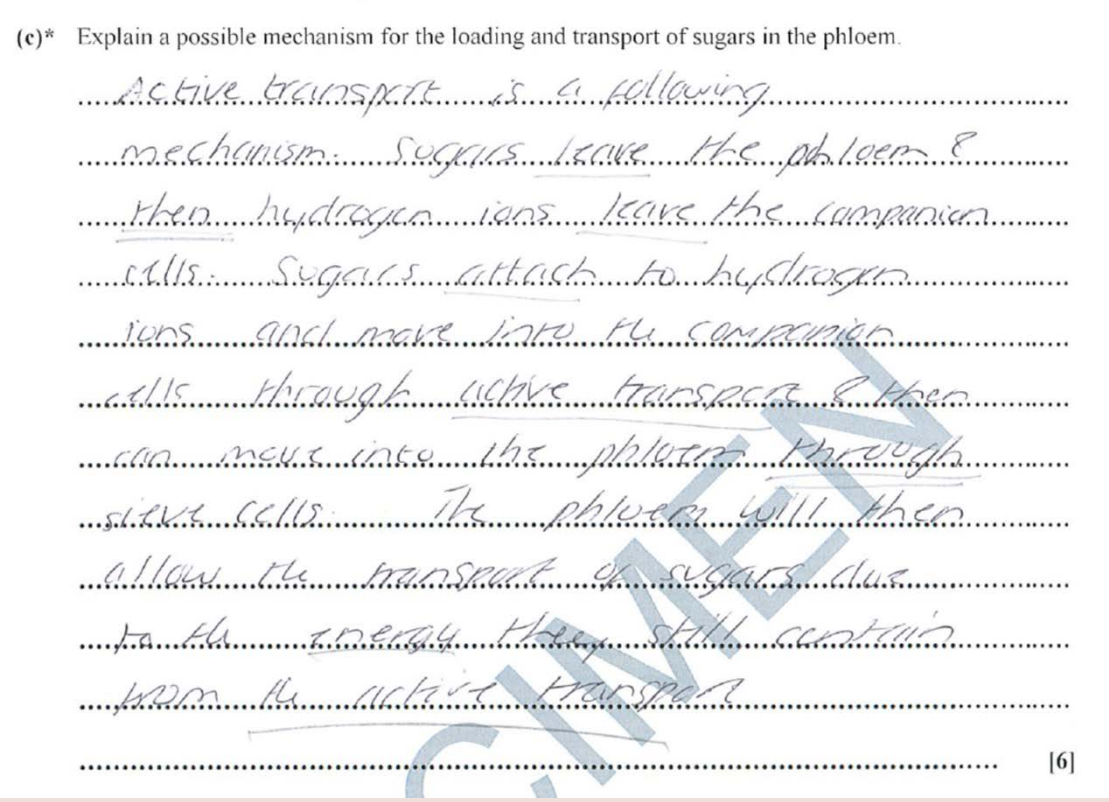
Examiner commentary

Candidate 11 **1 mark**

There is no reference to source or sink in this response and no detail of movement is provided. Loading is described incorrectly, with sucrose molecules binding to ions, and water potential moving by osmosis. Some aspects of loading are correctly explained, providing a best fit to Level 1.

This answer is ambiguous as there has been a possible use of bullet points (though not consistently) and this means that the ions referred to in lines 1 and 3 could be OH^+ or a bullet point followed by H^+. This impairs communication, and so the higher mark for this level cannot be awarded.

0 marks (Candidate 21)



(c)* Explain a possible mechanism for the loading and transport of sugars in the phloem.

Active transport is a following mechanism. Sugars leave the phloem & then hydrogen ions leave the companion cells. Sugars attach to hydrogen ions and move into the companion cells through active transport & then can move into the phloem through sieve cells. The phloem will then allow the transport of sugars due to the energy they still contain from the active transport

[6]

Examiner commentary

Candidate 21 **0 marks**

The answer contains no correct science content and so cannot even be awarded Level 1.

In the absence of correct and relevant science content, there is no possibility of awarding a communication mark.

Question 2 (with mark scheme)

SECOND QUESTION:

AS Level Biology A

H020/02 Depth in biology

Sample Question Paper

Question 4(b)

4 Haemoglobin is a protein that carries oxygen in the blood of all mammals. The structure of haemoglobin can vary slightly between species.

Fig. 4.1 shows a llama, a relative of the camel.

Fig. 4.1

- Llamas live at high altitudes and camels live at low altitudes.
- At high altitudes the partial pressure of oxygen is low.
- Llama and camel haemoglobin consists of 2 α subunits and 2 β subunits.
- Each subunit contains a haem group and is able to bind to one molecule of oxygen.
- In the β subunits, one amino acid present in camel haemoglobin has been replaced by a different amino acid in llama haemoglobin.

Fig. 4.2 shows dissociation curves for llama haemoglobin and camel haemoglobin.

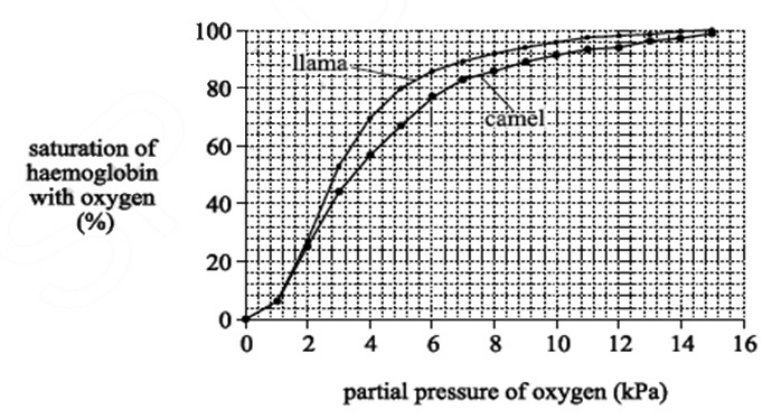


Fig. 4.2

(b)* Describe how the structure of llama haemoglobin is likely to be different from that of camel haemoglobin with reference to the four levels of protein structure.

..... [6]

This question requires candidates to consider *how likely* the structure of llama haemoglobin would *differ* from that of the camel. As would be the case in live marking, looking at a range of candidate responses has resulted in the mark scheme for this question being applied with the following amendments to the Level descriptors in the left hand column of the mark scheme:

Level 3 Describes differences (and similarities) of llama and camel …

Level 2 Describes differences (and similarities) of llama and camel …

Similarities are not required to meet the Level descriptors but their inclusion would not be considered irrelevant for the purposes of communication, as reference to similarity would indicate the degree to which they might differ.

As candidates have been given information in the stem of the question (all the information on page 10 of the specimen question paper, which is shown here on page 14-15), they would be expected to select and use information to justify the differences that they propose (i.e. the different amino acid present in the β chain of the llama haemoglobin). When considering the communication at Levels 1 and 2, this evidence must be stated (Level 1) and linked clearly to the differences suggested (Level 2).

