

L3 Lead Examiner Report 1906

June 2019

Level 3 National in

Sport and Exercise Science

**Unit 1: Sport and Exercise Physiology
(31813H)**

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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.

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Unit 1: Sport and Exercise Physiology

Grade	Unclassified	Level 3			
		N	P	M	D
Boundary Mark	0	10	20	32	45

Introduction

The format of this assessment followed that of previous test series. As previously, the paper was split into four questions. Each question was based on a sport or exercise scenario and required learners to demonstrate knowledge and understanding of a range of specification topics and apply this knowledge to the specific question scenario. Three questions were marked out of 18 marks, and one out of 16 marks, 8 marks being awarded for the final part of each question where an extended response was required.

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

Four extended response questions make this a potentially challenging assessment for learners, but centres and learners should be congratulated on their preparation for this assessment. Overall learners appeared well prepared and well versed on many of the specification topics covered in this assessment.

Introduction to the Overall Performance of the Unit

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

The assessment is also challenging due to the need to apply knowledge not only in the extended response questions but also the 'points-based' questions, for example, Q01c; Q02c; Q03a and Q04c. There are limited instances within each question where only recall of knowledge is required, for example, Q01a; Q01b; Q03b and Q04b therefore raising the demand on the learner.

Individual Questions

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

Q 01(a)

The context for question one is based around two athletes. The first athlete is a 100m sprinter, the second athlete is a 10,000m runner.

In part (a) learners are asked to match each event to the predominant muscle fibre type that would be used in each event.

The muscle fibre types identified in the specification are referred to as Type 1, Type IIa, Type IIx, therefore type IIx should have been stated for the 100 m sprint and type 1 for the 10,000 m run. Whilst most learners accurately identified the muscle fibre types, they often referred to type IIx as type b. Occasionally learners failed to gain marks as they identified each event with an incorrect fibre type.

This response gained 0 marks

<p>Jo and Shelly are athletes. Jo is a 100 m sprinter. Shelly is a long distance 10,000 m runner.</p> <p>1 (a) State the main muscle fibre type used by each athlete in her event.</p> <p>Jo – 100 m sprint Type 1</p> <hr/> <p>Shelly – 10,000 m run Type IIx</p>	<p>(2)</p>
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This response gained 1 mark

1 (a) State the main muscle fibre type used by each athlete in her event. (2)

Jo - 100 m sprint
 Type IIX this is because the ~~ATP-PC system is~~ ^{recruited} the event lasts 10 seconds and this is the best for fast explosive exercises.

Shelly - 10,000 m run
 Type IA muscle fibres as this lasts longer than 3 minutes and is the high endurance muscle fibre.

As this was not an explain question learners were only required to provide the name of the fibre type, therefore no additional marks were available for further knowledge.

No credit was awarded for type 1a.

This response gained 2 marks

1 (a) State the main muscle fibre type used by each athlete in her event. (2)

Jo - 100 m sprint
 Type 11b
 also known as 2x

Shelly - 10,000 m run
 Type 1

Learners should be aware that the fibre types are now type IIX and that this is the terminology that should be used for this specification.

Q 01(b)

This part of the question asked learners to state the meaning of the term hyperplasia. Examiners were looking for reference to the ‘splitting’ of the fibres, or an increase in number to differentiate from hypertrophy (increase in size).

Whilst this term was clearly known by some learners it was not well-known. Many learners attempted to explain the ‘hyper’ part of the term, often incorrectly linking to an increase in blood plasma, or did not attempt a response, whilst others described hypertrophy.

This response gained 0 marks

(b) State the meaning of the term hyperplasia. (1)

build up of waste products (Lactic acid)
increase of plasma in the body.

This response gained 1 mark

(b) State the meaning of the term hyperplasia. (1)

Hyperplasia is the split in the muscle cells.

This response gained 1 mark

(b) State the meaning of the term hyperplasia. (1)

Hyperplasia is the increase number of muscle fibres.

Q 01(c)

This question provides learners with an aerobic training adaptation, increased mitochondria. Learners are asked to explain why an increase in mitochondria would be advantageous to the 10,000 m runner.

As this was an 'explain' question learners needed to develop their response, making appropriate expansions to their initial point.

This was quite a challenging question. To be able to address the question learners needed to know the role of the mitochondria. Those that knew this was the site of aerobic respiration could easily make the link to the 10,000 m runner in terms of energy production and the impact of increased energy production on reducing fatigue. However, many learners incorrectly linked mitochondria with oxygen transport, and although some credit could still be gained for a relevant overlapping impact, for example, delays OBLA the other available marks were not accessed.

