# Examiners' Report
# Lead Examiner Feedback

## June 2023

Pearson BTEC Nationals
In Sport (31524H)
Unit 1: Anatomy & Physiology

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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 and 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

# Introduction

Centres and candidates should be congratulated on their preparation for this assessment format, in some very challenging times. Overall, candidates performed slightly better than previous 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 and previous series. The paper was split into six sections. Each section was based on a sport or exercise scenario and required candidates 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 with the specification design.

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 candidates have performed overall in the exam. For each question there is a brief analysis of candidate responses. You will also find examples of candidate 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 candidates for future examination series.

Candidate performance varied throughout the paper. Whilst the extended response questions still provided the greatest challenge, this was the best series as regards to performance on these. Most candidates gained some marks for these questions, and it is encouraging to see that more candidates are accessing to top mark boundaries. 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 candidates did not make full use of the stimulus material provided in the question, to reiterate, 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 awarded accordingly. Nevertheless, performance continues to get better series by series, with the mean mark increasing by 5 and the highest paper total was 77/80.

As always, the emphasis in this paper is on candidate'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 candidates to have the opportunity to practice this in their preparation for the assessment. Candidates 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 candidates 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 centres' stress to candidates 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 candidates are unable to apply the stimulus in their answer it will significantly restrict the number of marks candidates can receive. Generic responses will only gain limited credit.

Where the stimulus material uses a particular sport, it is not necessary for candidates 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 candidate responses. This section should be considered with the live external assessment and corresponding mark scheme.

## Q1

The majority of candidates performed as anticipated on this question, with many identifying the correct answers. It is important that technical terminology is used, and phonetic spelling was credited. Common errors were identifying the ulna and radius the wrong way around.

### This response gained 4 marks

**Figure 1** shows the bones in the upper skeleton.

1 Identify the bones labelled **A–D**.

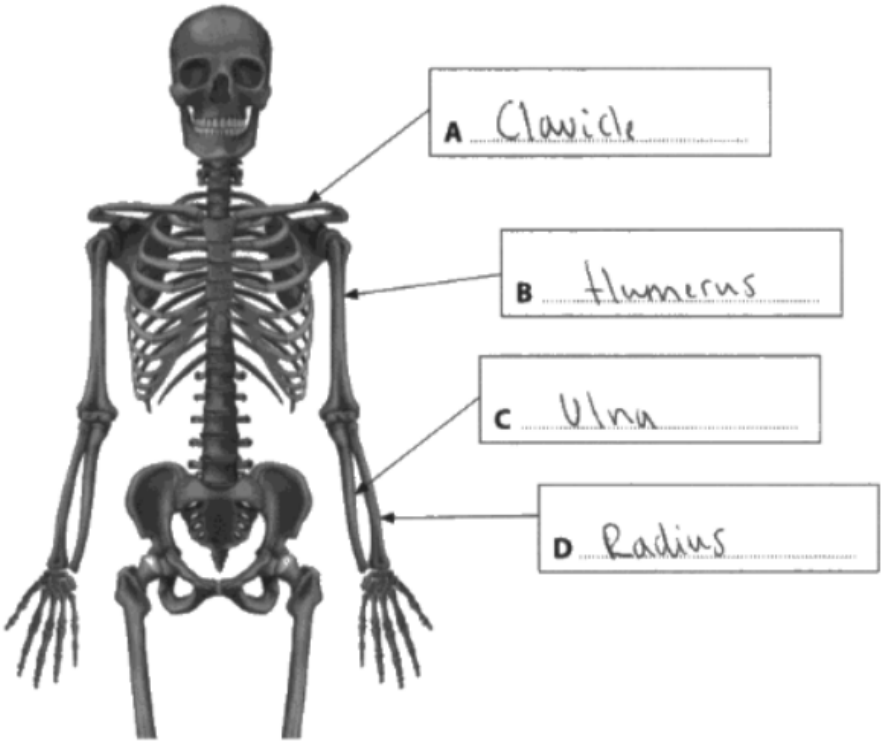



**Figure 1**

## Q2a & 2b

For 2a candidates were required to identify two postural deviations and then describe them. Q2a was answered very well with the majority of learners accessing full marks. Common errors were bringing in skeletal conditions such as osteoporosis/arthritis.

Q2b then took the knowledge of the spine and asked for the type of joint found there. This question was not answered as well as expected with it being a simple recall command. Common errors were listing a range of synovial joints.

**This response gained 2 marks for 2a and 0 marks for 2b**

**2** (a) Describe **two** postural deviations that would cause the curve of the spine to change from neutral.

**(4)**

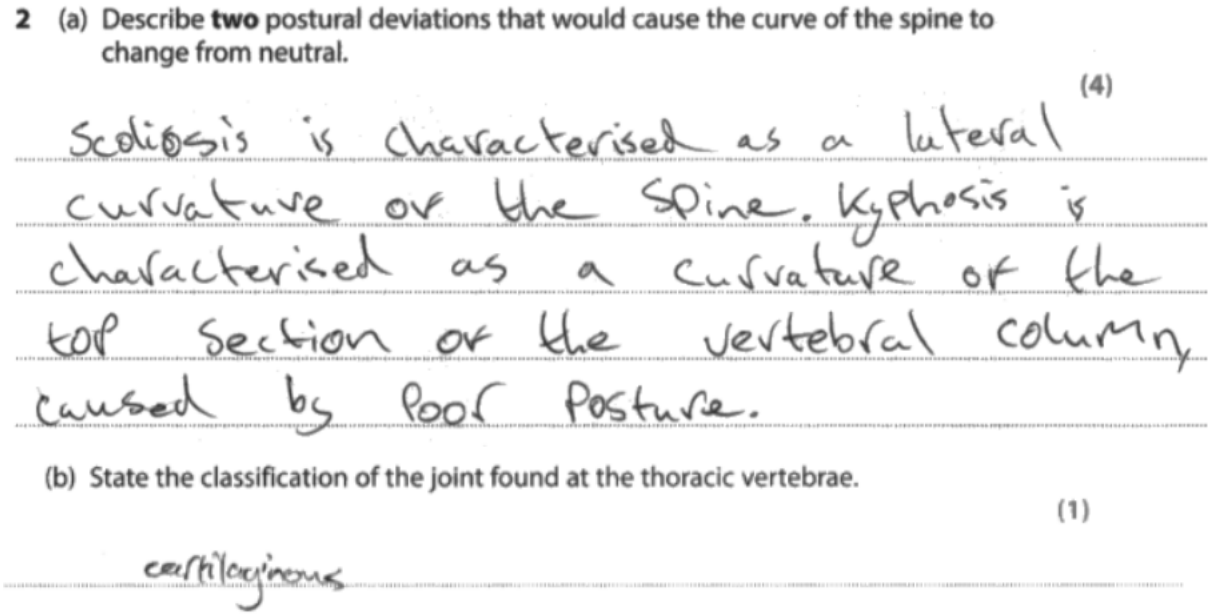
Scolios causes a lateral curveture in the spine, this is caused through genetics passed throughout a family. Osteoporosis is also a of spine problem that caeses a curve in your spine, This is caused by severe stress on the spine.

