Examiners' Report/
Lead Examiner Feedback

January 2018

BTEC Level 3 National in Sport
Unit 1: Anatomy and Physiology
(31524H)

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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: Anatomy and Physiology

Grade	Unclassified	Near Pass	Pass	Merit	Distinction
Boundary Mark	0	9	19	33	47

Introduction

This was the second series of the new specification, but the first time that this unit has been assessed under the new rubrics. Centres and learners should be congratulated on their preparation for this change to the assessment format. Overall, learners appeared performed better than the summer series and it was obvious that they prepared for many of the specification topics covered in this assessment, to which they need congratulating for.

The question paper followed the format identified in the sample assessment materials. The paper was split into six sections. Each section 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. Each section is weighted in accordance to the specification design. The changes to the summer series, is that the levels of response based questions from section A (Skeletal) and B (Muscular) have been removed and replaced with two 3 mark questions. Other changes to the format is that a total of 10 marks have been removed, however the time for the assessment remains the same at 90 minutes.

As in the summer 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 from the indicative content, 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 points-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

This report has been written to help you understand how learners have performed overall in the exam. For each question there is a brief analysis of learner responses. You will also find examples of learner responses to the questions that have been well answered. These should help to provide additional guidance. We hope this will help you to prepare your learners for future examination series.

Learner performance varied throughout the paper. Whilst the extended response questions still provided the greatest challenge, 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 writing questions account for just over 30% 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 answer questions but also the 'points-based' questions.

It was clear that some learners did not make full use of the stimulus material provided in the question, with explain command verb questions there is an expectation that knowledge and understanding tested is applied to the situation in context and expansion marks are gained accordingly.

As always the emphasis in this paper is on learner's application of their knowledge to a variety of practical sports related situations. The higher marks, particularly in levelled response questions (Sections C-F), will always focus on the ability to demonstrate application rather than the ability to recall theory. It will be important for learners to have the opportunity to practice this in their preparation for the assessment. Learners that were able to access higher marks for these questions were able to apply their knowledge and understanding to the stimulus and provide realistic and appropriate responses.

As this is a vocational sports related subject, the external assessment seeks to put the learners in applied sporting related situations and asks them to respond to these: this method of questioning will continue in the future. It is therefore essential that centre's stress to learners the need to read the stimulus information carefully before they answer questions, and be prepared to use this information within their responses, this also applies when graphical or statistical data is supplied. Where learners are unable to apply the stimulus in their answer it will significantly restrict the number of marks learners can receive. Generic responses will only gain limited credit.
Where the stimulus material uses a particular sport, it is not necessary for learners to have an in-depth knowledge of this type of sport in order to answer the questions well, however, an awareness of the basic requirements of sports are expected which will have been covered in core curriculum PE lessons throughout KS3 and KS4.

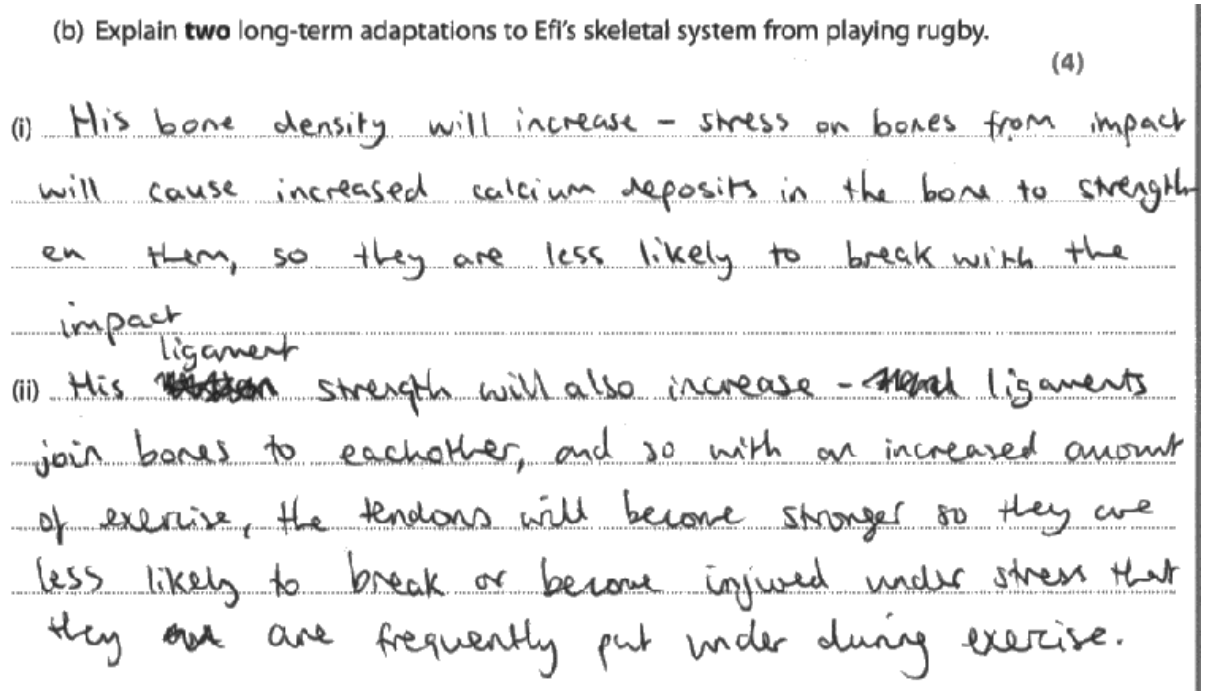
Individual Questions

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.

Q1(a)
The majority of learners gained at least two marks for this question, with many achieving three marks for identification of the carpals, meta-carpals and phalanges as correct answers. It is important that technical terminology is used and phonetic spelling was credited. Common errors were carpals being identified as tarsals and carpals and meta-carpals labelled the wrong way around.

Q1(b)
Learners were required to explain long term skeletal adaptations (A.5). Many identified to 'increase bone density' and 'increase the strength of the bones', but were unable to apply this to rugby for the expansion point. Significantly less learners correctly identified an increased ligament strength as the second adaptation. Common errors made were confusing adaptations (long-term) with responses (short term).

This response gained 3 marks



(b) Explain **two** long-term adaptations to Efi's skeletal system from playing rugby.

