Examiners' Report/
Lead Examiner Feedback

June 2018

BTEC Level 3 Nationals in Sport and Exercise Science
Unit 1: Sport and Exercise Physiology (31813H)

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Grade Boundaries

What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade (Distinction, Merit, Pass and Near Pass). The grade awarded for each unit contributes proportionately to the overall qualification grade and each unit should always be viewed in the context of its impact on the whole qualification.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark should be for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each test we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each test, because then it would not take into account that a test might be slightly easier or more difficult than any other.

Grade boundaries for this, and all other papers, are on the website via this link: qualifications.pearson.com/gradeboundaries

Unit 1: Sport and Exercise Physiology (31813)

Grade	Unclassified	Near Pass	Pass	Merit	Distinction
Boundary Mark	0	13	24	35	47

Introduction

This was the second test series of the new specification. Centres and learners should be congratulated on their preparation for this assessment. Overall learners appeared well prepared and well versed on many of the specification topics covered in this assessment.

The question paper followed the general format identified in the sample assessment material and the summer 2017 series. The main difference being the reduction in marks available for the extended responses, reduced from 10 marks to 8. As previously, the paper was split into four questions. Each question was based on a sport or exercise scenario and required learners to demonstrate knowledge and understanding of a range of specification topics and apply this knowledge to the specific question scenario. Three questions were marked out of 18 marks, and one out of 16 marks, 8 marks being gained for the final part of each question where an extended response was required.

Each of the extended response questions were marked using a 'levels based' approach to assessment where the overall quality of the response was considered rather than the specific number of facts stated, although this obviously had a bearing on the quality of the response. The remainder of the questions on the paper were assessed using a traditional point's based approach, where a mark was given for each appropriate point. More detail can be found below in the individual question section of the report.

Introduction to the Overall Performance of the Unit

Learner performance varied throughout the paper. Whilst the extended response questions were challenging most learners gained some marks for these questions. The style of the assessment is challenging due to the depth and breadth of knowledge required to fully address the demands of the paper. The extended response questions account for 45% of the paper, each question demanding depth of knowledge, but across the paper this also requires breadth as each of these questions examines different areas of the specification.

The assessment is also challenging due to the need to apply knowledge not only in the extended response questions but also the 'points-based' questions, for example, Q01c; Q02b; Q03b and Q04c. There are limited instances within each question were only recall of knowledge is required, for example, Q01a; Q02a and Q04a therefore raising the demand on the learner.

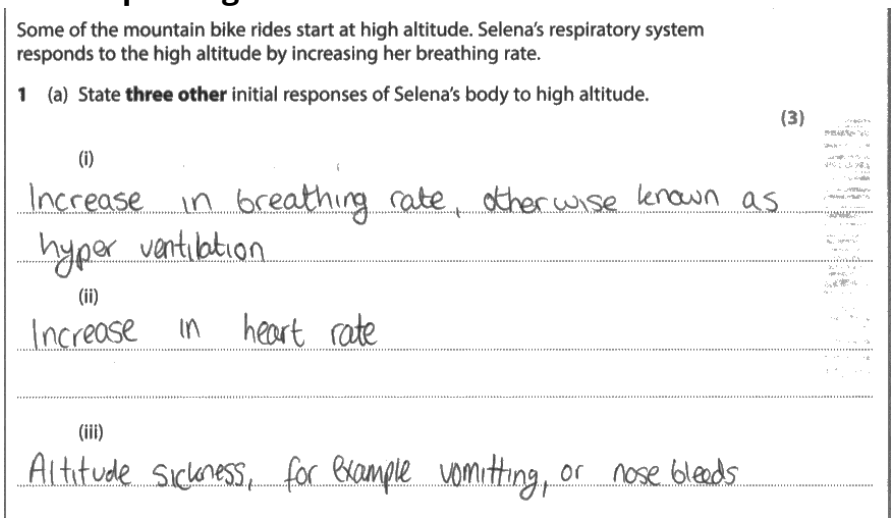
Individual Questions

The following section considers each question on the paper, providing examples of popular learner responses and a brief commentary of why the responses gained the marks they did. This section should be considered with the live external assessment and corresponding mark scheme.

Q 1(a)

Learners are told that one response to high altitude is an increase in breathing rate. They were then asked to state three other initial responses of the body to high altitude. Most learners accurately identified one or two responses to high altitude. Popular correct responses linked to altitude sickness, or a symptom of it, or increase in heart rate. Popular incorrect responses repeated the example given in the question (increased breathing rate); cited adaptations to high altitude or gave responses to exercise which could not be credited (unless these were the same as responses to high altitude).

This response gained 2 marks



Some of the mountain bike rides start at high altitude. Selena's respiratory system responds to the high altitude by increasing her breathing rate.

1 (a) State **three other** initial responses of Selena's body to high altitude.

(3)

(i)

Increase in breathing rate, otherwise known as hyper ventilation

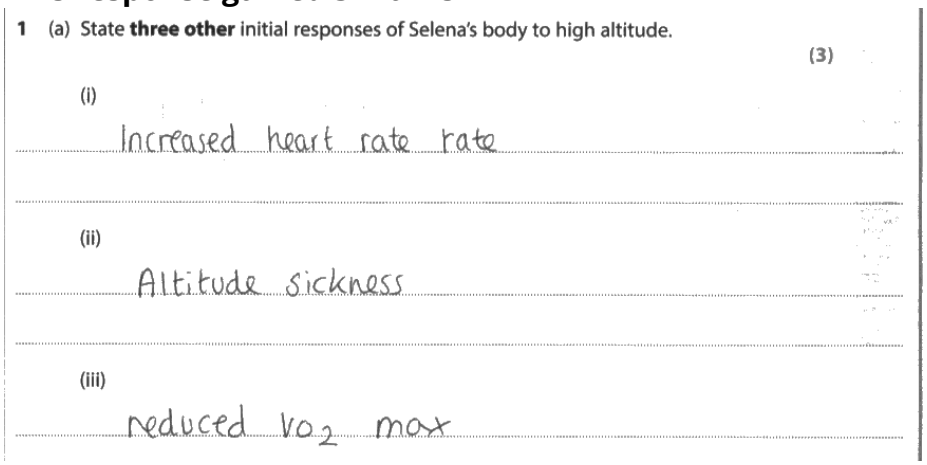
(ii)

Increase in heart rate

(iii)

Altitude sickness, for example vomitting, or nose bleeds

This response gained 3 marks



1 (a) State **three other** initial responses of Selena's body to high altitude.

(3)

(i)

Increased heart rate rate

(ii)

Altitude sickness

(iii)

reduced VO_2 max

Q 1(b)

This part of the question asked learners to explain why the body would respond by increasing breathing rate. Popular incorrect responses referenced 'thinner air' rather than using appropriate technical language, for example, lower partial pressure of oxygen or even that there was less oxygen available.

This response gained 2 marks

(b) Explain why Selena's respiratory system responds to high altitude by increasing her breathing rate.

(3)

Selena's respiratory system responds to high altitude by increasing her breathing rate because, the air is thinner at high altitude (2400m), lower partial pressure so breathing rate increases to get the same amount of oxygen in at a higher altitude to a low altitude. so the body can work just as efficient.

'Thinner air' was not credited as lacked required technical language. To access all three marks learners needed to identify that there was a lack of available oxygen at altitude due to a lower partial pressure of oxygen so breathing rate increased to compensate for this.

This response gained 3 marks

(b) Explain why Selena's respiratory system responds to high altitude by increasing her breathing rate.

(3)

Because at altitude there is a lower partial pressure of oxygen, meaning that less oxygen is taken in per breath. therefore to counteract this and supply the body with the oxygen it needs more breaths need to be taken.

This happens as chemoreceptors detect a lack of oxygen in the body and send a message to the medulla oblongata to speed up breathing rate.

All required elements were present in this response, lower partial pressure of

oxygen, therefore less oxygen available per breath so breathing rate increases to compensate for this.

Q 1(c)

This question asks learners to explain why carbohydrate drinks and water would be given during a six-hour bike ride.

It is critical learners read all the information given to them in a question and the question introduction as this will be there to help the learner. For example, a critical piece of information was that the bike ride was six hours long.

Two marks were available for each part of the question. To gain both marks learners needed to identify why the particular drink was given and then explain the reason why this was necessary. For example, carbohydrate drinks for energy and that the energy was required as there are insufficient stores in the body to last the six hours. Most learners gained at least two marks for this question. Answers tended to be incomplete rather than incorrect, i.e. learners appreciated that carbohydrates provided energy but did not then link this to the question context, that it was required due to stores only lasting two hours. Of the two drinks the reason for taking on water was more readily applied by learners.

