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Examiners' Report
October 2025

Pearson Edexcel International Advanced Level in Biology

WBI15/01

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Introduction

The paper was the thirteenth cycle of the new specification and tested respiration, internal environment, coordination, and gene technology.
The scope of the questions provided a good opportunity for candidates to demonstrate their knowledge and understanding of these topics.
There was an equal balance between topics 7 and 8.
The questions on this paper yielded a very wide range of responses with some excellent answers given, particularly in the questions with higher mark tariffs.

There were some parts of questions that were left blank particularly at the end showing some evidence that candidates might have had insufficient time to complete the paper. Many candidates made a good attempt at questions on the article, which was the final question, as is usual with this paper. It was evident that many had prepared themselves by studying the article in advance, but some responses indicated that candidates had not prepared themselves as thoroughly as they could, indicating that they were not familiar with some of the vocabulary used in the article.

There were some straightforward questions demanding recall that yielded high marks across the cohort and some more demanding questions that discriminated well. It was pleasing to see that candidates can use the data that they are provided with and apply their knowledge in the correct context. Multi choice questions were well answered and proved to be a good source of marks.

However, it is still evident that some candidates do not pay sufficient attention to the command word used in the question. This is particularly true of ‘determine’, ‘describe conclusions’ and ‘comment on’ questions where descriptions failed to gain the full marks.

Responses needing calculations were very varied, particularly where candidates had to take data from graphs and use that in their calculation. Candidates gain full marks for the correct answer, but they should be encouraged to always provide working, so credit may still be given if their final answer is incorrect. Candidates need to be careful to follow the instructions in the stem of the question eg. the number of significant figures.

‘Suggest’ questions offered candidates the opportunity to show their knowledge and understanding from across the specification.
Questions which demanded analysis, explanation, and application of knowledge to unfamiliar contexts were seen to be more challenging to candidates and proved to be excellent for discrimination.

Many centres are clearly using our mark schemes and examiner reports to prepare candidates. This is particularly evident where similar mark points have appeared on previous papers. eg. 6b movement of neurotransmitter across a synapse. Care must be given to not just use the points from previous mark schemes without relating it to the context of the current question.

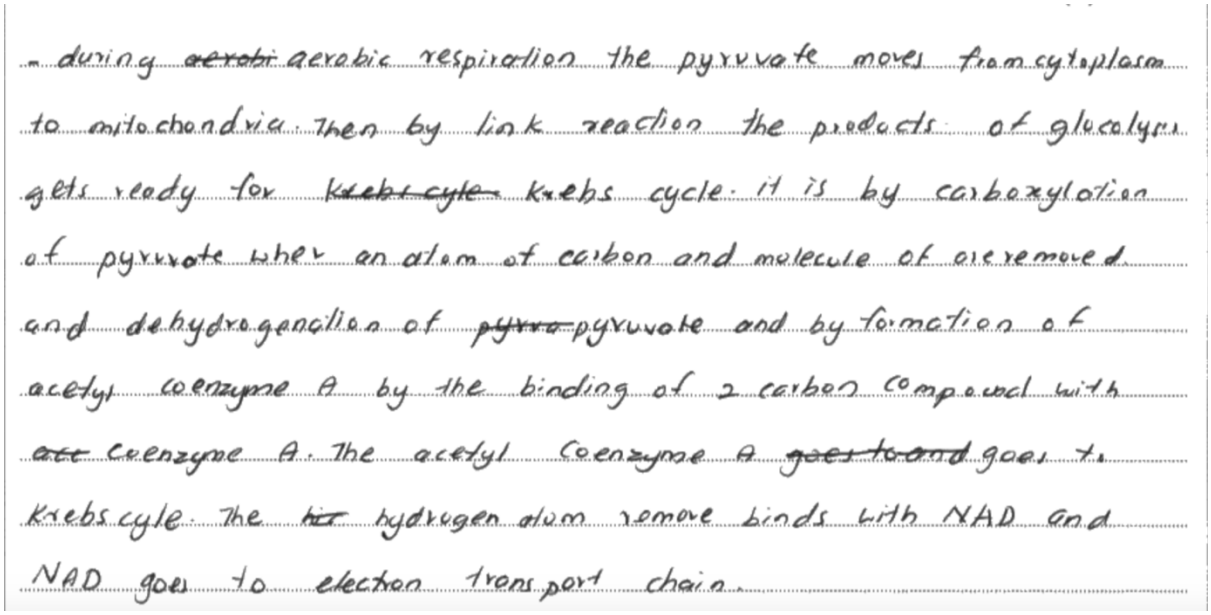
The multichoice questions were often answered accurately and were a good source of marks for candidates who found the application questions more challenging.

Question 1

This question assessed candidates' knowledge of respiration and many were able to give a coherent account of what occurs in aerobic and anaerobic respiration.