(4)

(i) His bone density will increase - stress on bones from impact will cause increased calcium deposits in the bone to strengthen them, so they are less likely to break with the impact

(ii) His ligament strength will also increase - ligaments join bones to eachother, and so with an increased amount of exercise, the tendons will become stronger so they are less likely to break or become injured under stress that they are frequently put under during exercise.

This response gained 0 marks.

Efi has been playing rugby for 5 years. Efi's skeletal system has adapted during those 5 years.

(b) Explain **two** long-term adaptations to Efi's skeletal system from playing rugby.

(4)

(i) Efi skeletal system has grown more flexabile to stop her from getting less injury's.

(ii) proceses more White and Red blood cell protudtion stores.

Q1(c)

Learners were required to explain the function of a bursa. Many identified to 'increase the range of movement' and achieved one mark. Significantly less learners correctly identified that the bursa is a cushion between the bones and tendons. Common errors made were 'secretes synovial fluid' which is incorrect knowledge and therefore did not achieve any marks.

This response gained 3 marks.

(c) A bursa is a fluid filled sac in most synovial joints.

Explain the function of a bursa.

(3)

A bursa acts like a cushion in a joint. It reduces friction between the bones and also absorbs the impact the joint faces, reducing the chance of injury at the joint.

This response gained 0 marks.

(c) A bursa is a fluid filled sac in most synovial joints.

Explain the function of a bursa.

(3)

A bursa is a sac filled with synovial fluid. If for some reason the is no synovial fluid in the joint the bursa sac realeases the fluid to refill the joint.

Q2

The majority of learners gained one mark for this question by correctly identifying the tricep muscle. A very small minority achieved the full marks for correctly identifying the wrist extensor. It is important that technical terminology is used and phonetic spelling is credited. Common errors were the wrist extensor being confused with the wrist flexor and in some cases, bones (ulna/radius) were put as the response. It is important for centres to relay to their learners that the section will only assess knowledge on that body system and learners will not gain any credit for other body systems.

Q3(a)

The majority of learners gained the at least one of the three marks available for this question, with many achieving the mark for identification of 'it helps the agonist/muscle to carry out the movement'. Common errors were 'the fixator stops the arm from moving'.

This response gained 1 mark for preventing injury

Frances is a 100 m sprinter. She uses weights as part of her training schedule.

3 (a) Explain the role of a fixator muscle during a weight training exercise.

(3)

The fixator muscle helps prevent the antagonistic muscle pairs from moving and pulling the bones a greater distance than they should, preventing muscle tears and other injurys

This response gained 3 marks

Frances is a 100 m sprinter. She uses weights as part of her training schedule.

3 (a) Explain the role of a fixator muscle during a weight training exercise.

(3)

Fixator muscles stabalise a ~~muscle~~ muscle to enable the movement of the agonist muscle, it keeps it in place. To get more power in her arms to run faster Frances can do bicep curls where the fixator muscle is the trapezius. This allows the movement to occur without any injury risk.

Q3(b)

Learners were required to describe a concentric contraction. Just over 40% of responses identified that it shortens the muscle, however, significantly less learners correctly identified that it was an increase in tension in the muscle, which is an expectation of muscle contractions, both eccentric and concentric. Common errors made were 'lengthens the muscle' which is an eccentric contraction, therefore, incorrect knowledge and therefore did not achieve any marks.

This response gained 2 marks

(b) Describe a concentric contraction.

(2)

Tension is created in the muscle. The muscle will contract and become shorter, pulling on the bone to create movement (either flexion or extension). Muscle fibres contract in concentric contractions, shortening the muscle

This response gained 0 marks

(b) Describe a concentric contraction.

(2)

a concentric contraction is the relaxation phase of a muscle movement

Q3(c)

Learners were required to explain the effects of increased muscle pliability and why this occurs. Many identified the effect that it would increase the muscles ability to stretch and reduces the risk of injury. Significantly less learners correctly identified that it occurs because of an increase in temperature in the muscle. Common errors made encompassed a lack of knowledge of what muscle pliability was.

This response gained 3 marks.

One of these short-term responses is an increased muscle pliability.

(c) Explain why there is an increased muscle pliability **and** explain how this affects Frances.

(3)

This would be due to the increased blood supply to the working muscles which overall increases muscle temprature. The muscle temprature increases the pliability of muscles as it allows the to extend more and they are less tight, when they have more length they're less likely to become injured. This is why it is important for Frances to warm up before any weight traing.

This response gained 1 mark.

One of these short-term responses is an increased muscle pliability.

(c) Explain why there is an increased muscle pliability **and** explain how this affects Frances.

(3)

When exercising liquid is released so that joints and muscles stay lubricated. This makes the muscles more pliable resulting in frances being able to perform exercises without getting injured, or damaging frances muscles.

Q4(a)

This question focused upon the providing a definition for the term residual volume. Common mistakes were the amount of oxygen left in the lungs rather than air. Also, it was evident that this was an area of the specification (Lung Volumes) that had not been learnt sufficiently.

This response gained 2 marks

4 (a) State the meaning of the term 'residual volume'.

(2)

Is the amount of air in the lungs after maximal exhale.

This response did not score any marks

4 (a) State the meaning of the term 'residual volume'.

(2)

Residual volume is not normal breathing it's breathing that changes a lot if doing exercise or not.

Q4(b)

This question was a continuation from the previous question in 4a and required a volume to be given, it was encouraging to see that the learners attempted to use units, but this was done with limited success. A small minority of learners achieved the one mark.

This response gained 1 mark

(b) Give the residual volume, including units, for an average, healthy, adult male.