This response gained 3 marks

Day one of the mountain bike ride takes six hours to complete.

All the cyclists in Selena's group are given carbohydrate drinks and water to take with them on the ride.

(c) Explain why the cyclists are given each type of drink.

(4)

(i) Carbohydrate drink

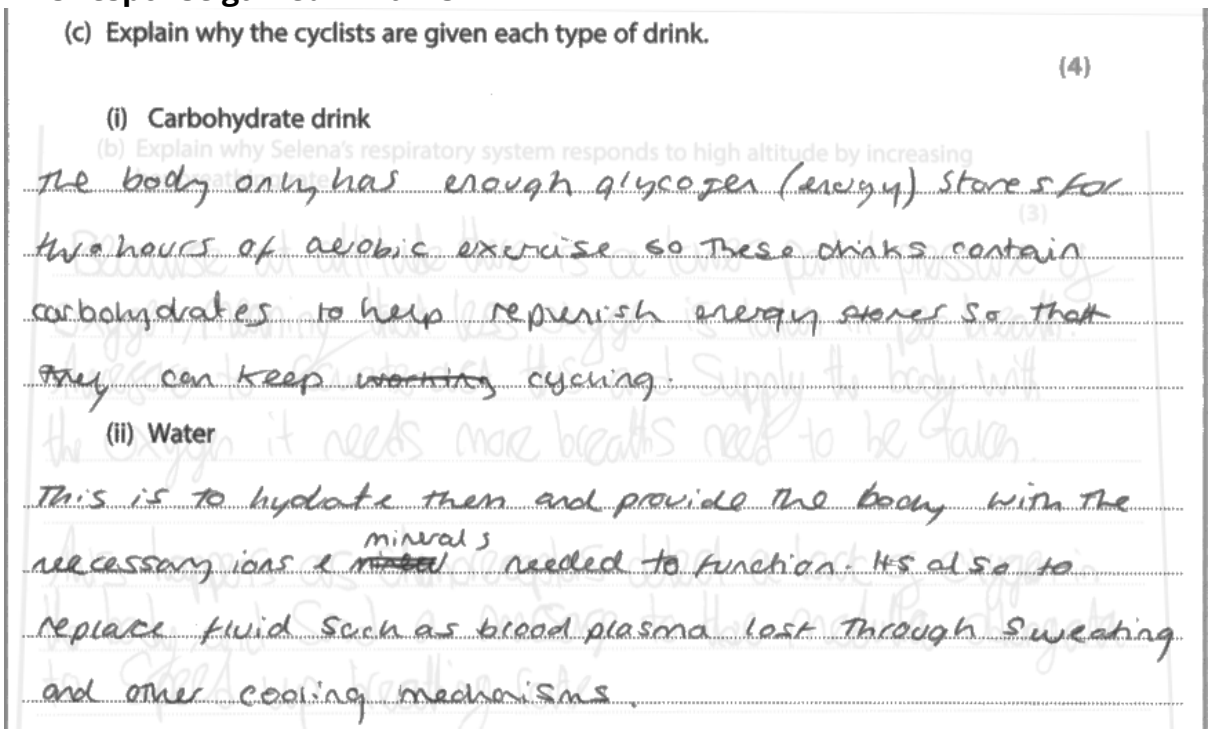
The carbohydrates will be used for boosting the performers energy levels, this done by the body breaking down glucose in the drink and turning it into glycogen to reduce the energy expenditure.

(ii) Water

This is to keep the athlete hydrated as they will constantly be sweating due to the demands of the race, it's given to them to try and prevent exhaustion.

The 'missing element' in this response was the reason why it was necessary to take on additional sources of carbohydrate during the long race.

This response gained 4 marks



(c) Explain why the cyclists are given each type of drink.

(4)

(i) Carbohydrate drink

The body only has enough glycogen (energy) stores for two hours of aerobic exercise so these drinks contain carbohydrates to help reperish energy stores so that they can keep ~~working~~ cycling.

(ii) Water

This is to hydrate them and provide the body with the necessary ions & ~~water~~ minerals needed to function. It's also to replace fluid such as blood plasma lost through sweating and other cooling mechanisms.

Q 1(d)

This was the first of four extended questions on the paper.

This question asked learners to evaluate the impact of the body's adaptations to excessive heat on performance.

Responses to extended answer questions are marked using levels based mark schemes; the quality of the response determining the level. There are four levels; level 0 where there is no rewardable material presented and then levels 1, 2, 3; the higher the level the greater the quality of the response.

To address this question, learners should have identified adaptations to excessive heat, demonstrated how these adaptations would be used within the bike ride and then evaluate the impact of them. For example, they might have identified that there was earlier onset of sweating, that this would mean the cyclist would start sweating during the race at a lower temperature meaning that she will be less likely to suffer from the effects of hyperthermia. Rather than identifying adaptations, many learners simply identified responses to exercising in the heat and therefore although gaining some credit did not progress through the levels.

This response was placed at level 1: and awarded 3 marks

This response was placed at level 1 as it did not make reference to any adaptations to excessive heat. Knowledge that was demonstrated was of responses of the body to excessive heat. Whilst some credit was given for this knowledge there was insufficient links to the specific question demands, i.e. to demonstrate knowledge and understanding of the adaptations of the body systems to excessive heat, to apply these to the question context (the cyclist) and then to evaluate the impact of these adaptations on cycling performance.

Whilst knowledge of sports is not assessed in any question there is an expectation that learners will be able to apply their knowledge to sporting contexts, for example, regardless of the activity, exercise will increase sweat production and it will generate heat which needs to be lost. Learners would be expected to take this knowledge and apply it in this case to cycling.

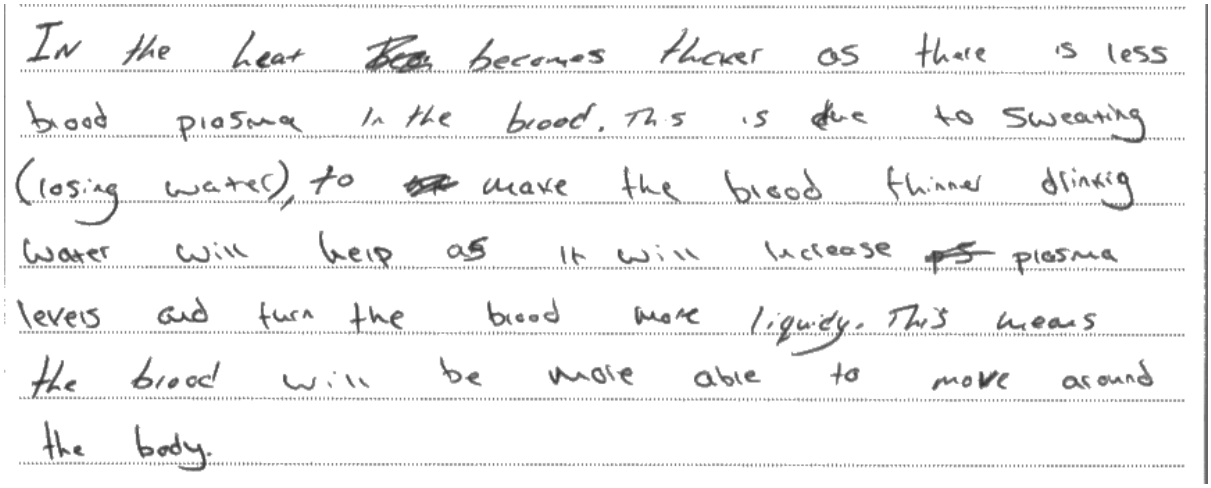
During Selena's three-week cycling holiday the weather is sunny and very hot.

During the first week Selena is badly affected by the heat and she is often behind the rest of the group. However, by the start of the third week Selena feels comfortable in the heat when she is cycling and she can keep up with the rest of the group.

(d) Evaluate the impact of the body's adaptations to excessive heat on Selena's cycling performance.