This response gained 1 mark

(c) Explain why an increase in mitochondria is an advantage for Shelly in her 10,000 m run. (3)

The more mitochondria the more oxygen able to pump around the body. Mitochondria will allow more blood to be transported via the blood vessels to the working muscles. More mitochondria will allow Shelly to work for a pro-longed period of time without fatiguing as quickly as she would due to the more oxygen within her body.

The role of the mitochondria is incorrectly associated with oxygen transport, however the suggested impact is appropriate, (work for a pro-longed period of time without fatiguing), this is an advantage to the runner therefore a mark is awarded.

This response gained 2 marks

Shelly's training is aerobic. Her muscular system adapts by increasing the number of mitochondria in her muscles.

(c) Explain why an increase in mitochondria is an advantage for Shelly in her 10,000 m run.

(3)

An increase in mitochondria is an advantage for Shelly because mitochondria provides energy. So the more mitochondria the more energy the muscles have. Therefore allowing Shelly to do more exercise.

The 'missing element' in this response was the impact, why this was an advantage to the 10,000 m runner. Whilst the learner states 'to do more exercise' this is not specific enough, they would need to say the reason they could do more, ie that fatigue would be delayed.

This response gained 3 marks

(c) Explain why an increase in mitochondria is an advantage for Shelly in her 10,000 m run.

(3)

An increase in mitochondria is good as her sport is long distance. Meaning it is aerobic. Mitochondria in the body help with aerobic respiration so provide energy. An increase in mitochondria will mean an increased aerobic capacity, which will help her run for longer or last for longer without fatiguing.

Q 01(d)

This question was split into two parts. The question was essentially the same in each part but applied to the two different events.

Despite the question being identical in terms of demand, more learners found part (i) on the ATP-PC system more accessible.

In (i) learners were asked to explain, in terms of energy systems, why the 100m sprinter would be able to run heats/ race four times on the same day. In (ii) they were asked why the 10,000 m runners would only run once.

Each part of the question was worth two marks. In (i) most learners correctly identified the ATP-PC system (no other system was accepted as the question focused on the 'main' energy system) and explained it could be used to race again during the day as it only took approximately 2-3 minutes to fully recover. Those not achieving marks often failed to provide an energy system or focused on the length of the event rather than the sprinters need to recover.

This response gained 0 marks

Jo and Shelly enter an athletics competition.

The 100 m sprinters race four times in the competition, but the 10,000 m runners only race once.

(d) (i) Explain why the main energy system used by the 100 m sprinters allows them to race four times on the same day.

②

The 100m sprinter is able to race four times ~~because~~ because each race will last around 10-11 seconds which means that ~~his~~ ~~his~~ his body will be able to recover in a short amount of time compared to the 10,000 m runner.

This response gained 2 marks

(d) (i) Explain why the main energy system used by the 100 m sprinters allows them to race four times on the same day.

(2)

100m sprinters use the ATP-PC system. The ATP-PC system lasts for 8-10 seconds. This is used for sprinting as 100m sprints last around the same time. The ATP-PC system has a short recovery time, it takes 2-3 minutes to recover its main fuels so therefore by the next sprint sprinters are recovered and ready to go again.

In (ii) many learners correctly identified the aerobic system although did not always go on to explain that as this system could take over 24 hours to replenish the runners wouldn't be able to run again on the same day.

This response gained 1 mark

(ii) Explain why the main energy system used by the 10,000 m runners only allows them to race once on the same day.

(2)

The 10,000 m runners will be using the aerobic system. The fuel for the aerobic system is glucose. Glucose stores take longer to replenish

This response gained 2 marks

(ii) Explain why the main energy system used by the 10,000 m runners only allows them to race once on the same day.

(2)

The aerobic energy system only allow her to race once, due to the recovery time, it usually takes 24 hours to fully recover.

Q 1(e)

This was the first of four extended questions on the paper. The full mark range was seen in student responses.

This question asked learners to analyse how the responses of the cardiovascular (CV) system help prepare for and then maintain performance in a long distance race.