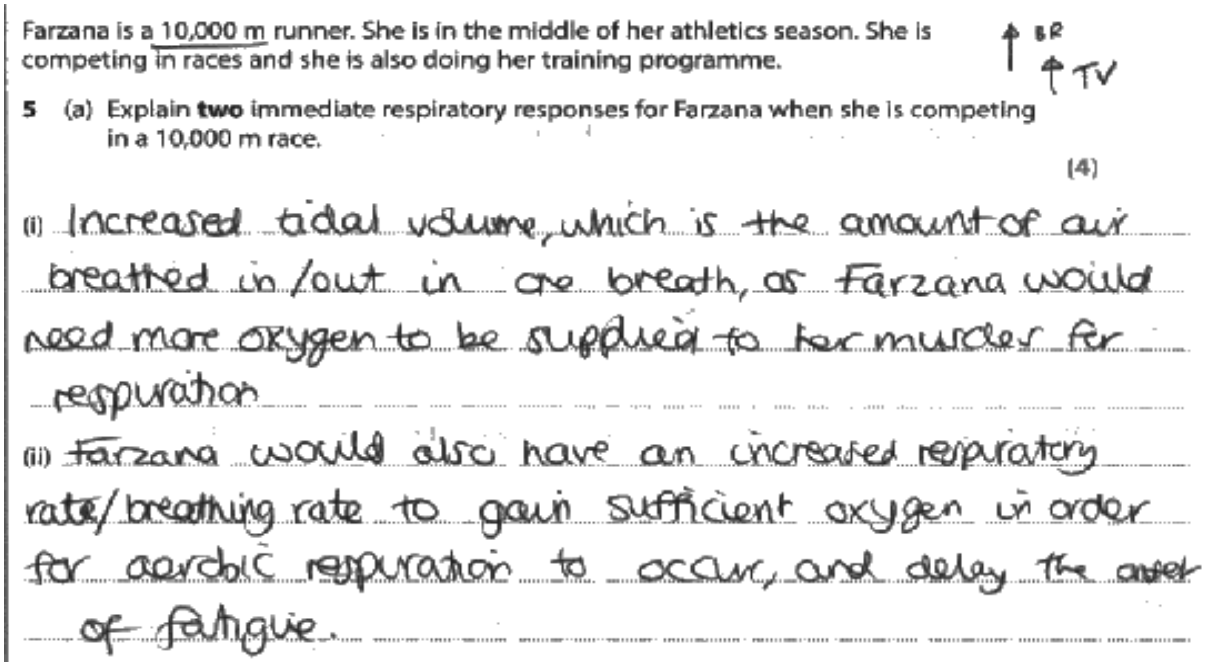
(1)

1.2 Litres

Q5(a)

Learners were required to explain two immediate respiratory responses when competing in exercise (10,000m race) (C.5). Many correctly identified that it would increase the breathing rate and tidal volume. Expansion marks were gained for each of these points. A significant amount stated that it was because the 'body needs to get more oxygen in' less learners correctly identified that it occurs because it needs to remove waste products. Common errors made were using the same expansion point for part ai and aii and therefore although correct this expansion point can only be gained once. This is the same for any other question within this paper and subsequent examination series.

This response gained 3 marks for correctly identifying increased tidal volume and breathing rate. It also was given one expansion point, but because this was repeated it was only gained once.



Farzana is a 10,000 m runner. She is in the middle of her athletics season. She is competing in races and she is also doing her training programme.

↑ BR ↑ TV

5 (a) Explain **two** immediate respiratory responses for Farzana when she is competing in a 10,000 m race.

(4)

(i) Increased tidal volume, which is the amount of air breathed in/out in one breath, as Farzana would need more oxygen to be supplied to her muscles for respiration

(ii) Farzana would also have an increased respiratory rate/breathing rate to gain sufficient oxygen in order for aerobic respiration to occur, and delay the onset of fatigue.

This response was given 4 marks because even though the expansions are the same, both oxygen (inspire more) and remove waste products have been included and credited even though it was in the same point.

Farzana is a 10,000 m runner. She is in the middle of her athletics season. She is competing in races and she is also doing her training programme.

5 (a) Explain **two** immediate respiratory responses for Farzana when she is competing in a 10,000 m race.

[4]

(i) She will have an increased breathing rate as she is needing to get oxygen to her working muscles quickly whilst removing waste products such as CO^2.

(ii) She will have an increased tidal volume due to her needing to inspire more oxygen and expiring carbon dioxide.

Q5(b)

The theme of the 10,000m race continued within this question and required the learners to explain how increased vital capacity will help performance. As in all explain command verb questions, marks are available for expansion points that relate to the scenario. It is important for centres to inform learners of this. Over 70% of responses achieved at least one mark and these were generally gained for 'inspiring and/or expiring more air'. Signifcantly less learners achieved the expansion marks by relating this to the performance.

This response gained 3 marks.

One of the long-term adaptations that has occurred in Farzana's respiratory system following her training programme is an increase in her vital capacity.

(b) Explain how increasing vital capacity will help Farzana's performance in a 10,000 m race.

[4]

Vital capacity is the maximum amount of air she can inhale/exhale. This may be down to the thoracic cavity increasing its size due to training. This will help her performance as she will be able to take bigger breathes when running (increasing her tidal volume) to take in more oxygen to supply her muscles reducing the build up of lactic acid and fatigue to make her time faster.

This response was gained 1 mark.

One of the long-term adaptations that has occurred in Farzana's respiratory system following her training programme is an increase in her vital capacity.

(b) Explain how increasing vital capacity will help Farzana's performance in a 10,000 m race.

(4)

It will help her store more energy in her body and when she uses her energy she will have more of it so this means that she will ~~~~ be able to run for longer without getting tired or fatiguered.

Q5(c)

This was the first extended response question of the paper and focused on the gas exchange process to ensure the athlete could continue in the 10,000m race. Responses for the question required focus on the gas exchange process at the lungs and the indicative content was written accordingly, to encompass this knowledge and application.

Like all of the extended response questions, the quality of learners' responses varied. Some learners were clearly very knowledgeable about the gas exchange process. Other learners were unable to address the question fully due to confusion between the cardiovascular system and respiratory system.

Level 1 responses tended to focus on one gas or provided a list with no development of the points within the indicative content. At level 3 learners' responses provided accurate knowledge of the gas exchange process, analysed both gases, used technical terminology with clear development of the point and referenced the 10,000m.