(b) State the classification of the joint found at the thoracic vertebrae.

**(1)**

Hinge joint

**This response gained 4 marks for 2a and 1 mark for 2b**



2 (a) Describe **two** postural deviations that would cause the curve of the spine to change from neutral.

(4)

Scoliosis is characterised as a lateral curvature of the spine. Kyphosis is characterised as a curvature of the top section of the vertebral column, caused by poor posture.

(b) State the classification of the joint found at the thoracic vertebrae.

(1)

cartilaginous

**Q3a and Q3b**

For Q3a candidates were required to identify the movement occurring when kicking a rugby ball in the image provided. The vast majority of learners performed as expected and got the question correct. Common errors were putting flexion rather than extension.
For Q3b candidates were required to explain how synovial fluid enables the player to kick the ball. The majority of candidates accessed the section marking point around reducing friction and allowing smooth movement, with fewer accessing the points available for provides lubrication and less so for increasing power and full range of movement. Errors were answering the question as if it was about osteoporosis.

**This response gained 1 mark for Q3a and 3 marks for Q3b**

Emily is a rugby player who specialises in kicking the ball. She relies heavily on her knee joint to perform the kicks successfully.



(Source: © Oleksandr Osipov/Shutterstock)

**Figure 2**

**3** (a) State the movement that takes place in Emily's left knee joint (circled) when she performs the kick.

**(1)**

extension

(b) Explain how synovial fluid enables Emily to kick the rugby ball.

**(3)**

Synovial fluid, lubricates the joint bones. When exercising the synovial joint will secrece synovial fluid ~~to~~ to allow movement into the knee, without fricition on the bones. This protects the joint, ~~from~~ by the ~~ligaments~~ fluid being used as a protector to allow a ~~rang~~ wide range of movement.

## This response gained 0 marks for Q3a and 1 mark for Q3b

Emily is a rugby player who specialises in kicking the ball. She relies heavily on her knee joint to perform the kicks successfully.



(Source: © Oleksandr Osipov/Shutterstock)

**Figure 2**

**3** (a) State the movement that takes place in Emily's left knee joint (circled) when she performs the kick.

**(1)**

Flexion

(b) Explain how synovial fluid enables Emily to kick the rugby ball.

**(3)**

Synovial fluids allow for free movement in the joint, when kicking a ball this will allow Emily to kick the ball with a smooth action. It furthermore lessens friction in the joint making the movement easy.

## Q4 & Q5

Were both recall questions and candidates performed as anticipated on this question, with the spread of marks clearly outlining the candidate's knowledge and understanding of muscle locations and responses of the muscular system to exercise.
Common errors seen on Q5 were identifying DOMS as a response, as well as repeating the response given in the Stem 'pliability'.

## This response gained 3 marks for Q4 and 3 marks for Q5

**Table 1** shows the types of muscle and examples of where they are found.

**4** Complete **Table 1** to identify the muscle type or where it is found as indicated **A–C**.

| Muscle type | Where it is found |
|---|---|
| A Cardiac | Heart |
| Smooth | B intestines |
| C skeletal | Biceps |

**Table 1**

When a person is exercising one response of the muscular system is an increase in muscle pliability.

**5** State **three other** responses of the muscular system when a person is exercising.

1 Increase tempreture
2 Increase blood supply
3 Micro tears

## This response gained 1 mark for Q5

When a person is exercising one response of the muscular system is an increase in muscle pliability.

**5** State **three other** responses of the muscular system when a person is exercising.

1 increase ~~temperature~~ muscle temperature

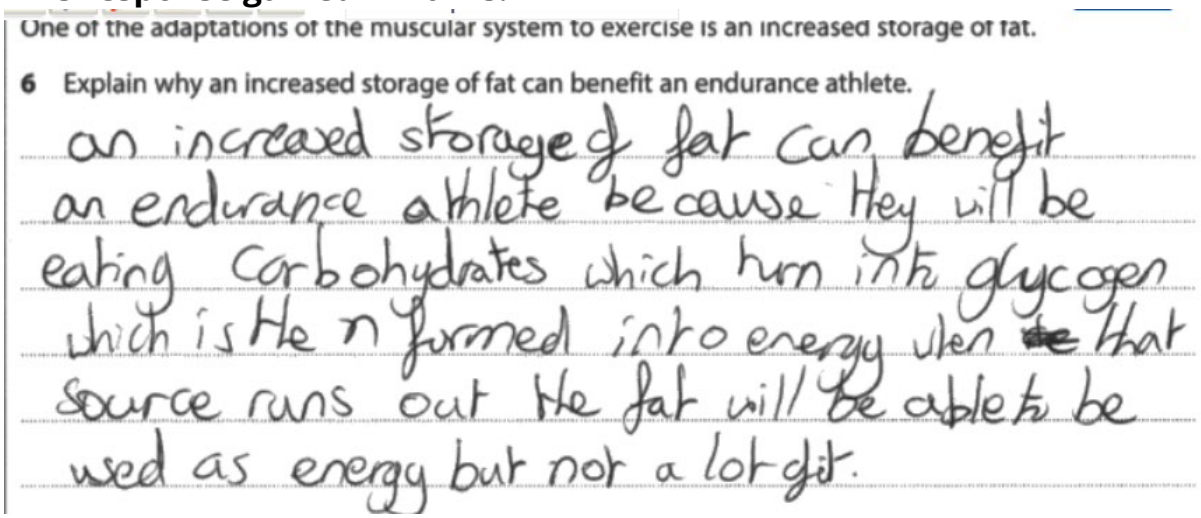
2 increase ~~flexibility~~ muscle flexibility

3 Increase ~~muscles~~ tendon strength.

## Q6

Question 6 performed as anticipated. The question required candidates to explain why increased storage of fat can benefit an endurance athlete, the vast majority of candidates achieved 1 mark, for stating it was another energy source. Fewer candidates gained the second marking point of it is used when carbohydrates are depleted