(8)

Excessive heat can make the cyclists sweat more which will use the water in her body. This can lead to dydration if they do not ~~stay hydrate~~ keep drinking water through out the face. Cycling in hot weather can also be very dangerous as there is a risk of other heating (if our core body temp(37c°) changes even 1c° higher or lower you'll die). If we did not thermoregulate Then this could be very possible for Selena. thermolgeuriation is when our body adapts the climate around us, in this case it would be adapting to ~~that~~ the excessive heat. ~~If~~ Some adaptations to this ~~could be~~ are; sweating (to stay cool) increased ~~Ear~~ heart rate (as she is exercising and blood has become thicker).


In the heat ~~the~~ becomes thicker as there is less blood plasma in the blood. This is ~~the~~ due to sweating (losing water), to ~~the~~ make the blood thinner drinking water will help as it will increase ~~the~~ plasma levels and turn the blood more liquidy. This means the blood will be more able to move around the body.

This response was placed at level 3: and awarded 7 marks

The response demonstrates knowledge of adaptations and develops the response, writing coherent paragraphs about each initial point being made. They make reference to:

- increased sweat production
- the body will adapt by sweating earlier
- and the consequences of these factors - i.e. that evaporation happens sooner
- increased blood plasma volume (* point at end of response)
- meaning more water provided for sweat production
- and initially there is a summative evaluation of the consequences of these adaptations in terms of cooling down 'faster allowed her to work at higher intensities'

There is also some knowledge demonstrated of vasodilation

Therefore, the response demonstrates knowledge, application and applied reasoning - the impacts of these adaptations. It is the links to cycling and impact of the adaptations that place this response at L3.

(d) Evaluate the impact of the body's adaptations to excessive heat on Selena's cycling performance.

(8)

It is very important to stay hydrated and comfortable in hot conditions, as too much heat can affect performance heavily.

One impact of the body's adaptations to excessive heat is that the body will increase the sweat production and the body will adapt by sweating earlier. By the sweating process increasing and happening faster it will allow evaporation to happen sooner and quicker so selena can get rid of heat quicker. By doing this she will feel these processes happening it will cool down selena faster and make give her the ability to work at higher intensities.

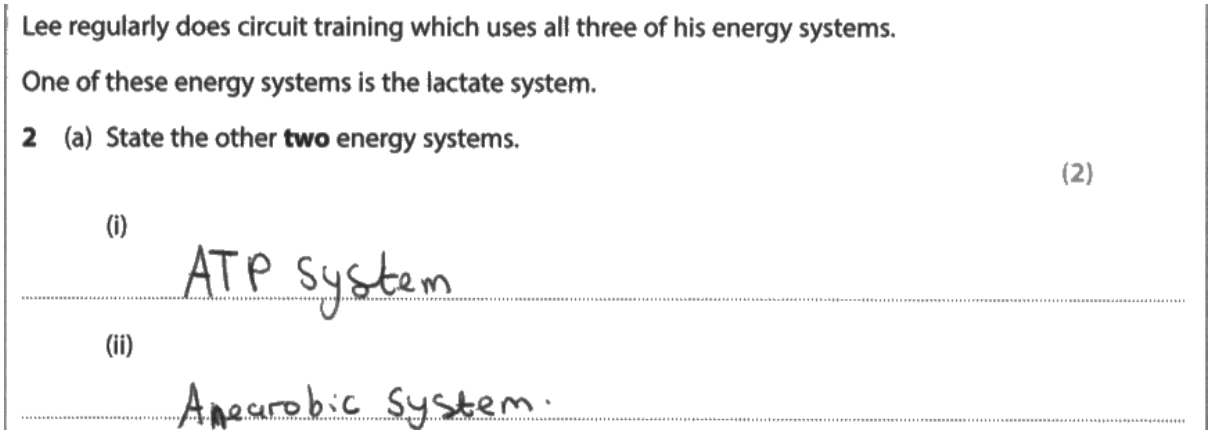
Another adaptation is that her blood vessels closest to her skin will vasodilate at a faster rate, meaning she can get more blood to the surface of her skin. The peripheal blood vessels will warm her face and then colder objects will bring the heat away quicker. Resulting in selena feeling comftable.

As blood plasma will increase so more water can be provided for the mechanism of sweating.

Q 2(a)

This question was about energy system.
Learners were told that one energy system is the lactate system, and then asked to state the other two energy systems. Most learners gained at least one mark for this question, correctly identifying the aerobic system. If full marks were not gained this was often because learners failed to differentiate between the anaerobic systems, i.e. stating anaerobic rather than ATP-PC as required. Alternatively, some learners made reference to ATP. This was not credited as it is the energy source rather than energy system.

This response gained 0 marks


Lee regularly does circuit training which uses all three of his energy systems.

One of these energy systems is the lactate system.

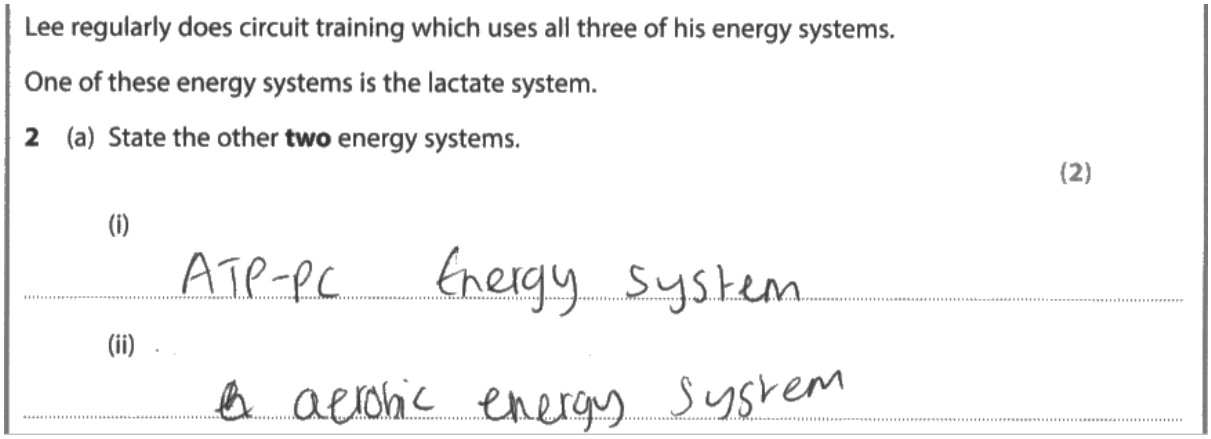
2 (a) State the other **two** energy systems.

(2)

(i) ATP System

(ii) Anaerobic System.

This response gained 2 marks


Lee regularly does circuit training which uses all three of his energy systems.

One of these energy systems is the lactate system.

2 (a) State the other **two** energy systems.

(2)

(i) ATP-PC Energy System

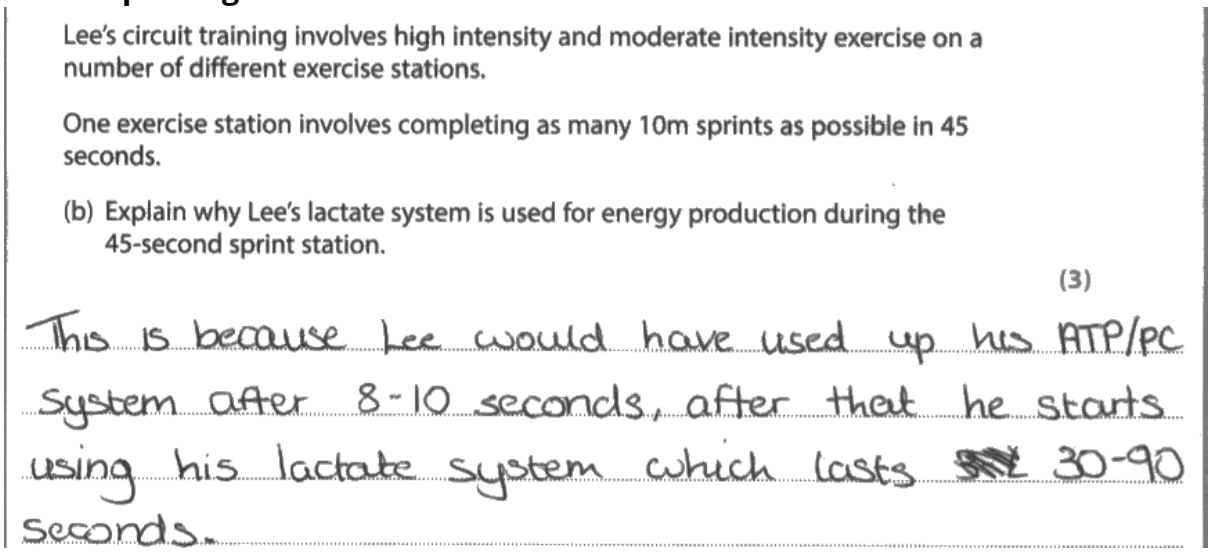
(ii) Aerobic energy System

Q 2(b)

This question asks learners why the lactate system would be used to provide energy during a 45 second circuit station. Again the information given in the question is key, i.e. that the station lasts for 45 seconds.