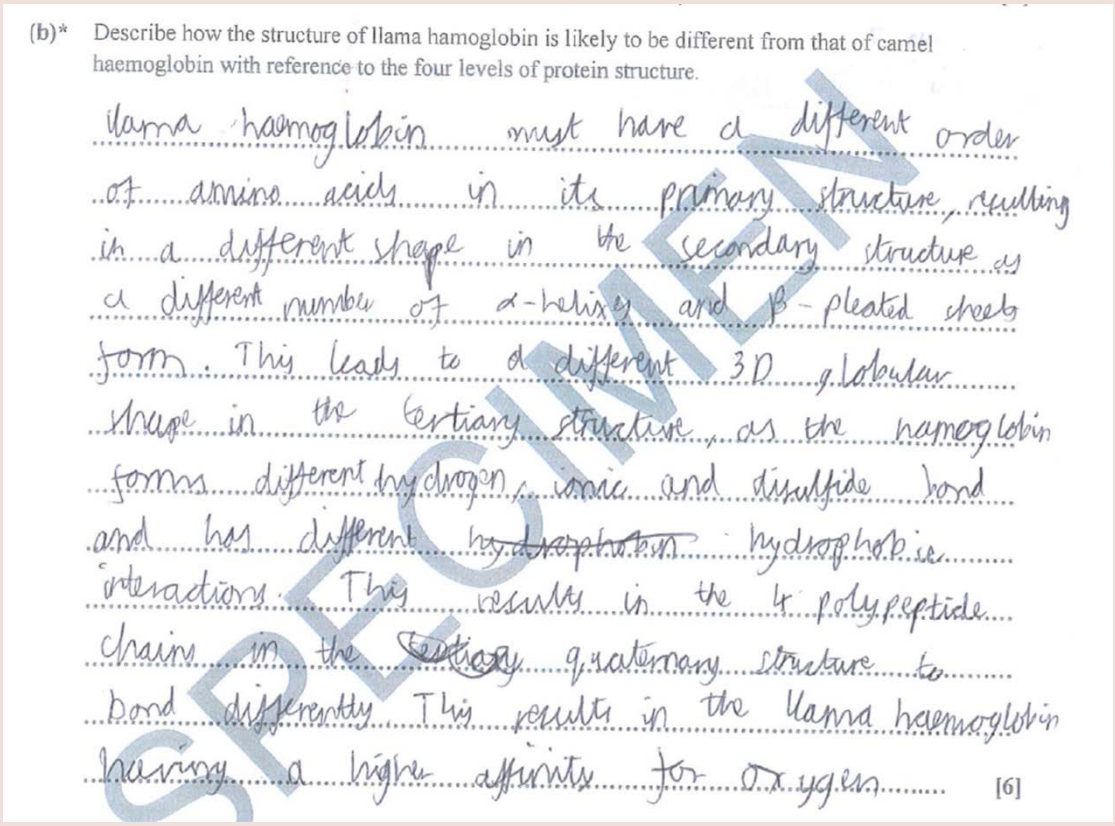
LoR Mark Scheme Qu4(b) AS Level Biology A, H020/02

Question			Answer	Marks	Guidance
	(b)*		**Level 3 (5–6 marks)** Describes differences and similarities of llama and camel haemoglobin at all four levels of protein structure with correct reference to bonding. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Describes differences and similarities of llama and camel haemoglobin in some levels of protein structure with some reference to bonding. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.* **Level 1 (1–2 marks)** Describes a difference or similarity of llama and camel haemoglobin at a level of protein structure. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.	**6**	**Indicative scientific points include:** • difference in primary structure • different amino acid / polypeptide sequence • one amino acid changed. • amino acid change could cause change to secondary structure • initial coiling or folding of polypeptide chain • α-helix • β-pleated sheet • hydrogen bonding. • amino acid change could cause change to tertiary structure • further coiling of secondary structure • ionic bonding • disulphide bonds • hydrophilic/hydrophobic bonds • 3D shape. • amino acid change has not changed quaternary structure • alpha and beta subunits still able to form haemoglobin in both camel and llama.

Question 2, Sample answers and commentary

This section includes seven candidate responses, which have been selected to show answers worthy of 6, 5, 4, 3, 2, 1 and 0 marks.

Level 3, 6 marks (Candidate 6)



(b)* Describe how the structure of llama hamoglobin is likely to be different from that of camel haemoglobin with reference to the four levels of protein structure.

Llama haemoglobin must have a different order of amino acids in its primary structure, resulting in a different shape in the secondary structure as a different number of α-helixes and β-pleated sheets form. This leads to a different 3D globular shape in the tertiary structure, as the haemoglobin forms different hydrogen, ionic and disulfide bond and has different ~~hydrophobic~~ hydrophobic interactions. This results in the 4 polypeptide chains in the ~~tertiary~~ quaternary structure to bond differently. This results in the llama haemoglobin having a higher affinity for oxygen. [6]

Examiner commentary

Candidate 6 **6 marks**

This candidate's response addresses all of the science content required for the Level 3 descriptor in the left hand column of the mark scheme and the science is correct.

The line of reasoning meets the guidelines in the communication statement in the left hand column of the mark scheme – it flows and reads well, with clarity.

Level 3, 5 marks (Candidate 11)

(b)* Describe how the structure of llama hamoglobin is likely to be different from that of camel haemoglobin with reference to the four levels of protein structure.

For the primary structure, sequence in amino acid's will be different resulting in a different polypeptide chain and sequence, also the there is one different amino acid. The secondary structure will be inevitably be different with a different coiling of the primary structure forming a different secondary structure, hence a change in alpha helix and beta pleated sheet structure, held together by hydrogen bonds which many vary in number. The further folding will form the tertiary structure held together by H-bonds, ionic bonds disulphide bonds and hydrophobic / hydrophobic bond also be the R group on the amino acids. However the quaternary structure is the same 2 alpha and beta subunits forming a haemoglobin protein. [6]