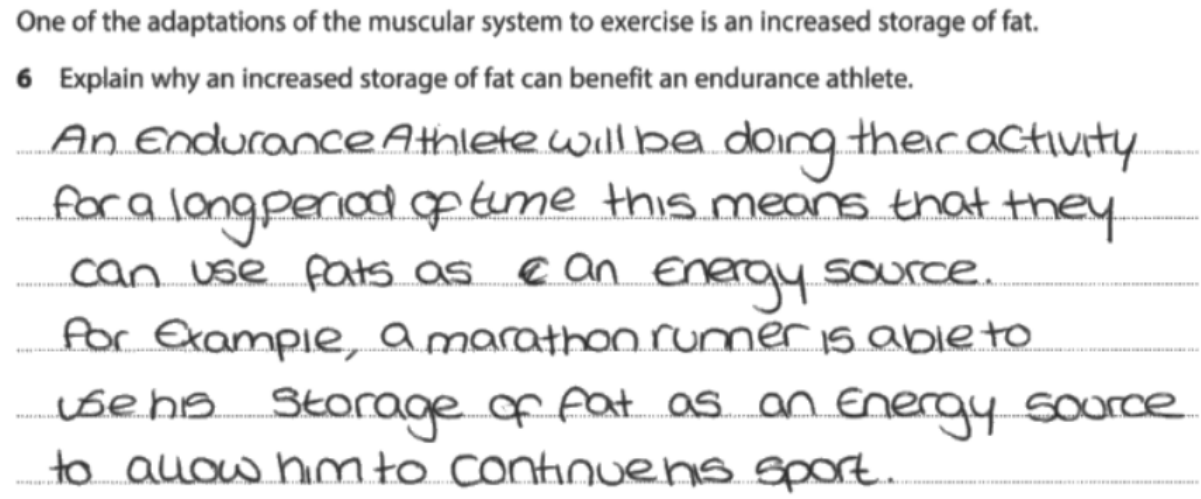
**This response gained 2 marks.**


One of the adaptations of the muscular system to exercise is an increased storage of fat.

6 Explain why an increased storage of fat can benefit an endurance athlete.

an increased storage of fat can benefit an endurance athlete because they will be eating carbohydrates which turn into glycogen which is then formed into energy when that source runs out the fat will be able to be used as energy but not a lot of it.

**This response gained 1 mark.**


One of the adaptations of the muscular system to exercise is an increased storage of fat.

6 Explain why an increased storage of fat can benefit an endurance athlete.

An Endurance Athlete will be doing their activity for a long period of time this means that they can use fats as an energy source. For Example, a marathon runner is able to use his storage of fat as an energy source to allow him to continue his sport.

## Q7a

Candidates found this question surprisingly challenging, the question required to describe the antagonistic muscle action to complete the downward phase of the tricep dip. Common errors were candidates identifying the bicep as the agonist and tricep as the antagonist. This could be due to looking at the elbow in a state of flexion and assuming this is generated from the bicep.

### This response gained 2 marks

As part of his training he participates in gym-based sessions, mainly doing body-weight exercises. One such exercise is the triceps dip. **Figure 3** shows him completing the downward phase of a triceps dip.



(Source: © VOLYK IEVGENII/Shutterstock)

**Figure 3**

**7** (a) Describe the antagonistic muscle action that enables Mo to complete the downward phase of the triceps dip.

**(2)**

The Tricep is the agonist, The bicep is the ~~Antagonist~~ Antagonist
The bicep lengthens as the tricep ~~contracts~~ shortens when
extended, then when flexed the bicep shortens and the
tricep lengthens, this is in the downward phase. The
Tricep is relaxed as it is ~~is~~ not extended.

## This response gained 0 marks

**7** (a) Describe the antagonistic muscle action that enables Mo to complete the downward phase of the triceps dip.

**(2)**

As he is pushing down, his biceps are contracting whilst his triceps are relaxing.

**Q7b**

The majority of candidates performed as anticipated on this question, with a nice spread of marks, many could identify that hypertrophy was an increase in strength and size and leads to more powerful contractions. Fewer candidates identified that this would result in a higher jump. To reiterate, with explain command verb questions, there is an expectation that knowledge and understanding that is tested, is applied to the situation in context and expansion marks are awarded accordingly. Common errors when applying to performance was to not be specific, such as stating jump 'higher' rather than help him jump.

**This response gained 3 marks.**

Over a period of time, Mo's muscular system has adapted to the training programme, causing muscular hypertrophy.

(b) Explain the impact of hypertrophy of Mo's leg muscles on his basketball performance.

**(3)**

Muscular hypertrophy means that his muscles have increased in size and strength leading him to the ability to exhert more Power. So when Mo needs to jump to perform a slam dunk or to jump for a ball his hypertrophy in the legs enables him to jump higher.

**(Total for Question 7 = 5 marks)**

**This response gained 1 mark.**

Over a period of time, Mo's muscular system has adapted to the training programme, causing muscular hypertrophy.

(b) Explain the impact of hypertrophy of Mo's leg muscles on his basketball performance.

**(3)**

Hypertophy is from an overload in training where the muscle fibres tear and then heal making the muscle bigger and stronger. This will make it so Mo's legs are stronger this will have a positive effect making Mo faster and be able to use his legs more prominantly.

