Examiners' Report/
Lead Examiner Feedback
Summer 2017

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, at Distinction, Merit, Pass and Near Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external 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 is 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 external assessment 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 assessment, because then it would not take accessibility into account.

Grade boundaries for this, and all other papers, are on the website via this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Unit 1: Anatomy and Physiology

Grade	Unclassified	Level 3			
		N	P	M	D
Boundary Mark	0	10	21	34	48

Introduction

This was the first series of the new specification, and as such, the first time that this unit has been externally assessed via an examination rather than centre based internal assessment. Centres and learners should be congratulated on their preparation for this radical change to the assessment format. Overall, learners appeared well prepared and well versed on many of the specification topics covered in this assessment.

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. Within each section, the final part of each question 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 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 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 writing questions account for just under half 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 a number of learners did not make full use of the stimulus material provided in the question and wrote generic responses or did not actually answer the question but wrote about a different area of knowledge.

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 leveled response questions, will always focus on the ability to demonstrate application rather than the ability to recall theory. It will be important for learners to have practice in doing 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. 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.

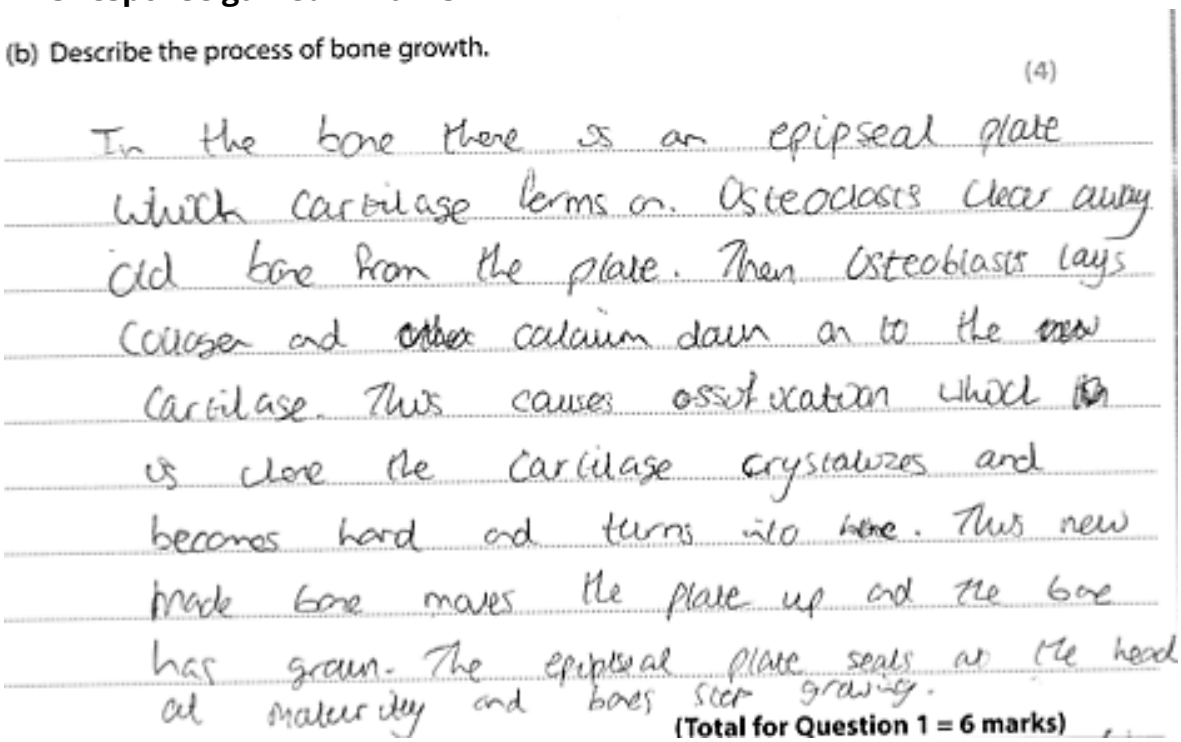
Q1(a)

The majority of learners gained at least one mark for this question, with many achieving two marks for identification of the thoracic and coccyx as correct answers. It is important that technical terminology is used and phonetic spelling is credited. Common errors were coccyx being identified as tail-bone, which is not the technical terminology required for Level 3.

Q1(b)

Learners were required to describe the process of bone growth. Many identified the process as ossification and were gained the marking point for this. Common errors made were confusing the role of osteoblasts and osteoclasts.

This response gained 4 marks



(b) Describe the process of bone growth.

(4)

In the bone there is an epipseal plate which cartilage forms on. Osteoclasts clear away old bone from the plate. Then Osteoblasts lays collagen and other calcium down on to the new cartilage. This causes osseification which is where the cartilage crystalizes and becomes hard and turns into bone. This new made bone moves the plate up and the bone has grown. The epipseal plate seals at the head at maturity and bones stop growing.

(Total for Question 1 = 6 marks)

This response gained 1 mark, for correctly identifying ossification.

(b) Describe the process of bone growth.

(4) 1 Q01b

The process of bone growth is called ossification. This is when your bones grow over your lifetime, making them larger and stronger.

Q2

This extended response question focused on the structure of the shoulder joint and how it enabled the bowler to perform the action.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about the structure of the shoulder joint and were able to apply this knowledge to provide an assessment of the impacts on performance. Other learners were unable to address the question fully due to confusion between the structure and performing a movement analysis, which was not required by the question.

Level 1 responses tended to focus naming the type of joint and confusing the movement with rotation. Level 2 responses tended to demonstrate knowledge of both the joint type, movement and some of the structures, notably synovial fluid but again, often failed to contextualise the answer. To achieve level 3, learners' responses provided accurate knowledge of the structure of the shoulder joint and expressed this knowledge within the question context.

The response below was placed at level 3 and given 6 marks

Rather than simply listing each structure the learner develops their response, explaining the effect of this adaptation and often the impact of this to the cricketer, hence the placement of the response at level 3, achieving maximum marks.

Figure 2 shows Alastair bowling at cricket.

The synovial joint of the shoulder allows him to complete the bowling action.