1bi There sometimes confusion as to the order of the Link Reaction and the Krebs cycle and the processes that were taking place but many could get the details correct and gained full marks for this question. Some candidates went on to describe the details of the Krebs cycle but no credit was given for this. The most commonly awarded marking points were 1,3,4.

The response below scored full marks.


- during ~~aerobi~~ aerobic respiration the pyruvate moves from cytoplasm to mitochondria. Then by link reaction the products of glycolysis gets ready for ~~Krebs cycle~~ Krebs cycle. it is by carboxylation of pyruvate wher an atom of carbon and molecule of oi are removed and dehydrogenation of ~~pyru~~ pyruvate and by formation of acetyl coenzyme A by the binding of 2 carbon compound with ~~co~~ coenzyme A. The acetyl coenzyme A ~~goes to and~~ goes to Krebs cycle. The ~~hi~~ hydrogen atom remove binds with NAD and NAD goes to electron transport chain.

1bii In the second part of the question, pyruvate and anaerobic respiration, most candidates were able to identify that lactate/lactic acid would be formed but some struggled to explain what else happened as part of the process. The liver was often identified as the place that the lactic acid would be converted to glucose or back to pyruvate but some responses identified the conversion of pyruvate to lactic acid as taking place in the liver.

The response below demonstrates that lengthy responses were not required to gain full marks.

pyruvate undergoes anaerobic pathway to form lactate. some of the lactate goes to the liver to form glucose by gluconeogenesis. some part of lactate is reconverted to ~~pyruvate~~ pyruvate to form molecules of ATP, CO_2 and H_2O.

Question 2

This question assessed knowledge of germination and the role of phytochromes. The multichoice calculation was well answered but some candidates struggled with the role of phytochromes and analysing the data.

2a(ii) Many candidates spent too much of their answer describing the results and not explaining the implications of the light shone with regards to the activation of the different forms of phytochrome. There was often confusion with which type of phytochrome was the active form. Most commonly, candidates could identify the impact of red light and relate this to the results of the experiment but the impact of darkness and far-red light on the form of phytochrome present was less commonly identified.

The answer below is an example of a response that gained full marks.

Group A with no treatment showed very little germination so phytochromes play a role in germination. Group B last treated by far red light shows 48% germination. this plant has Pr accumilated in it as far red light converts Pfr to Pr. however it does have some Pfr as it was initially treated with red light. Group C shows 100% germination. group C has an accumilation of Pfr as it was last treated with red light. it can be concluded that these plants require Pfr which acts as a transcription factor for proteins required for germinating.

Pfr in group B and C are not all converted to Pr when left in the dark as this is a very slow process.

2b This was mostly well answered with many candidates including sufficient detail to gain two or three marks. Sometimes, incorrect storage molecules identified and the role of the resultant molecules in germination.

The response below is an example of one scoring full marks.

(3)

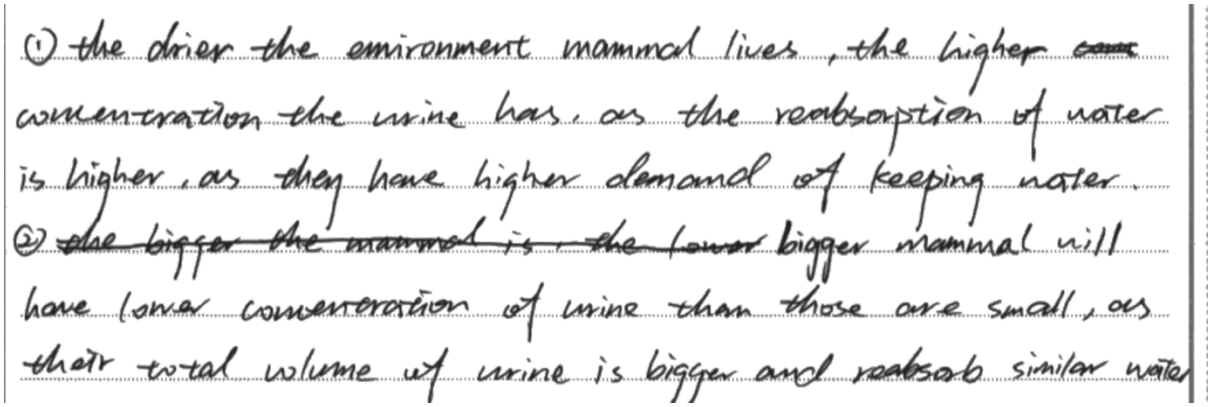
Amylase can be used to break the glycosidic bonds in starch, and the starch can be broken down to glucose and maltose. Glucose can provide energy for thale cress seeds to do aerobic respiration to produce ATP for mitosis.

Question 3

This question assessed knowledge of the kidney and the ability to identify conclusions from data provided. Many candidates got all the multichoice questions correct.