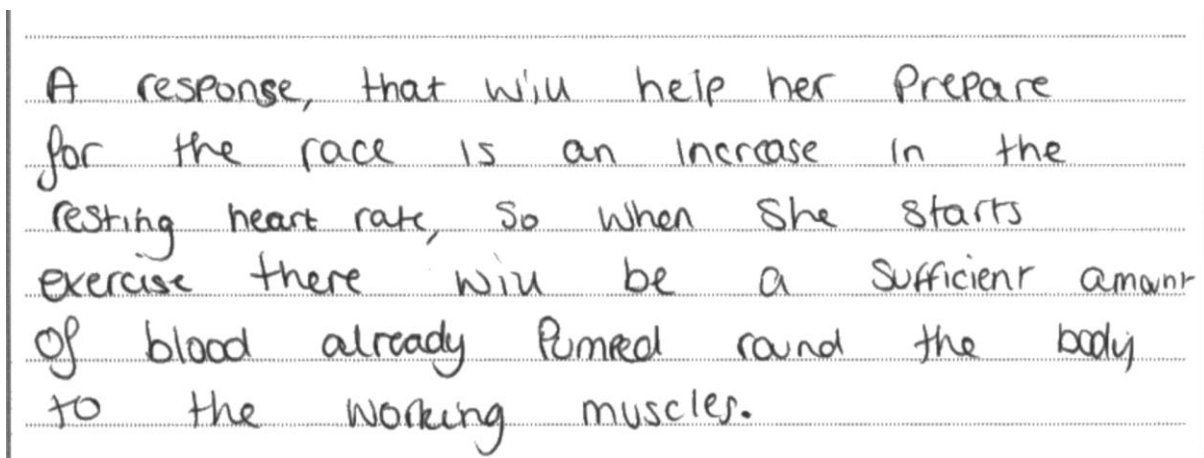
Responses to extended answer questions are marked using levels based mark schemes; the quality of the response determining the level. There are four levels; level 0 where there is no rewardable material presented and then levels 1, 2, 3; the higher the level the greater the quality of the response.

To address this question, learners should have identified the responses of the CV system to exercise, eg anticipatory rise, increased stroke volume or redistribution of blood flow. Had any relevant response of the CV system been stated, this would have contributed to the overall level of the response. If knowledge of the responses was the only relevant content it is likely the response would have been placed at level 1. To move into level 2 and level 3 it would be necessary to demonstrate the skills of application of knowledge. Eg the increased stroke volume meaning that due to the increased blood flow the runner would be able to receive more nutrients for energy production during exercise. If the presented knowledge points were dealt with in this way the response would clearly be at a higher level than if the learner had simply recited a list of responses. There should also have been some analysis within the question, a further development of the points already made. Eg the increased nutrients for more energy production would mean that

the runner could maintain a faster pace for longer improving their overall time. By developing knowledge points in this way, the quality of the response also develops.

Many learners did identify anticipatory rise or an increase in heart rate although a much smaller number were then able to apply this knowledge to develop their response further.

Level 1 extract



A response, that will help her prepare for the race is an increase in the resting heart rate, so when she starts exercise there will be a sufficient amount of blood already pumped round the body to the working muscles.

Although there is relevant content included here, (the description of anticipatory rise), this is not developed other than to say another response which is that there will be increased blood flow. Compare this to the quality of the next extract

Level 2 extract

Shelly's body will also start to thermoregulate by through vasodilation the widening of blood vessels, increasing blood flow to the surface of the skin which will also increase sweat production.

In this extract there is an example of a partially developed point. The learner has identified a response and applied this to the question but does not complete the point being made, ie how this helps the performer maintain their performance during the race. Some further reference to the sweating reducing heat/preventing overheating and how this would reduce feelings of fatigue would have completed the 'argument'.

Level 3 extract

for contraction. Before exercise we go through a process known as an anticipatory rise in which heart rate and stroke increases just before exercise. The brain senses that we will be exercising or performing which causes heart rate to increase in order for the body to have enough blood supply for exercise. ~~As a result~~ This helps her performance as an increased heart rate helps Shelly to receive more oxygen for her working muscles to contract and break down lactic acid. This will mean she can delay OBLA better which onset of blood lactate accumulation. As she will have more oxygen. This will help her to perform

The extract is selected as it shows how a knowledge point can be developed. If a response takes this approach with 3 or 4 knowledge points it would be likely to be placed at level 3.

Q 02

The context used in question 2 is a rugby player.

Q 02(b)

This question was marked out of four marks. The question asked about two additional skeletal muscles that can assist with inspiration and expiration during exercise. This proved to be a challenging question for learners.

Many knew of the respiratory muscles so could explain the role of the diaphragm and external intercostal muscles, often putting these muscles as their answer rather than considering the additional skeletal muscles required.

It was anticipated that learners would refer to the assistance of the sternocleidomastoid during inspiration and the rectus abdominus assisting in expiration although other skeletal muscles were also stated and credited, eg the scalene muscles and the internal intercostal muscles.