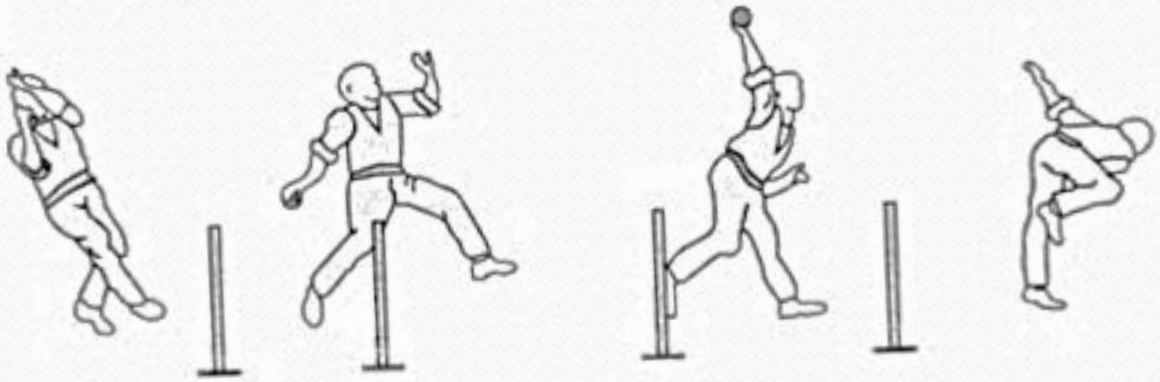


Figure 2

2 Analyse how the structure of Alastair's shoulder joint allows him to complete the bowling action.

As it's at the shoulder it is a ball and Socket joint which is made up of the clavicle, humerus and scapula. The shoulder allows rotation in which is how he is bowling. The joint is also synovial which means its made has a joint capsule which has a synovial membrane and produces synovial fluid. This Synovial fluid lubricates the joint and allows it to move easier, hence allowing the rotation movement of the ball. It also has ligaments which are holding bones and stabalizing the articulating bones, again allowing him to ball.

2. The Synovial joint also has articulating cartilage which acts as a shock absorber and stops the articulating bones from rubbing on each other. It also has a bursa which stops the bones from rubbing on the tendon. All of these allows Alastair to perform the bowling movement

This response was placed at Level 1 and given 1 mark.
Credit was gained for the correct identification of the shoulder as being a ball and socket joint, but the movement identified (rotation) was incorrect. The remainder of the response pays no reference to the structural components on the shoulder joint and thus reflected in the marks gained.

Figure 2 shows Alastair bowling at cricket.

The synovial joint of the shoulder allows him to complete the bowling action.

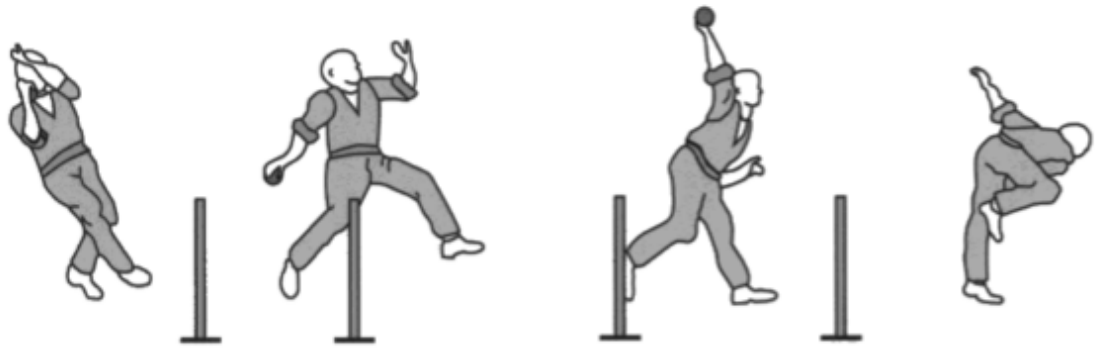


Figure 2

2 Analyse how the structure of Alastair's shoulder joint allows him to complete the bowling action. **1** Q02

Alastairs shoulder joint allows him to complete the bowling action because the shoulder joint is a ball and socket ~~joint~~ joint. This means that Alastair is able to get a rotation in his shoulder allowing him to bowl.

Q3

The majority of learners gained the two marks available for this question, with many achieving two marks for identification of the smooth and cardiac as correct answers, with appropriate places where they are located. Common errors were not making the connection between skeletal muscle and muscles of the body.

This response gained 1 mark for the correct muscle type but incorrect location.

Skeletal muscle is one type of muscle tissue.

3 State **one** other type of muscle tissue **and** its location in the body. 1

Smooth under other muscles

Q4

This question focused upon the affects that cramp has on performance. With any explain questions marks are gained for application to the sport/exercise. Common errors were that cramp is caused by lactic acid, with the high level responses identifying that it is caused through dehydration/lack of electrolytes.

This response gained 3 marks for the correct description of cramp and the cause of it, a final mark was gained for application, causing her to stop.

Sonia is a footballer playing in a cup final.

The final has gone into extra time and she develops cramp in her leg.

4 (a) Explain how cramp will affect Sonia's performance.

(4)

Cramp is an ~~a~~ uncontrolled muscle twitch in the muscle fibres caused by dehydration or lack of stretching or electrolytes. This will be extremely painful for Sonia ~~and~~ which will hugely impede her performance as she may be forced to stop due to the pain in her leg. This would result in her losing out on valuable time and might leave an opportunity for her opponent to get an advantage in the cup final.

This response did not score any marks due to stating that cramp is caused by a lactic acid build up and no application to the affects that it has on performance.

Sonia is a footballer playing in a cup final.

The final has gone into extra time and she develops cramp in her leg.

4 (a) Explain how cramp will affect Sonia's performance.

(4) **0** Q04a

Sonia has got cramp in her leg due to the amount of lactic acid building up in her muscles. Cramp could have appeared due to her low level warm-up and can now leave the muscles in her leg feeling really tight with her leg being felt as heavy.

Q4(b)

This question was a continuation from the performer within 4a, it is important for centres to inform learners that the answers from previous questions will never follow through or be required for the next question. Throughout the paper and within subsequent examination series for each section there will be one focus on sport/exercise.

This response gained 4 marks for correctly stating that myoglobin carries oxygen to enable greater energy production due to more oxygen being delivered (implied increased oxidative capacity). The final mark was gained for application for working at a higher intensity for longer, without fatiguing.

Sonia follows a sustained exercise programme and her muscular system starts to show adaptations. One adaptation is an increase in her muscle myoglobin stores.

(b) Explain how an increase in myoglobin stores will benefit Sonia's football performance.