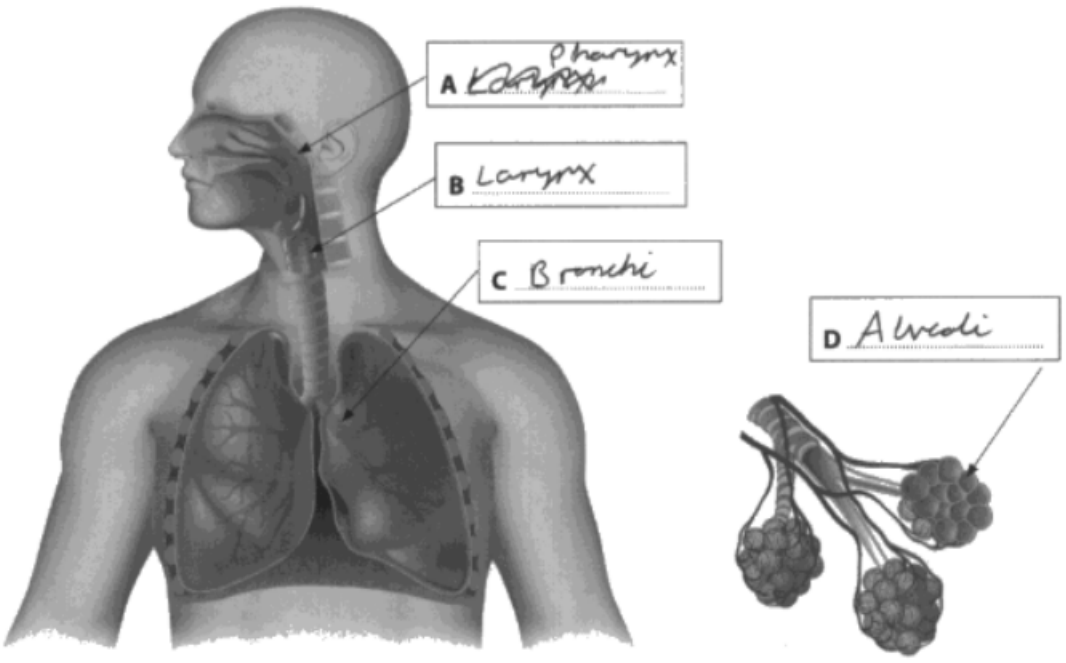
## Q8

On the whole candidates performed well on this question, with the spread of marks clearly outlining their knowledge and understanding of location of the respiratory structures.
Many identified the bronchi and alveoli correctly, with less identifying the pharynx and larynx. Common errors were identifying the larynx as the trachea and the bronchi as the bronchioles.

### This response gained 4 marks

**Figure 4** shows the structure of the respiratory system.

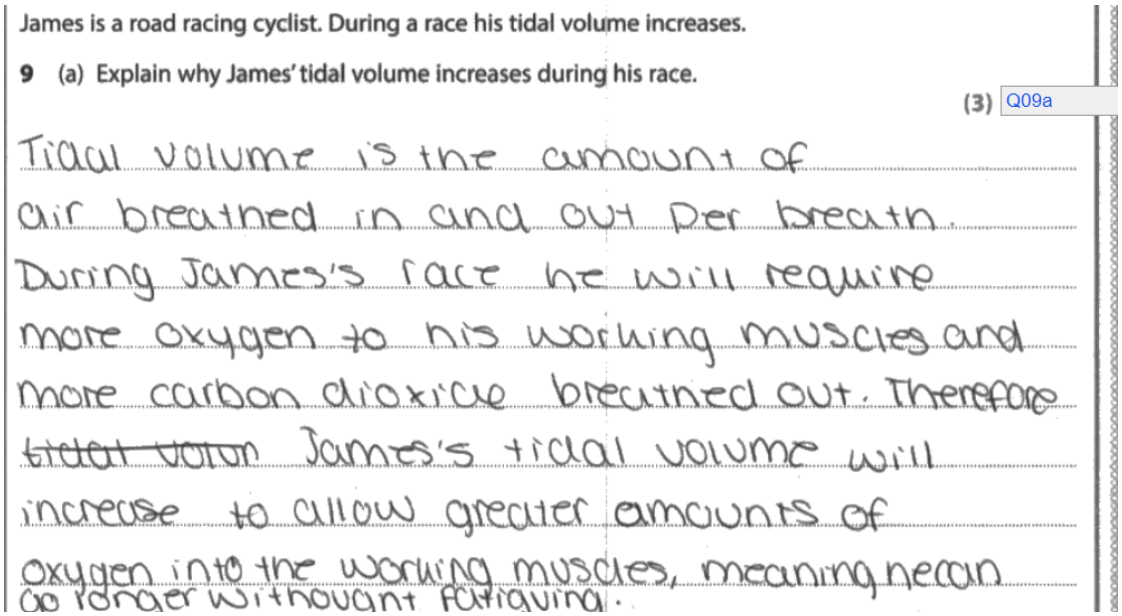
**8** Identify the respiratory structures labelled **A–D**.



## Q9a

The majority of candidates found this question challenging to access the full marks, a significant number correctly identified that a person would need more oxygen. Significantly fewer identified that the body would bring in more oxygen or produce and remove more carbon dioxide. Common errors were not being specific enough by stating more oxygen or more carbon dioxide.

**This response gained 3 marks.**



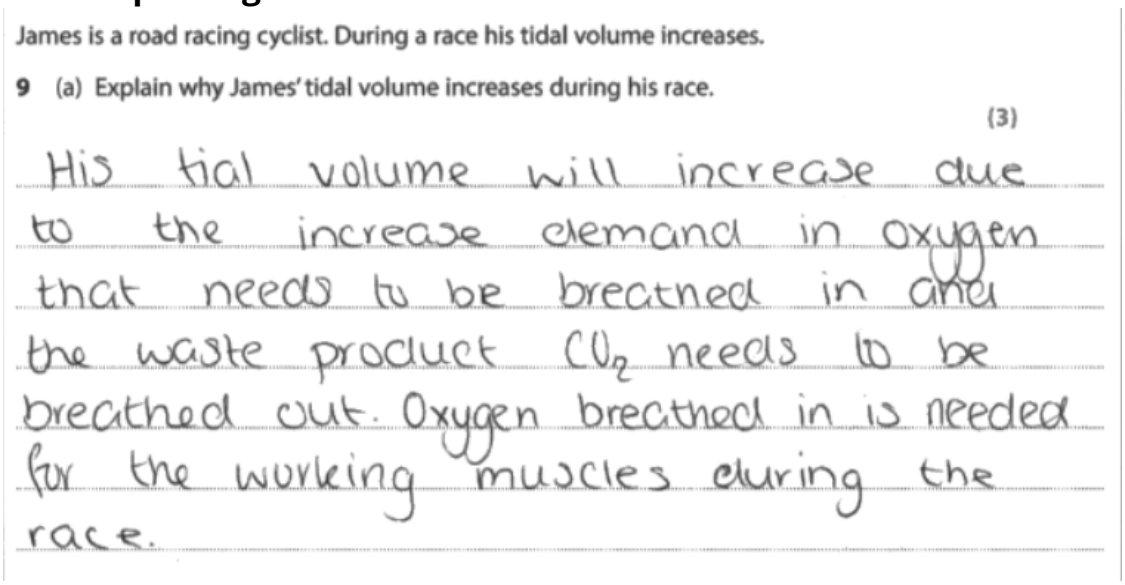
James is a road racing cyclist. During a race his tidal volume increases.

9 (a) Explain why James' tidal volume increases during his race.