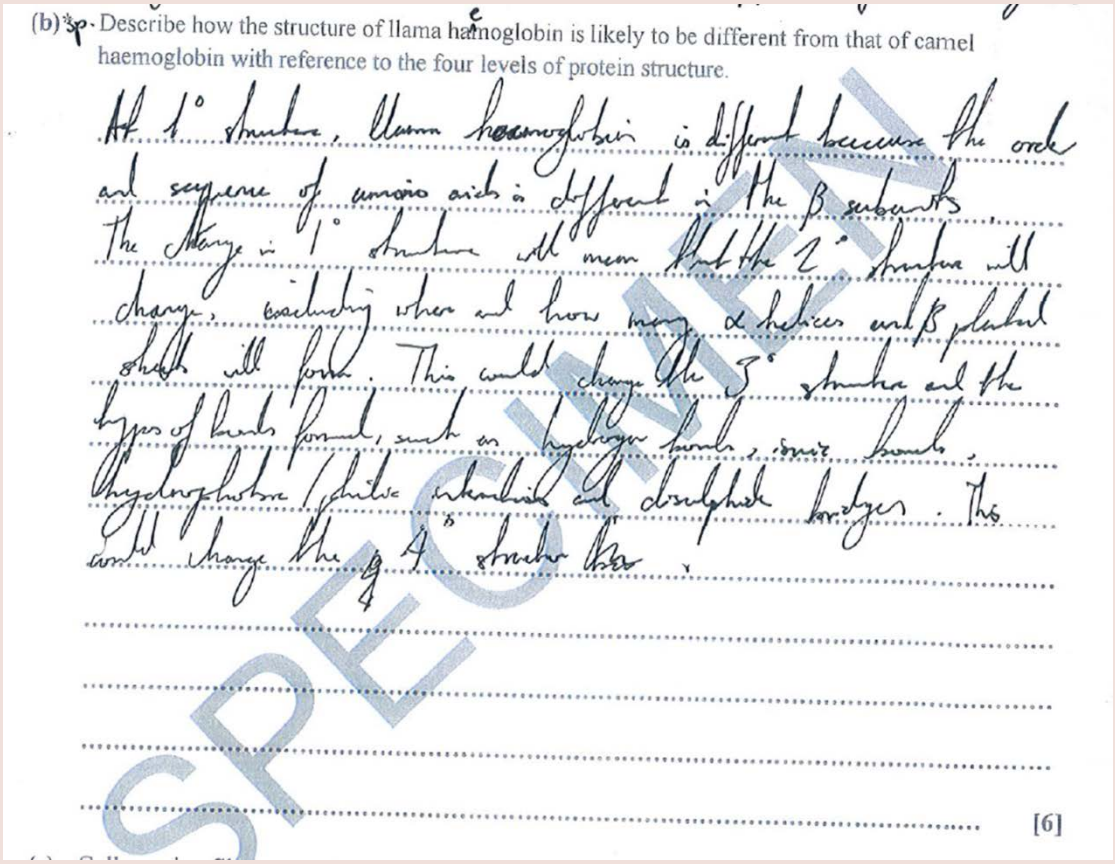
Examiner commentary

Candidate 11 **5 marks**

This candidate's response addresses all of the science content required for the Level 3 descriptor in the left hand column of the mark scheme with all references to bonding being correct.

The lower mark within this level is awarded because it is not clear whether the tertiary structure of the llama β chains and camel β chains is similar or different.

Level 2, 4 marks (Candidate 21)



(b) Describe how the structure of llama haemoglobin is likely to be different from that of camel haemoglobin with reference to the four levels of protein structure.

At 1° structure, llama haemoglobin is different because the order and sequence of amino acids is different in the β subunits. The change in 1° structure will mean that the 2° structure will change, exactly where and how many α helices and β pleated sheets will form. This would change the 3° structure and the types of bonds formed, such as hydrogen bonds, ionic bonds, hydrophobic/hydrophilic interactions and disulphide bridges. This would change the 4° structure too.

[6]

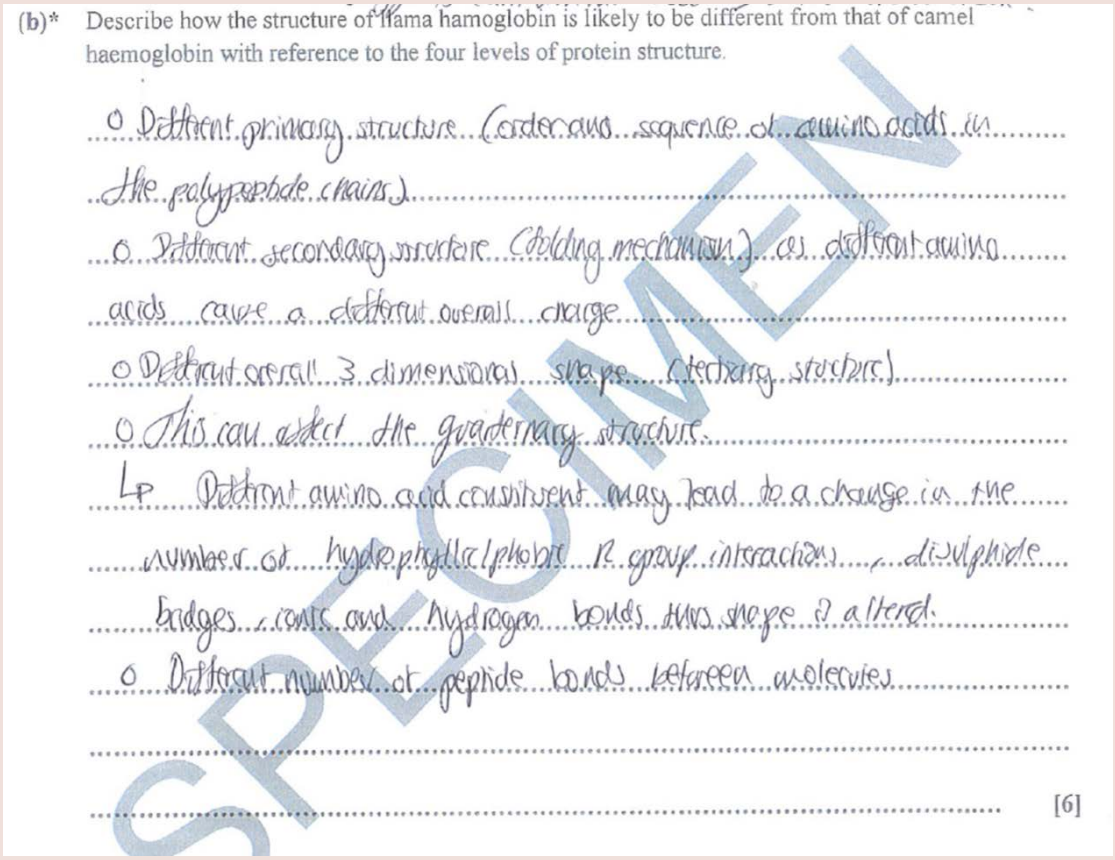
Examiner commentary

Candidate 21 **4 marks**

Although all four levels of protein structure are considered, and there is correct reference to bonding in the tertiary structure, the quaternary structure statement is vague and does not clearly show that the candidate knows what quaternary structure is. This response is placed in Level 2.

The answer is well structured, clear and easily followed. The content is relevant and the conclusions are clearly linked to the difference in structure selected from the information supplied; therefore, the higher mark within the Level is awarded.