(4)

Myoglobin is how Oxygen is transported from the blood to the mitochondria. The more myoglobin means the more O_2 that can be delivered. This means more energy can be produced and therefore Sonia can carry on playing and can working for longer without fatiguing. She would also be able to perform at a higher intensity.

This response gained 1 mark for the correct application for playing longer in the game without fatiguing.

Sonia follows a sustained exercise programme and her muscular system starts to show adaptations. One adaptation is an increase in her muscle myoglobin stores.

(b) Explain how an increase in myoglobin stores will benefit Sonia's football performance.

(4) 1 Q04

An increase in myoglobin stores will benefit Sonia's football performance because. She would be able to play longer in a match without feeling fatigue.

Q4(c)

This extended response question focused on the analysis of the press up for both phases of the movement.

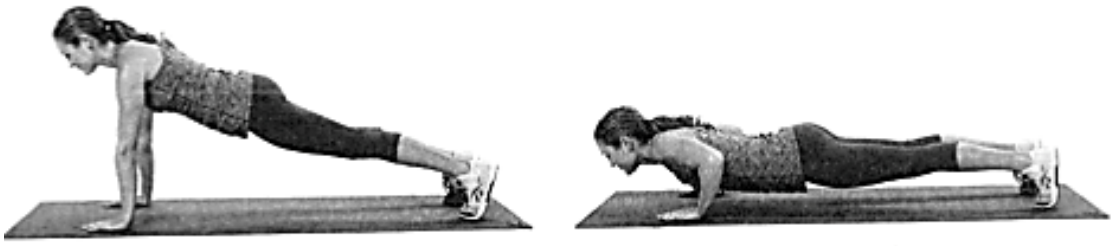
Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about the roles, correct muscles and contractions. Other learners were unable to address the question fully due to confusion between the movements of the elbow in the downward phase, resulting in the bicep being the agonist.

Level 1 responses tended to focus naming the muscles correctly in the upward phase (Tricep agonist, Bicep antagonist), but then said they swap roles in the downward phase, which is incorrect. They focused only on the muscles of the elbow joint and no reference to synergists and fixators. To achieve level 3 learner's responses provided accurate knowledge of the roles (agonist, antagonist, fixator and synergists), contractions and muscles used in both phases of the press up.

This response was placed at level 3 and given 5 marks, it provided a highly detailed correct analysis of the press-up in both phases incorporating all muscular roles and contractions. This was not given full marks, due to no reference to the elbow joint and the bicep and tricep.

Figure 3 shows Sonia performing press-ups as part of her pre-season muscular training programme.

(c) Analyse the antagonistic muscular contractions used to perform **both** the upward and downward phase of the press-up. (6)



Upward phase

Downward phase

Figure 3

For the dawnward phase the agonist would be the ~~bicep~~ Pectorals as its the muscle that is under tension and doing the work. The antagonist would be the trapezius as it is allowing the pectoals to work. The synergist which helps and directs the movement of the agonist would be the deltoid. The fixator which stabilises the joint would be the abdominals and obliques. For the upward phase the agonist would again be the pectorals as they are the muscle under tension. The antagonist would be the

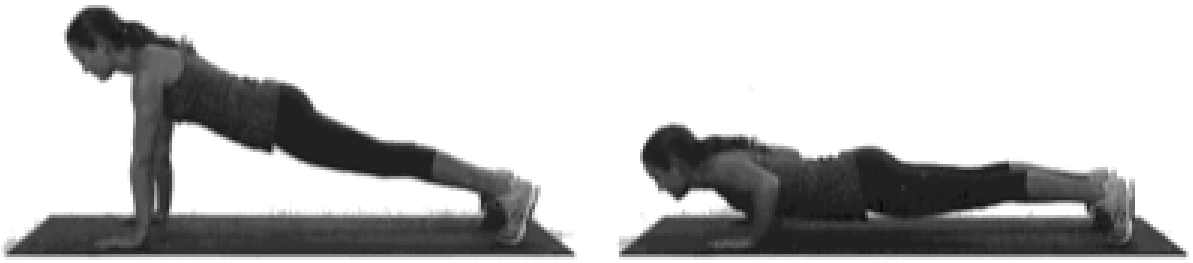
4	
C.	trapezius again as its allowing the pecs to do the work. The synergist and fixator would be the same as the dawnward phase; the deltoid being the synergist and obliques and abdominals being the fixators.

This response was placed at Level 1 and given 2 marks. Marks were gained for the correct identification of the roles of the bicep and tricep in the upward phase, as well as what a synergist and fixator muscle does. However, the response stated that the roles swap, which is incorrect and was a common mistake on a number of scripts.

Figure 3 shows Sonia performing press-ups as part of her pre-season muscular training programme.

(c) Analyse the antagonistic muscular contractions used to perform **both** the upward and downward phase of the press-up.

(6) Q04c



Upward phase

Downward phase

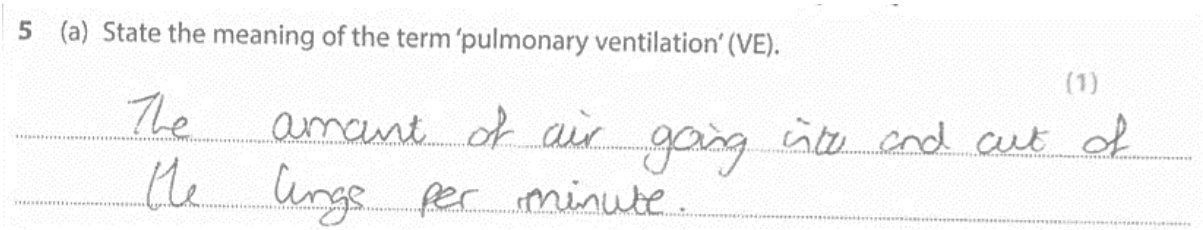
Figure 3

The antagonistic muscle pair Sonia is using in her press-ups are her biceps and triceps, in the upward phase, her bicep will be the antagonist due to it being the relaxing muscle and her triceps will be the agonist. In the downward phase, this would reverse as her bicep would now be the agonist and her tricep the antagonist. In every antagonistic muscle pair, there are synergists and fixators, where synergists assist muscle contraction and fixators remove any unwanted contractions or movements.

Q5(a)

Pulmonary Ventilation may be an unfamiliar term used, often this is referred to as Minute Ventilation, therefore impacting on performance and some learners were confused referring to cardiovascular responses.