From this information, learners should conclude that the ATP-PC system cannot be used as it would be depleted before the 45 seconds was completed, those that did recognise this gained credit. Other correct responses made reference to the speed with which the lactate system can supply energy (to allow the performer to work at medium to high intensity) and the reason for this rapid energy supply being that oxygen is not required. Popular correct responses focused on the length of time the lactate system could work for making it a good choice for the 45 second station. Most learners found this part of the question the least accessible, often scoring 0 or 1 mark.

This response gained 0 marks



Lee's circuit training involves high intensity and moderate intensity exercise on a number of different exercise stations.

One exercise station involves completing as many 10m sprints as possible in 45 seconds.

(b) Explain why Lee's lactate system is used for energy production during the 45-second sprint station.

(3)

This is because Lee would have used up his ATP/PC system after 8-10 seconds, after that he starts using his lactate system which lasts ~~30~~ 30-90 seconds.

A mark is awarded as there is correct reasoning why the lactate system is used, i.e. that it lasts longer than the circuit station.

This response gained 3 marks

(b) Explain why Lee's lactate system is used for energy production during the 45-second sprint station.

(3)

Our body has around 6 seconds of ATP stores, as this is depleted the Lactate System is required as it can work from a period of around 10s-2minutes. the body has stores of glycogen that can be used to resynthesise the phosphate molecule for a short period of time. This is required in order to supply the body. It's NEEDED during a sprint session as it doesn't require oxygen, and works quickly as we ALL have glycogen stores!

The response contains all the required elements. That energy can be supplied quickly using this system, because it doesn't utilise oxygen and that the system can continue to provide enough energy for the 45 seconds as it lasts up to two minutes.

Q 2(c)

Learners were asked to explain why blood lactate accumulation (OBLA) occurs during the circuit session. Credit was given for responses that identified that OBLA occurs because oxygen was not available therefore could not be used to remove the lactate being produced, or that as lactate was produced as a by-product, when it was being produced faster than it could be removed it started to accumulate. As with part (b) learners found this to be a challenging question. Learners who simply stated that OBLA occurs as lactate is building up were not credited as this much information was given in the question.

This response gained 0 marks

(c) Explain why onset of blood lactate accumulation (OBLA) occurs during the circuit session.

(2)

OBLA occurs as the lactate system become depleted and lactic acid starts to build up in the working muscles.

No mark was awarded for simply saying that lactic acid builds up**.**

This response gained 2 marks

(c) Explain why onset of blood lactate accumulation (OBLA) occurs during the circuit session.

(2)

The lactate created as a by product of the lactate system increases the acidity of blood. When this reaches a certain point the body CANT remove it fast enough, this is when OBLA occurs.

In this example response the learner correctly identifies that lactate is a by-product which accumulates because it cannot be removed fast enough.

Q 2(d)

This part of the question asked learners to explain the effect of having a two-minute break on lactate levels.

To gain maximum marks learners would need to apply their knowledge of the lactate system to identify that the two minutes would allow lactate levels to drop. This was a very accessible point to gain credit. Thus many learners achieved at least one mark for this question. To gain further credit learners needed to explain why levels dropped. In order to explain this, learners were credited if they explained this was because Lee could take in additional oxygen during the recovery period which could be used to break down or remove the lactate.

Despite the accessibility of the first marking point this question proved challenging to many learners.

This response gained 0 marks

Lee completes a full circuit with a 2 minute recovery period before completing a second circuit.

(d) Explain the effect of the two-minute recovery period between each circuit on Lee's blood lactate levels.

(3)

Lee's blood lactate levels will increase because he's stopped exercising the body response will think he has stopped exercise so start the onset of fatigue, producing lactic acid. This will stop Lee from exercising and reduce his performance.

This response gained 3 marks

(d) Explain the effect of the two-minute recovery period between each circuit on Lee's blood lactate levels.

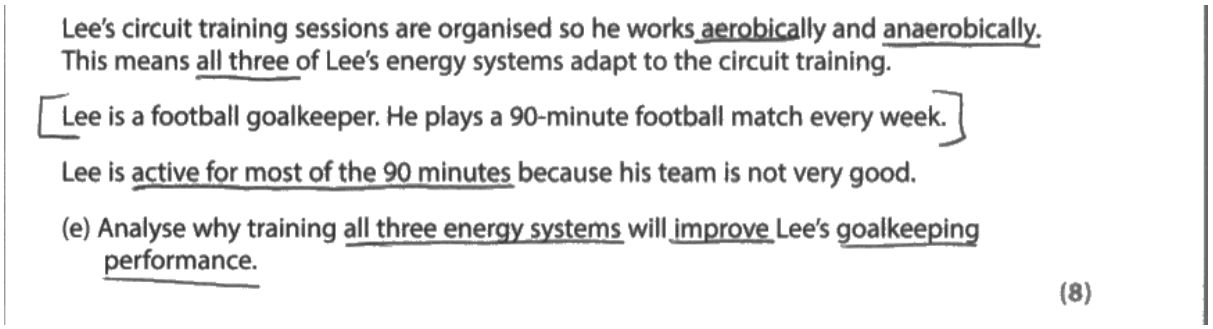
(3)

The 2 minute rest will give his body time to get oxygen in the body and a little time to deplete the lactic acid build up but not enough time to reduce it to its minimum

The learner's response contains all the required elements, i.e. use of oxygen; lactic acid is depleted; but not completely as insufficient time. The third point here was an alternative acceptable response to the oxygen being used to break down the lactate

Q 2(e)

The extended response for question 2 asked learners to analyse how the adaptations to each energy system would improve goalkeeping performance.



Lee's circuit training sessions are organised so he works aerobically and anaerobically. This means all three of Lee's energy systems adapt to the circuit training.

Lee is a football goalkeeper. He plays a 90-minute football match every week.

Lee is active for most of the 90 minutes because his team is not very good.

(e) Analyse why training all three energy systems will improve Lee's goalkeeping performance.

(8)

Specific knowledge of football was not required to address this question as vital information about the duration and intensity of the work Lee (the goalkeeper) was doing was given in the introduction to this part of the question. To address this question, learners should have given a description or feature of the energy system or identified adaptations to the energy systems, for example, increased myoglobin stores, demonstrated how these adaptations would be used within the football game by the goalkeeper and then evaluate the impact of them. For example, they might have identified that one adaptation was an increase in the time the ATP-PC energy system could be used for (due to increased stores of PC) which Lee could use to keep jumping to intercept high shots or crosses meaning that he could maintain this in a period of constant pressure from his opponents.

When addressing this question, many learners focused on the use of each system in the game without linking to either an adaptation or feature of the energy system in use, thus limited their responses and the level achieved. Typical examples of the use of the energy system in the game for the ATP-PC system were often good, for example, use in a reaction save or diving to save the shot. Examples for the aerobic system tended to focus on sustaining performance for the 90-minute game and also gained credit. Examples for the use of the lactate system were more challenging, credit was given if it was clear that the goalkeeper was working at a moderate to high intensity, repetitively, for example, making several saves in a row in quick succession.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about energy systems and were able to apply this knowledge so could provide appropriate links and explanations of these links between the energy systems and the match. Generally, learners were not able to access level 3 as they failed to 'analyse' the effect of the adaptations (often not stating any adaptations) on improving goal keeping performance.

This response was placed at level 1

The response gains credit for identifying when, during the match, each energy system would be used, however the section on 'training' does not gain credit as it is too vague, a specific adaptation to this system should have been identified and the impact of this analysed.

(e) Analyse why training all three energy systems will improve Lee's goalkeeping performance.

(8)

ATP - PC:

This energy system is required for short, high intensity bursts of energy. It would be used in situations such as when Lee is jumping and reaching to defend the goal.

Training ATP - PC:

Training the ATP - PC energy ~~w~~ system will improve Lee's ~~goal~~keeping goalkeeping performance because he will be able to use the short, high intensity bursts more efficiently than before, ~~meaning~~ meaning he can defend the goal better. ~~by~~

Lactate:

This energy system is required during medium, ~~mono~~ moderate intensity bursts of energy. It would be used in situations such as dribbling the ball away from his goal.