This response gained 0 marks

When Jack is playing rugby, additional skeletal muscles are used to increase his minute volume.

(b) Explain the role of **two** additional skeletal muscles, one during inspiration and one during expiration, that help increase Jack's minute volume. (4)

Inspiration

External^{internal} intercostal muscles contract^{and relax} which causes air to be forced into the lungs. These help us to inspire as much air as possible.

Expiration

Diaphragm which flattens, this allows for maximal room for the lungs to expand and hold oxygen. The diaphragm holds the lungs in place, supporting them.

This response gained 4 marks

When Jack is playing rugby, additional skeletal muscles are used to increase his minute volume.

(b) Explain the role of **two** additional skeletal muscles, one during inspiration and one during expiration, that help increase Jack's minute volume.

(4)

Inspiration

The sternocleidomastoid is used to lift the sternum when it contracts. This will increase the size of the thoracic cavity. Another skeletal muscle that aids inspiration is external intercostal muscles.

Expiration

The rectus abdominus is used to pull the rib cage down to increase the ^{air} pressure causing the air to leave the lungs. Another skeletal muscle that aids expiration is internal intercostal muscles.

In inspiration, marks were awarded for identification of the sternocleidomastoid and for its role in lifting the chest. In expiration, marks were awarded for identification of the rectus abdominus and for its role in pulling the rib cage down.

Q 2(c)

This was a three-mark question. Learners were told that the rugby player trained with heavy weights to increase their strength for rugby. They were asked to explain how lifting heavy weights could lead to increased strength.

Some learners achieved maximum marks on this question. Explaining that the training causes micro-tears which stimulates protein synthesis which overtime means the muscle can adapt and increase in size, increasing strength.

This response gained 2 marks

Jack trains regularly with heavy weights to increase his muscular strength for rugby.

(c) Explain how lifting heavy weights can lead to increased strength. (3)

By lifting heavy weights it causes micro-tears in the muscle fibres. These muscle fibres will undergo hypertrophy which will rebuild the fibres, however it will make them larger and stronger meaning that it is less likely for them to tear when exerting that much force when lifting a certain weight.

The omission here was that there was no reference to protein or protein synthesis to allow the muscle to increase in size.

This response gained 3 marks

Jack trains regularly with heavy weights to increase his muscular strength for rugby.

(c) Explain how lifting heavy weights can lead to increased strength.

(3)

Lifting heavy weights causes resistance to the muscle which will then cause micro-tears. Jack will then rest and ~~eat~~ consume protein which will allow his muscles to repair themselves and they'll get larger and increase in mass. Muscle mass is relative to the force it can produce which means Jack's muscles will then be bigger and stronger allowing him to produce more

The response provides a good explanation how lifting heavy weights can lead to an increase in strength.

Q 2(d)

Whilst learners appeared to manage the context of lifting heavy weights in the previous part of the question and could apply their knowledge to it, this context proved more problematic in this part of the question.

Learners did tend to gain the accessible first marking point, that blood pressure would increase, but this was often linked generally to exercise rather than the reason for this effect specifically in relation to weight training.

This response gained 1 mark

(d) Explain the effect of lifting heavy weights on Jack's blood pressure during the training session. 4

(2)

his blood pressure will go up due to his cardiac muscle pumping out a greater volume of blood to supply his working muscle with high oxygen demand of his working muscles

The mark is awarded for increased blood pressure, but the reason given is not specific to the question context, ie it would be appropriate to other forms of activity such as games activities.

This response gained 2 marks

(d) Explain the effect of lifting heavy weights on Jack's blood pressure during the training session.

(2)

During heavy ~~blood~~ weight training Jack's blood pressure will increase due to the lumen constricting / vasoconstriction.

The learner identifies the effect on blood pressure and why it happens, ie the blood vessels constrict.

Q 02(e)

The extended response for question 2 asked learners to assess the importance of two different nutritional strategies as part of the recovery after exercise. The classes were over the course of a week and included the strength training session and a two-hour aerobic training session. The nutritional strategies were provided, these were protein and carbohydrate strategies.

In the main learners seemed to find this extended response slightly more accessible than the previous. Most made appropriate links between the strategies and the different exercise sessions.

Many learners considered the need for protein for muscle hypertrophy and the impact this would have on future rugby performance in terms of effectiveness of tackles or other aspects of the game requiring high levels of strength. Others went into the detail of the timing of the protein strategy and demonstrated an excellent level of knowledge, referring to alternative sources of protein to allow consumption of sufficient protein at an appropriate time. Knowledge of a carbohydrate strategy was also well known by some but seemed to be the more challenging of the strategies.