This response gained 1 mark for correctly defining pulmonary ventilation.



5 (a) State the meaning of the term 'pulmonary ventilation' (VE).

(1)

The amount of air going into and out of the lungs per minute.

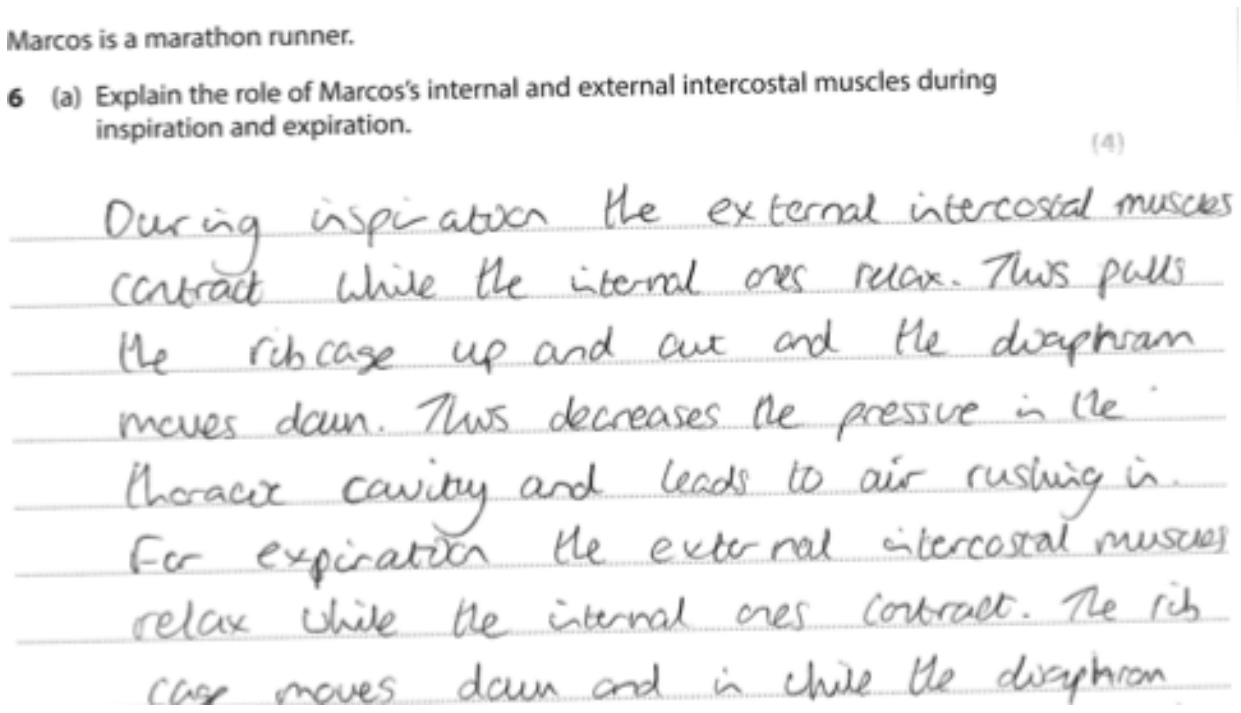
Q5(b)

Based upon the information in the preceding question, responses were varied and inaccurate. The terminology 'value', may have been misinterpreted with a number of learners not putting a number. For those who included a value they were missing the units of measurement (l/min), which is an expectation at Level 3 and will be required in any subsequent papers.

Q6(a)

The question required the roles of both intercostal muscles to be explained within inspiration and expiration as stated in the question. Many did not explain the role of both intercostal muscles (External/Internal) in inspiration and expiration.

This response gained 4 marks for correctly explaining what the intercostal muscles do in relation to the rib cage and also their state of contraction/relaxation for both inspiration and expiration.



Marcos is a marathon runner.

6 (a) Explain the role of Marcos's internal and external intercostal muscles during inspiration and expiration.

(4)

During inspiration the external intercostal muscles contract while the internal ones relax. This pulls the rib cage up and out and the diaphram moves down. This decreases the pressure in the thoracic cavity and leads to air rushing in. For expiration the external intercostal muscles relax while the internal ones contract. The rib cage moves down and in while the diaphram

This response did not score any mark because of incorrect terminology and also reference to the diaphragm that was not required for the question.

Marcos is a marathon runner.

6 (a) Explain the role of Marcos's internal and external intercostal muscles during inspiration and expiration.

(4) 0 Q06a

When marcos inhales the diaphram extends allowing more oxygen to come through but when exhaling the diaphram and intercostal muscles shrink allowing carbon dioxide to leave the body.

Q6(b)

This question looked at the process of gas exchange of oxygen at the alveoli. Many learners did not answer the question effectively, time was spent explaining the process of gas exchange of carbon dioxide, when the question asks for oxygen only. A number stated that oxygen exchanges with carbon dioxide.

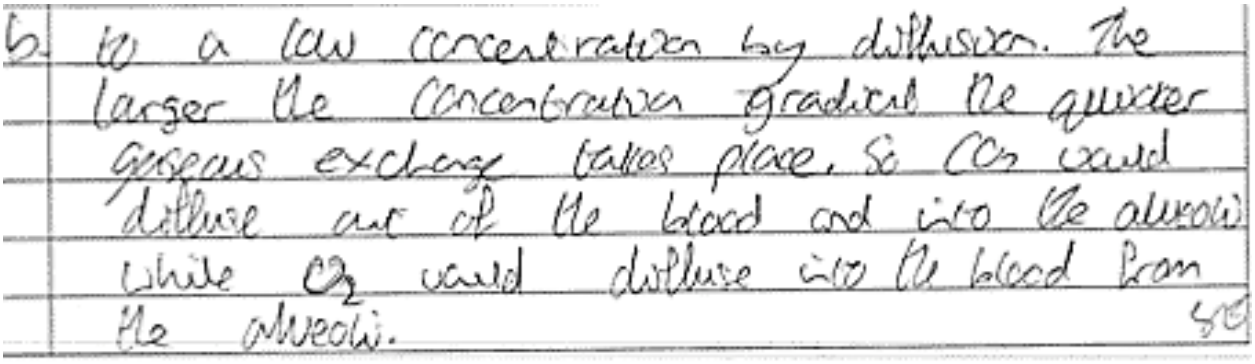
This response gained all 4 available marks.