Level 2, 3 marks (Candidate 2)



(b)* Describe how the structure of llama hamoglobin is likely to be different from that of camel haemoglobin with reference to the four levels of protein structure.

o Different primary structure (order and sequence of amino acids in the polypeptide chains)
o Different secondary structure (folding mechanism) as different amino acids have a different overall charge
o Different overall 3 dimensional shape (tertiary structure)
o This can affect the quaternary structure
L> Different amino acid constituent may lead to a change in the number of hydrophyllic/phobic R group interaction, disulphide bridges, ionic and hydrogen bonds thus shape is altered.
o Different number of peptide bonds between molecules

[6]

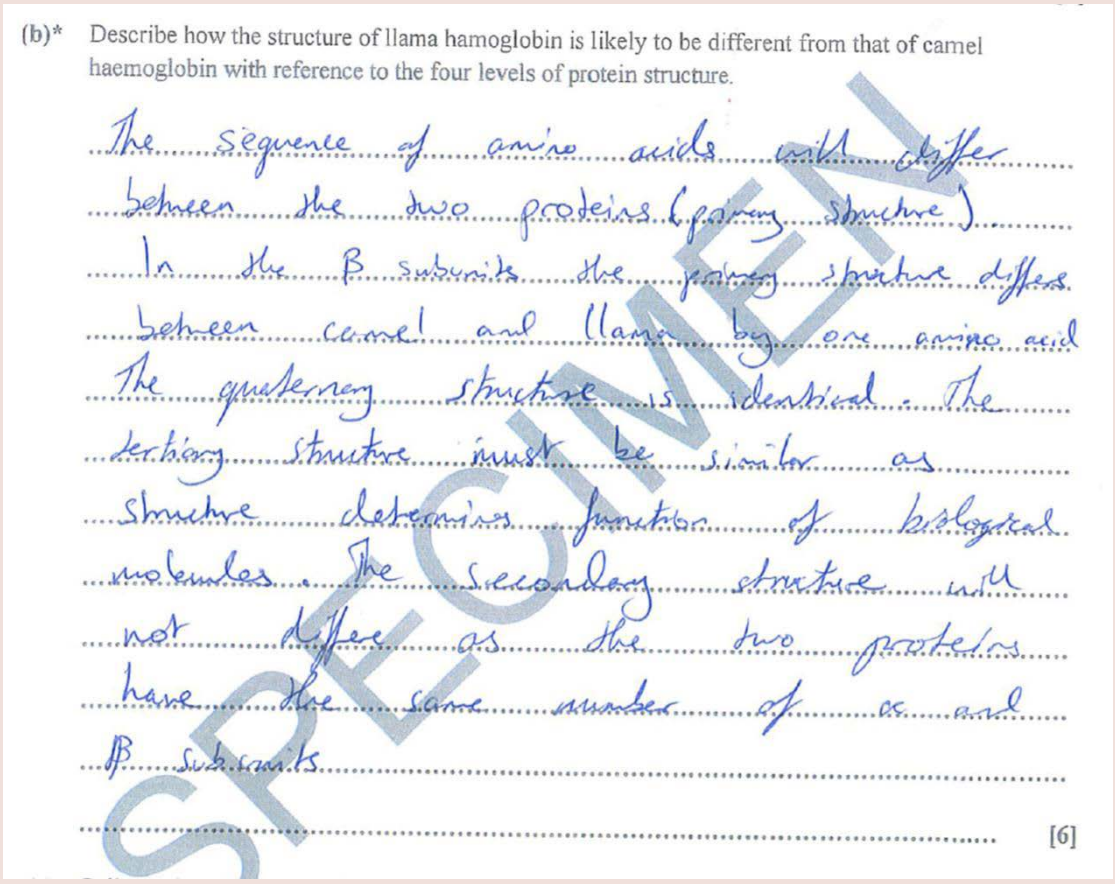
Examiner commentary

Candidate 2 **3 marks**

Although all four levels of protein structure are considered, and there is some correct reference to bonding, there is also an incorrect statement relating to peptide bonds.

While the first part of the answer is reasonably structured, it is not clear which level of protein structure the remainder of the answer refers to. The lack of structure and reasoning, particularly in the latter part of the answer, detracts from the flow of the answer; therefore, the lower mark within the Level is awarded.

Level 1, 2 marks (Candidate 16)



(b)* Describe how the structure of llama hamoglobin is likely to be different from that of camel haemoglobin with reference to the four levels of protein structure.

The sequence of amino acids will differ between the two proteins (primary structure) In the β subunits the primary structure differs between camel and llama by one amino acid The quaternary structure is identical. The tertiary structure must be similar as structure determines function of biological molecules. The secondary structure will not differ as the two proteins have the same number of α and β subunits

[6]