Like all of the extended response questions, the quality of learner responses varied. Some learners were clearly very knowledgeable about nutritional strategies and were able to apply this knowledge so could provide appropriate links and make informed assessments of the impact on future performance as required by the question.

Level 1 extract

carbohydrate is also key as it helps with restoring energy to the muscles and other areas in the body it is important Jack gets carbs as it will help during his aerobic training ~~making him~~ improving his cardiovascular system.
His ~~per~~ performance in rugby will improve overall allowing him to play for longer

There is limited information present, (carbohydrates for energy), and although there has been an attempt to develop this the quality is low due to the vagueness of the response. For example, there is no link to depleted glycogen stores due to the activity or clear impact, reference to playing for longer is considered too vague. Instead something about maintaining the quality of the play for longer, delaying fatigue, continuing to work at a high intensity throughout the match would have provided a bit more to the response.

Level 2 extract

Carbohydrates are ~~also~~ essential after an aerobic training session. Jacks ~~glucose~~ glycogen stores will be low. Carbohydrates make up 70% of your dietary intake so it is essential they are replenished in order to replenish glucose so Jack has energy. This will improve Jacks future rugby performance as he will have more energy and will therefore be able to perform better for longer without fatigue.

The focus in this extract is the carbohydrate strategy. Timing of carbohydrate intake is alluded to, but this is a little vague, a specific time frame would be required, for example an hour after training. However, there is application of carbohydrates for energy, ie the idea that carbohydrates are required to replace the glycogen stores he will have used during the exercise class and the impact of this being a delay in fatigue.

Level 3 extract

(e) Assess the importance of an appropriate protein and carbohydrate nutritional strategy in helping Jack's recovery after his training sessions and future rugby performance.

(8)

It is important that during the recovery stage of training that Jack consumes protein supplements such as protein shakes. These supplements ensure that the muscles are repaired and recovered after the session. This will improve his muscular hypertrophy due to protein repairing the micro tears from the strength/anaerobic part of the training. This will also increase strength of muscle as well as adaptation of muscle fibre recruitment increasing. As a result of his adaptations of his muscular system increase it will improve his performance as you need to be strong and physical in rugby for example when you lift someone up in the line-out or when you make a tackle as as a

In this part of the learner response they focus on the protein strategy, knowledge is demonstrated through reference to protein supplements that might be used and the

value of protein in the diet. This is exemplified on through application, eg reference to possible adaptations and the creation of micro-tears during the activity and this is rounded off with the impact of this on the players future rugby performance, ie use in line outs/tackles. One possible area this could have been developed would have been through assessment of the timing of the protein intake. An alternate assessment of impact could have been consideration of reduced risk of injury. **Q 3(a)**

The context for question 3 is sculling. An image is provided to learners to confirm the nature of this activity. The question begins by asking learners to explain why a reduction in viscosity of synovial fluid would be advantageous when sculling.

Correct responses focused on the role of synovial fluid in lubricating the joint, reducing friction and therefore providing a better range of movement. Some learners linked this to the context by explaining that with an increased range of movement technique would improve allowing them to go faster.

This response gained 2 marks

3 (a) Explain why a reduction in the viscosity of synovial fluid is an advantage for Chloe when she is sculling. (3)

The reduction in viscosity will allow for a larger range of motion at the joints which will allow her to perform the actions of sculling with longer strokes equally as powerful.

One mark was awarded for increased range of movement and a second mark for the advantage to performance, ie that this allowed the use of longer strokes with equal power.

This response gained 3 marks

- 3 (a) Explain why a reduction in the viscosity of synovial fluid is an advantage for Chloe when she is sculling.

(3)

Synovial fluid is found in the joint capsule at joints like the knee and reduces ✓ friction in the joint during movement. A reduction in the viscosity of the synovial fluid means the joint can move more easily. ~~and also~~ This increases ✓ range of movement and therefore athletic performance as Chloe can ~~complete~~ bend her knees fully allowing greater force generation ✓ when she extends them.

Q 3(b)


This question tested learners' knowledge of the cardiac cycle.

Whilst this was a relatively straight-forward question for many learners, allowing them to access all four marks, many also struggled with this topic. Incorrect responses would sometimes focus on blood pressure as blood left the two chambers rather than focus on the required description of ventricular systole and ventricular diastole. Other incorrect responses described the opposite type of systole, whilst many others left a blank response.

This response gained 0 marks

The cardiac cycle helps maintain blood flow when Chloe is sculling.