(3) Q09a

Tidal volume is the amount of air breathed in and out per breath. During James's race he will require more oxygen to his working muscles and more carbon dioxide breathed out. Therefore ~~tidal volum~~ James's tidal volume will increase to allow greater amounts of oxygen into the working muscles, meaning he can go longer without fatiguing.

**This response gained 1 mark.**



James is a road racing cyclist. During a race his tidal volume increases.

9 (a) Explain why James' tidal volume increases during his race.

(3)

His tial volume will increase due to the increase demand in oxygen that needs to be breathed in and the waste product $CO_2$ needs to be breathed out. Oxygen breathed in is needed for the working muscles during the race.

**Q9b**

This question acted as a good differentiator. It was clear from the spread of marks that some candidates found this question challenging and this area of knowledge for some was missing. Those who did display knowledge of increased strength of respiratory muscles and the impact on performance accessed all marking points.
Common errors were bringing responses from the previous question into the answer, which is irrelevant when the question is based around respiratory muscles.

**This response gained 3 marks.**

James has been a cyclist for 15 years. During this time his respiratory system has adapted by increasing the strength of his respiratory muscles and increasing his oxygen and carbon dioxide diffusion rate.

(b) Explain how an increased strength of the respiratory muscles affects James' cycling performance.

(3)

The respiratory muscles are the intercostal muscles and the diaphragm. Increasing the strength of these muscles would result in a higher stroke volume as it is able to contract with a greater force which pushes higher volumes of air in and out. So higher volumes of blood will be pumped to the working muscles so he can work for longer without tiring.

**This response gained 1 mark.**

James has been a cyclist for 15 years. During this time his respiratory system has adapted by increasing the strength of his respiratory muscles and increasing his oxygen and carbon dioxide diffusion rate.

(b) Explain how an increased strength of the respiratory muscles affects James' cycling performance.

(3)

An increase in the strength of James's respiratory muscles will allow them to breathe in more air without working as hard. This ~~he~~ will impact his cycling performance by allowing him to take in more air for the working muscles ~~by~~ supporting them through the race.

**Q9c**

This was the first extended response question of the paper and candidates had to analyse the effect of an increased oxygen and carbon dioxide diffusion rates on performance. The candidates needed to articulate impact this would have on performance. The indicative content was written accordingly to encompass this knowledge and application.

Like all the extended response questions, the quality of candidates' responses varied. Some candidates were clearly very knowledgeable about impact of these changes. Other candidates were unable to address the question fully and only highlighted the more oxygen comes in or more carbon dioxide is removed.

Level 1 responses tended to focus on the lung volume going up and down and links to performance were general in nature.
At level 3 candidates' responses provided accurate knowledge of the effects on performance of the changes in diffusion rates, used technical terminology with clear development of the point and linked to cycling performance.

Overall, this was a challenging question, and it was obvious from a number of responses that this knowledge was lacking, although a clear specification point. Some candidates also discussed the impacts on the cardiovascular system when it was in the respiratory section and thus generated no credit.

**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 the changes with appropriate development in reference to the question.

(c) Analyse the effect of an increase in the oxygen and carbon dioxide diffusion rate on James' cycling performance.

(6)

An increase in the oxygen ($O_2$) and carbon dioxide ($CO_2$) diffusion rate will benefit James's performance.

An increased $O_2$ diffusion rate (from a larger vital capacity and improved respiratory muscles) will allow his muscles to respire aerobically for longer. This means they are less likely to dip into his anaerobic systems which would produce lactic acid. Similarly increased $O_2$ will also help to ~~bre~~ break down any lactate accumulation, which stops muscle contraction impediment and stops him fatiguing. This will allow James to cycle at a faster pace for longer allowing him to be in a better position for his race. (e.g. when cycling up hill).

Similarly ~~eed~~ an increased $CO_2$ diffusion rate will stop ~~his~~ his muscles building up in waste product which could cause fatigue and muscle impediment (as $CO_2$ is carried as carbonic acid). This means that he can also reduce the time spent cycling at a lower speed (~~as~~ which would be to increase $O_2$ and remove $CO_2$), as the diffusion is faster. This will allow him to increase his overall cycling pace and cycle faster e.g. on long straight ~~road~~ roads.

This is all aided by the capillarisation and better blood flow to the muscles.

**(Total for Question 9 = 12 marks)**

**TOTAL FOR SECTION C = 16 MARKS**

**This response was placed at Level 2 and given 3 marks**.
The answer is correctly identifying that more carbon dioxide is removed, linked to lactic acid production, there is also an attempt to link this to performance outcomes.

(c) Analyse the effect of an increase in the oxygen and carbon dioxide diffusion rate on James' cycling performance.

(6)

The diffusion of CO2 out of the body at a quicker rate means that James is less likely to get the build up of lactic acid meaning he can ~~compete~~ work for longer at a higher intensity.

An increase in the diffusion of oxygen means that James will ~~have~~ be able to mantain cycling at a higher intensity because he will have a more readily available oxygen supply to go to his working muscles.

**This response was placed at Level 1 and given 1 mark**.
The answer is very general and brief in nature, it correctly identifies that more carbon dioxide is removed, but the rest is very vague in nature.

(c) Analyse the effect of an increase in the oxygen and carbon dioxide diffusion rate on James' cycling performance.

(6)

James will be using more oxygen as well as carbon dioxide during a race. This is because his heart rate will increase, forcing him to take in more oxygen. Though, as a result of this, he will be getting rid of more and more carbon dioxide.

## Q10a&b

Was a recall question and candidates performed very well on it, with a large number accessing all available marks. It required them to identify two components of blood and their function.

**This response gained 4 marks.**

Plasma is one component of blood. One function of plasma is to help regulate body temperature.

**10** Complete **Table 2** by:

(a) stating **two other** components of blood.

(b) giving **one** function of each component of blood.

| | Component of blood | Function of component of blood |
|---|---|---|
| **Example** | Plasma | Helps regulate body temperature |
| 1 | Red blood cells (1) | carry ~~oxygen~~ ~~oxygen~~ oxygen around the body (to carrie hemoglobin) (1) |
| 2 | white blood cells (1) | help to fight of infections ~~in~~ that may occur. (1) |

**Table 2**

## Q11

The majority of candidates found this question unexpectedly challenging. Responses were generally too vague, stating that hyperthermia was an increase in body temperature, rather than specifying a range. Common errors were confusing it with hypothermia.

**This response gained 2 marks.**

**11** Describe hyperthermia.

Hyperthermia is when a person's core body temperature increases above 38°C which causes them to over heat. The symptoms include tiredness, dizziness and can cause death.