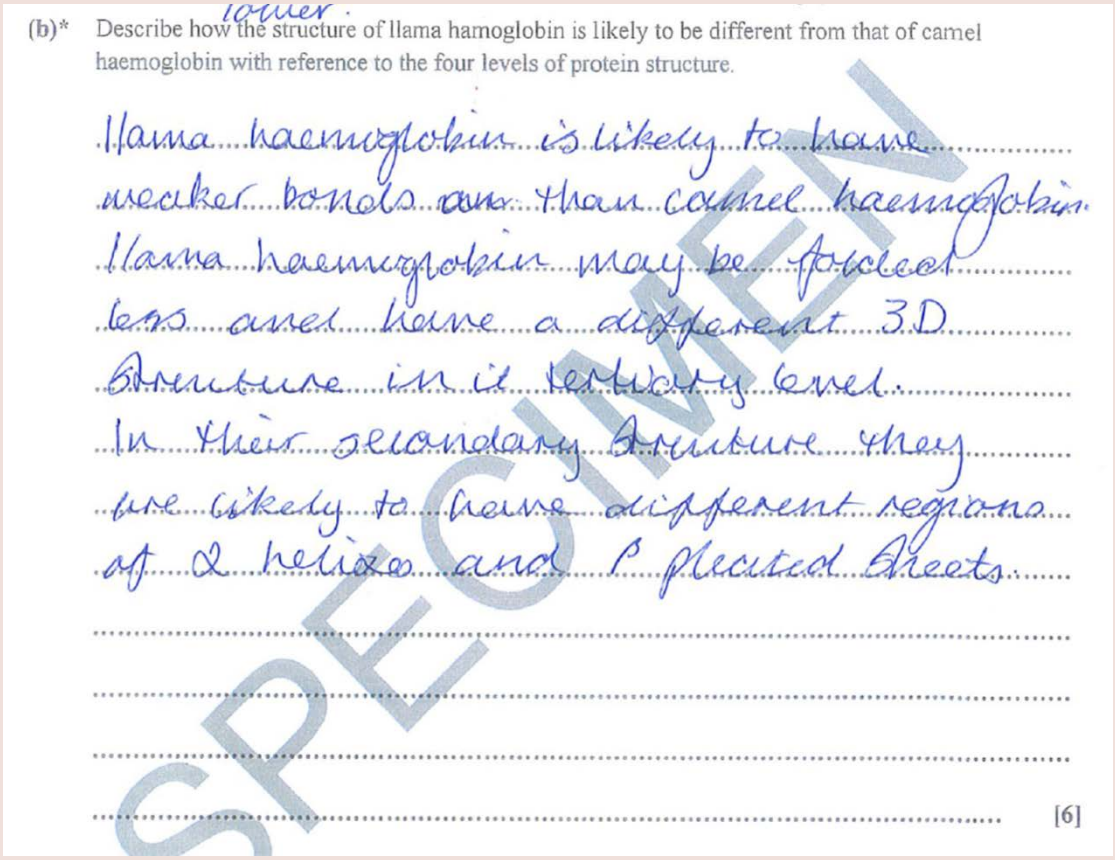
Examiner commentary

Candidate 16 **2 marks**

This candidate's response is classified as Level 1, as there is no reference to bonding and there is an incorrect statement relating to secondary structure.

There is a line of reasoning that can be followed easily and the information is supported by relevant evidence; therefore, the higher mark within the Level is awarded.

Level 1, 1 mark (Candidate 19)



(b)* Describe how the structure of llama hamoglobin is likely to be different from that of camel haemoglobin with reference to the four levels of protein structure.

Llama haemoglobin is likely to have weaker bonds as than camel haemoglobin. Llama haemoglobin may be folded less and have a different 3D structure in it tertiary level. In their secondary structure they are likely to have different regions of α helixes and β pleated sheets.

[6]

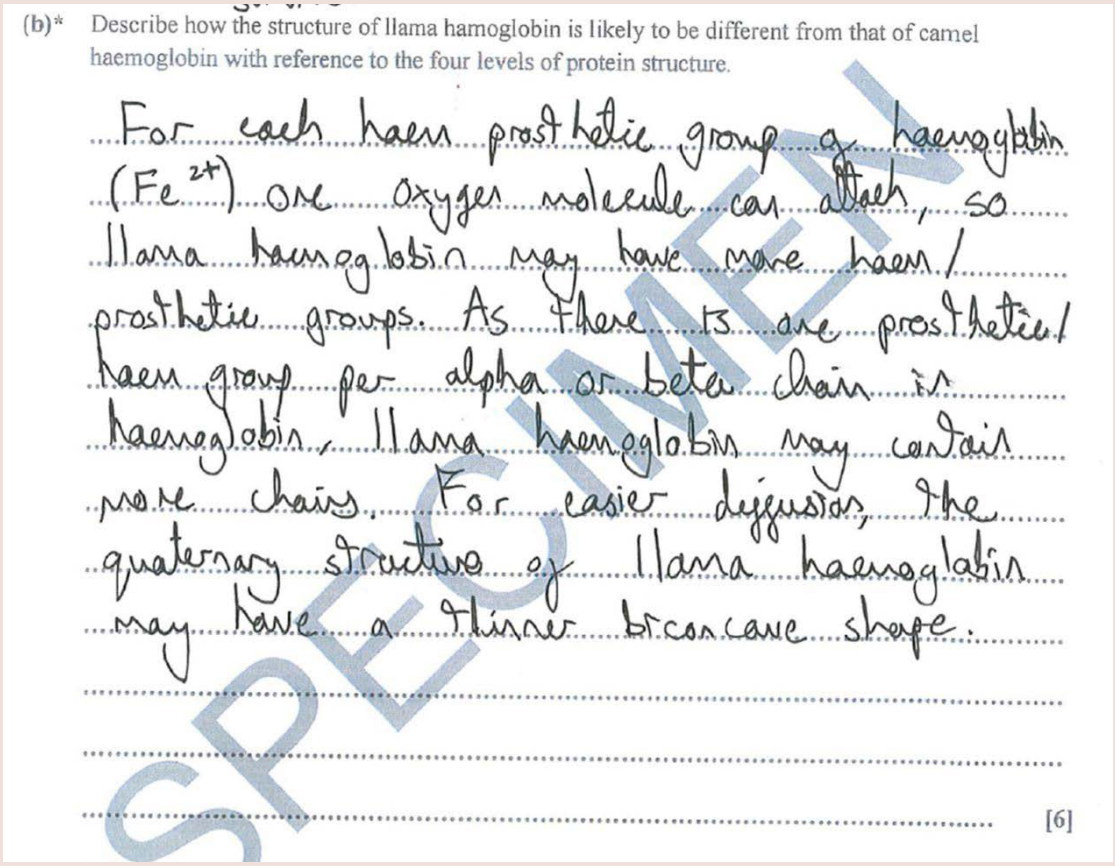
Examiner commentary

Candidate 19 **1 mark**

The answer is classified as Level 1 as there is no reference to bonding.

There is no attempt to link evidence from page 10 of the specimen question paper (page 14-15 in this document) to the reasoning presented and so the lower mark within the Level is awarded.

0 marks (Candidate 3)



(b)* Describe how the structure of llama hamoglobin is likely to be different from that of camel haemoglobin with reference to the four levels of protein structure.

For each haem prosthetic group a haemoglobin (Fe^{2+}) one oxygen molecule can attach, so llama haemoglobin may have more haem / prosthetic groups. As there is are prosthetic / haem group per alpha or beta chain in haemoglobin, llama haemoglobin may contain more chains. For easier diffusion, the quaternary structure of llama haemoglobin may have a thinner biconcave shape.

[6]

Examiner commentary

Candidate 3 **0 marks**

The answer contains some incorrect science and that which is correct is not relevant to the question. Therefore this response cannot even be awarded Level 1.

In the absence of correct and relevant science content, there is no possibility of awarding a communication mark.

Question 3 (with mark scheme)

THIRD QUESTION:

AS Level Biology A

H020/02 Depth in biology

Sample Question Paper

Question 5(b)

(b)* The pipistrelle is the most common species of bat in Europe.

Table 5.1 shows information about two distinct populations of pipistrelle.

Population	Mean body mass (g)	Mean wingspan (m)	Range of echolocation call (kHz)	Colour	Habitat
Common pipistrelle	5.5	0.22	52-60	medium to dark brown	woodland, hedgerows, grassland, farmland, suburban and urban
Soprano pipistrelle	5.5	0.21	42-47	medium to dark brown	wetland, woodland edge, tree lines, hedgerows, suburban gardens and parks

Table 5.1

A researcher made the following claim:

'The common pipistrelle and soprano pipistrelle must be distinct species.'

Evaluate the researcher's claim by using the evidence in Table 5.1 to support and to challenge the researcher's conclusion.

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..... [6]

This question requires candidates to ***evaluate*** the researcher's claim, using the data in Table 5.1 – rather than to just describe the data.