Gas exchange occurs so that Marcos's body receives oxygen from the air he breaths in. 4

(b) Explain the process of gaseous exchange of oxygen at the alveoli during a marathon.

(4)

During a marathon the muscles would be working hard to keep running. This means lots of CO_2 is going to be produced as a by product. Once it gets to the alveoli there will be a low amount of O_2 in the capilleries covering the alveoli and a high amount in the alveoli. This causes a concentration gradient and O_2 moves from a high concentration



Q6(c)

This extended response question focused on how the respiratory system adapts following completion of a 6 month extensive endurance based programme. It is important for centres to pass on terminology used within the specification to support their learners. When the term adaptations is used this refers to long-term and when the term responses is used, this is referencing immediate changes due to the exercise/sport.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about the respiratory adaptations. 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 adaptation or provided a list with no development. To achieve level 3 learner's responses provided accurate knowledge of three respiratory adaptations with clear development of the point and reference to the marathon.

This response was placed at Level 3 and given 6 marks. The answer clearly assesses a number of respiratory adaptations with appropriate development in reference to the question.

As part of his preparation to run the marathon Marcos completed a six-month endurance training programme.

(c) Assess the adaptations to Marcos's respiratory system at the end of his six-month endurance training programme.

(6)

One of the adaptions could be an increase in lung capacity as his lungs would have become larger and can stretch further. This could therefore allow for an increase in vital capacity as his lungs can hold more, so after the maximum inhale could be more and therefore the maximum exhale could also be more. He would also have an increase in the maximum breathing rate as his lungs are bigger the he can breathe more times per minute As he can breathe more times per minute his pulmonary ventilation

C. would also increase. As his tidal volume would have also increased, so that could have also increased his pulmonary ventilation. His respiratory muscles would have become stronger and more efficient meaning they will fatigue as easily. He will also have an increase in gaseous exchange as more alveoli and capillaries would have formed. This then leads to a more efficient gaseous exchange system as there is a larger surface area for gaseous exchange.

This response was placed at Level 1 and given 2 marks. The answer clearly identifies that the intercostal muscles will get stronger enabling more oxygen to come into the body, this is also referenced to the impact on performance. Additional information is related to the cardiovascular system and therefore irrelevant for this question.

As part of his preparation to run the marathon Marcos completed a six-month endurance training programme.

(c) Assess the adaptations to Marcos's respiratory system at the end of his six-month endurance training programme.

(6) 2 Q06

The adaptations to marcos's respiratory system at the end os his six-month endurance training programme are: He's intercostal muscles would become alot stronger, his heart would become bigger and so would his lungs, allowing more oxygen to come into the body and to the working muscles so he doesn't get fatigue.

Q7(a)

This question looked at how carbon dioxide is transported in the blood. On the whole the question was misinterpreted with a number of learners describing how carbon dioxide is removed from the body.

This response gained 2 marks.

Carbon dioxide (CO_2) is a by-product of respiration.

7 (a) Describe how carbon dioxide (CO_2) is transported in the blood.

(2)

It is dissolved into carbonic acid and is transported in the blood plasma.

This response did not score any mark, although correctly identified that it travels in the blood, this was not specific enough at Level 3.

Carbon dioxide (CO_2) is a by-product of respiration.

7 (a) Describe how carbon dioxide (CO_2) is transported in the blood.

(2) 0 Q07a

Carbon dioxide is transported in the blood as it enters through the arteries, into the capillaries and out through the veins.

Q7(b)

Still looking at carbon dioxide, this question focused upon how it is removed from the body. Low-level responses highlighted that carbon dioxide is removed through gas exchange/diffusion and expired. High-level responses charted the journey of carbon dioxide from the muscle tissue via the heart and into the lungs to be expired. With any process question, annotated diagrams will be accepted.

This response gained 5 marks. It provided a systematic flow of carbon dioxide from the muscle tissue through to the alveoli, using the correct technical terminology.

(b) Explain how carbon dioxide (CO_2) is removed from the body. pulmonary artery.

(5) 5 Q07b

Carbon Di oxide is removed, firstly by the working muscles as it transfers from an area of high pressure to low pressure and ends up in the Red Blood cells. This then flows through vessels, then into bigger veins before reaching and entering the right side of the heart through the Vena Cava. From here it enters the right atrium and then passes through the tricuspid valve into the right ventricle which then pumps it out into the pulmonary artery which leads to the lungs. The carbon dioxide then diffuses again (from an area of high pressure to an area of low pressure) and enters the alveoli/ lungs where it is then breathed out.

This response did not score any mark. This is due to the inaccuracy of the response and not correctly outlining how carbon dioxide is removed from the body.

(b) Explain how carbon dioxide (CO_2) is removed from the body.

(5) 0 Q07b

Co_2 is removed from the body when ~~oxygen~~ Co_2 goes into the lungs. This is because Co_2 is then transferred into oxygen(O) which goes to the working muscles ~~and the Co_2 is released when we exhale.~~

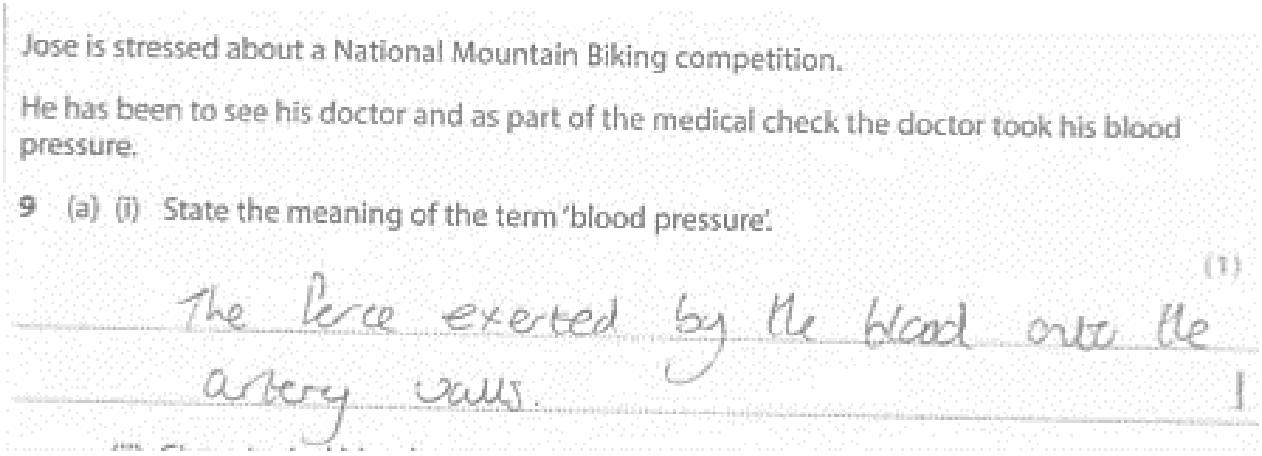
Q8

This was a recall question for stating what blood vessel is responsible for transporting oxygen from the left ventricle. A number of responses were correct, stating the aorta. Common errors were the different cardiovascular blood vessels (Pulmonary artery, Pulmonary vein).