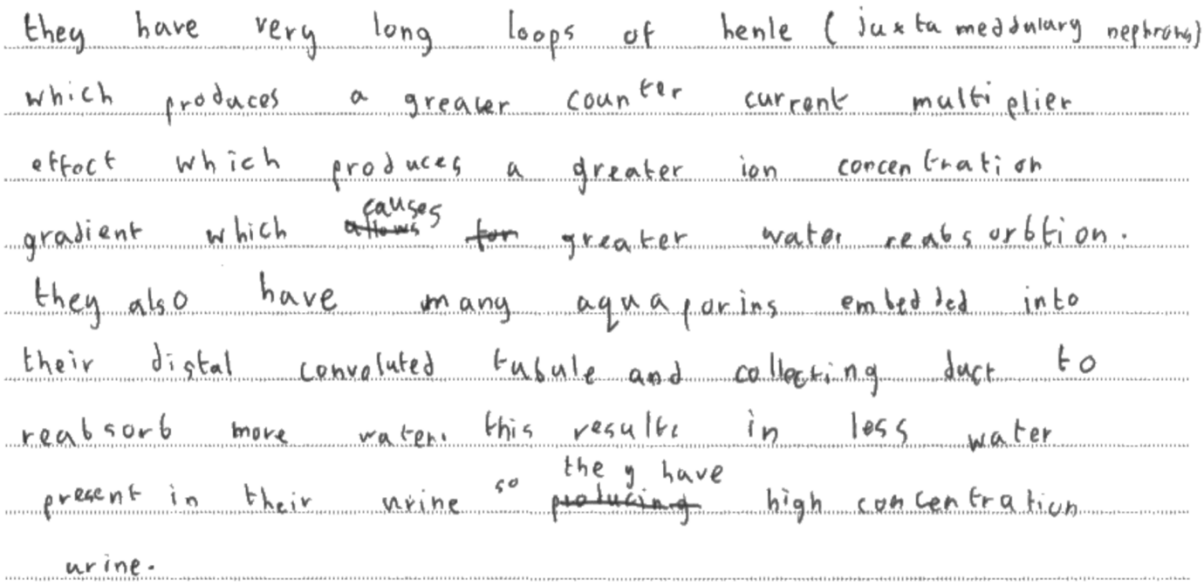
3bi Many did well in this question, successfully identifying the size of the animals and the environment they live in as the key points to form the basis of their conclusions.

The response below scored full marks.



3bii Generally the candidates' knowledge of the loop of Henle was sound but there were instances where although the biology was correct, candidates did not score more than one mark as they had simply described the kidney rather than how the rat was adapted to tolerate dry conditions.

The response below scored full marks.

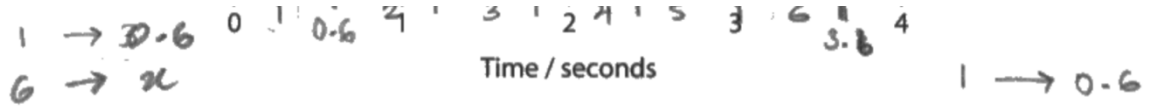


Question 4

This question started with a calculation using the graph that asked candidates to calculate heart rate of a seal and then the level-based question that involved using two graphs and a table and assessing the role of aerobic and anaerobic respiration.

4a About half of the candidates calculated the heart rate correctly but many used the whole graph, not looking that this was slightly more than 7 complete heart rates and so their calculation was inaccurate.
This is a prime example of where showing working is important as there was one mark for candidates who had read the information incorrectly from the graph but had carried out the rest of the calculation correctly.

The response below scored full marks.



The heart rate of the seal during a dive was 13 beats per minute (bpm).

Calculate the change in heart rate when the seal dives.

heart rate before seal dives = 100

change in heart rate =

Answer 87 bpm

The response below scored one mark.

The heart rate of the seal during a dive was 13 beats per minute (bpm).

Calculate the change in heart rate when the seal dives.

(2)

$\frac{7}{4} \times 60 = 105$ bpm

$105 - 13$

$= 92$ bpm

Answer 92 bpm

4b This question yielded a good range of marks. Credit was not given for references to respiration that were not connected to the data that was provided but many were able to describe the data provided and go some way to explaining what the data meant with regards to the type of respiration taking place. It was good to see candidates making connections to the heart rate calculated in the earlier part of the question. The higher-level responses were able to explain the different types of respiration in the different areas of the body and understand the implications within the seal.

The response below scored the maximum marks as the candidate described and explained the data, related the role of respiration to the needs of the seal and made a comment on the limitations of the data with regards to the age of the single seal used.

Assess the role of aerobic and anaerobic respiration when seals dive.

(6)

Graph 1: As duration of dive increase, oxygen concentration in aterial blood and skeletal muscles decreases linear decrease for arterial blood whereas after 10 mins O_2 conc. remains constant. During aerobic respiration O_2 is used up Ca^{2+} binds to troponin, tropenin changes shape, myosin binds forming the actin myosin bridges where it is hydrolysed to release ADP and Pi. As aerobic respiration takes place, oxygen is used up for ventilation and homeostasis.

