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Examiners' Report
Principal Examiner Feedback

Summer 2025

Edexcel AS Level GCE In Biology A Salters Nuffield (8BN0) Paper 01: Lifestyle, Transport, Genes and Health

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Introduction:

This paper tested the knowledge, understanding and application of material from the topics 'Lifestyle, health and risk' and 'Genes and health'.

The range of questions provided ample opportunity for candidates to demonstrate their grasp of these topics and apply their knowledge to novel contexts.

The questions on this paper yielded a wide range of responses and some very good answers were seen. The paper appears to have worked very well with all questions achieving the full spread of marks.

There were some straightforward questions that yielded high marks across the ability range and some more challenging questions that discriminated well. The utilisation of qualitative and quantitative data showed an improvement from past exam series.

There was a significant improvement in the quality of responses to the question requiring an investigation to be devised.

As previously, questions that required recall of knowledge were generally well answered, as were the majority of the calculation questions.

Q01bii
This question asked candidates to give three differences between the process of DNA replication and the process of DNA transcription.
It was clear that many candidates had a good understanding of both processes, with many excellent answers gaining full marks.
It was pleasing to see most responses showed good examination technique, writing comparative statements in their answers.
The most common errors made by candidates were to confuse transcription with translation or to refer to nucleotides without making it clear whether they were DNA or RNA nucleotides.

Q02ai
This question asked candidates to state one role of ATP in the movement of molecules through a component labelled T on the diagram provided.
It was expected that candidates would use the information in the diagram to support their answer.
Most candidates were able to deduce that component T was involved in active transport and that the ATP was the source of energy to move the glucose molecules against the concentration gradient. A pleasing number made reference to ATP facilitating a change in shape of the transport protein.
A small number of candidates incorrectly referred to facilitated diffusion.

Q02aii
This question asked candidates to describe how ions enter the cell through the component labelled P on the diagram.
As with Q2ai, it was expected that candidates would use the information in the diagram to support their answer.
A small minority referred to active transport or simple diffusion which were not credit worthy.
Most candidates could correctly describe facilitated diffusion of the ions down the concentration gradient.

Q02bi
This question asked candidates to name the process by which water molecules pass between phospholipids to enter or leave a cell.
Most candidates gave the correct answer of osmosis.

Q02bii
This question asked candidates to explain why the phospholipids labelled Q and R in the diagram had different shapes.
Candidates are reminded of the importance of the command word. Answers which describe without reasoning cannot gain full marks if the command word is ‘explain’.
Most candidates could recognise that Q represented a saturated phospholipid, and that R was an unsaturated phospholipid, but fewer could explain that this was due to the difference in fatty acids.
Most candidates could explain why a carbon-to-carbon double bond would cause a kink and therefore gained the second marking point.

Q02biii
This question asked candidates to predict the effect of increasing the proportion of the phospholipid labelled S on one of the properties of this cell membrane.
This question expected candidates to recall at least one property of a cell membrane and then make a prediction as to the effect of increasing the proportion of phospholipids with two unsaturated fatty acid chains.
Some candidates could not recall details about the properties of a cell membrane, with some using terminlonogy more relevant to properties of the cell wall. Others what would happen to the rate of diffusion.
Some incorrectly referred to a decrease in the fluidity of the cell membrane.

Q03ai
This question asked candidates to state what is meant by the terms genotype and phenotype.
Most candidates could correctly define what is meant by the term phenotype, but fewer could correctly define the term genotype.
The most common error was to use the term 'gene' incorrectly.

Q03aii
This question asked candidates to explain the type of inheritance shown in the diagram provided.
Most candidates could recognise that the diagram showed co-dominance, but some candidates did not develop their answer into an explanation.