Training lactate:

Training the lactate system will improve Lee's performance because he will be able to work more efficiently, allowing him to get the ball away from his goal quicker.

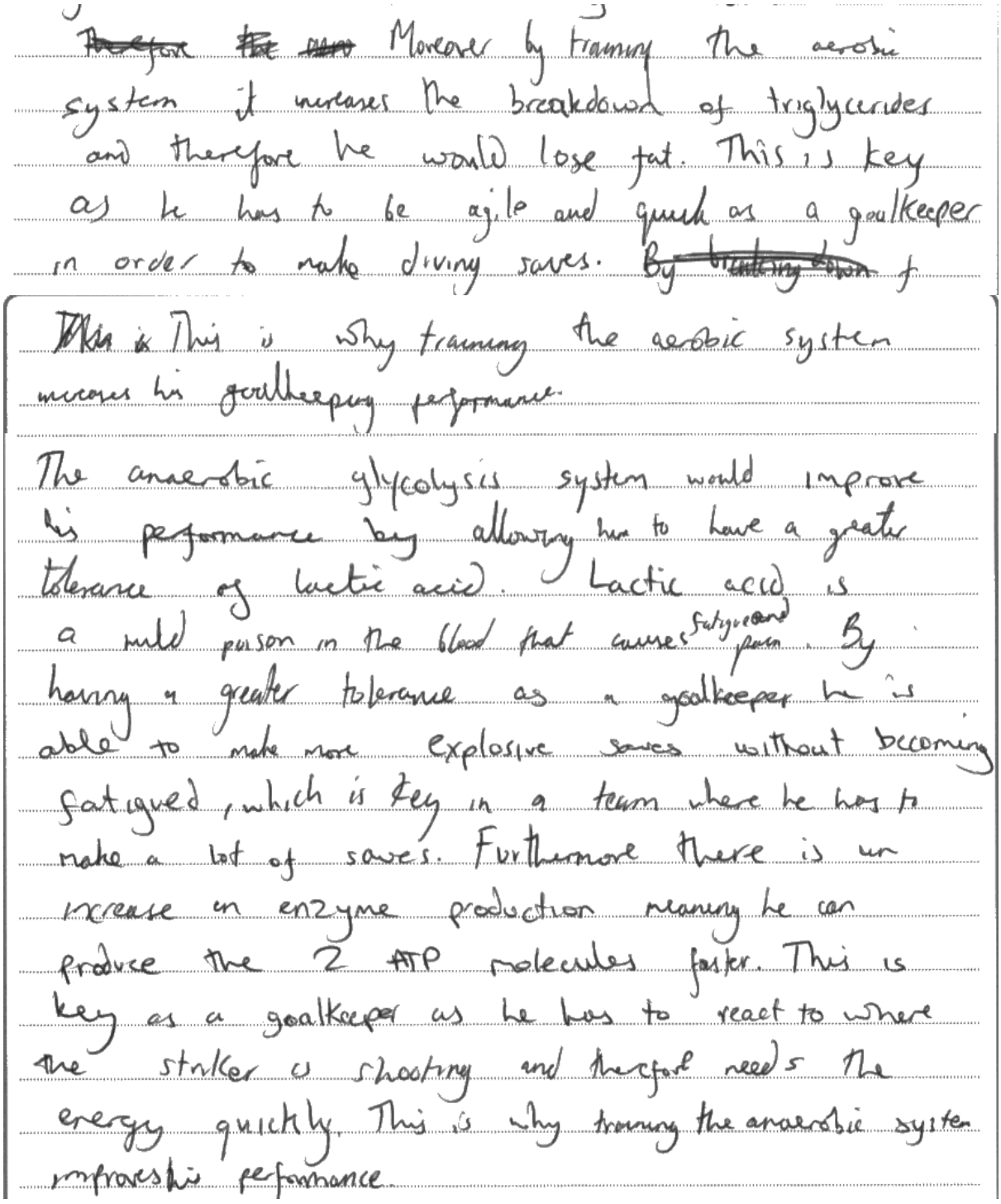
Aerobic:

This energy system is required during endurance based exercises. It would be used throughout the game when Lee is running up and down the pitch.

Training aerobic:

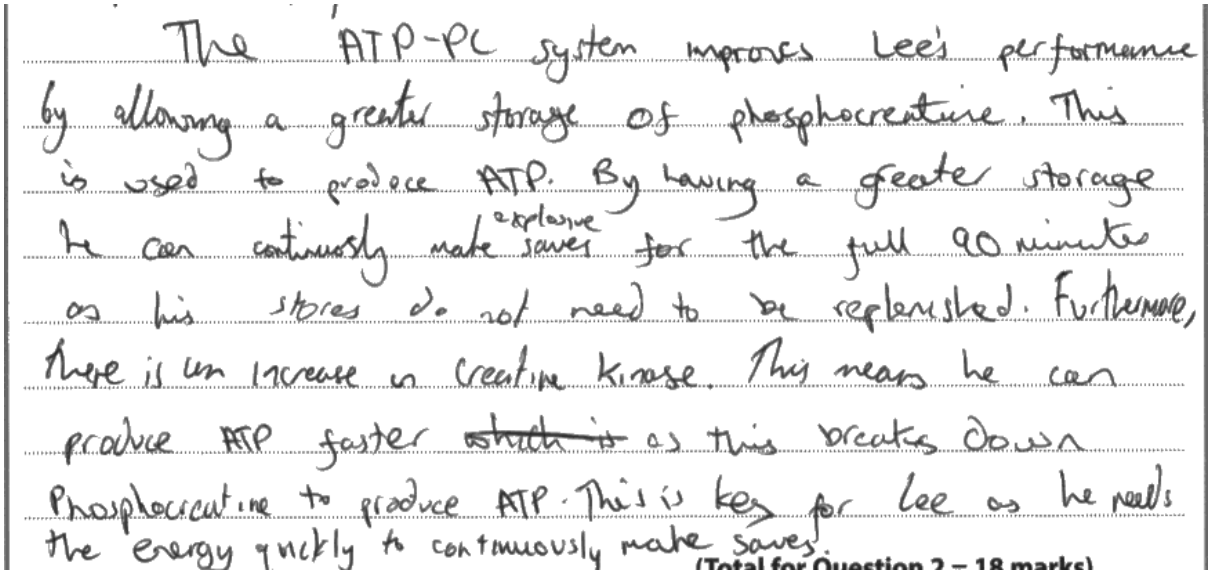
Training the aerobic system will improve Lee's performance because he will be able to run around for the whole 90 minutes without getting out of breath and tired.

This response was placed at level 3: and awarded 7 marks
Whilst there is some inaccurate content included in the response there is sufficient relevant, applied content to warrant being placed at level 3. Several adaptations are identified and there is a clear attempt to apply these to the sporting context, although sometimes these are a little too vague/unrelated to energy systems, e.g. the breakdown of triglycerides to lose fat, linked to agility, rather than the use as an energy source for the duration of the game. The analysis of anaerobic glycolysis and the impact of increasing the lactate threshold meets the requirements of the question for this energy system.



~~Therefore the~~ Moreover by training the aerobic system it increases the breakdown of triglycerides and therefore he would lose fat. This is key as he has to be agile and quick as a goalkeeper in order to make diving saves. By ~~training the aer~~ This is why training the aerobic system increases his goalkeeping performance.

The anaerobic glycolysis system would improve his performance by allowing him to have a greater tolerance of lactic acid. Lactic acid is a build poison in the blood that causes fatigue and pain. By having a greater tolerance as a goalkeeper he is able to make more explosive saves without becoming fatigued, which is key in a team where he has to make a lot of saves. Furthermore there is an increase in enzyme production meaning he can produce the 2 ATP molecules faster. This is key as a goalkeeper as he has to react to where the striker is shooting and therefore needs the energy quickly. This is why training the anaerobic system improves his performance.


The ATP-PC system improves Lee's performance by allowing a greater storage of phosphocreatine. This is used to produce ATP. By having a greater storage he can continuously make explosive saves for the full 90 minutes as his stores do not need to be replenished. Furthermore, there is an increase in creatine kinase. This means he can produce ATP faster ~~stretch it~~ as this breaks down Phosphocreatine to produce ATP. This is key for Lee as he needs the energy quickly to continuously make saves.