(b) Describe ventricular systole and ventricular diastole in the cardiac cycle. (4)



Ventricular systole

Ventricular Systole is when the ventricle is relaxed and filling with blood from the Atrium. ready to contract sending the blood to the body.

Ventricular diastole

Ventricular diastole is when the ventricle is contracted and has forced blood out into the body.

In this example the learner confuses the two phases.

This response gained 0 marks

Ventricular systole

ventricular systole is where the pressure on the blood ~~vess~~ vessel vessels or parts of the heart decreases meaning blood flow is reduced ~~slow~~ (slows down).

Ventricular diastole

ventricular diastole is when the pressure on the blood vessel or parts of the heart increases / is greater meaning blood to forced around at a greater speed.

The learner incorrectly focuses on blood pressure rather than describing the phases of the cardiac cycle.

This response gained 4 marks

The cardiac cycle helps maintain blood flow when Chloe is sculling.

(b) Describe ventricular systole and ventricular diastole in the cardiac cycle. (4)

Ventricular systole

Systolic is when blood is pumped out of the heart to the body when the heart contracts. The blood in the ventricles is pumped out.

Ventricular diastole

The diastolic phase is when the ventricles fill up with blood in order to be pumped out. relaxation phase of the heart.

Q 3(c)

This question asked learners to describe the effects of Starling's Law on stroke volume.

Again, this question proved challenging for many learners. Whilst Starling's Law is a small part of the specification all topics must be assessed so to be best placed for the external examination learners should be familiar with all content.

As a 'describe' question, linkage between points is still required but there is no need for justification, just a description of Starling's Law and through providing this, its effect on stroke volume.

Many learners achieved at least one mark for this question by stating that stroke volume increased. Several learners also stated that this was the result of the ventricular walls becoming more elastic or that there was greater filling of the ventricle during diastole but relatively few learners linked this all to increased venous return.

This response gained 1 mark

(c) Describe the effect of Starling's Law on Chloe's stroke volume. (3)

Starling's Law states that the more powerful the contractions of the heart are, the more blood is released. Stroke volume is the amount of blood ejected from the heart per beat. Starling's law will mean that Chloe's stroke volume will increase.

This response gained 3 marks

(c) Describe the effect of Starling's Law on Chloe's stroke volume. (3)

Starling's Law increases the stroke volume as more blood is pumped back to the heart during ~~exercise~~ sculling from body which stretches the ventricular walls causing the

Q 3(d)

This was the third extended response question. Learners were given information that the person in the question trains four times a week and competes in a sculling race most weekends.

They were then asked to assess the importance of adequate rest for recovery of the muscular and skeletal system.

Chloe trains four times each week and she competes in a sculling race most weekends.

(d) Assess the importance of adequate rest for the recovery of Chloe's muscular system and skeletal system.

(8)

The need for rest to allow the muscular system to recover from micro-tears was well known, and reference was often made about the need for appropriate rest to avoid overtraining although there was relatively little evidence of further development of these points. Often, with extended responses, learners do well applying knowledge, or using the question context, but this was not so evident here, although some still made an assessment, for example without rest the micro-tears will not repair potentially leading to injury, or making an injury worse until they had to stop training.

Very few learners made reference to the need to replace collagen or the replacement of calcium.

Level 1 extract

(d) Assess the importance of adequate rest for the recovery of Chloe's muscular system and skeletal system.

(8)

It is extremely important that Chloe gains sufficient rest as her muscles need time to heal any **micro tears** within the fibres. Also her tendons will need time to regain **collagen** content, which

The response includes some relevant knowledge but there is little depth to this section of the response, for example, an assessment of what might happen if time is not made for recovery from micro-tears, or for application, why it was important the sculler regained appropriate collagen levels.

Level 2 extract

Adequate rest is important for Chloe's muscular system as it allows time for the collagen to return to the tendon and ligaments so they can strengthen and repair. It is also important that Chloe rests so that the muscles can repair the micro-tears in the muscles because if not they will continue to rip and cause the muscle to weaken.

This extract focuses on collagen and microtears. There is knowledge of the need for time for collagen to repair the tendons/ligaments, so they increase in strength although this is not developed further. This could have been achieved through application, eg by referring to strength to cope with the forces at play during sculling or the potential impact of injury if rest was not allowed. Similarly, micro-tears are correctly referenced and there is a suggestion that they may 'continue to rip' without adequate recovery, it would have been good to know the impact of this.