Graph 2: while diving, lactic acid conc. increases in skeletal muscles but arterial blood remains constant. when returned to the surface, lactic acid conc. decreases while arterial blood increase. This is because, during diving, all the oxygen gets used up. This leads to ↑ CO_2 levels and pH which is deted by the chemoreceptors that sends signals from the brain through neurons, leading to anaerobic respiration. During this anaerobic respiration, lactic acid is formed. As per the table, proportion of blood flow is the highest in brain & lowest in skeletal muscle. Blood flow less in muscles because oxygen cannot bind to haemoglobin due to less no. of oxygen molecules. Aerobic respiration takes place $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ when sufficient O_2 is present. However, as it runs out lactic acid is produced in the muscles. Moreover, lactic acid conc. increase after returning to surface as oxygen debt is getting paid due to availability of O_2. The changes in body detected by chemoreceptors, and sends signals to the brain. However, there is no error bars, standard deviation to speak for the validity & reliability of the graphs. **(Total for Question 4 = 8 marks)**

Other factors such as temperature & age of the seal are unaccounted for.

This is an example of a level 2 response.

Assess the role of aerobic and anaerobic respiration when seals dive.

(6)

→ as seals are mammals that breathe air, they ~~g~~ cannot get oxygen underwater when they dive. So, as duration of dive increases, the oxygen concentration in arterial blood decreases as lungs cannot ~~oxidise~~ give oxygen to blood for oxidised blood. skeletal muscle has much lower concentration of oxygen than arterial blood as muscles are away from the heart when compared with arteries.

→ graph 2 shows that lactic acid concentration in skeletal muscle increases as duration of dive increases. This is because as seals cannot get oxygen underwater, they respire anaero-bically. In animals, anaerobic respiration produces lactic acid which will accumulate in the muscles. graph shows that after the seal has returned to the surface, lactic acid concentration decreases gradually. This is due to the seals being able to get O_2 at the surface and they can start aerobically respiring. So lactic acid is no longer produced.

→ The table shows that proportion of blood flowing to brain (cortex) increases by 20% when seal is diving. This is because brain cortex coordinates muscle movement for the seal to move and hence needs more O_2 supplied to the cortex through blood flow.

(Total for Question 4 = 8 marks)

This is an example of a level 1 response – the data is discussed but there is no reference to aerobic or anaerobic respiration.

Assess the role of aerobic and anaerobic respiration when seals dive.

(6)

During dive as time increases oxygen concentration in both arterial blood and skeletal muscle decreases. Because they breath air and during dive no air is available and oxygen taken inside decreases. As shown is second graph as time increases lactic acid concentration in both arterial blood and skeletal muscle increase and decrease. Because as lactic acid increases Ph decreases. chemoreceptor detect the change and send increasing impulse to sympathetic nervous system increasing heart rate and increase removing of CO_2 from blood and muscle. & those lactate in muscle enters to kelvin cycle after removal of oxygen. Therefore lactic acid decreases. As shown in table as seal dives blood flowing to tissues like cardiac muscle and skeletal muscle decreases. ~~so lactic acid~~ As when they dive O_2 cannot be inhaled so the blood flowing decreases.

Question 5

For the most part, this question was answered well. A significant number of the candidates could not answer the multichoice question on the rod cell correctly and were unable to identify that active transport is responsible for the change to the polarisation of rod cell membranes.

5bi Many answered this correctly, but some candidates did not know the names of the muscles involved and confused contraction with constriction of the pupil.

5bii In this calculation, there was some confusion among some candidates regarding what data to extract from the graph, but many could calculate the change in area, successfully using πr^2 and give their final answer to the correct number of significant figures.

The response below scored full marks.

(3)

$\frac{d}{2} = 1$

πr^2

$= \pi \times \left(\frac{4.92}{2}\right)^2$

$= 19.0$

$19.0 - 16.9 = 2.1$

Answer 2.1 mm^2

5biii As is often the case, some candidates struggle to describe conclusions and their answer is limited to descriptions of the data. Conclusions should be clear statements. Many candidates could describe the trends in the data, although fewer candidates used relevant data points in their answer and therefore some answers did not gain mark point 3. Most gave the first marking point. Some candidates misread the data and thought that the children had a greater increase in pupil diameter. Mp2 Was infrequently awarded.

The responses below show a very good response followed by one that only scored one of the available marks.

(iii) Describe **three** conclusions that can be made from the results shown in the graph.

(3)

- both control groups have lower mean pupil diameter than the other group.
- Children has a higher mean pupil diameter than adults.
- as the difficulty of learning task increase, the mean pupil diameter for adults increase but for children it increases up to learning task 5 and then decreases for anything with difficulty of learning task greater than 5.

(iii) Describe **three** conclusions that can be made from the results shown in the graph.