Level 3 answer guidelines:

Level 3 expects the use of all five categories of data in Table 5.1. The answers should use and provide evidence in support of and in challenging the researcher's statement. Level 3 answers should also contain conclusions about speciation (rather than about similarities/differences).

Level 2 answer guidelines:

Level 2 answers should use most (at least three) categories of data in Table 5.1. They should use evidence in support of and in challenging the researcher's statement. Level 2 answers should also contain a conclusion about speciation (rather than about similarities/differences).

If no attempt is made at evaluation, then Level 3 and Level 2 cannot be awarded.

As candidates have been given data, they would be expected to select and use it to evaluate the researcher's statement.

As the mark scheme currently stands, provision of this evidence as part of the answer is a pre-requisite for the science content for Level 3. So for Level 3, information must be directly quoted from Table 5.1. This has no bearing on the communication aspect of the answer.

For Levels 1 and 2, to determine the mark within the level, there must be some supporting information directly quoted from Table 5.1 in order to provide the evidence to back up any conclusion(s) arrived at.

The communication statement for Levels 1 and 2 requires some evidence in support and this is how the statement has been interpreted.

LoR Mark Scheme Qu4(b) AS Level Biology A, H020/02

Question			Answer	Marks	Guidance
	(b)*		**Level 3 (5–6 marks)** Full and detailed evaluation of the claim using all of the data in Table 5.1. Learner demonstrates a holistic judgement of the data providing evidence for and against the claim. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Detailed evaluation of the claim using most of the data in Table 5.1. Sound judgement is made on a range of aspects of the data. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.* **Level 1 (1–2 marks)** An evaluation of the claim is attempted using some of the information in Table 5.1. Simple conclusions are drawn citing limited aspects of the data. *The information is basic and communicated in an unstructured way. The information is supported be limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.	6	**Indicative scientific points may include:** **Support for conclusion (that common and soprano pipistrelle are distinct species)** • echolocation ranges do not overlap • genetic basis for echolocation suggests genetic difference between populations • idea that different species are likeley to have genetic differences. **Information that could be used in support or to challenge** • Mean wing span is very similar • Could indicate difference, though not significant • Could be due to environmental factors, where the populations live • Habitats overlap • Could indicate same species in different areas • Could be different species adapted to slightly different environments. **Challenge to conclusion** • same mean body mass, could be same species • same colour, could be same species • potential environmental cause of body mass variation implies weak challenge to conclusion. **ALLOW** a comment on whether the researcher's conclusion is supported.

Question 3, Sample answers and commentary

This section includes seven candidate responses, which have been selected to show answers worthy of 6, 5, 4, 3, 2, 1 and 0 marks.

Level 3, 6 marks (Candidate 10)

Evaluate the researcher's claim by using the evidence in **Table 5.1** to support and to challenge the researcher's conclusion.

The claim is supported by the fact that the ~~two~~ 2 populations have a different range of echolocation call : common pipistrelle 52 – 60 kHz and soprano pipistrelle 42 – 47 kHz which suggests they could hunt different insects/ prey ~~and~~ so be different species. Other than hedgerows, the two also have different habitats which further supports the claim since members of the same species tend to live in similar or the same habitat. However the claim is challenged by the fact that both types of bat have the same mean body mass (5.5g) and only an 0.01m difference in the mean wingspan of the two. ~~They are~~ Both types are medium to dark brown in colour. This evidence also suggests they could be members of the same species so challenges the claim. [6]

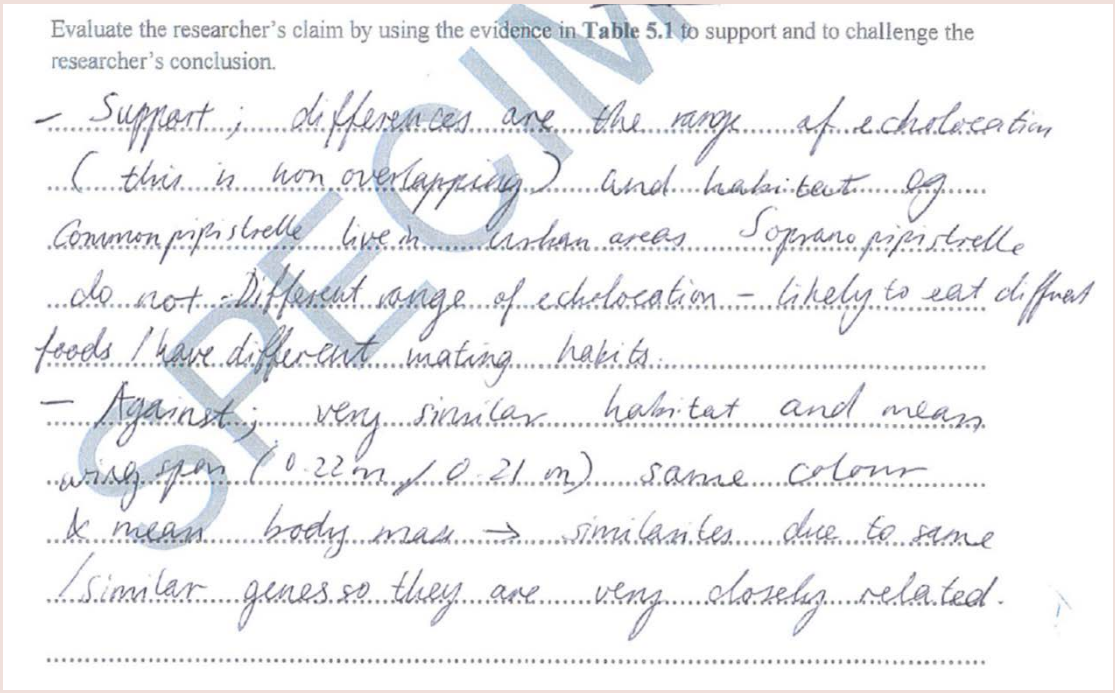
Examiner commentary

Candidate 10 **6 marks**

This candidate's response considers all five pieces of evidence in assessing whether each supports or challenges the claim and quotes extensive information from Table 5.1. Two opposing conclusions are made about speciation.

The line of reasoning meets the guidelines in the communication statement in the left hand column of the mark scheme – it flows and reads well, with clarity.

Level 3, 5 marks (Candidate 12)



Evaluate the researcher's claim by using the evidence in **Table 5.1** to support and to challenge the researcher's conclusion.

- Support ; differences are the range of echolocation (this is non overlapping) and habitat eg. Common pipistrelle live in urban areas Soprano pipistrelle do not - Different range of echolocation - likely to eat diffrent foods / have different mating habits
- Against ; very similar habitat and mean wing span (0.22m / 0.21 m) same colour & mean body mass → similarites due to same / similar genes so they are very closely related.