Q03b
This question asked candidates to draw a genetic diagram to find the expected ratio of the phenotypes of the offspring of two chickens that were white with black flecks.
It was expected that candidates would use the genotype BW as provided in the diagram.
Most candidates correctly identified that the parents would both be BW and were able to complete a genetic diagram. Most responses showed a correctly completed Punnet square which gained two marks.
It is important that candidates read the question carefully, with many candidates not giving the relevant **named** phenotypes to accompany their ratios.

Q04a
This question asked candidates to calculate the volume of purple-sprouting broccoli extract that would provide 85 mg of vitamin C.
An expected maths skill is the ability to correctly convert units. It was disappointing that a significant number of candidates could not convert mg to µg or cm^3 to dm^3.

Q04b
This question asked candidates to devise an investigation to test the given hypothesis and collect valid data.
Most candidates were able to devise a suitable investigation to test the vitamin C content of broccoli, with most describing a DCPIP titration correctly.
Higher level responses gave additional details which would allow the collection of valid data, for example the control of both biotic and abiotic variables.
The highest-level responses were able to access the fifth marking point by taking into account the need to compare vitamin C content with that of uncooked broccoli and then finding out which method decreased the vitamin C content the most.

4c
Most candidates were able to correctly state what is meant by a negative correlation between vitamin C intake and the risk of coronary heart disease. Some candidates thought it meant that vitamin C intake had no effect on the risk of coronary heart disease.

5ai
Most candidates were able to draw a suitable line on the graph to show the pressure changes in the right ventricle.
A small minority did not answer this question; it is important that candidates look for mark allocations and not just answer lines.

5aii
Most candidates were able to correctly calculate the heart rate of 75 beats min^{-1}.

5aiv
This question asked candidates to explain what is causing the change in pressure in the left ventricle during two time periods.
It is important that candidates take careful note of the command word, descriptions of the data were not sufficient.
Most knew that blood was entering the ventricle between 0 to 0.08 seconds, with most able to give a correct explanation using the correct terminology.
Most knew that the ventricle muscle wall was contracting between 0.16 to 0.3 seconds, but some answers lacked the correct terminology.
Contractions of ventricle wall without reference to either the muscle, or systole was not a sufficiently detailed explanation.
Fewer candidates could explain that the pressure was increasing due to a decrease in ventricle volume.

5bi
Most candidates could explain that the patient might need the treatment due to the need to widen the lumen of the artery after it had been narrowed. Fewer candidates could give the explanation that this increased oxygenated blood supply would allow the cardiac muscle to contract or respire aerobically, therefore reducing the risk of a heart attack.

Some candidates referred to a reduction in risk of a stroke, which was not creditworthy as the context was for a coronary artery.