(3)

children has a higher capacity to learn difficult things than adults.

in both as the difficulty of learning task increases the mean pupil diameter also increases.

the maximum difficulty for children is 5 at 4.92 mm pupil diameter. however the maximum difficulty for adults is 8 at 4.6 mm pupil diameter.

5bv This was a Suggest question and many were able to provide a sensible reason for the difference in response of children and adults. There was quite a range of answers but many focused on the differences in the development of the brains.

Question 6

This question centred around testing knowledge of the nervous system, habituation and application of data. The first few parts were relatively straightforward although some candidates surprisingly struggled to name the property of myelin that makes it suitable for saltatory conduction.

6b This was generally well answered with many candidates scoring full marks. It showed that candidates are clearly using mark schemes to help them to prepare for examinations. The main difference between this question and that from the previous series was that there was credit for describing the role of calcium ions in addition to the movement of the neurotransmitter from the presynaptic neurone to the post synaptic neurone, resulting in an action potential. Some candidates referred to sodium channels or movement of sodium instead of sodium ions. A good answer is shown below.

Nerve impulse arrives at presynaptic terminal. Ca^{2+} calcium channels on presynaptic membrane opens and influx of Ca^{2+} occurs. This causes vesicles containing neurotransmitters to move forward and fuse with presynaptic membrane. The neurotransmitters are released to the synaptic cleft. It diffuses down concentration gradient and binds to neuroreceptors on post synaptic membrane. Sodium channels open and sodium moves into post synaptic membrane. If threshold is reached (+40 mV) then action potential is generated and impulse is carried along neurone.

6ci Many candidates were able to gain one mark for identifying that the number of clicks would diminish but what set the better candidates apart was the fact that they were able to make their answer specific to the question. As usual, candidates should look carefully for the command word.

The response below scored full marks.

At the start both groups had high number of button clickers, when they didn't recieve the food after multiple rounds, they realised they weren't getting it, so they got used to it and thus, number of button clickers decreased

6cii This was another example where it was important for candidates to display their working as many could gain a mark for their working even if their final answer was incorrect.

Give your answer to two significant figures. (2)

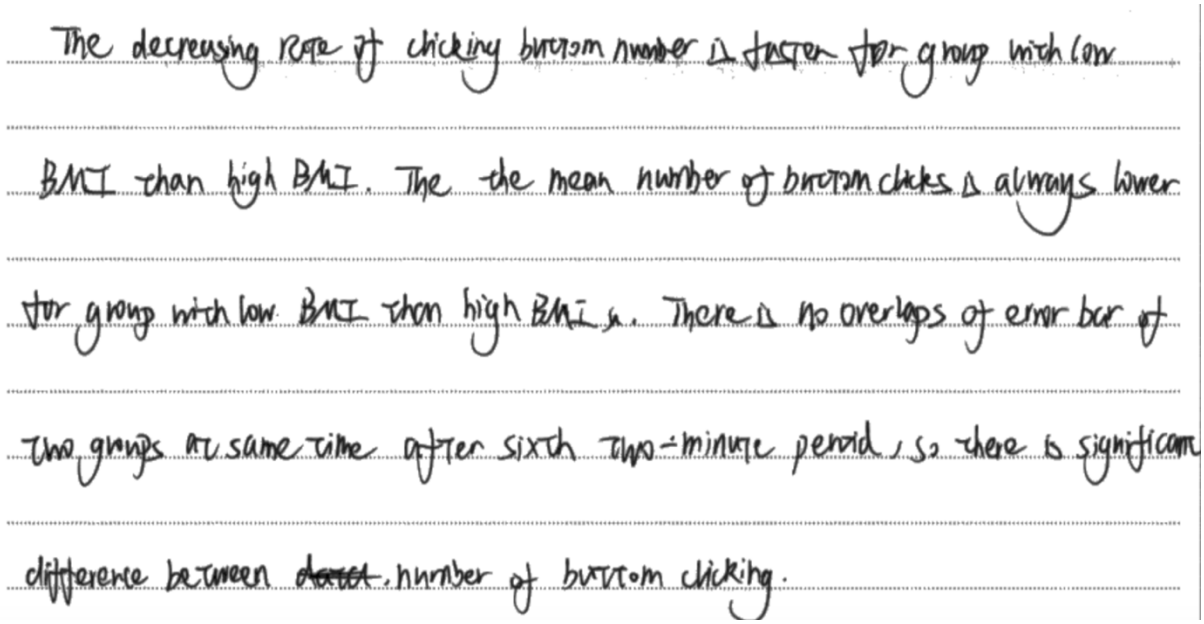
$$\frac{1}{2} = \frac{(200-130)}{165} \times 100$$

$$\frac{(200+130)}{2} = 165$$

Answer 42 %

6ciii There was some confusion with the interpretation of data with regards to the error bars and the slope of the lines of data from the two different groups. Candidates must remember to give clear conclusions, not simple descriptions of the data. Few relevant comments on the methodology were seen.