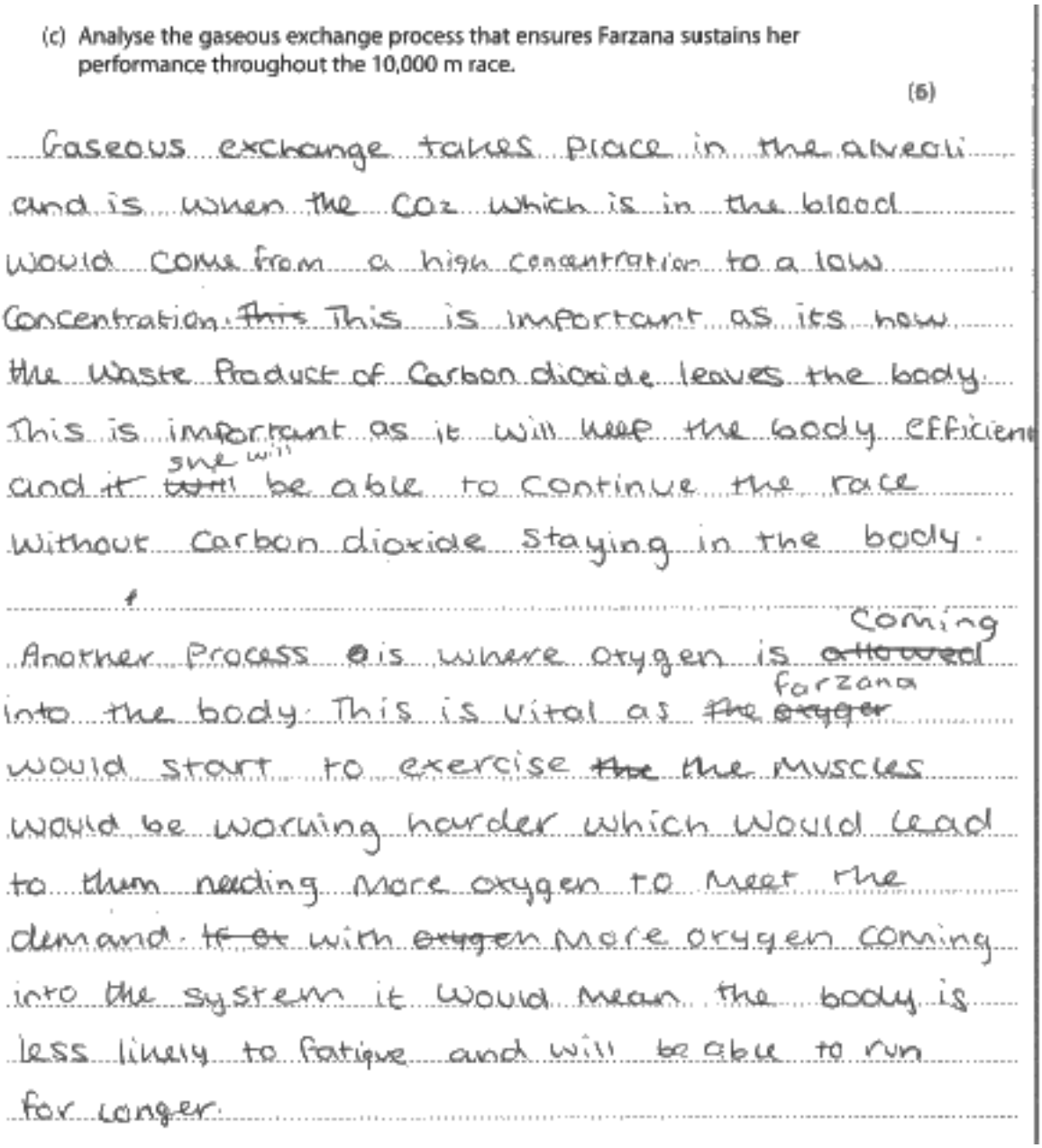
This response was placed at Level 3 and given 6 marks. The answer clearly assesses a number of points from the indicative content, focusing on both gases, correct concentrations and reference to increased speed of diffusion due to the race, with appropriate development in reference to the question.

(c) Analyse the gaseous exchange process that ensures Farzana sustains her performance throughout the 10,000 m race.

(6)

Depending on the partical pressure of oxygen ~~the~~ depends on how effiecent ~~alveous picks up~~ diffusion taker place. The alveoli recieve air from the lungs. ~~Oxygen~~ This is when the oxygen is at a high level of concentration in the alveous. ~~because gases~~ The blood or the capillerties are the low concentrations at this point. The gases from a high concentration diffuse in the place where there is a low concentration. In this case the alveous diffuses the oxygen into the capillerties. This mean the level of concentration changes. ~~For~~ When the capillerties hold ~~waste~~ waste product such as CO_2 there is a high concentration in the ~~the~~ blood stream. This mean the CO_2 would diffuse into the alveous where it will then be expired. Throughout the race diffusion will take place in the alveoli and the surrounding capillerties at a faster rate due to the intensity and length of the race. This is because more oxygen needs to be transported to the working muscles. This will mean she will be able to sustain her performance.

This response was placed at Level 2 and given 3 marks. The answer assesses some points from the indicative content, focused on both gases, but the section of carbon dioxide generates more credit due to the application of the correct concentrations, where this is missing from the oxygen part of the response.



(c) Analyse the gaseous exchange process that ensures Farzana sustains her performance throughout the 10,000 m race.

(6)

Gaseous exchange takes place in the alveoli and is when the CO2 which is in the blood would come from a high concentration to a low concentration. ~~this~~ This is important as its how the waste Product of Carbon dioxide leaves the body. This is important as it will keep the body efficient and it ~~they~~ she will be able to continue the race without Carbon dioxide staying in the body.

Another Process is where oxygen is ~~attracted~~ coming into the body. This is vital as ~~the~~ ~~oxygen~~ Farzana would start to exercise ~~the~~ the muscles would be working harder which would lead to them needing more oxygen to meet the demand. ~~If~~ ~~or~~ with ~~oxygen~~ more oxygen coming into the system it would mean the body is less likely to fatigue and will be able to run for longer.

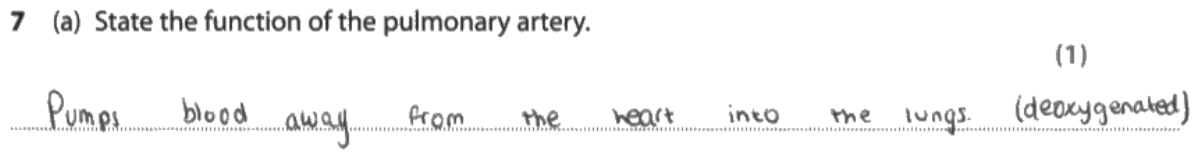
Q6

This was a recall question for stating what component of blood carries most oxygen. The vast majority of responses were correct, stating the red blood cells/haemoglobin. Common errors were the white blood cells.