(Total for Question 2 = 18 marks)

Q 3(a)

Question 3 begins by asking learners to explain the role of the muscle spindle. This was well known by many learners.

Responses that identified the role, for example to detect the stretch of the muscle or to prevent injury and then went on to explain how the role was fulfilled scored maximum marks. For example, a response that stated that the muscle spindle prevents injury by signalling the central nervous system if a muscle is overstretching, would have been awarded maximum marks.

Many learners successfully identified the role of the muscle spindles and could expand on this a little.

This response gained 1 mark
Initially the learner describes the reason for warming up, therefore no marks are awarded initially. However, towards the end of the response they identify the role of the muscle spindles, i.e. to prevent injury to the muscle.

Jacob competes regularly in athletics.

Jacob warms up before each race. He divides his warm-up into three phases.

One phase of Jacob's warm-up is stretching.

3 (a) Explain the role of the muscle spindles during the stretching phase of Jacob's warm-up.

(3)

In the Stretching phase of jacobs warm up muscle spindles will become elasticated in order to prevent injury he will become loose to allow good movement in the muscles. Muscle spindles can also prevent tears in the muscle fibres.

This response gained 3 marks
All required elements are present: their role is to detect the stretch; send a signal to the CNS to stop the muscle being overstretched.

Jacob competes regularly in athletics.

Jacob warms up before each race. He divides his warm-up into three phases.

One phase of Jacob's warm-up is stretching.

3 (a) Explain the role of the muscle spindles during the stretching phase of Jacob's warm-up.

(3)

During this phase the muscle spindles detect the stretching, they send a message to the CNS which relays a message back wit which holds the contraction and stops the muscle from being over-stretched.

Q 3(b)

This question tested learners' knowledge, and ability to apply that knowledge, of muscle fibre types.

Jacob's athletics event is the steeplechase.

Each race is 3,000m long and has 35 barriers.

Figure 1 shows athletes jumping a water barrier in the steeplechase.

(Source: ©Jamie Roach/Shutterstock)

Figure 1

(b) Explain why type I and type IIx muscle fibres are used in the steeplechase event.

(4)

The question context is the steeplechase and to support learners two images are supplied, one showing the athletes running the race and one showing them clearing the barriers.

Learners were required to use their knowledge to decide which part of the race used type 1 fibres, and which part of the race used type 2. Having made this judgement, learners needed to explain their reason for doing so by making reference to a characteristic of the muscle fibre type that made it suitable for the activity. The majority of learners were able to correctly link the muscle fibre type to the part in the race although relatively few were then able to explain why the fibre type was used, i.e. its characteristics that made its use appropriate. For example, use of type 1 to complete the 3000 m run due to their resistance to fatigue allowing their continued use throughout the running phase.

This response gained 2 marks
The learner correctly links each fibre type to the stage of the race.

(b) Explain why type I and type IIx muscle fibres are used in the steeplechase event.

(4)

(i) Type I

Slow twitch fibres ~~shot~~ used for the long distance running.

(ii) Type IIx

fast twitch fibre used for jumping over hurdle and sprint finishes.

This response gained 4 marks
This response identifies a characteristic of each muscle fibre type that makes it suitable for the identified stage in the race

(i) Type I

Type 1 muscle fibres work at a low intensity over a long period of time and are used in the aerobic system and they have lots of mitochondria. Both mean the athlete can run for the 30cm.

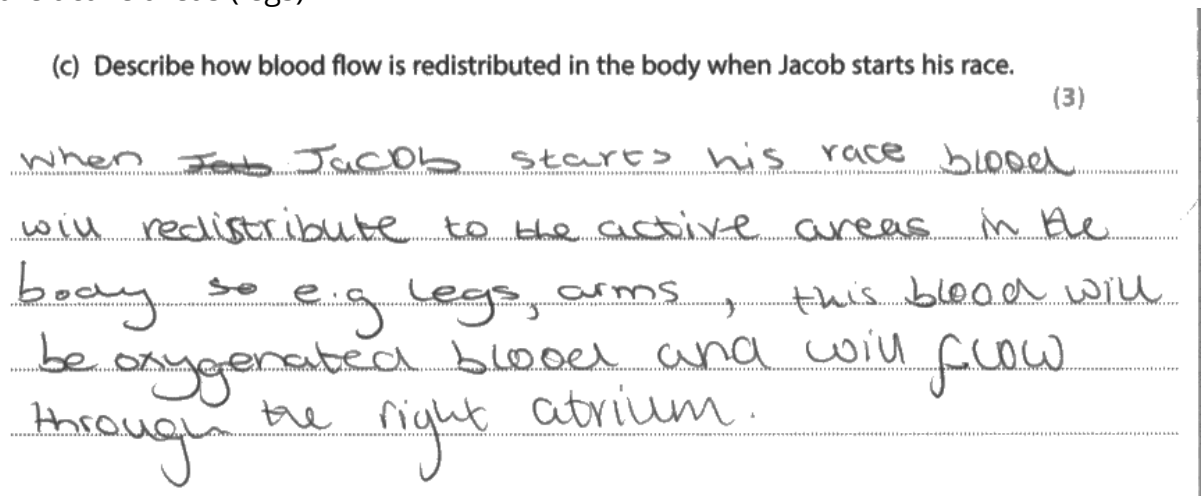
(ii) Type IIx

They are used for explosive actions, working at a high intensity over short periods of time, for example, you would use these fibres at the water barriers, as you need explosive power to jump over the hurdle.

Q 3(c)
This question asked learners to describe the process of redistribution of blood flow at the start of exercise.

As a 'describe' question learners did not need to provide any explanations or justifications for their statements, just an account of the process. Most learners achieved at least one mark for this question. Common correct responses described how blood flow increased to the active areas of the body. Credit was also given for correct use of technical language to describe the process.

This response gained 1 mark
This response gains one mark for identifying that blood flow would be increased to the active areas (legs)



(c) Describe how blood flow is redistributed in the body when Jacob starts his race.

(3)

when ~~Jeb~~ Jacob starts his race blood will redistribute to the active areas in the body so e.g legs, arms, this blood will be oxygenated blood and will flow through the right atrium.

This response gained 3 marks
The learner correctly describes how blood flow is redistributed at the start of exercise. The description covers all aspects of the process including more points than required. This is useful as maximum marks can still be achieved despite reference to vasoconstriction of blood vessels to the organs. Care needs to be taken here as it is only some of the organs affected in this way, e.g. the heart will not experience vasoconstriction.

(c) Describe how blood flow is redistributed in the body when Jacob starts his race.

(3)

This is achieved by the vascular shunt mechanism. This is where at exercise blood vessles at the organs/core will vasoconstrict therefore forcing blood flow towards muscles, and the blood vessles at the muscles will vasodilate to allow blood flow to get to the muscles. Pre capillary spinchters will be used to reduce blood flow to certain areas.

Q 3(d)

This was the third extended response question. Learners were given information about a performer who was addicted to training and asked to evaluate the effects of this exercise addiction on his body systems and performance.

Jacob is training hard for his next steeplechase competition.

He trains every day, often twice a day. His coach is worried that Jacob is becoming addicted to training.

(d) To what extent would the effects of exercise addiction on Jacob's body systems impact on his athletics performance?

As with all extended responses the learner's response was judged on the quality with which it addressed all aspects of the question. For example, responses at level 1 tended to be so due to knowledge of effects on one system in detail, or a superficial knowledge of effects across two or three body systems. Those learners who were aware of the effects of exercise addition and could develop their responses, giving more detail of the effect and the impact it would have on performance were placed at level 3.

Most responses included some effect on the muscular system, for example that with lack of time for rest and recovery injury to the muscles was more likely, as micro tears would not have been repaired from the previous session, leading to enforced time away from training causing loss of previous adaptations. Many learners were also knowledgeable about the endocrine system and that exercise addiction resulted in increased adrenaline and cortisol production, the main impact of these being referred to as loss of sleep or suppression of the immune system.

This response was placed at level 1

The response includes some relevant knowledge but there is little depth to the response, for example, why overtraining may lead to injury.

Jacob is training hard for his next steeplechase competition.

He trains every day, often twice a day. His coach is worried that Jacob is becoming addicted to training.

(d) To what extent would the effects of exercise addiction on Jacob's body systems impact on his athletics performance? (8)

injury decrease in comes effects impacts lack of motivation

Jacobs the effects of overtraining on jacob will effect his ability to pform well. Overtime jacobs pformance levels will decrease from his [redacted] usual standereds. [redacted] Exercise addiction will lead to jacobs [redacted] overtraining his body and when yeou begin to do that on a daily basis you increase the chance of becomming [redacted] injured or even an overuse of an injury that jacob might not know of.