The response below scored full marks.



Question 7

This question assessed knowledge of muscles, the properties of collagen and elastin in the context of tendons and ligaments and candidates were asked to determine a ratio using the gradients of the lines on a graph. As the penultimate question on the paper, the level of difficulty increased and candidates found all but 7bii quite challenging.

7ai This questions was assessing the features of fast-twitch muscles when compared to slow-twitch muscles. Often candidates talked about features that were not present rather than those that would be present and were prevented from gaining higher marks because their response was not comparative.

The response below is an example of one that gained full marks as although they referred to features not present, their answer also refers to the features that are.

Fast twitch muscle fibres have less mitochondria and less capillary network, to facilitate anaerobic respiration. It has more sarcoplasmic reticulum so more calcium ions can be released during contraction. Have high glycogen content so that it can readily be converted to glucose.

7aii Many candidates struggled to use the data to explain their answer although many were able to identify that epigenetic modification or differential gene expression may be involved.

The response below is an example of one that gained full marks.

by differential gene expression. ✓ Epigenetic modification takes place and genes coding for myosin switched on by process such as DNA demethylation. Then transcription for myosin takes place and pre mRNA is formed but spliceosomes remove introns and ~~up~~ arrange exons in different order so post transcriptional modification takes place to produce mRNA which codes for different forms of myosin such as M2, M1 and M4. These mRNA are translated to produce these proteins to bring permanent change to muscle cells. For fast-twitch muscles M_2, M_1 and M_4 myosin proteins will be produced while for slow twitch M7 myosin will be produced.

7bi Many candidates struggled with this calculation and there were many blank responses. Some struggled to read the correct data from the graph or only calculated the gradient of one of the slopes. The mark scheme allowed for some leeway in reading of the data from the graph.
The response below scored all marks on offer.

(i) Calculate the ratio of the slopes for elastin and collagen. (2)

elastin : collagen.