**(Total for Question 11 = 2 marks)**

**This response gained 0 marks.**

**11** Describe hyperthermia.

hyperthermia is when ~~they~~ your body is too cold to transfer blood ~~and~~ around the body

## Q12a&b

These questions acted as good differentiators, for heart rate responses before and during exercise. It was clear from the spread of marks that some candidates found these questions challenging during performance. Those who did display knowledge of the role generally accessed all marking points.
Common errors were confusing anticipatory rise with using the term 'nerves' and being too general regarding requiring more oxygen and now met the demand in Q12b.

**This response gained 2 marks for Q12a and 3 marks for Q12b.**

*Penny* is a runner.

**Figure 5** shows her heart rate before, during and after a race.

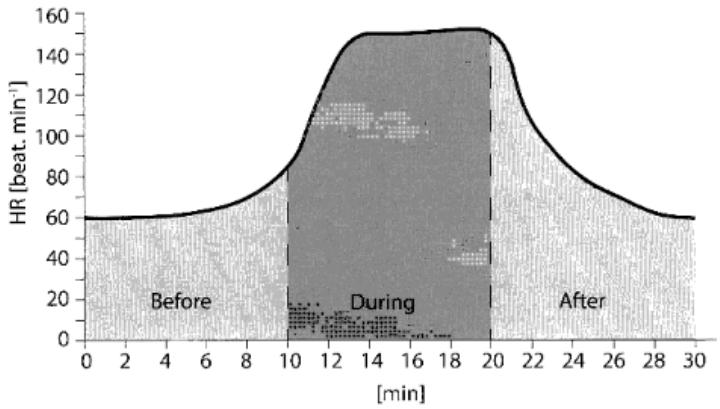



**Figure 5**

**12** (a) Explain, using **Figure 5**, the changes to Penny's heart rate **before** the race.

(2)

Anticipatory rise takes place before race due to adrenalin. Causing heart rate to go up slightly in anticipation of exercise.

(b) Explain, using **Figure 5**, the changes to Penny's heart rate **during** the race.

(3)

During the race there is a steep incline ~~at the start~~ of heart rate at the start due to an increased demand for oxygen to working muscles. This then levels out when demand is reached and a constant is found.

**This response gained 1 mark for Q12a and 0 marks for Q12b.**

'enny is a runner.

**Figure 5** shows her heart rate before, during and after a race.

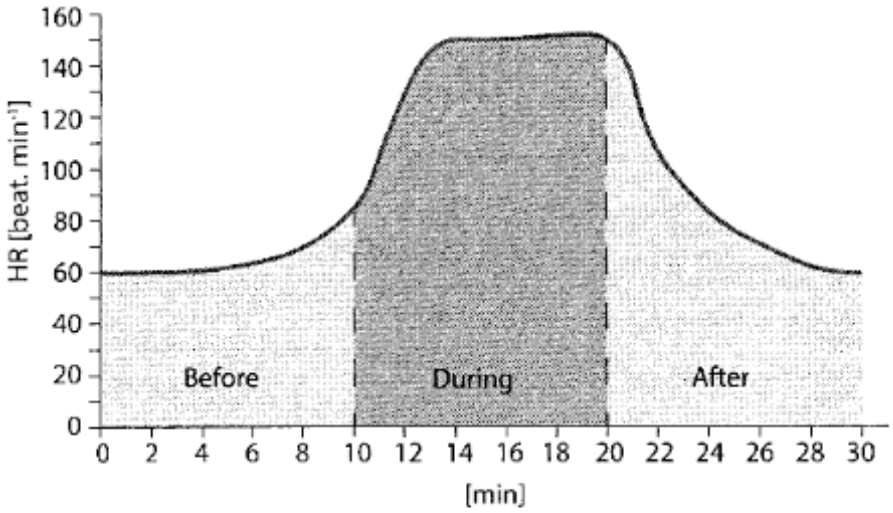



**Figure 5**

**12** (a) Explain, using **Figure 5**, the changes to Penny's heart rate **before** the race.

(2)

Anticipatory rise which prepare the body for exercise by pumping more blood to working muscles.

(b) Explain, using **Figure 5**, the changes to Penny's heart rate **during** the race.

(3)

Penny's heart rate regulate because the heart has reached her maximum ~~beat~~ consuming per minute.

**Q13**

This was the second extended response question of the paper and focused changes in the distribution of blood and the impact that would have on netball performance, the indicative content was written according to encompass this knowledge and application.

Like all the extended response questions, the quality of candidate responses varied. Some candidates were clearly very knowledgeable about changes in the distribution, but some candidates struggled to express this beyond transferring more oxygen to working muscles.

Level 1 responses generally only included that the function to transport oxygen and provided limited application to performance.
At level 3 candidates charted accurately the three changes in the distribution of blood and how that impacted on performance.

**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 the three areas of the body and the changes in blood distribution has on performance, with effective use of technical terminology and appropriate development in reference to the question.

Kellis is a netball player.

**Figure 6** shows the percentage distribution of blood at rest and during a netball game.

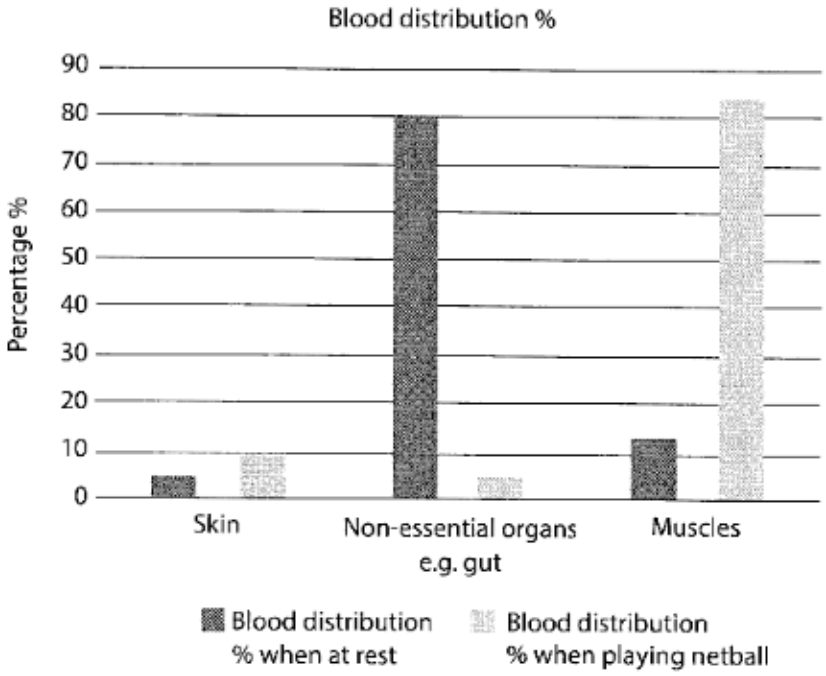



**Figure 6**

**13** Analyse, using **Figure 6**, the changes in distribution of Kellis' blood flow to her skin, non-essential organs and muscles when playing netball.