This response was placed at level 3: and awarded 8 marks
Several body systems are considered in the response. A factual knowledge point is made and then developed by application to the question context and then a judgement is made as to the extent of the effect of this on Jacob's athletics performance. For example, overtraining (as a result of exercise addiction) leads to inability to recover, reducing immune function, impacting on general health which will prevent training/competing. The effects on the muscular and endocrine system are also examined.

Jacob is training hard for his next steeplechase competition.

He trains every day, often twice a day. His coach is worried that Jacob is becoming addicted to training.

(d) To what extent would the effects of exercise addiction on Jacob's body systems impact on his athletics performance?

(8)

Jacob training addiction ~~could cause~~ is a sympton to overtraining. Overtraining can lead to a decrease in performance as his muscle become more fatigued and reduction of strength. Overtraining can cause Jacobs body ~~to fatil~~ to become unable to recover. Overtraining would have an mpact on Jacobs body system. for example a decrease in immune function which could lead to Jacob getting frequent colds and his body producing less

white blood cells and antibodies making it harder for him to fight infections ~~Jacob could also experience~~ this would mean that Jacob ~~may~~ may not be able to compete if he is ill. He could also have a disturbance to his sleep due to overtraining as he is not allowing his body to fully recover or allowing his micro tears in his muscles to fully repair which could therefore increase his risk of injury. If jacob was to experience injury due to his lack of recovery and time this would impact his performance negatively as he would

therefore be unable to train and compete causing a detrimental impact on his ability to perform. Jacobs exercise addiction could also lead to an imbalance to his endocrine system. which could result in an increase in Human growth hormone, adrenaline / noradrenaline, testosterone and cortisol which could increase his levels of stress and arousal meaning that he would be unable to perform to his maximum potential.

Q 4(a)
This question asked learners about the responses of the skeletal system during activity. As with other questions, some learners had difficulty differentiating between adaptations and responses.

Adaptations to regular training were not credited as the focus of the question was on the responses to exercise. Popular correct answers linked to osteoclast activity or increased synovial fluid production. Popular incorrect responses made reference to the adaptation of increased bone density.

This response gained 1 mark
One mark was awarded for increase in synovial fluid, but no credit for increased bone density as this would be a training adaptation.

There are changes in Melvin's skeletal system in response to playing a single game of rugby.

4 (a) State **two** responses of Melvin's skeletal system to playing a single game of rugby. **(2)**

(i) Increase bone density

(ii) Increase in synovial fluid.

This response gained 2 marks
As a 'state' question the learner did not need to explain or expand on their answer, i.e. credit would still have been given for osteoclast activity, without reference to weight bearing.

There are changes in Melvin's skeletal system in response to playing a single game of rugby.

4 (a) State **two** responses of Melvin's skeletal system to playing a single game of rugby. **(2)**

(i) Osteoclast activity due to weight bearing activity

(ii) increase Synovial fluid in the joint and decrease in Viscosity.

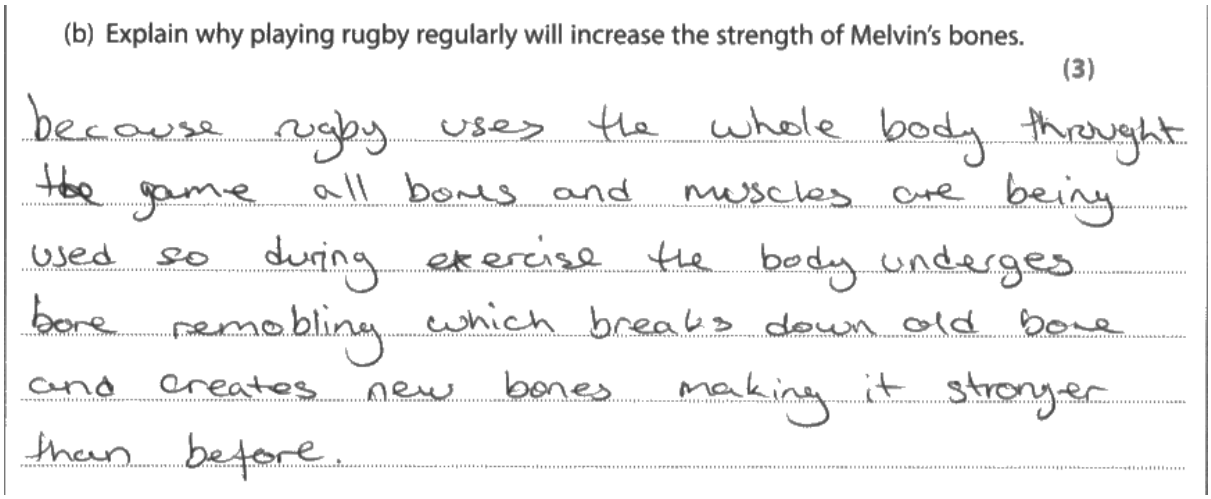
Q 4(b)

Unlike part (a), this part of the question was all about adaptation, in particular increased bone strength. Learners needed to explain why bone strength increased as a result of playing rugby regularly.

This was an accessible question with many learners achieving maximum marks. Marks were awarded for recognition that rugby is a weight bearing activity and as such will stimulate bone remodelling. Marks were also awarded for any aspect of this process.

This response gained 1 mark

A mark was awarded for bone remodelling but no further marks were awarded as the explanation is incomplete. I.e. whilst old bone is broken down we need to know the type of bone cell responsible for this action, similarly for creating the new bone.



(b) Explain why playing rugby regularly will increase the strength of Melvin's bones.

(3)

because rugby uses the whole body throught the game all bones and muscles are being used so during exercise the body underges bone remobling which breaks down old bone and creates new bones making it stronger than before.

This response gained 3 marks

The response includes a good account of why playing rugby regularly will strengthen bone due to the action of the different types of bone cell. Ossification was accepted as an alternative to bone remodelling.

(b) Explain why playing rugby regularly will increase the strength of Melvin's bones.

(3)

By playing rugby Melvin's bones will become stronger through a process called Ossification - this occurs when stress or weight bearing exercise is placed upon the bone, Osteoclasts then break down the bone layers (old, weak bone layers) and osteoblasts then form new bone, making it stronger and more dense. This will overall increase Melvins strength of bones.

Q 4(c)

This question tackled a traditionally challenging topic for learners, despite this some learners were clearly knowledgeable about this topic achieving high marks for this question.

During the game of rugby, Melvin needs more oxygen than when he is resting.

(c) Explain the effect of playing a game of rugby on the oxygen dissociation curve.

(3)

Learners were asked to explain the effect of exercise on the oxygen dissociation curve. Learners needed to identify that the curve shifts to the right and then explain why, for example, due to increased carbon dioxide causing a drop in blood pH, or due to exercise generating heat which in turn increased body temperature.

On occasion learners also explained that the curve shifted to the right to make sure oxygen dissociated more quickly to the muscle. The complete range of marks was achieved for this question, some learners gave an incorrect direction for the shift of the curve, (e.g. up, down, forwards, left) but still gained some credit for correctly explaining why the curve shifted.

This response gained 2 marks

A mark is awarded for identifying that the reason the curve shifts is an increase in temperature and a drop in pH, correct identification of either of these factors would have been sufficient for one mark. The second mark is awarded for the expansion of this, i.e. that because of the shift oxygen 'can be unloaded more readily'. To gain the third mark the learner needed to state the direction of the shift, i.e. to the right.

During the game of rugby, Melvin needs more oxygen than when he is resting.

(c) Explain the effect of playing a game of rugby on the oxygen dissociation curve.

(3)

When exercising bodily temperature and blood DH. lowers ~~acidity increase~~. When oxygen and haemoglobin bind in high oxygen areas e.g. Lungs. it creates Oxyhaemoglobin. However due to increase in temperature and lowering of blood pH Oxygen can be unloaded more readily from a haemoglobin than at rest. Higher the demand of oxygen the from the muscle, the increased rate of the oxygen dissociation curve.

This response gained 3 marks
All elements are included: blood pH becomes more acidic and that this is due to an increase in carbon dioxide. The result of which is the curve shifts to the right.

During the game of rugby, Melvin needs more oxygen than when he is resting.