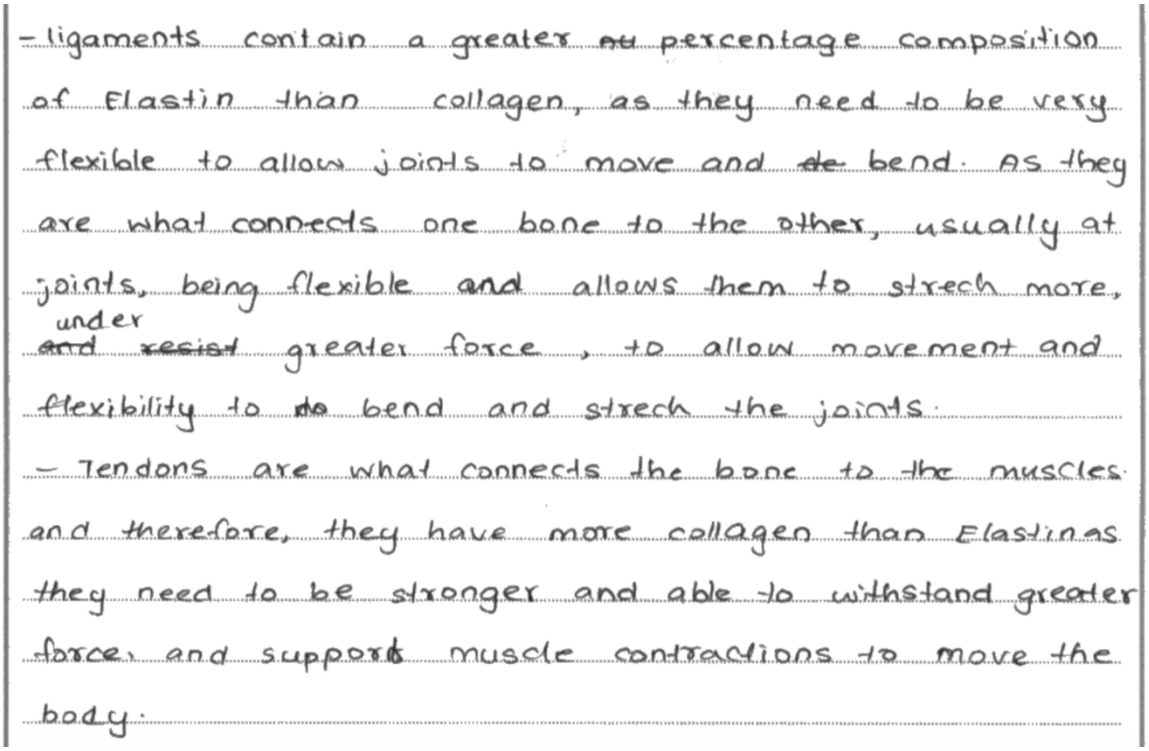
$\frac{\cdot 9}{0.8} : \frac{0.8}{0.4}$

: 1

11.3

Answer 11.3 :1

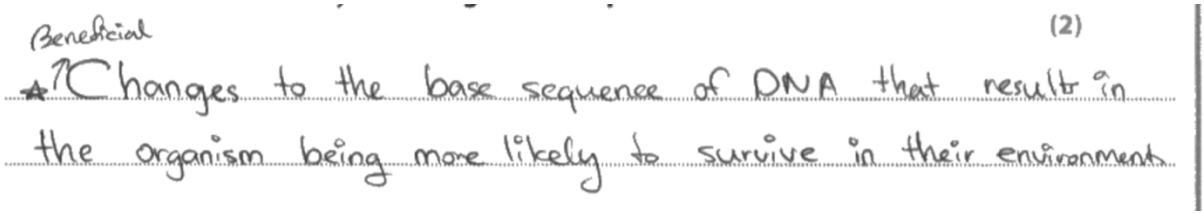
7bii This was often well answered with candidates successfully using the data provided and relating it to the function of ligaments and tendons. Some got confused when trying to use the data, but many could successfully name the function of at least one of a tendon or a ligament.


- ligaments contain a greater ~~an~~ percentage composition of Elastin than collagen, as they need to be very flexible to allow joints to move and ~~de~~ bend. As they are what connects one bone to the other, usually at joints, being flexible and allows them to strech more, under and ~~resist~~ greater force, to allow movement and flexibility to ~~do~~ bend and strech the joints.
- Tendons are what connects the bone to the muscles and therefore, they have more collagen than Elastin as they need to be stronger and able to withstand greater force, and support muscle contractions to move the body.

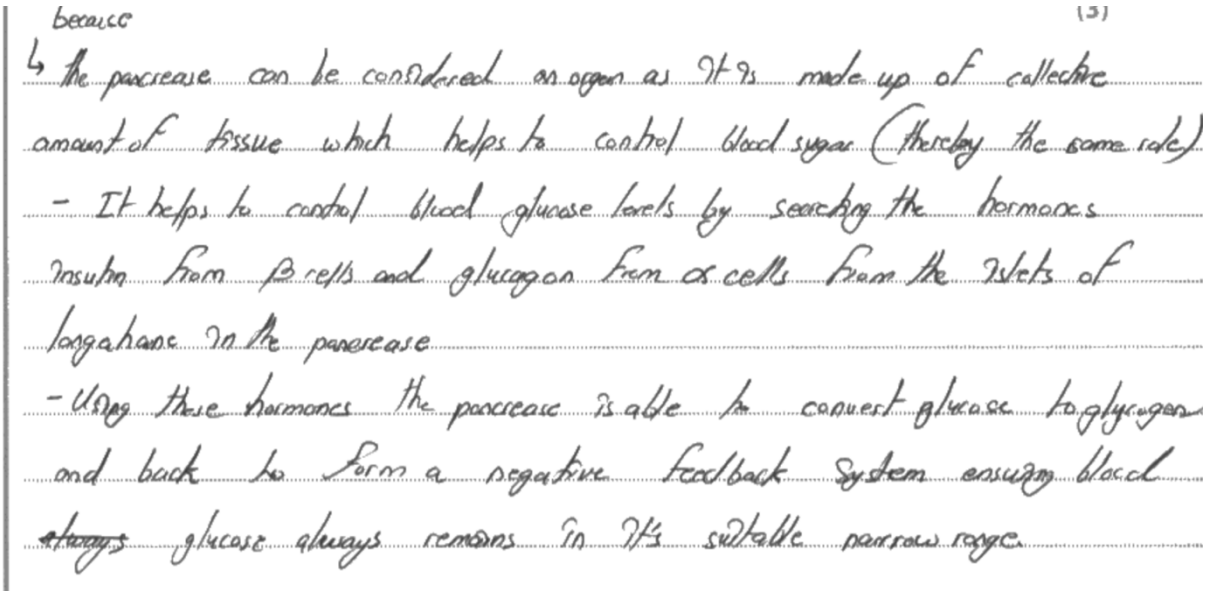
Question 8

As previously mentioned, many candidates had prepared well for this section of the paper but responses were varied throughout. The last three items were challenging for candidates but this might also be partly because candidates were running short on time.

8a Candidates were asked to describe what is meant by genetic adaptations in the context of the article. Credit was not given for the use of the words genetic or adapted but many could define these words and some good responses were given, such as that below.