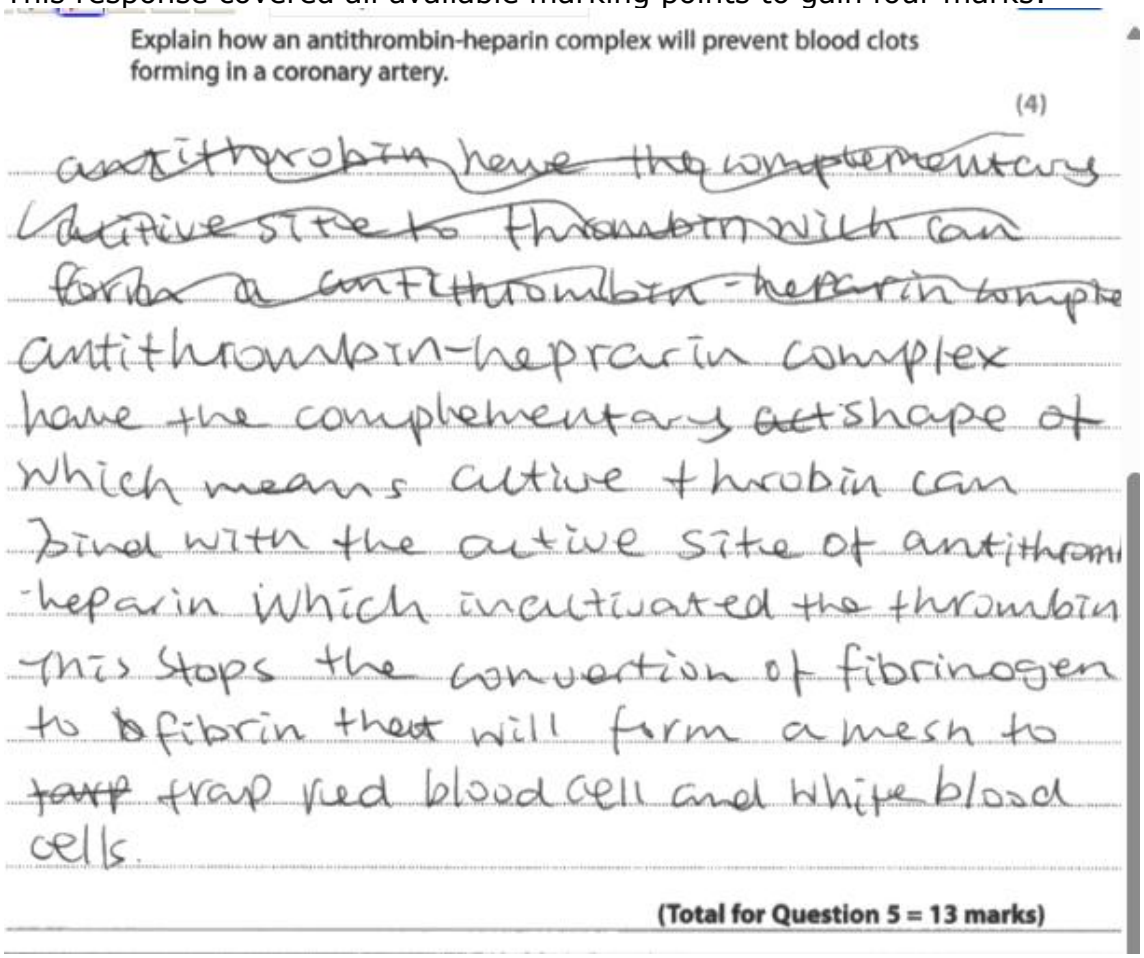
Q05bii

This question asked candidates to explain how an antithrombin-heparin complex will prevent blood clots forming in a coronary artery.

It was clear that most candidates had a good knowledge of the blood clotting cascade, with many detailed descriptions of the process seen. However, fewer were able to apply this knowledge to the given context to explain why inactivated thrombin would prevent formation of a blood clot.

Some candidates did not make use of the diagram or the information provided, which limited the awarding of the first three marking points.

This response covered all available marking points to gain four marks:



Explain how an antithrombin-heparin complex will prevent blood clots forming in a coronary artery.

(4)

antithrombin have the complementary active site to thrombin which can form a antithrombin-heparin complex antithrombin-heparin complex have the complementary shape of which means active thrombin can bind with the active site of antithrom heparin which inactivated the thrombin this stops the convertion of fibrinogen to fibrin that will form a mesh to trap red blood cell and white blood cells.

(Total for Question 5 = 13 marks)