Q7(a)

This was a recall question for stating what the function of the pulmonary artery is. A significant number of responses were incorrect. Common errors were, 'the pulmonary artery carries oxygenated blood' and some learners also did not state the end destination (lungs).

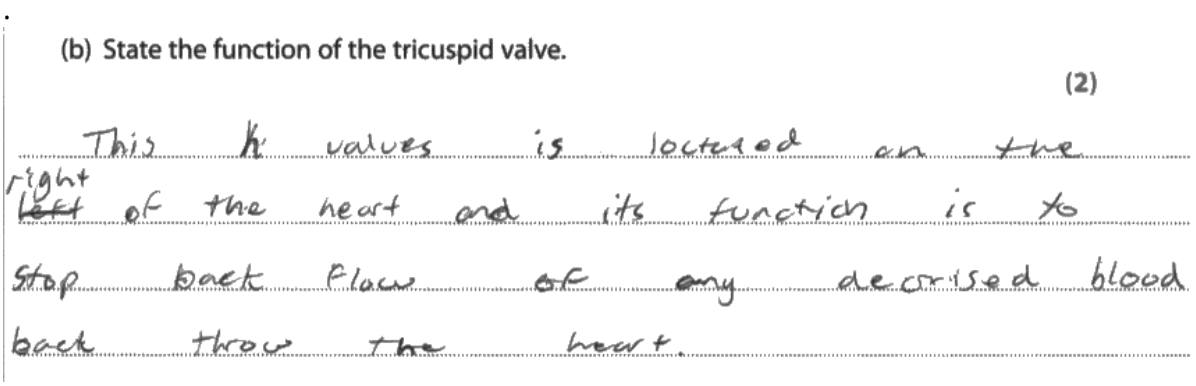
This response gained 1 mark



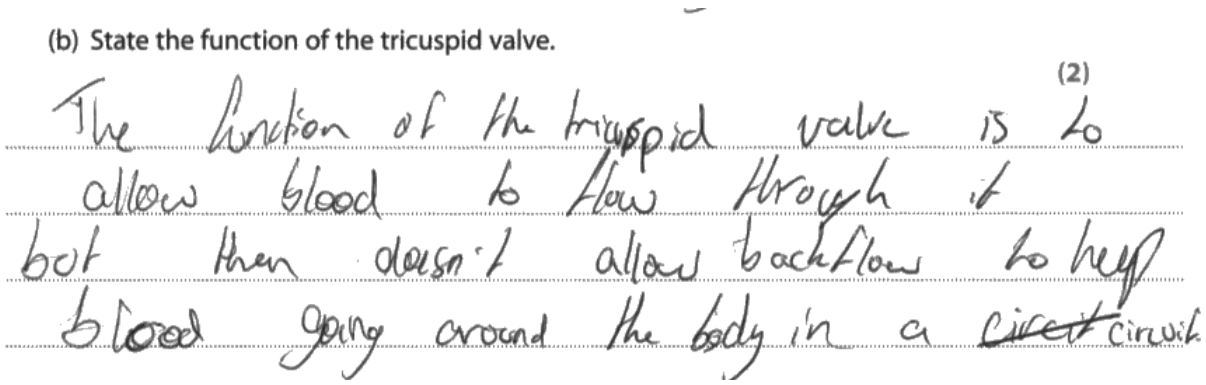
Q7(b)

This was a recall question for stating the function of the tricuspid valve. Over 50% of learners accessed at least one of the two available marks. Predominately this was for preventing backflow. Common errors were that the learners were not specific in terms of selecting the right side of the heart and some confused this with the bicuspid valve.

This response gained 2 marks



This response gained 1 mark



Q8(a)(i)

Learners were required to explain the changes to heart rate before the swim (D.4). Many correctly identified that it would increase, due to an anticipatory rise. Expansion marks were gained for caused by adrenalin. Common errors made were using the graph incorrectly and talking about during the swim rather than before. It is important for centres to inform their learners to read the question and use the stimulus material (in this case the graph) accurately.

This response gained 2 marks

Freddie is an open water swimmer. **Figure 4** shows his heart rate before, during and after a 10-minute training swim.

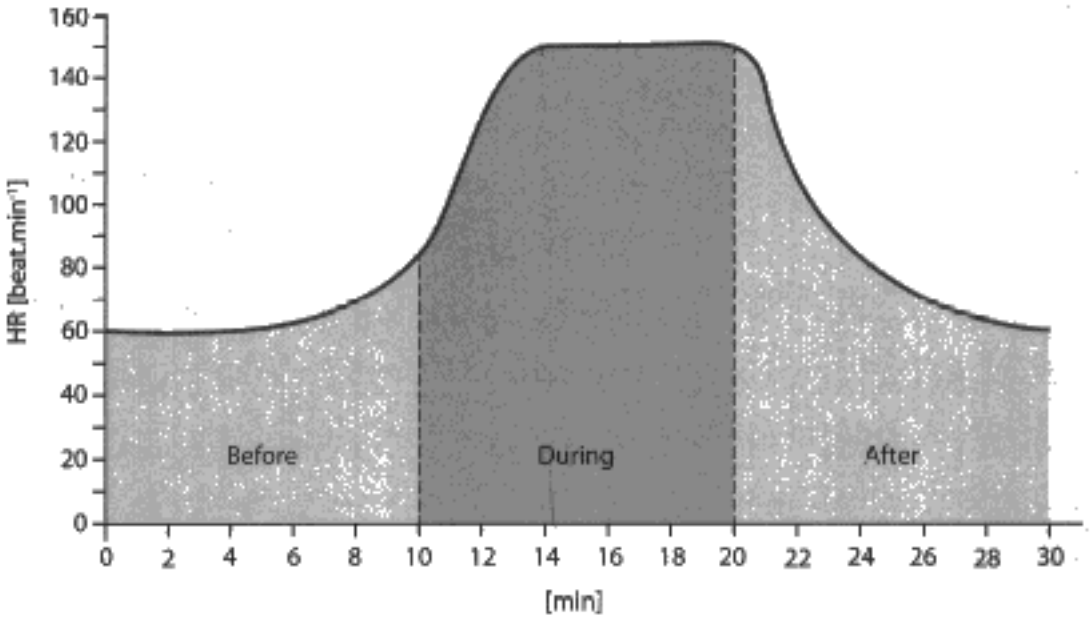


Figure 4

8 (a) (i) Explain the changes to Freddie's heart rate before the swim.