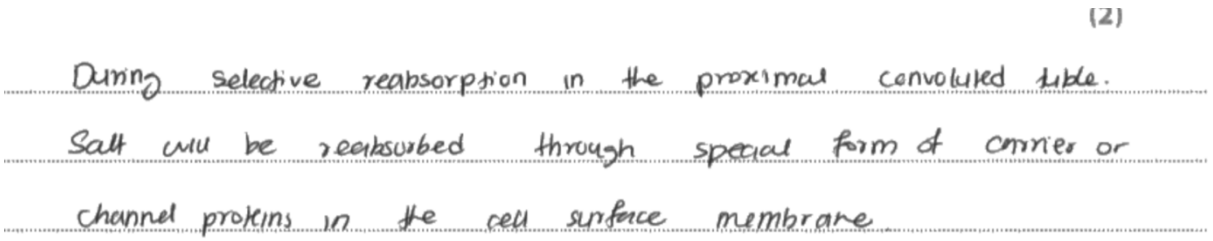

Beneficial (2)
* Changes to the base sequence of DNA that results in the organism being more likely to survive in their environment

8b Many candidates missed the aim of this question which was to use the context of the article to explain the role of the pancreas as an organ. There were many descriptions of blood glucose control but this only enabled candidates to gain one or two marks. The response below is an example of one scoring full marks.



8c In this question, candidates had to apply their knowledge of the areas of the nephron that would be involved in selective reabsorption. Many were able to successfully name a region of the nephron and/or identify that selective reabsorption was used but there were relatively few references to active transport.

The response below gained full marks.



8d Candidates were required to explain epigenetic modification and how it could affect gene transcription. Many could identify the mechanism taking place and the implications on gene expression but there was often confusion or a lack of understanding as to how this related to the histones associated with the DNA. There were some very detailed responses such as the one illustrated here.

↳ the DNA transcription is affected by epigenetic modifications
↳ the DNA methylation adds a methyl group to the cytosine that appears next to a guanine.
↳ methylation is associated with gene silencing as the addition of the methyl group prevents binding of transcription factors to the region of DNA / gene.
↳ Histone modifications such addition of a methyl group to one of the lysines in histones causes the chromatin structure to close becomes super coiled, giving a heterochromatin structure which prevents transcription that gene and hence is silenced.

8e Candidates were able to suggest the mechanism by which bats could prevent blood clotting and there were some good responses suggesting how the blood clotting mechanism could be stopped.

[2]
→ anticoagulating substances / chemicals were present in their saliva · so the blood clotting was prevented by the ~~absence of~~ inhibition of thromboplastin so can't convert inactive prothrombin to thrombin.

8f This should have been a fairly straight forward question on natural selection but there was occasional confusion where candidates identified that it was the pathogens adapting to the environment instead of them providing the selection pressure. Care should be given with the use of the terms alleles and genes.

(3)

~~This~~ The pathogens would act as a selection pressure to mammals, which causes ~~the~~ mammals with weaker immune systems to die and mammals with mutations that cause stronger immune system to survive. These mammals live longer and reproduce, ~~with~~ passing down the ~~genes~~ alleles for the advantageous immune system to offspring.

8g There were many suggestions for the role of interferons but we were holding out here for the role of interferons in preventing viral replication in host cells specifically. There were quite a few blank responses in this question, indicating that candidates may have been running out of time.

(2)

* Interferons are released from virus infected cells. The ~~might a~~ will attach to healthy cells so that viruses cannot attach to them.

8h This question was often well answered but some candidates were prevented from gaining maximum marks because they did not fully explain the use of microarrays, bioinformatics and DNA profiling. These terms needed to be clearly explained in the context of the question, as shown below.

* use microarray to identify which genes are active.
* use restriction endo nuclease and Flourecent dye to split ~~the~~ genes.
* use PCR to amplify the DNA.
* use bio informatics to observe ~~the~~ and identify which genes drive bats to 20-30 years life spans.
* compare with bats that dont have ~~with~~

SUMMARY

A few suggestions for improving candidate performance are given below.

- candidates need to have time study the article, and focus on novel words.
- candidates need to refer to the command word used in the question and focus their answer in an appropriate manner. Appendix 7 in the specification lists all the command words and their meaning. This is particularly true for explain and describe as command words.
- in level based questions, all of the diagrams and graphs need to be used as well as relevant knowledge and understanding.
- in calculations it is better to show the workings as well as an answer as if the answer is incorrect candidates may gain some credit for correct working.
- care needs to be taken in the interconversion of units – eg cm^3 to dm^3, and mm to μm.
- in calculations care, needs to be taken to ensure that the answer is in the required format eg. two significant figures, standard form and the number of decimal places.
- candidates must ensure that their responses are legible. There was a clear increase in writing that was very difficult to read.
- If a candidate puts part of an answer in a place somewhere else on the paper it is vital that the candidate indicates this and give some idea where the extra response is to be found.
- many 'suggest' questions refer to novel situations. Candidates need to use knowledge from the specification and apply it to this situation in specific terms rather than in generalisations.
- The context of the question is key to attaining full marks – often candidates answer gives no link to their explanation and the context of the question e.g. 3biii where candidates made descriptions of the nephron but did not make their answer appropriate for the question. 8h where often there was no relation of their answer to the 20-30 year lifespan of bats.