Level 3 extracts

Her muscles will experience micro-tears as her body ~~is~~ was working against the resistance of the water. These micro-tears will be causing her pain due to DOMS, the delayed onset muscular soreness, requires 24 to 48 hours of recovery and causes pain due to inflammation of microtears. This period is essential for allowing the muscle to repair, so that performance isn't hindered or injury doesn't occur.

This extract does attempt to provide all elements, knowledge, application and assessment. There is knowledge of micro-tears and DOMs, there is application through linking the activity to the cause of the micro-tears and performance decrement to DOMS and the impact of ensuring injury does not occur.

Q 4(a)

The context for this question is a triathlon.

Learners were asked to describe, for two marks, how the nervous system increases motor unit recruitment.

Some learners described how variations in force could be generated, possibly drawing on a similar question from a previous paper. However, this did not address this question. Specifically, what was wanted here was how motor unit recruitment was increased. Therefore, responses needed to focus on increased frequency of stimulation, activating an increased number of motor units.

Credit was given for responses identifying that impulses/signals were used in the process although learners need to be careful that they describe the correct route of the impulse, in this case it would be along the motor neurone rather than to the brain. Many learners incorrectly linked the medulla oblongata to this process.

This response gained 0 marks

4 (a) Describe how the nervous system increases motor unit recruitment.

(2)

The nervous system uses type 4 motor units first as they give less force, then type IIa motor units are recruited and lastly type IIX as they generate

The learner is correctly describing the 'size' principle of motor unit recruitment, however, does not address the question of how they are recruited.

This response gained 2 marks

Kieran is a triathlete. The triathlon involves swimming, cycling and running.

When Kieran is cycling, motor unit recruitment allows him to generate the required force needed to push against the peddles on his bike.

4 (a) Describe how the nervous system increases motor unit recruitment.

(2)

The nervous system sends signals to the motor units to get to the muscles to tell them to work ✓ so the stronger and healthier the nervous system is means means signals can get sent faster ✓ + stronger to recruit more motor units

One mark is awarded for reference to sending a signal to tell the motor units to 'work', this was accepted as alternative to contract and towards the end of the response the learner states that these signals can get round faster, this was accepted as increased frequency of stimulation (due to the increased speed of the impulses).

This response gained 2 marks

Kieran is a triathlete. The triathlon involves swimming, cycling and running.

When Kieran is cycling, motor unit recruitment allows him to generate the required force needed to push against the peddles on his bike.

4 (a) Describe how the nervous system increases motor unit recruitment. (2)

A motor unit is made up of motor neurones and corresponding muscle fibre types. An impulse is sent down the muscle fibre from the motor neurone to tell them to contract or relax.

Some learners achieved both marks by describing the motor unit structure and then referencing the impulse.

Q 4(b)

To achieve both available marks for this part of the question learners needed to state the second and third stages of aerobic energy production. (The first stage was provided). Although designed as an accessible question not all learners could capitalise on this.

Whilst some learners did achieve both marks many did not. Krebs cycle seemed marginally more well-known than the electron transport chain.

This response gained 1 mark

Kieran will generate a lot of energy for his race through his aerobic energy system.

There are three stages of energy production in the aerobic system.

The first stage is aerobic glycolysis.

(b) State the names of the **other two** stages of aerobic energy production.

(2)

Stage 1 – aerobic glycolysis

Stage 2 – *Kreb cycle* ✓

Stage 3 – ~~Kreb~~ *Pyruvate cycle.*

This response gained 2 marks

Kieran will generate a lot of energy for his race through his aerobic energy system.

There are three stages of energy production in the aerobic system.

The first stage is aerobic glycolysis.

(b) State the names of the **other two** stages of aerobic energy production.

(2)

Stage 1 – aerobic glycolysis

Stage 2 –

Kreb's cycle.

Stage 3 –

Electron transport chain.

Q 4(c)

Learners were given information about the weather conditions for the date of the triathlon competition.

The weather forecast for the day of Kieran's next race is hot and sunny.

Table 2 shows the expected air and water temperatures for the race.

	Temperature
Air temperature	35°C (95°F)
Water temperature	26°C (80°F)

Table 2

It is important that Kieran's body thermoregulates while swimming, running and cycling.

Evaporation of sweat is one method of heat loss to aid thermoregulation.

They were also told that evaporation of sweat is one method of heat loss. They were then asked to describe two other methods of heat loss. Overall, learners found this question quite accessible. Some still gave evaporation as an answer despite being in the question so limited the mark they could achieve but many others did gain all four available marks.

This response gained 0 marks

(c) Describe **two other** methods of heat loss that Kieran's body will use in the race.

(4)

Method 1

Shivering as he will enter water that is cooler than air temperature in order to warm his muscles that'll chill when he enters the water.