Q9(a)(i)

Another recall question where the learners were required to define blood pressure. This question was not answered as well as anticipated, many responses were not specific enough and missing the blood vessel 'walls' out of their answer.

This response gained 1 mark.



Jose is stressed about a National Mountain Biking competition.

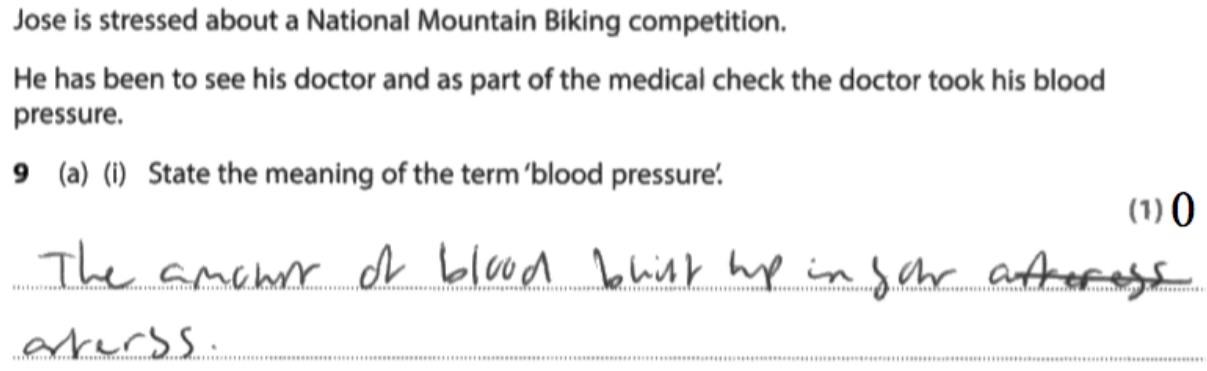
He has been to see his doctor and as part of the medical check the doctor took his blood pressure.

9 (a) (i) State the meaning of the term 'blood pressure'.

(1)

The force exerted by the blood onto the artery walls. 1

This response did not score any mark.



Jose is stressed about a National Mountain Biking competition.

He has been to see his doctor and as part of the medical check the doctor took his blood pressure.

9 (a) (i) State the meaning of the term 'blood pressure'.

(1) 0

The amount of blood that up in your ~~arteries~~ arteries.

Q9(a)(ii)

This question was a continuation of blood pressure. For those who included a value they were missing the units of measurement (mmHg), which is an expectation at Level 3 and will be required in any subsequent papers.

This response did not score any mark, although the correct value was given within the range, there was no units provided.

(ii) Give a typical blood pressure value for someone suffering with hypertension.

(1) 0

160/100

Q9(b)

The question looked at the process of blood clotting, the learners performed relatively well, with a number displaying knowledge of platelets and how they stop blood flow/form a scab. High level responses brought in fibrin and the role it plays within the blood clotting process.

This response gained 5 marks, for clearly describing the process of blood clotting.

Jose fell of his bike two weeks ago and he cut his arms and legs. These cuts soon healed due to the clotting action of the blood.

(b) Describe the process of blood clotting.

(5) 5 Q09b

Blood is clotted by platelets. These are fragments of cells produced by the bone marrow. They join together and form a plug at the site of infection to prevent blood loss. This stimulates coagulation factors to form fibrin strands securing the platelets along with red and white blood cells and trapping them. These blood cells can then be used to repair the broken tissue making it heal.

This response gained 1 mark for correctly stating that blood clots to form a scab.

Jose fell off his bike two weeks ago and he cut his arms and legs. These cuts soon healed due to the clotting action of the blood.

(b) Describe the process of blood clotting.

(5) 1 Q09b

The process of clotting action, is the capilleries cover up the cuts and cause a blood clot ~~or~~ causing ~~there to be~~ a 'scab'.

Q9(c)
This was a recall question for stating what part of blood is responsible for fighting infections. A high number of responses were correct, stating the white blood cells.

Q9(d)
This extended response question focused on how increased stroke volume will help improve the quality of cycling performance.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about the impacts of increased stroke volume. Other learners were unable to address the question fully due to confusion between the cardiovascular system and respiratory system and confusing stroke volume with tidal volume.

Level 1 responses tended to focus on stating it would get more blood or oxygen to the muscle. To achieve level 3, learners responses provided accurate knowledge of how increased stroke volume with clear development of the point and reference to improvement in performance.

This response was placed at Level 3 and given 5 marks. The answer clearly analyses the impact of an increased stroke volume, in increasing cardiac output and then linking it directly to cycling performance and the implications that it has.

Jose cycles 60 miles per week, as part of his training. His stroke volume will increase because of this training.

(d) Analyse how an increased stroke volume will help to improve the long-term quality of Jose's cycling performance.

(6)

Stroke volume is the amount of blood ejected out by the heart per beat. As Jose has an increase in stroke volume it means that he will be able to pump more blood out per beat. This means that lactic acid is removed more efficiently as more O_2 can be delivered per beat. This allows Jose to therefore carry on for longer at a high intensity. So he could be able to cycle for longer distances without fatiguing. As his stroke volume increased so would his cardiac output also which means more blood is being delivered per minute to working muscles. This again [illegible] Jose's cycling performance. Fatiguing other would help

(Total for Question 9 = 14 marks)

This response was placed at Level 0 and given 0 marks. It provided no reference to the question and did not link the increased stroke volume to cycling performance.

Jose cycles 60 miles per week, as part of his training. His stroke volume will increase because of this training.

(d) Analyse how an increased stroke volume will help to improve the long-term quality of Jose's cycling performance.