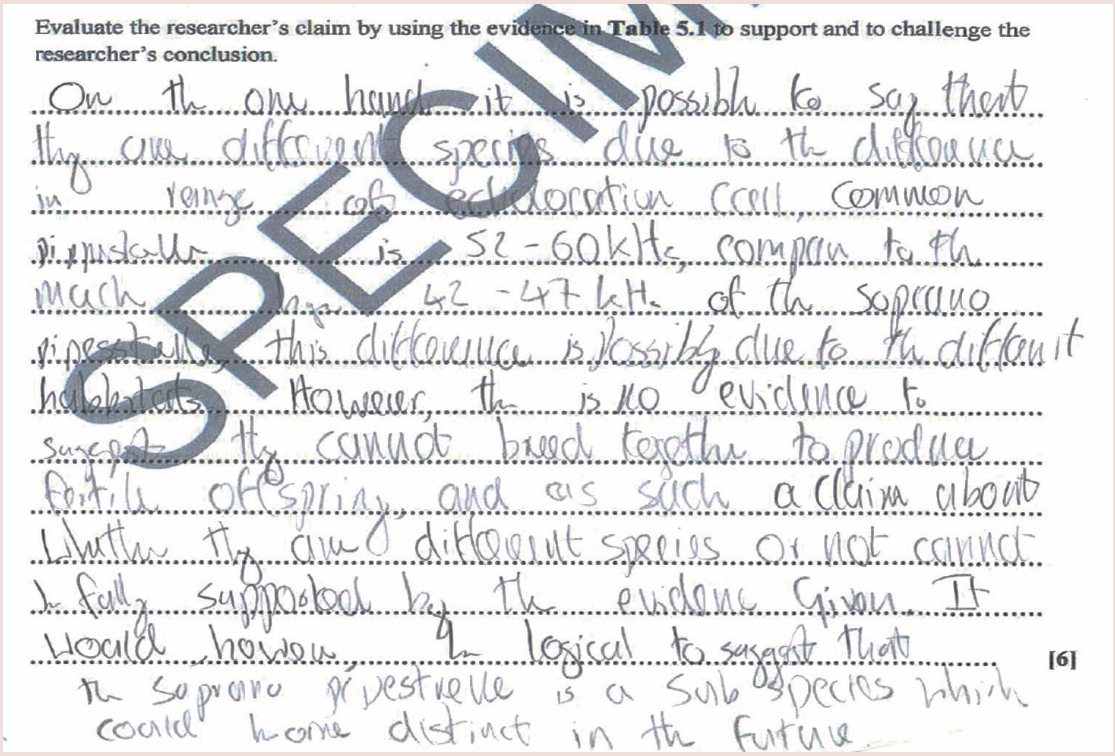
Examiner commentary

Candidate 12 **5 marks**

This candidate's response analyses all five pieces of evidence, quoting information from Table 5.1. The response would be an unambiguous Level 3 if there had been a specific statement relating to speciation. The layout of the answer and reference to being 'closely related', however, imply this. The answer has a higher scientific content than required at Level 2 and so this is a case where the answer is placed in Level 3 as a best fit.

The lower mark within the Level is awarded because the candidate has not clearly linked the scientific content to the context of speciation.

Level 2, 4 marks (Candidate 17)



Evaluate the researcher's claim by using the evidence in **Table 5.1** to support and to challenge the researcher's conclusion.

On the one hand it is possible to say that they are different species due to the difference in range of echolocation call. Common pipistrelle is 52 - 60kHz, compare to the much rarer 42 - 47kHz of the soprano pipistrelle, this difference is possibly due to the different habitats. However, there is no evidence to suggest they cannot breed together to produce fertile offspring, and as such a claim about whether they are different species or not cannot be fully supported by the evidence given. It would however, be logical to suggest that the soprano pipistrelle is a sub species which could become distinct in the future [6]

SPECIMEN

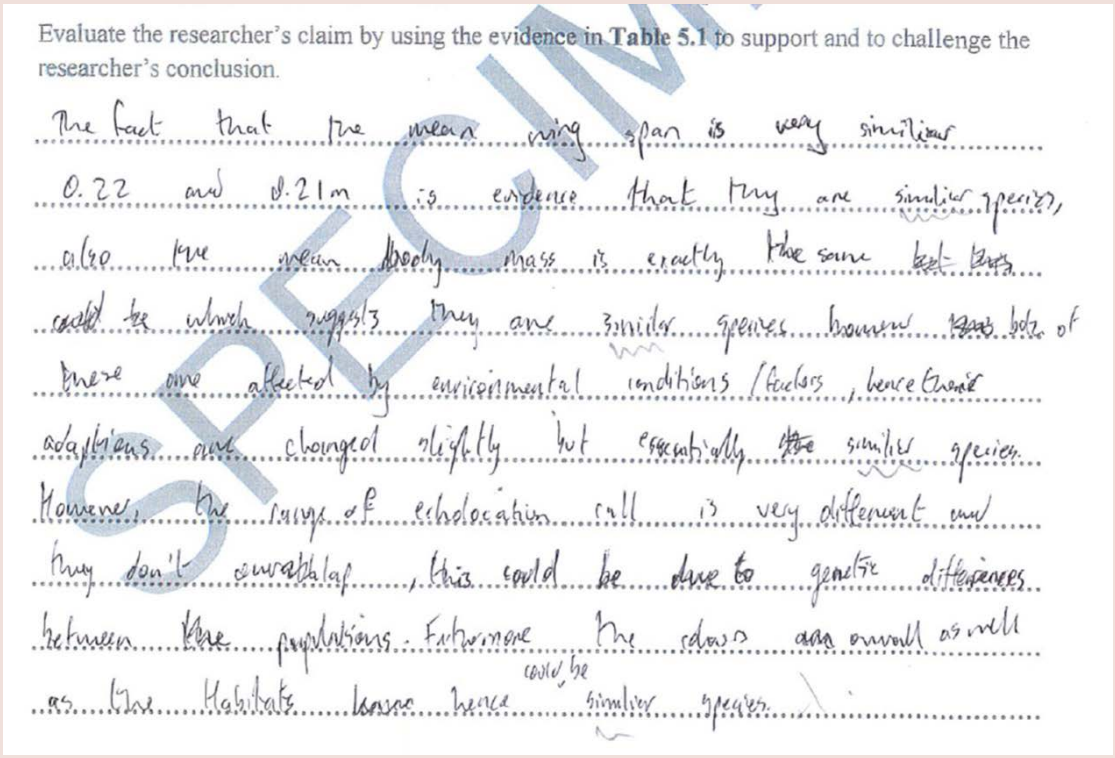
Examiner commentary

Candidate 17 **4 marks**

This candidate has not referenced all five pieces of evidence and so the answer does not fit Level 3. The answer, however, is far better than that expected for Level 1 and contains some good and relevant science in the argument put forward. Despite the fact that only two pieces of evidence have been used, the answer would best fit in Level 2.