(c) Explain the effect of playing a game of rugby on the oxygen dissociation curve.

(3)

When exercising the blood pH becomes more acidic due to the increase in carbon dioxide. Because of this the oxygen dissociation curve shifts to the right meaning more oxygen needs to be consumed to decrease the acidity of the blood and to hold off muscle fatigue.

Q 4(d)
The final extended response question asked learners to assess the effect of testosterone on strength and rugby performance. Earlier in the question learners had been provided with some information about rugby including Melvin's role in tackling and assisting in line outs.

Melvin plays rugby.

Part of his role on the field is to tackle the opposition and to assist in line outs by lifting a team mate to catch the ball.

Figure 2 shows a line out in rugby.

Figure 2

This information was provided so that learners had the rugby information they needed to successfully address this question.

Melvin trains at his local gym to improve his strength for rugby.

The gym instructor tells Melvin that all he needs to increase his strength for rugby is:

- an appropriate strength training programme
- the testosterone that is naturally produced by the body.

(d) Assess the affect of testosterone on Melvin's strength **and** rugby performance.

(8)

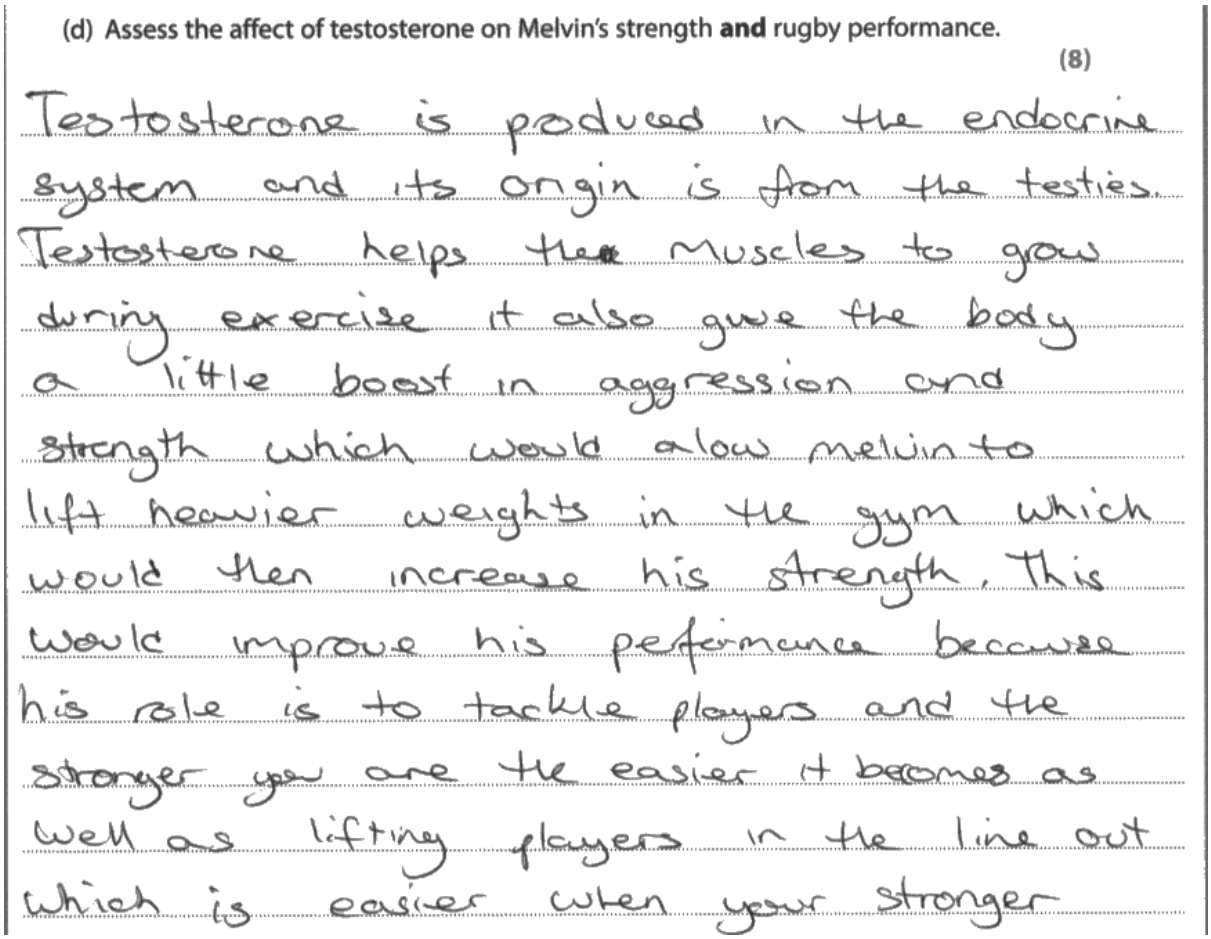
Credit was given for responses that identified the different possible effects of testosterone and the impact of these effects on his playing performance. Thus a successful response might identify that testosterone allowed the player to train harder or more frequently resulting in increased muscular strength which meant he would be able to lift players higher in the line out.

Other popular correct responses made reference to the increased aggression associated with increased testosterone which was particularly useful in rugby when tackling, allowing them to go in for harder tackles or not be concerned when being tackled.

As with all extended response questions it is important to show development in the answer, taking a fact, e.g. increased protein synthesis and developing this by applying to the question context, e.g. meaning more rapid adaptation to exercise so increased strength which he can use in the line out to lift the player higher than opponent so they are more likely to catch the ball.

This response was placed at level 2 and awarded 4 marks

The learner has identified two effects of testosterone: increased muscle growth and increased aggression. They have tried to develop one of these points stating that increased muscle growth would lead to increased strength which would make it easier to tackle and opponent or lift a player in the line out. In addition, they have also identified testosterone can increase aggression but have not developed this. As there is a clear attempt to follow one of the points through fully in relation to the question demands and some additional information this response is just placed in level 2.



(d) Assess the affect of testosterone on Melvin's strength **and** rugby performance.

(8)

Testosterone is produced in the endocrine system and its origin is from the testies. Testosterone helps the muscles to grow during exercise it also gives the body a little boost in aggression and strength which would allow melvin to lift heavier weights in the gym which would then increase his strength. This would improve his performance because his role is to tackle players and the stronger you are the easier it becomes as well as lifting players in the line out which is easier when your stronger

This response was placed at level 2: and awarded 6 marks

This response provides more depth within the response, exploring the points in more detail. There is a good assessment of why strength will increase, and do so more quickly, i.e. not just as a result of testosterone increasing muscle mass but also as the training will increase his levels of testosterone to accentuate the effect on strength. How this increased strength impacts on performance is explained well, e.g. lifting the team mate higher so they have more chance of catching the ball or the opponent being more likely to drop the ball due to a harder tackle.

(d) Assess the affect of testosterone on Melvin's strength **and** rugby performance.

(8)

Testosterone is hormone that is made naturally in the body, it is responsible for assisting the growth of muscle mass development.

If testosterone increases muscle mass the Melvin is most likely going to increase his strength as a result of that. The fact that Melvins doing strength training means that the hormone will increase in the body meaning his muscle mass ~~elevat~~ development would increase at a faster rate, ~~Some with~~ resulting in strength to also increase.

If Melvin has increased strength then ~~he~~ it is likely that he will experience a gradual increase to performance. ~~If~~ If he is stronger then when performing line outs he will find it easier to lift his team mate which can result in ~~him~~ Melvin pushing him higher giving his team a greater chance of winning the ball. As another main role of ~~Melvin's~~ Melvin's is to tackle, he will be able to tackle harder as his strength increases which can ~~cause~~ lead

to an increased chance of ~~a~~ the opponent dropping the ball allowing Melvin's team to regain possession.

Summary

Based on their performance on this paper, learners should:

- Know the different body systems so you can focus on the correct one within a question.
- Be clear about terminology used in the specification as these words will be repeated in the exam paper, e.g. responses, adaptations.
- Use appropriate technical language throughout your responses, e.g. partial pressure of oxygen rather than 'thinner air'
- Read questions carefully to avoid repeating answers already given in the question, e.g. Q1a
- Tailor your response based on the command word in the question, e.g. state does not require any expansion of a point but explain will.
- Use the number of marks awarded and the space available as a guide to the depth of response required.
- Be clear, if an extended question asks about adaptations to different body systems make sure you are clear in your response which adaptations occur to which system.
- Use all of the information provided in the question scenario to demonstrate your ability to apply your knowledge.

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