(2)

His heart rate increases before the swim due to the anticipatory rise. This is where hormones such as adrenaline are released into the body to prepare for exercise.

This response gained 1 mark

8 (a) (i) Explain the changes to Freddie's heart rate before the swim.

(2)

Freddie's heart has slowly start to increase due to anticipatory rise. This happens because your body is preparing itself for some form of physical activity.

Q8(aii)

This question was a contiunation of the theme of the swim and required the learners to explain the changes in heart rate during the swim. Again the learners should use the stimulus material to support their answer to the question, and this technique should be used for any subsequent examination series. In all explain command verb questions, marks are available for expansion points that relate to the scenario. It is important for centres to inform learners of this. Over 70% of responses achieved at least one mark and these were generally gained for needing to get oxygen in, which was positively marked for oxygen deficit. Many learners did not access the first mark point for 'rapid increase' due to not being specific enough and only stating the heart rate 'increases'. Signifcantly less learners achieved the expansion linked to the heart rate plateaus, where supply meets demand.

This response gained 3 marks

(ii) Explain the changes to Freddie's heart rate during the swim.

(3)

During the swim Freddie's heart rate rapidly begins to increase. This is because the demand for oxygen is increasing in his working muscles so energy can be provided and waste products like carbon dioxide and lactic acid can be removed. Four minutes into the race his heart rate levels out and stays the same because his heart is beating at a quick enough rate to fulfil the demand and supply for oxygen.

This response gained 1 mark

(ii) Explain the changes to Freddie's heart rate during the swim.

(3)

Freddie's heart rate increases due to the working muscles needing a greater blood supply to sustain the amount of exercise. It begins to level out because that's Freddie's maximum working heart rate.

Q8(b)

This question was a contiunation of the theme of the swim and required the learners to describe how nevous control of the cardiac cycle decreases heart rate after the swim. This question proved to be a good differentiator evident through the spread of marks. 20% of learners achieved 4 or 5 marks and 60% received 0 marks. It was evident that those learners who understood the process scored highly with succient answers. Common errors were that some learners confused nervous control with chemical control. With any process question, annotated diagrams will be accepted.

This response gained 1 mark

(b) Describe how nervous control of the cardiac cycle decreases Freddie's heart rate when the training swim has finished.

(5)

Parasympathetic system brings Freddies heart rate and adrenaline back down to normal. The chemoreceptors also send impulses to the medulla oblongata to slow down his heart rate after his training swim is finished.

This response gained 5 marks

(b) Describe how nervous control of the cardiac cycle decreases Freddie's heart rate when the training swim has finished.

(5)

The nervous control of the cardiac cycle decreases Freddie's heart rate when the training swim has finished as the sino atrial node, which is the pace maker send signals to atria ventricle (AV) node, which open the ventricles to allow blood to go trough first. then it sends the signals to the purkinje fibres, via the bundle of his. this then squeezes the heart to push which then pumps blood. When training has finished as there is less demands for oxygen by the muscles than when working, the signal is send later as the parasympathetic nervous system relaxes and lower the heart rate

Q8(c)

This was the second extended response question of the paper and focused on the hypothermia following the swim. Responses for the question needed to analyse the effects of hypothermia on the cardiovascular system and the indicative content was written according to encompass this knowledge and application.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about the hyperthermia, but struggled to express this in the context of the cardiovascular system. Other learners were unable to address the question fully due to confusion between the cardiovascular system and other body responses, such as shivering.

Level 1 responses tended to focus on 'it was a reduction in the body temperature' and did not access development of the points within the indicative content. At level 3 learners responses provided accurate knowledge of the effects of hypothermia on the cardiovascular system, used technical terminology with clear development of the points.

This response was placed at Level 3 and given 5 marks. The answer clearly assesses a number of points from the indicative content, focusing on the effects of hypothermia, with effective use of technical terminology, although there is one error (vasoconstriction used twice) appropriate development in reference to the question was evident.

Freddie has just completed a long training session in cold water. His coach notices that Freddie has slurred speech and is confused. The coach thinks that Freddie might be suffering from hypothermia.

(c) Analyse the effects that hypothermia could have on Freddie's cardiovascular system.

[6]

Hypothermia could cause an increase heart rate and blood pressure which could then trigger a cardiac arrest through an irregular heartbeat which could effectively kill Freddie. Furthermore this could lead to his fingers and toes becoming ice frosted through vasoconstricting e.g where the muscles dilate and shrink in areas that don't need oxygen and vasoconstrict to places that need it eg where muscles dilate and expand in places like the vital organs. This is called redistribution of blood and also the supply of oxygen would decrease as less oxygen will get to his body as his system could collapse. Lastly the shock could cause a heart attack in which could kill him.

In conclusion there are a number of lethal effects that could occur through of hypothermia.

This response was placed at Level 1 and given 2 marks. The answer clearly identifies the process of vasoconstriction and this was developed into keeping the blood away from the skin to reduce heat loss.

(c) Analyse the effects that hypothermia could have on Freddie's cardiovascular system.

[6]

Hypothermia can be a serious condition caused by vulnerability to extreme cold. The bodys reaction to suffering from hypothermia would be for the bodys main blood vessels to constrict, in a process called vasoconstriction. Vasoconstriction causes the blood vessels to shrink, and this is in order to try and keep the blood as far away from the surface of the skin, to avoid losing as much heat as possible

The next section of the paper looked at the energy systems, as anticipated learners found this section more difficult than other sections and this was reflected within their responses, although this was somewhat improved from the summer.

Q9

Another recall question where the learners were required to state the fuel and ATP produced for both the ATP-PC and Aerobic energy systems. Over 50% of learners accessed at least one mark.

This response gained 3 marks

9 Complete the following table by stating the chemical source and amount of ATP produced for both the ATP-PC and aerobic energy system.