(6)

vasodilation occurs at her skin when she begins playing Netball in order to increase the blood flow at the skin from 9% to 37%. This happens as part of thermoregulation in order to increase heat loss through sweat/evaporation and prevent hyperthermia

vasoconstriction occurs at her non essential organs when she plays Netball in order to prevent blood flow from 80% to 37%. This is because there is little demand for oxygen as they aren't being used and therefore blood flow is restricted so oxygen can be used where the demand is.

vasodilation occurs at the working muscles to increase blood flow so more oxygen gets to the muscles to meet the demand. It also increases the removal of $CO_2$. This means that cells can stay at a higher intensity for longer, delaying fatigue. We can see that the percentage of blood flow increases from 13% to 84%.

**This response was placed at Level 2 and given 3 marks**.
The answer assesses some of the points from the indicative content.
The response correctly expanded upon delivering oxygen to the working muscle and the impact on performance.

Kellis is a netball player.

**Figure 6** shows the percentage distribution of blood at rest and during a netball game.

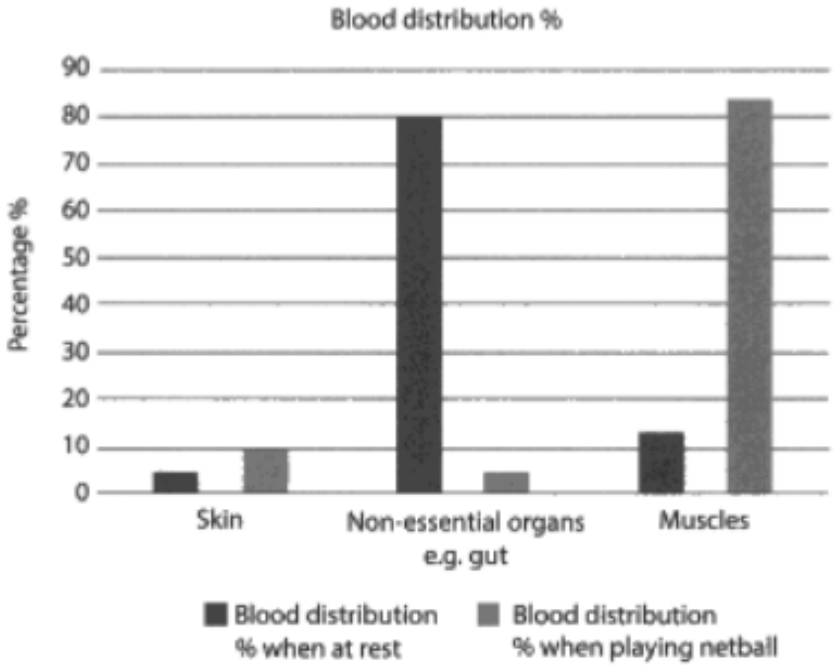



**Figure 6**

**13** Analyse, using **Figure 6**, the changes in distribution of Kellis' blood flow to her skin, non-essential organs and muscles when playing netball.

(6)

The significant drop in blood flow to the non-essential organs happens because there is much less of a demand for oxygen ~~seen~~ in comparison to the muscles. The majority of the blood flow gets redistributed to the muscles to deal with the increased demand for oxygen during exercise. This increases the blood supply to the muscles which gives them more oxygen to use in respiration. This allows the muscles to keep working without tiring as they have access to a much greater volume of oxygen.

## Q14

This was a recall question for identifying the fuel used and ATP yield for the ATP-PC system and Lactate system. Common errors were candidates identifying the fuel as carbs for the Lactate system rather than glycogen or glucose.

**This response gained 4 marks.**

**14** Complete **Table 3** by:

(a) stating the chemical source or fuel used for each energy system.

(b) giving the amount of ATP produced by each energy system.

| Energy system | Chemical source/fuel | Amount of ATP produced |
|---|---|---|
| ATP-PC | ~~phosphocreatine~~ creatine phosphate (1) | 1 ATP (1) |
| Lactate | glycogen (1) | 2 ATP (1) |

**Table 3**

## Q15

This question acted as a good differentiator. It was clear from the spread of marks that some candidates found this question challenging and this area of knowledge for some was missing. Those who did display knowledge of the electron transport chain accessed all marking points.
Common errors were bringing in general information about the energy systems into the answer, which is irrelevant when the question is based around the electron transport chain

### This response gained 3 marks

Describe the electron transport chain.

1e electron transpon chain recieves hydrogen from krebs
jcle and accepts it by hydrogen acceptors. This happens
2 the mitocondria when oxygen is available and
2) a by product of water. It resynthesises 34 ATP

### This response gained 0 marks

**15** Describe the electron transport chain.

Election transport chain is when the energy created
"ATP" get's used during exercise from ATP, Lactate
and aerobic systems the transport chain will help
break down of ATP to get the energy out of it.

**Q16**

The final question of this section required the candidates to analyse the role of the energy systems from a stimulus table in relation to badminton performance.

Like all the extended response questions, the quality of candidate responses varied. Some candidates were clearly very knowledgeable about the energy systems (ATP-PC/Lactate/Aerobic) in relation to intensity, duration and could articulate where each system contributes to badminton performance. Other candidates were unable to address the question fully by writing everything they knew about the energy system in general rather than answering the specific question.

Level 1 responses came from those candidates who identified around time or intensity for one system and not all, with limited or accurate links to performance.
Level 3 responses were those who assessed all energy systems in terms of intensity and time and linked this directly into performance. They articulated using technical terminology.

**This response was placed at Level 3 and given 6 marks.**

The answer analyses the contributions of each of the energy systems and develops a number of points from the indicative content. Clear relation to performance is evident.

Shaz is an elite badminton player.