Q06aii

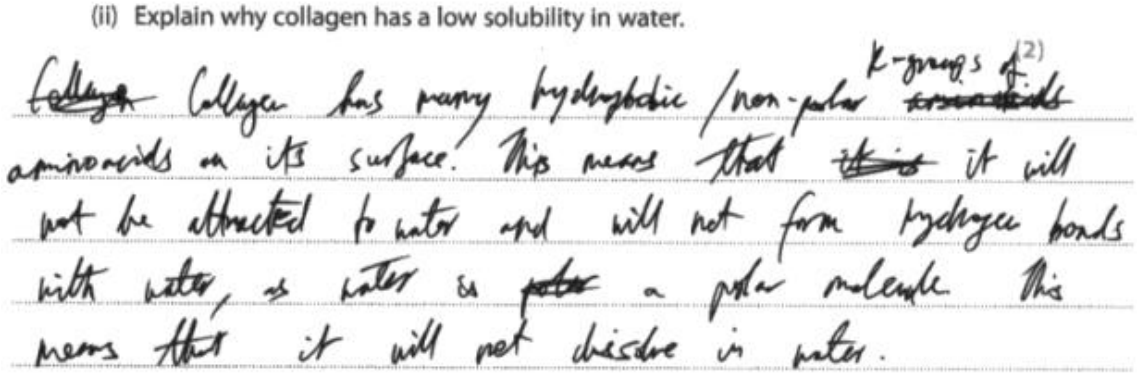
Most candidates knew that collagen is a fibrous protein and therefore gained the first marking point.

Fewer were able to give the higher level of detail required by the other marking points. A significant number of candidates described it being a polypeptide without giving the required detail of the number of

polypeptide chains or the hydrogen bonds between them. Very few mentioned the the triplets of amino acids.
Some incorrectly referred to the properties of collagen and not its structure.

6bi
Most candidates could give a different property of collagen, with high tensile strength being the most common.
Unfortunately, some candidates did not read the question carefully and gave the property of low solubility despite having been told it had low solubility in water and being asked to give one other property.

6bii
Most candidates could explain that collagen had either non-polar regions or hydrophobic regions. However fewer candidates could give the additional detail of this being due to the arrangement of certain amino acids or R groups on the surface of the molecule. The more detailed explanations considered the lack of hydrogen bond formation between collagen and water, for example:


(ii) Explain why collagen has a low solubility in water. (2)

~~Collagen~~ Collagen has many hydrophobic / non-polar ~~amino acids~~ R-groups of amino acids on its surface. This means ~~that~~ it will not be attracted to water and will not form hydrogen bonds with water, as water is ~~polar~~ a polar molecule. This means that it will not dissolve in water.

6c
Most candidates were able to identify a correct difference between intracellular and extracellular enzymic action, but fewer were able to use appropriate terminology for a similarity.
For example, a response which mentioned that both involve enzymes colliding with a substrate was an insufficient response as not all collisions are successful, whereas a response which referred to both enzymes being able to form an enzyme-substrate complex gained the first marking point.
It was pleasing to see that some candidates recognised that not all enzymes break down substrates, with specific mention of both anabolic and catabolic reactions.

6di
Most candidates were able to interpret the information shown in the graph correctly to give at least one creditworthy conclusion.
The most common conclusion was either chemical C being the most effective or that chemical A was least effective. Some responses gave both of these conclusions.

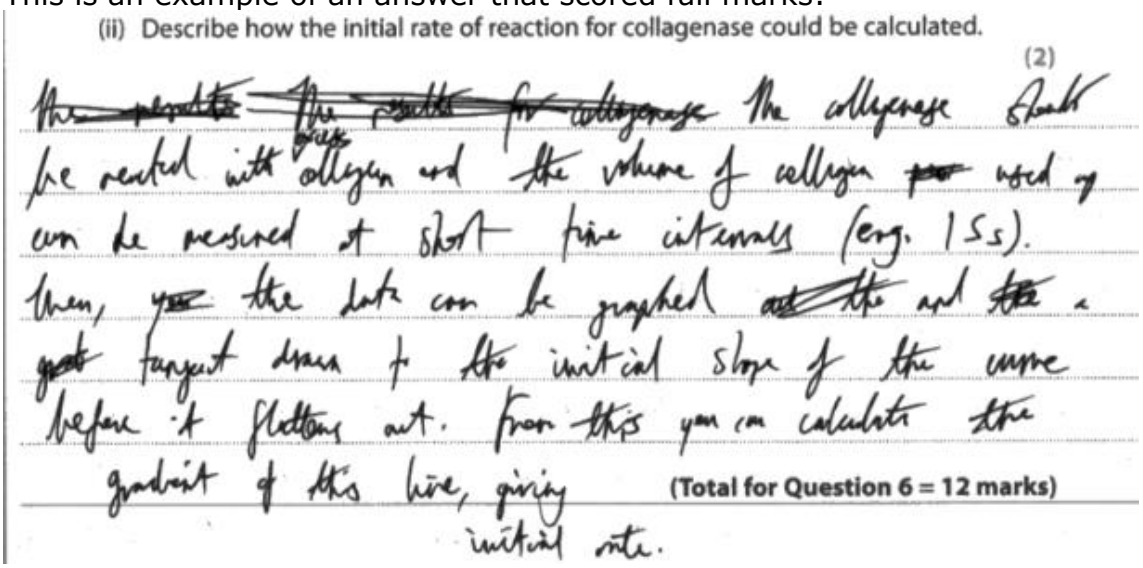
Fewer candidates considered the effect of increasing chemical concentration. It is important that candidates considered the effect of each variable changed in an investigation.