Energy System	Chemical Source/Fuel(s)	Amount of ATP produced
ATP-PC	Creatien Phosthate	2
Aerobic	(i) Glycogen (ii) Fatty acids	36

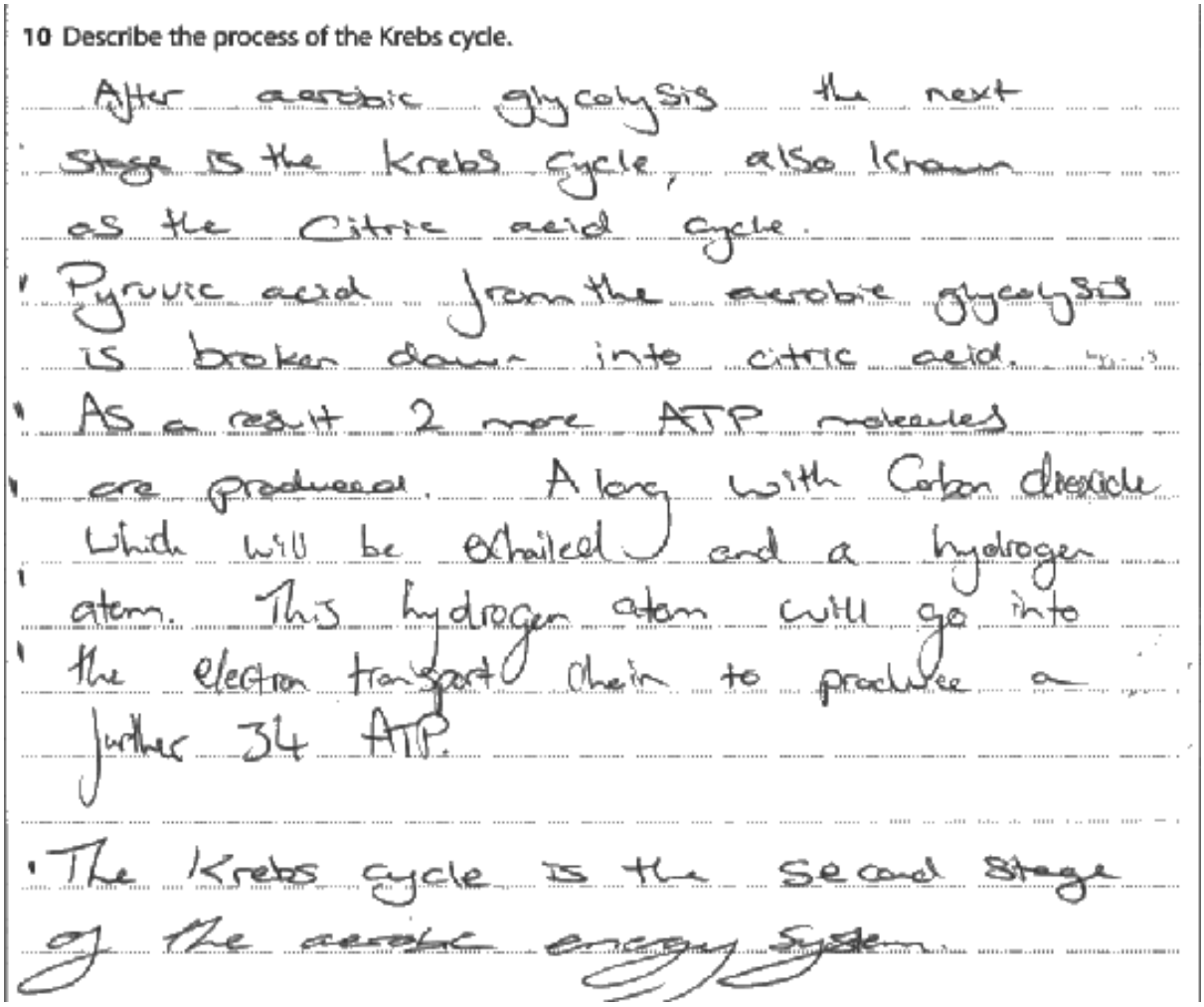
This response gained 1 mark

Energy System	Chemical Source/Fuel(s)	Amount of ATP produced
ATP-PC	creatine. ~~glucose~~	3
Aerobic	(i) Glycogen (ii) oxygen	38

Q10

This question required the learners to describe the krebs cycle. This question proved to be a good differentiator evident through the spread of marks, with the same percentage of learners getting 2, 3, 4 and 5 marks respectively. It was evident that those learners who understood the process scored highly with succient answers. Common errors were that, some learners did not understand the krebs cycle and therefore, wrote everything that they knew about energy sytems. With any process question, annotated diagrams will be accepted.

This response gained 5 marks



10 Describe the process of the Krebs cycle.

After aerobic glycolysis the next stage is the Krebs Cycle, also known as the Citric acid cycle.

Pyruvic acid from the aerobic glycolysis is broken down into citric acid.

As a result 2 more ATP molecules are produced. Along with Carbon dioxide which will be exhaled and a hydrogen atom. This hydrogen atom will go into the electron transport chain to produce a further 34 ATP.

The Krebs cycle is the second stage of the ~~aerobic energy system~~

This response gained 2 marks

10 Describe the process of the Krebs cycle.

The Krebs cycle is part of the aerobic energy system. Hydrogen becomes a waste product of the Kreb's cycle, which is then used in the electron transport chain. Pyruvic acid is used in the Kreb's cycle (before it turns into lactic acid) which is was a waste product from glycolysis

Q11

The final question of this section required the learners to evaluate the importance of the ATP-PC for a marathon runner.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about the use of the ATP-PC system in marathon and could articulate the positive and negative reasons. Other learners were unable to address the question fully and as with the entire section learners were writing everything they knew about the energy system/s in general rather than answering the specific question.

Level 1 responses tended to focus one side of the argument, either positive or negative with very limited reference to the question. Level 3 responses provided accurate knowledge of how the ATP-PC system is used for the marathon, for example changing pace and regenerating energy, but also looked at why it is not the efficient system in the marathon. Following this conclusions were drawn.

This response was placed at Level 3 and given 5 marks. The answer clearly evaluates the ATP-PC system in relation to the marathon. The system characteristics are discussed and conclusions are drawn to the effectiveness of the system for the marathon.