**Table 4** shows the contribution of the energy systems during her badminton match.

| Energy system | Contribution % |
|---|---|
| ATP – PC | 30 |
| Lactate | 10 |
| Aerobic | 60 |

**Table 4**

**16** Assess the contribution of each energy system during her badminton match.

(6)

Shaz would use her ATP-PC system for things such as a smash in ~~a~~ badminton or ~~other~~ sprinting to reach a shot. This is because phosphocreatine is readily available in the muscles and allows for high intensity activity ~~for up to 10s. It contributes 30%~~ Many shots in badminton ~~it~~ are high intensity and therefore Shaz would use it frequently however ~~it~~ the store only lasts 10s.

The lactate system is used for maintaining high intensity for ~~long~~ things such as rallys longer than 10s that involve running around the court and powerful shots. However it has little contribution as the rallys aren't very long ~~on~~ in elite games and therefore ATP-PC is used more.

The aerobic system contributes the most. It's used between points and at periods of low intensity rally. It produces ~~large sums~~ 38 ATP and can therefore provide energy

r longer in the match. It also resynthesises ATP PC stems allowing ~~sally~~ shar to ~~ma~~ continue hitting nashes near the end of the match. ~~The aerobic system~~ ~~sts~~ Since its long duration and there are breaks in Badminton, used the most

**(Total for Question 16 = 6 marks)**

**This response was placed at Level 2 and given 3 marks.**
The answer generates credit through the attempt to link the ATP-PC and Aerobic systems to performance.

Shaz is an elite badminton player.

**Table 4** shows the contribution of the energy systems during her badminton match.

| Energy system | Contribution % |
|---|---|
| ATP – PC | 30 |
| Lactate | 10 |
| Aerobic | 60 |

**Table 4**

**16** Assess the contribution of each energy system during her badminton match.

(6)

the ATP-PC system ~~is~~ will only be used when shaz as to produce shot ~~bursting energy~~ bursts of energy when shaz has to either hit the shuttle cock or run to reach the shuttle cock ~~the lack~~ ~~shaz~~ the lactate system doesn't really contribute to the badminton match as much as the other systems because most of the anearibic respiration energy is used up in shot burst which is mainly the ATP-PC system but the lactate system might be used when shaz has ~~to~~ run from ~~one~~ one end of the cart to the other. the aerobic energy system is use. ~~throughout~~ throughout the entirety of the badminton match so ~~[illegible]~~ has the highest contribution.

**Q17**

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. Candidates should look to synthesise their writing and make connections between the systems where possible demonstrating the inter-relationship.

Like all the extended response questions, the quality of candidate responses varied. Some candidates were clearly very knowledgeable about how the cardiovascular and energy systems work together. Some candidates 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 bringing in respiratory adaptations so irrelevant in the context of this question. Other errors were bringing in cardiovascular responses rather than adaptations.

High level responses displayed synoptic coverage from both areas as well as making link to how these systems work collectively. High-level responses displayed coverage from both areas as well as clearly relating this to the movement taking place.

Like any levels of response-based question, it is not 1 point equals 1 mark, the indicative content is extensive for candidates 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 how the systems work together. Each systems adaptations visited and application to football performance and interrelationships are developed throughout.

**17** Analyse how the adaptations to Jesse's cardiovascular and energy systems will affect his fitness for football.

(8)

One adaptation is cardiac hypertrophy which increases the size of the heart chambers and strength of the heart walls. This increases his ~~SV~~ stroke volume as a larger volume of blood can be pumped out per beat. A larger stroke volume leads to an increase in cardiac output as cardiac output is stroke volume × heart rate. This means that there is less stress on the heart to contract ~~faster~~ frequency and Jess's resting heart rate can decrease. Larger stroke volume also increases recovery time so she can recover more in periods of rest in football matches. Capillarisation allows a larger amount of oxygen to be carried to his working muscles.

~~She~~ will also have increased creatine stores which allows ~~her~~ him to use ~~hers~~ his ATP-PC store for longer ~~so she can~~ and allows the systems to recover faster. She will also have increased tolerance to lactate, this allows him to use the lactic system for longer in areas such as running up the court with the ball. Jesse will also have an increased number of mitochondria, this gives him ~~as~~ more aerobic energy

owing more efficient use of the aerobic system. He will
an
also have increase of fats as an energy store meaning more
less reliance on glycogen.

- impact of these adaptations is that he will be able to
nerate more power for things such as shooting and
able to do this throughout the match due to more
ficient recovery. ~~The~~ He will be able to run at a higher
tensity for longer when dribbling. ~~It~~ It also allows
im to delay the effect of fatigue.

**This response below was placed at Level 3 and given 5 marks**. The answer identifies isolated elements of knowledge and understanding, to which some of this is well developed from the cardiovascular and energy system adaptations. However, the information is not sustained across the adaptations.

Jesse is a footballer. He tested his fitness at the start and at the end of a three-month training programme. The tests showed significant improvements to Jesse's cardiovascular and energy system adaptations.

**17** Analyse how the adaptations to Jesse's cardiovascular and energy systems will affect his fitness for football.

**(8)**

An adaptation is something that changes over a Period of time so is not immediate. Football is a high intensity sport so overtime the body will adapt to improve the Player's performance.

One Cardiovascular adaptation is an increase in strength in the cardio muscles. This means that it can allow more blood to be pushed throughout the heart and therefore, taken to the working muscles. It will improve jesse's football performance because he can play for longer before getting tired.

One energy system adaptation is an increase in glycogen stores. This is mainly used in the lactate and aerobic systems. Glycogen is used at the start of the process to create energy. By increasing the stores of glycogen, it can allow jesse to have more energy when playing football. Therefore, it has a positive affect on his performance.

Another energy system adaptation is an increase in lactate. This is mainly used in the lactate energy system. When Jesse plays football, an increase in lactic acid build up will cause more energy to be produced quicker but also lactic acid to ~~but~~ build up quicker. Therefore, can impact his performance if oxygen isn't present in the working muscles.

Another Cardiovascular adaptation is increase blood supply. This ~~is~~ means that more blood can be Produced ~~to~~ and therefore transported to the working muscles. It will affect Jesse's performance in football as it will allow him to break down lactic acid quicker. This is because ~~he~~ in the blood oxygen would break down lactic acid.

**(Total for Question 17 = 8 marks)**

# Summary

Based on their performance on this paper, candidates should:

- Use appropriate technical language throughout their responses,
- Tailor their response based on the command word in the question, e.g. 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, e.g. short-term responses (immediate, due to the exercise/sport), adaptations (long term).
- Only address the correct body system within this section, e.g.in Section A 'The Skeletal System' credit will only be awarded for responses from the specification of the skeletal 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 and not write general impacts but relate this to performance.
- Check their paper carefully for any missed questions and attempt and read everything.
- Please click here for the specification and SAMS.



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