(6) Q09d

An increased stroke volume will improve his quality for the long term. This will happen as he is then able to release more power in his cycling and will then be able to complete more miles a week which will then make his performance ger even better due to the amount of miles he ends up completing.

The next section of the paper (overleaf) looked at the energy systems, as anticipated learners found this section more difficult than other sections and this was reflected within their responses.

Q10(a)

This question looked at how ATP is resynthesised. It is important for centres to inform learners that they must answer the question as opposed to writing everything they know. Learners did not utilise their time efficiently as many discussed the breakdown of ATP, rather than how it is resynthesised. With any process question, annotated diagrams will be accepted.

This response gained 4 marks, but large amounts of it are irrelevant to the question, such as the breakdown of ATP, marks are gained from line 6 onwards.

Clarissa is a time trial cyclist. She has to cycle 25 miles as quickly as she can.

10 (a) Describe how the ATP-PC system re-synthesizes ATP during Clarissa's ride.

(5)

First ATP is broken down by ~~ATPase~~ the enzyme ATPase into ADP + a inorganic phosphate + energy. The bonds between the second and third phosphates are broken and this produces the energy. Then phosphocreatine is broken down into phosphate and creatine and the energy ~~for that produces~~ produced from that resynthesises ADP + an inorganic phosphate into ATP. This process happens into the Sarcoplasm and is to maximum intensity activities as it Supplys a quick supply of energy.

This response did not score any mark, there was a clear gap in the knowledge base of the ATP resynthesis.

Clarissa is a time trial cyclist. She has to cycle 25 miles as quickly as she can.

10 (a) Describe how the ATP-PC system re-synthesizes ATP during Clarissa's ride.

(5) **0** Q10a

While she is cycling, The ATP-PC ~~system~~ will be the dominant energy system. This means that this system will be providing her with ATP, which is Adenosine Triphosphate. This will give her energy until it runs out and then the ATP-PC system will create more energy for her ~~to use~~. TO USE.

Q10(b)

Another question looking at the recovery process. When learners are provided with a stimulus such as a graph, there will be available marks for the correct interpretation of it. Within the responses of the majority of learners there was a lack of evident knowledge of the recovery process, which should be taught alongside recovery time.

This response gained 3 marks, for correctly stating that there is a high amount of oxygen used, as well as the amount of oxygen and time taken to recover.

Clarissa has just completed her time trial.

Figure 4 shows Clarissa's rest, exercise and recovery period.

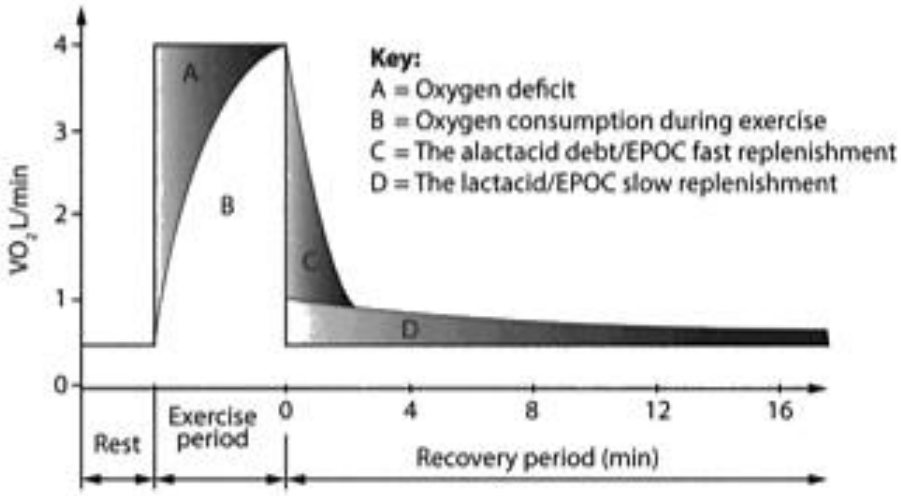


Figure 4

(b) Explain the section labelled C, that is the alactacid component of Clarissa's recovery process.

[5] 3 Q10b

This is the instant building up of lactic acid in the muscles straight after exercise has finished. This is because lactic acid is a waste product of the lactic acid system. It happens when ~~energy is produced~~ glycogen is broken down anaerobically to produce energy. It can cause muscle fatigue and soreness and ~~will~~ will eventually prevent muscle contraction. There is a high amount (4 L/min) straight after exercise but it decreases quickly down to 1 L/min by 2 minutes of recovery time. Lactic acid is produced by an oxygen deficiency and oxygen is needed to remove it from ~~the~~ the muscles.

This response did not score any mark, there is a lack of knowledge of the recovery process and the graph has not been interpreted.

Clarissa has just completed her time trial.

Figure 4 shows Clarissa's rest, exercise and recovery period.

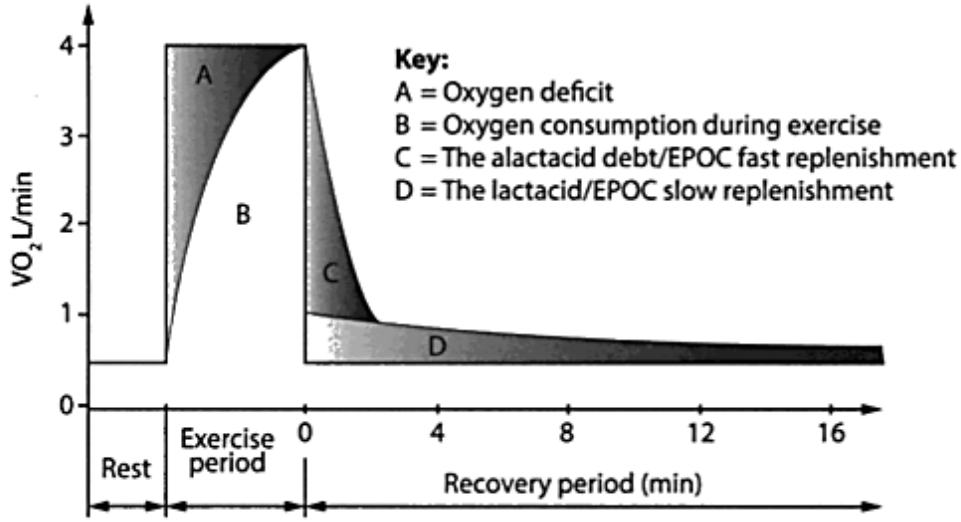


Figure 4

(b) Explain the section labelled C, that is the alactacid component of Clarissa's recovery process.