Q06dii

This question asked candidates to describe how the initial rate of reaction for collagenase could be calculated. Few candidates recognised that a different investigation would need to be carried out and therefore the first two marking points were less commonly awarded.

The majority of candidates knew that a tangent should be drawn, or a line gradient should be calculated but did not recognise that this should be done at the start of the line on the graph to calculate the initial rate of reaction.

This is an example of an answer that scored full marks:


(ii) Describe how the initial rate of reaction for collagenase could be calculated.

(2)

~~The results for collagenase~~ the collagenase should be reacted with collagen and the volume of collagen ~~you~~ used can be measured at short time intervals (eg. 15s). then, ~~you~~ the data can be graphed ~~out the~~ and ~~the~~ a ~~good~~ tangent drawn to the initial slope of the curve before it flattens out. From this you can calculate the gradient of this line, giving initial rate.

(Total for Question 6 = 12 marks)

Q07a

Most candidates could give a basic explanation that the *Daphnia* needs a heart to transport oxygen and other required substances to cells. Some explained why these cells required these substances or that diffusion could not supply enough oxygen.

The most common error was stating that the *Daphnia* had a large surface area to volume ratio or referring to the small volume or surface area of the *Daphnia*.

Q07bi

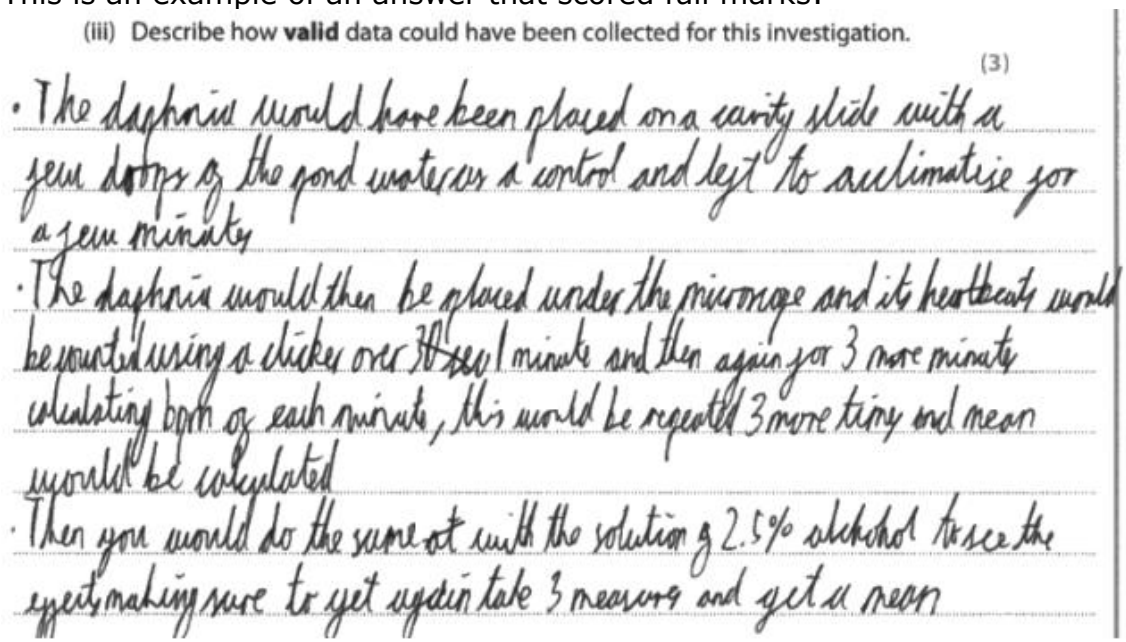
This question was answered very well by most candidates, with varying different features and appropriate corresponding explanations seen. The most common centred around the transparent surface meaning the heart was visible.