Occasionally learners would focus on methods to conserve heat rather than heat loss. This could not be credited.

This response gained 0 marks

Method 2
 Production of sweat to help cool down the body during its increase in temperature.

Occasionally learners referenced sweating and or evaporation which could not be credited as already stated in the question.

This response gained 4 marks

(c) Describe **two other** methods of heat loss that Kieran's body will use in the race.

(4)

Method 1

Convection will occur, which is where the wind will brush past him as he runs and cycles which will help Kieran cool down.

Method 2

Conduction method will also occur, as he begins to swim the direct contact from the water will help heat loss as the water is 15°C cooler than the air temperature.

Q 4(d)

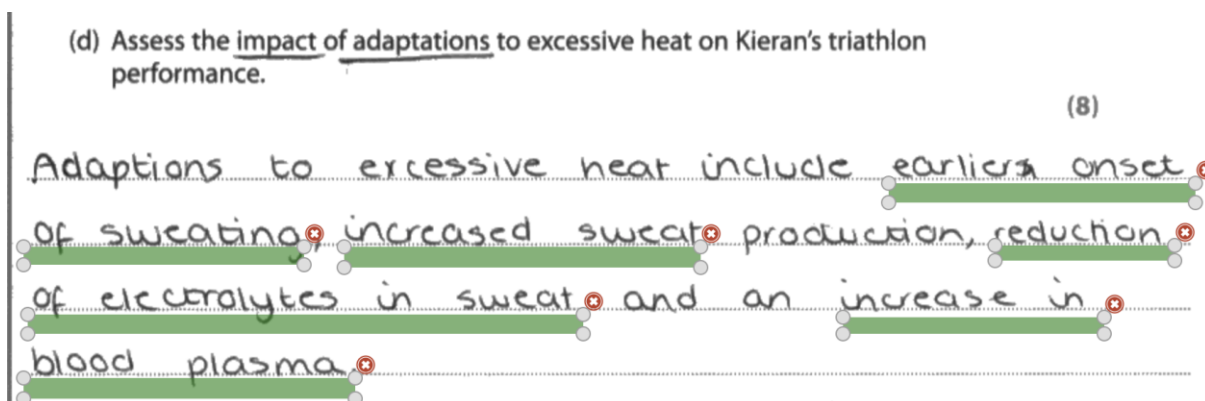
The final extended response question asked learners to assess the impact of adaptations to excessive heat on triathlon performance.

Credit was given for responses that identified the different adaptations and the impact of these adaptations on performance. Thus, a successful response might identify that one adaptation was earlier onset of sweating which allowed the athlete to begin cooling sooner, or at a lower temperature thus avoiding the risk of overheating or even hyperthermia.

Other popular correct responses made reference to the increased blood plasma volume which was particularly useful for the triathlete as this improved oxygen transport whilst racing.

As with all extended response questions it is important to show development in the answer, taking a fact, e.g. increased sweat production and developing this by applying to the question context, e.g. meaning a greater cooling effect could take place as the sweat evaporates.

Level 1 extract



A list of adaptations without development would be placed at level 1.

Level 2 extract

The last adaptation is increased blood plasma volume. An increased blood plasma volume will ensure there is more water in the blood which will improve performance and reduce risk of dehydration as well as more oxygen within the blood going to working muscle quicker to work for longer.

The learner has identified an adaptation in this extract and applied this knowledge to the question context. Had a little more been stated rather than just 'working for longer' for example as shown in the clip below this would have been considered indicative of the quality of work for level 3 and had that quality been repeated throughout the response 7 or 8 marks would have been awarded.

Level 3 extract

the races. The last adaptation that Kieran will experience is an increase in the amount of plasma in his ~~body~~ blood. The increased amount of plasma will allow oxygen to move more fluidly around the body to the working muscles, this will allow Kieran to last longer during the races and fatigue less.

Summary

Based on their performance on this paper, learners should:

- Know the different body systems so you can focus on the correct one within a question.
- Be clear about terminology used in the specification as these words will be repeated in the exam paper, eg responses, adaptations.
- Read questions carefully to avoid repeating answers already given in the question, eg Q04c
- Tailor your response based on the command word in the question, e.g. state does not require any expansion of a point but explain will.
- Use the number of marks awarded and the space available as a guide to the depth of response required.
- Be clear, eg if an extended question asks about different nutritional strategies make sure you are clear in your response which strategies are relevant to which training activity in the question.
- Use all of the information provided in the question scenario to demonstrate your ability to apply your knowledge.

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