(5) 0 Q10b

Section C shows the period of time in which she has finished her exercise and is need to quickly cool down and for her EPOC to be quickly replenished before her fun B rest period (section D)

Q10(c)

The final question of this section looked at how oxygen availability and fuel availability determined which energy system is used.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about oxygen and fuel availability in determining the energy system used. 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 on stating it would get more blood or oxygen to the muscle. To achieve level 3 learners responses provided accurate knowledge of how oxygen and fuel availability dictates the energy system used.

This response was placed at Level 3 and given 5 marks. The answer clearly evaluates the energy systems used in relation to oxygen and fuel availability. Each system is visited, however, large amounts are irrelevant, such as the description of the electron transport chain.

(c) Evaluate the effects of oxygen and fuel source availability to determine the energy system Clarissa uses in a race.

(6)

Depending on how long the race is will be determine what energy system is used. If the race is short e.g. 50m then the ATP/PC system would be used as it is for maximum intensity and lasts for 15-30 seconds. As there is only a limited supply of ATP/PC then it can't be used for longer races. If its a longer race then the lactate system may be used. This is where anaerobic ~~respiration~~ glycolysis takes place and glycogen is broken down into glucose. This is good for 2min to 10min as there is a larger store of glycogen than ATP/PC and also it doesn't need O_2 to work. However if no O_2 is

10

c. Here the a by product is lactic acid, which if too much builds up will lead to fatigue. However if its a long race such as 10 000m then the aerobic system would be best. This is because if O_2 is present after anaerobic glycolysis then pyruvate acid is broken down into acetyl - coenzyme A. by ~~the enzyme ATP~~ PFK. Thus then turns into citric acid which is oxidised in the krebs cycle and produces CO_2 and resynthesises 2 ATP. Then from the electron transport chain glycogen is then broken down into 34 ATP and water. Therefore for long distance races aerobic system is the best as it produces more ATP per mole of glycogen and no lactic acid is produced meaning they can go for longer without tiring.

This response did not score any mark. The learner has taken the graph from the previous question and brought this into the current question. It is important for centres to inform learners that this will not be an expected and not credit worthy.

(c) Evaluate the effects of oxygen and fuel source availability to determine the energy system Clarissa uses in a race.

(6) 0 Q10c

The effects of oxygen and fuel source available shows that she should use the lactate system. This would be most beneficial to her rather than the others due to it being used for a short burst of time of up to 2 minutes but has a longer time of recovery of 8 minutes. This would be the ideal system for her as the graph shows she had a recovery period of 16 minutes.

Q11

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.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about the impact of a warm up on the cardiovascular and muscular systems. Other learners were unable to address the question fully and it was clear that some ran out of time.

Low level responses demonstrated some knowledge and understanding of the indicative content and often lacked balance or coverage. Common errors were anticipatory rise, however, the questions asked about the effects of the warm-up, rather than what happens before. Also, low-level responses brought in answers from skeletal, respiratory and energy 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 stating it would reduce the risk of injury and increase the heart rate, with no attempt to apply this. To achieve level 4, learner's responses provided accurate knowledge of how the warm up impacts upon the cardiovascular and muscular systems. 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 4 and given 8 marks. The answer clearly analyses the impact of the warm up on the cardiovascular and muscular systems. Each system is visited and application and interrelationships are developed throughout.

SECTION F: Interrelationships between Body Systems for Sports Performance

Answer the question. Write your answer in the space provided.

The warm-up is a fundamental part of a team's preparation that takes place before a game.

Dave is a rugby coach and his team warm up before every game. In their warm-up they do some light jogging, dynamic stretching and more intense drills.

11 Analyse the response of the muscular and cardiovascular systems to the warm-up. (8)

8 Q11

A warm up causes short term effects to your bodily systems. Your muscles will increase in temperature due to exothermic chemical reactions and therefore increase in pliability increasing their range of movement. This means you're less like likely to get injured. Your muscles also get a greater blood supply as a direct effect of the cardiovascular short term effects. When completing a warm up your heart rate increases this is because your muscles need more oxygen to aerobically respire so to meet the need you pump blood quicker. Your heart rate may also increase to move any lactate that has been produced by your muscles in anaerobic respiration, the production of lactate is another short term effect to the muscular system. Your blood supply to your muscles allow increases due to the redistribution of blood flow in the cardiovascular system. When you are struggling to meet the demand for oxygen. you redistribute blood from areas that don't need as much oxygen such as your digestive system and move it to your working skeletal muscle. by vasoconstricting the vessels leading to the digestive system and vasodilating the vessels leading to skeletal muscle. This means more blood and therefore oxygen is delivered to the working muscles and therefore there is an increase in blood supply.

This response was placed at Level 1 and given 2 marks. Credit is gained elasticity of muscles as well as reducing levels of injury. Cardiovascular impacts are less developed and there is no attempt to display the interrelationship between the two systems.

The warm-up is a fundamental part of a team's preparation that takes place before a game.

Dave is a rugby coach and his team warm up before every game. In their warm-up they do some light jogging, dynamic stretching and more intense drills.

11 Analyse the response of the muscular and cardiovascular systems to the warm-up.

(8) 2 Q11

The response of the muscular and cardiovascular system to the warm up is the muscles in the muscular system become warm. This means that they become elasticated, so it ~~easir~~ easier to move and there is a lesser chance of ~~them~~ the persons getting ~~injuried~~ injured. ~~It also~~ The muscles are also ready to contract so the athlete is more than likely to perform to the best of ~~their~~ each persons.

The cardiovascular system responds by increasing the oxygen debt needed, so the lungs and the ~~heart~~ heart would work alot harder, to ~~give~~ provid the ~~oxyg~~ oxygen needed to the working muscles.

Summary

Based on their performance on this paper, learners should:

- Use appropriate technical language throughout their responses,
- Use appropriate units/measurements were applicable
- Tailor their 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 gained and the space available as a guide to the number and depth of responses required.
- Be clear about terminology used in the specification as these words will be repeated in the exam paper, e.g. short-term responses (immediate, due to the exercise/sport), adaptations (long term).
- Know the different body systems so they can focus on the correct one within a question.
- Use the question scenario to demonstrate their ability to apply their knowledge.
- Check their paper carefully for any missed questions.
- Please click here for the specification and SAMS.

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