Some candidates explained that the Daphnia was an invertebrate, which was creditworthy for the first marking point, but then stated that this meant that it would not feel any pain, which was not creditworthy.

Some high-level responses explained that the alcohol could be absorbed though the surface of the aquatic organism.

Q07bii
Some candidates knew what a suitable control solution would be, with all of the aspects in the additional guidance of the mark scheme seen. However, there were a significant number of candidates which confused this with a controlled variable, with responses such as the volume of solution or age of the *Daphnia* seen.

Q07biii
This question asked candidates to describe how valid data could have been collected for the given investigation.
Most candidates were able to identify at least one variable that should have been controlled in the investigation.
Some candidates recognised that the data would only be valid if the measurement of the dependent variable was accurate, and either described a method to ensure the correct heart rate was counted or described the need to allow time for acclimatisation. The higher-level responses considered both aspects.
This is an example of an answer that scored full marks:



(iii) Describe how **valid** data could have been collected for this investigation.

(3)

- The daphnia would have been placed on a cavity slide with a few drops of the pond water as a control and left to acclimatise for a few minutes
- The daphnia would then be placed under the microscope and its heartbeats would be counted using a clicker over 30 sec/1 minute and then again for 3 more minute calculating both of each minute, this would be repeated 3 more time and mean would be calculated
- Then you would do the same set with the solution of 2.5% alcohol to see the effect, making sure to get again take 3 measures and get a mean

Q07biv

The majority of candidates could describe the decrease and then increase of the heart rate after the *Daphnia* was placed into the 2.5% alcohol solution. Some candidates gave explanations as to why the heart rate was increasing which were not needed for this question.

Most candidates recognised that the heart rate did not return to the control heart rate. Fewer candidates could correctly describe the significance of the non-overlapping SD bars.

This is an example of an answer that scored full marks:

(iv) Comment on the effect of alcohol on the heart rate of *Daphnia*.

(3)

Between 2 - 3 minutes the heart rate of the Daphnia increased due to prolonged exposure to the alcohol, the longest exposure to the alcohol (at 4 minutes, showed the highest heart rate at 215 beats per minute. However, at 1 minute (the lowest exposure to alcohol) the second highest heart rate is shown, possibly because the daphnia wasn't given time to acclimatise. When compared to the control, it is seen that alcohol decreases the heart rate of the Daphnia overall but prolonged by very little exposure causes it to increase again slowly. There is also significant differences between the data as the error bars do not overlap. **(Total for Question 7 = 12 marks)**

Q08aiii

This question required candidates to analyse the diagram of the two alveoli to identify why severe emphysema could result in hypoxia.

Some candidates described changes to the bronchiole and not the alveolus which were not sufficient.

Most candidates could explain that it could result in hypoxia due to reduced diffusion of oxygen or reduced gas exchange, but fewer candidates could correctly explain that this was due to a reduced surface area of the alveolus. Some candidates referred to a reduced volume which was insufficient.