The answer is well structured, clear and easily followed. The content is relevant and information from the table is quoted in support; therefore, the higher mark within the Level is awarded.

Level 2, 3 marks (Candidate 9)



Evaluate the researcher's claim by using the evidence in **Table 5.1** to support and to challenge the researcher's conclusion.

The fact that the mean wing span is very similiar 0.22 and 0.21m is evidence that they are similar species, also the mean body mass is exactly the same but this could be when suggests they are similar species however both of these are affected by environmental conditions / factors, hence their adaptions are changed slightly but essentially the similar species. However, the range of echolocation call is very different and they don't overlap, this could be due to genetic differences between the populations. Furthermore the sexes age overall as well as the habitats hence could be similar species.

Examiner commentary

Candidate 9 **3 marks**

Only three aspects of the data are considered and so this answer does not fit Level 3. Evaluation has been attempted as there is discussion that some of the features included in the table may be influenced by the environment while others have a genetic basis.

The answer is reasonably well structured and information from the table is used in support. However, the use of the term 'similar' when describing the species is ambiguous and therefore detracts from the line of reasoning; it is not clear whether the candidate is supporting or challenging the conclusion they have been asked to evaluate. This results in the lower mark within the Level being awarded.

Level 1, 2 marks (Candidate 1)

Evaluate the researcher's claim by using the evidence in **Table 5.1** to support and to challenge the researcher's conclusion.

Both are practically identical in terms of observational features ~~as~~ like their identical body mass of 5.5g and a wingspan of 0.22 and 0.21 metres, so it's not necessarily obvious and the two do not have distinct physical differences. However, their habitats are contrasting with the common pipistrelle found in farmland as opposed to soprano pipistrelle which are found in the tree lines. Moreover the range of their echolocation call is moderately different and can be a way of identifying them with the common having a maximum range of 60 kHz and the soprano having a max range of 47.

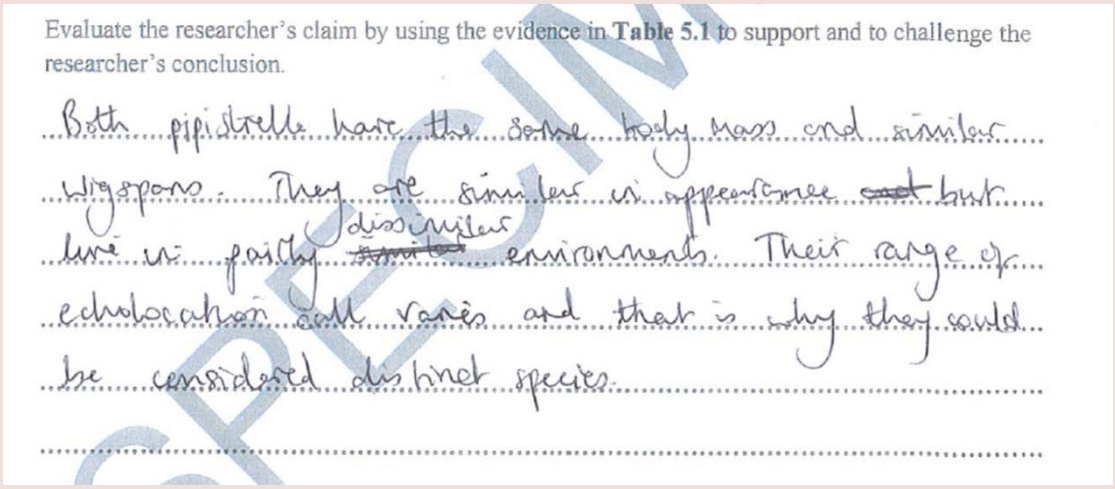
Examiner commentary

Candidate 1 **2 marks**

Although four aspects of the data are considered, there has been limited attempt at evaluation (by comparing and contrasting the information) and so the answer is classified as Level 1. Clearer evaluation linked to speciation would have been required for the answer to be considered for a higher level.

There is a line of reasoning that can be followed easily and information from the table is used to support statements; therefore, the higher mark within the Level is awarded.

Level 1, 1 mark (Candidate 6)



Evaluate the researcher's claim by using the evidence in **Table 5.1** to support and to challenge the researcher's conclusion.

Both pipistrelle have the same body mass and similar wingspans. They are similar in appearance ~~and~~ but dissimilar live in partly ~~similar~~ environments. Their range of echolocation call varies and that is why they could be considered distinct species.

Examiner commentary

Candidate 6 **1 mark**

This response is Level 1 because the candidate has used the information from the table to make simple statements and draw a simple conclusion.

Although the answer is easy to follow, no evidence from the table has been quoted and so the lower mark within the Level is awarded.

0 marks (Candidate 8)

Evaluate the researcher's claim by using the evidence in **Table 5.1** to support and to challenge the researcher's conclusion.

In support of the claim both types of pipistrelle have the exact same mean body mass of 5.5 g and also a mean wingspan with a difference of only 0.01 m. The common pipistrelle has a span of 0.22 and the soprano has a span of 0.21. Another similarity to support the conclusion is that the both have a medium to dark brown colour. The both like in hedgrows and woodland areas however there are some differences in habitat. The common pipistrel lives in grassland, farmland and suburban urban areas whereas the soprano lives in wetland, tree lines and only suburban gardens and parks. They also have a different [6]
echolocation call range with the sopranos being 42–47 kHz unlike the common's 52–60 kHz range.

Examiner commentary

Candidate 8 **0 marks**

On initial inspection, this answer appears to be well written and could potentially score well. However, the answer contains incorrect science in that the candidate cites the evidence that challenges the researcher's statement in the context of supporting the statement. Similarly, the evidence that supports the statement is described as opposing it. The fact that the candidate has extensively quoted information from the table does not compensate for the fact that the candidate is either misinterpreting the information in the table or misinterpreting the researcher's statement. This means that it cannot even be awarded Level 1. In the absence of correct and relevant science content, there is no possibility of awarding a communication mark.

Appendix and Teacher Activity

Teacher Marking Activity

Once you have read through all the questions, sample answers and commentary in this AS Level Biology LoR resource, you can have a go at marking the additional responses.

The appendix to accompany this resource includes,

AS Level Biology B, H022/02 Biology in depth, Question 2(c) – 26 responses

AS Level Biology A, H020/02 Depth in biology, Question 4(b) – 21 responses

AS Level Biology A, H020/02 Depth in biology, Question 5(b) – 29 responses

All of these responses have been marked by our senior examining team. The marks have been included as a separate list. Once you have marked the responses for each question, you can check your marking against the examiners' judgements.

Acknowledgement: We would like to thank Hills Road Sixth Form College Cambridge for their involvement in the development of this resource.

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