11 Evaluate the importance of the ATP-PC energy system for elite marathon runners in a race.

For the majority of the race the ATP-PC system is irrelevant to the performance of the athlete as it will be the least dominant energy system. This is because the ATP-PC system is limited to short events that require bursts of power such as the shot put. Therefore in a long distance race such as this the most important system will be the aerobic system. This is because it is the system most suitable for events that require working over a longer period of time. However, towards the very end of the marathon the ATP-PC system becomes most more important. This is because due to its high power suitability, it allows the athlete to run a fast final sprint for the last 10-12 seconds of the race. As an entire marathon however is much longer than 10-12 seconds mark of the time this system will be the least dominant.

This response was placed at Level 1 and given 2 marks. The answer clearly demonstrates how the ATP-PC system is used in the race and activities (4-10 secs) where the ATP-PC system is used, but why it is not important is not evaluated.

11 Evaluate the importance of the ATP-PC energy system for elite marathon runners in a race.

This is important for marathon runners as they will need the quick bursts of energy produced by this system when they are trying to get past people or are on an incline as it will produce lots of power for 4-10 seconds which they need. It will also be important for when the runner sees the finish line as they will aim to get the fastest time they can by sprinting at the last 100m or less.

Q12

The final question in the paper is a synoptic analysis. I urge centres to read the guidance under AO5 (page 20) of the specification to see the combinations between body systems. This question will always be a maximum of two systems. Learners should look to synthesise their writing and make connections between the systems where possible demonstrating the inter-relationship.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about the long term adaptations of the cardiovascular and energy systems and how this affects performance in football. Some learners were unable to address the question fully.

Low level responses demonstrated some knowledge and understanding of the indicative content and often lacked balance or coverage. Common errors were decreased resting heart rate, although correct this has no impact on performance. Other errors were short term responses of both systems, rather than the long term adaptations were given, with no link to performance. Also, low-level responses brought in answers from skeletal, muscular and respiratory systems, which were not required within the question. High-level responses displayed coverage from both areas as well as making link to how these systems work collectively.

Level 1 responses tended to focus on isolated elements that make general assertions and did not reference performance. Level 3 responses provided accurate knowledge of both the cardiovascular and energy system adaptations and how they affect performance. Like any levels of response based question, it is not 1 point equals 1 mark, the indicative content is extensive for learners to demonstrate a breadth of knowledge and generate credit.

This response below was placed at Level 3 and given 7 marks. The answer clearly analyses the impact of the adaptations of the cardiovascular and energy systems. Each system is visited and application to performance and interrelationships are developed throughout.

Paula is a football player. She has completed a pre-season training plan resulting in long-term adaptations to her cardiovascular and energy systems. ↑ blood supply capillarisation ↑ lactate tolerance

12 Analyse how long-term adaptations of Paula's cardiovascular and energy systems affect her football performance.

(8)

~~First of all, an increased blood~~ First of all, capillarisation of the alveoli and skeletal muscle would be very important to Paula's football performance. This is because it produces a larger surface area for gaseous exchange to occur, meaning more oxygen (O_2) can enter the muscle for respiration and carbon dioxide (CO_2) can be removed effectively to delay the onset of fatigue. This means Paula can repeatedly contract her muscles and continue playing in the match for longer. This links to an increase in myoglobin stores, as it is responsible for taking O_2 from haemoglobin in the blood, and transporting it into the muscle, for it to be used in the energy systems to produce ATP. An increased lactate tolerance means that Paula can repeatedly contract her muscles without the build up of lactic acid, due to an efficient cardiovascular system, which removes it via gaseous exchange. This will allow Paula to perform for longer as the removal of waste products will delay the onset of fatigue, and give her an advantage in the game. An increase in creatine stores would also be beneficial for Paula's performance as it would mean she could perform high intense activities for longer. For example, she could sprint for longer, but also jump for a header later on in the game. A long term effect on Paula's CV system would be a decreased resting heart rate, meaning Paula's heart isn't having to work as hard to pump the same amount of blood around the body, making her CV system more efficient. This also links to an increased resting and working stroke volume, which is the ~~same~~ volume of blood pumped out of left ventricle per beat. This again puts less stress on the heart as more blood is pumped out per beat, so it doesn't have to pump as many ~~times~~ times.

This response was placed at Level 1 and given 3 marks. Credit is gained increased size and strength of the heart, although technical terminology of cardiac hypertrophy is not used. There is also an attempt to link the information to performance. Energy system adaptations are credited for increased glycogen stores that are developed and applied to performance. There is no attempt to display the interrelationship between the two systems.

12 Analyse how long-term adaptations of Paula's cardiovascular and energy systems affect her football performance.

(8)

Firstly a long term adaptation of Paula's Cardio-vascular system could be a reduced resting heart rate. This will help her football performance because a lower resting heart rate means both the strength and size of her heart has increased, so it does not have to work as hard to pump the blood around the body to supply the working muscles with the oxygen they need. Due to this her body will not fatigue as quickly meaning she is able to perform to the best of her ability for the duration of the game. 3sec

Secondly an adaptation that would've occured of her energy systems would be increased glycogen stores this would be beneficial to Paula's football performance as then she would have quicker access to ATP which is needed for her to carry out a Football match.

Summary

Based on their performance on this paper, learners should:

- Use appropriate technical language throughout their responses,
- Tailor their response based on the command word in the question, eg, for an explain question there will always be marks available for expansion points and relevance to the scenario.
- Be clear about terminology used in the specification as these words will be repeated in the exam paper, eg, short-term responses (immediate, due to the exercise/sport), adaptations (long term). The same can be said for questions such as 1b – skeletal adaptations. This is taken directly from the specification A.5 and therefore they were the only two answers available for credit.
- Only address the correct body system within this section, eg, in Section B 'The Muscular System' credit will only be gained for responses from the specification of the muscular system. No marks will be available for reference to any other body system.
- I urge Centre's to read the guidance under AO5 (page 20) of the specification to see the combinations between body systems.
- Use the question scenario to demonstrate their ability to apply their knowledge.
- Check their paper carefully for any missed questions and attempt everything.
- Please click here for the specification and SAMS.

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