This is an example of an answer that scored full marks:

Explain why severe emphysema could result in hypoxia. (2)

As people with emphysema have less surface area for oxygen to diffuse across, they have a lower rate of gas exchange, this would cause low oxygen concentrations in the blood, which can cause hypoxia.

Q08b

This question required candidates to read off a percentage increase value from the graph at 500 hours of training, calculate the mass of haemoglobin before training and use these values to calculate the total mass of haemoglobin in an athlete.

Some candidates did not calculate the mass of haemoglobin before training, failing to multiply body mass by 13.1. Instead, they calculated a 6.8% increase of 13.1 g. Some candidates did calculate the correct increase in haemoglobin but did not add this to the mass of haemoglobin at the start.

It is important that candidates read the instructions carefully, as many candidates did not convert their answer to kg nor give their answer to two significant figures.

This is an example of an answer that scored full marks:

Give your answer in kilogrammes to **two** significant figures. (3)

70·8kg

13·1g Per 1kg

70·8 x13·1 = 927·48g of haemoglobin

6·8% increase

927·48 x1.068=990.54864g ÷1000

0·99054864

0·99

0·99 kg

Q08c
This question required candidates to analyse the given data, both qualitative and quantitative to explain the advantages and disadvantages for mountain climbers of carrying an oxygen supply. It was pleasing to see that nearly all candidates wrote lengthy answers to this question.

It was clear that most candidates analysed the given information carefully, with correct comments made of the effect of altitude on the saturation of hemoglobin and the side effects that this would cause which enabled them to be awarded marks at level one.

Candidates' explanations of the disadvantages were usually more detailed than the advantages, with the majority of candidates able to identify at least one disadvantage and use relevant scientific knowledge in their supporting explanation, in addition to a basic consideration of advantages, to achieve level two.

Although candidates recognised that carrying an oxygen supply would be advantageous, they did not always explain the advantages in their answer directly. Some candidates inferred the advantages in their comments of the effect of altitude on the saturation of hemoglobin, but in a reverse argument approach which was not suitable to achieve a higher level. Some higher-level responses explained the effect on concentration gradients between the alveolar air and the blood, as well as between the blood and respiring cells. Some referred to the resulting impact on rate of diffusion using Fick’s Law and the rate of aerobic respiration.

This is an example of a level three response:

Explain the advantages and disadvantages for mountain climbers of carrying an oxygen supply.

Use all of the information in Question 8 and your own knowledge to support your answer.

(6)

· Advantages of carrying an oxygen supply can be that there will be higher oxygen concentration for a higher percentage of haemoglobin in the aorta combined with oxygen

· Partial pressure of oxygen at 5 800 m / kpa decreases from 12·5 to 6 by 6·5 kpa in the alveoli and by 7·5 in the arterial blood

· This will lead to less oxygen available for aerobic respiration and leads to an increase in anaerobic respiration, therefore an increased production of lactic acid causing fatigue

· A partial pressure of oxygen at 5 800 m/kpa will also decrease percentage of haemoglobin combined with oxygen in the aorta from 98·8% to below 82%

· Disadvantages of carrying an oxygen supply can be that it can add weight from 3·5 to 7kg

· This can lead to more force needed to carry the supply and therefore more oxygen needed for muscles in aerobic respiration for energy

· Therefore it is best to carry the oxygen supply for a higher quantity of oxygen

(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 80 MARKS

Paper summary

Based on their performance on this paper, candidates are offered the following advice:

- Read the whole question carefully, including the introduction, to help relate your answer to the context. You should take into account the command words as well as all of the context given. Answers which do not match the command words or do not relate to the given context will not gain high marks.
- Ensure you are familiar with the mathematical skills listed in the specification, especially unit conversion and significant figures.
- Ensure you use the correct technical names and terms in your answers.
- Apply your practical skill knowledge to given contexts.

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