Pearson
Edexcel

Examiners' Report
June 2023

GCE Physical Education 9PE0 01

ResultsPlus

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk.

Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

ResultsPlus

Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit www.edexcel.com/resultsplus. Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

Pearson: helping people progress, everywhere

Pearson aspires to be the world’s leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We’ve been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk.

June 2023

Publications Code 9PE0_01_2306_ER

Introduction

Candidates had prepared well for this paper and were able to access all of the questions. It was pleasing to see previous advice being acted on, and they were more familiar with structural and functional terminology. There were also some pleasing extended responses, although to access the highest marks more application is still needed.

Spellings are important and key terms will need to be spelt correctly. Definitions need to be learnt well, using the topic guides. Units are also important when answering with figures as seen in question (Q)19i, where marks were lost for not using them. Candidates are good at learning Assessment Objective (AO) AO1 facts but sometimes the application is more challenging, as seen in Q19iii and Q19iv. 'Explain' questions need linked points to be made.

In levels-based questions, the application part of the question is important. Teachers should encourage candidates to use the phrases 'so that' and 'this leads to' to try to elicit more application from them in sporting scenarios as they practise past papers and learn new areas of the specification.

Candidates using examples in multiple sports, is also to be encouraged. They are more likely to find a good example, rather than always stick to their own sport. This was seen in Newton's Laws. Q12.

Question 1 (i)

This definition caused some confusion. The most-able candidates knew the definition and what a fixator did and were able to talk about stabilising the joint, as well as the origin of the prime mover.

Some candidates were confused by including that it stabilised the muscle, rather than the joint. There were also some candidates who answered with the synergist definition in this question. These were examples of candidates who were able to give the definition.

Learning definitions off-by-heart using topic guides is essential. Most candidates knew they supported but not in the detail required, with enough precision to gain the credit. This was not known well.

Candidates should learn definitions for all key terms using the glossary and topic guides.

1 Define the following:

(i) Fixator

(1)

A fixator muscle helps the prime mover work more efficiently by stabilizing the bone at which the prime

ResultsPlus
Examiner Comments

This definition is clear.

Total: 1 mark

ResultsPlus
Examiner Tip

Learn the definitions.

1 Define the following:

(i) Fixator

(1)

Muscle that stabilises the origin of the prime mover (agonist muscle) to help prevent any unwanted movements

ResultsPlus
Examiner Comments

This response is also correct.

Total: 1 mark

Definitions are best learnt off-by-heart but may be awarded if the key information is there.

1 Define the following:

(i) Fixator

(1)

A muscle that stabilises the bone where the agonist originates

ResultsPlus
Examiner Comments

This definition achieves the mark available.

Total: 1 mark

1 Define the following:

(i) Fixator

(1)

A fixator is a muscle which provides stability, primarily at the point of origin.

ResultsPlus
Examiner Comments

This is another example of a maximum-mark definition.

Total: 1 mark

Including examples to support points made is a good idea, even though a definition does not require it.

1 Define the following:

(i) Fixator

(1)

A muscle that stabilises the joint, at its primary of origin.
e.g. shoulder (deltoid) in a bicep curl.

ResultsPlus
Examiner Comments

This is a correct definition.

Total: 1 mark

Question 1 (ii)

Some candidates answered incorrectly, with the fixator definition in this question. There was more understanding that a synergist worked with (in synergy with) the prime mover and helped it.

Candidates still did not remember key definitions or learn them from memory from topic guides and glossaries. There are always AO1 definition marks available in examination papers. These are examples where candidates have given enough information to gain the mark.

This question was not well known with enough precision for marks in many cases. It was poorly answered by quite a large number of candidates.

(ii) Synergist Prime mover originates.

(1)

A muscle which aids the prime mover by stabilising the joint where the prime mover acts.

ResultsPlus Examiner Comments

This response achieves the mark.

Total: 1 mark

There are always marks on papers for definitions of key terms.

(ii) Synergist

(1)

A synergist muscle aids the movement of the prime mover by stabilizing the joint at which the prime mover acts on.

ResultsPlus Examiner Comments

This response receives the mark.

Total: 1 mark

Question 2

The most-able candidates were able to achieve these marks with ease, by remembering the muscles that performed these movements.

However, spelling errors meant that a large number of candidates who knew the word did not gain the mark. Key specification terminology needs to be spelt correctly to achieve marks.

The examples show where candidates have spelt the key terms correctly and therefore gained full marks. Many also incorrectly put abdominals rather than the main muscle of rectus abdominus. Perhaps the term 'trunk' is one that needs to be taught.

Note also that writing has to be legible enough that the examiner can make out the spelling, or marks could be lost.

2 Name the main muscle responsible for each movement.

Movement	Muscle responsible
(i) Flexion of the trunk	Rectus Abdominus (1)
(ii) Dorsi flexion of the ankle	Tibialis anterior (1)
(iii) Plantar flexion of the ankle	Gastrocnemius. (1)

ResultsPlus
Examiner Comments

The correct muscles are identified.

Total: 3 marks

2 Name the main muscle responsible for each movement.

Movement	Muscle responsible
(i) Flexion of the trunk	rectus ~~abdominus~~ abdominus **(1)**
(ii) Dorsi flexion of the ankle	tibilas anterior **(1)**
(iii) Plantar flexion of the ankle	gastrocnemius **(1)**

ResultsPlus
Examiner Comments

The correct muscles are given.

Total: 3 marks

2 Name the main muscle responsible for each movement.

Movement	Muscle responsible
(i) Flexion of the trunk	rectus abdominius **(1)**
(ii) Dorsi flexion of the ankle	tibialis anterior **(1)**
(iii) Plantar flexion of the ankle	gastrocnemius **(1)**

ResultsPlus
Examiner Comments

This response shows correctly-named muscles.

Total: 3 marks

Question 3

Generally, this question was answered well.

There were fewer errors this season on candidates understanding the difference between structural and functional. This has been referenced in previous papers so it was pleasing to see that this has been noted, resulting in an improvement in candidate work. However, it does still need work, with some candidates not achieving as many marks as they could.

All points on the mark scheme were used by the candidates but knowledge of the specific enzymes creatine kinase and ATPase were less usual than the other answers.

The responses below are all examples of candidates who achieved maximum marks. Sometimes "white in colour" was referenced but this is as a result of the structures and not the structure itself. Large fibre size was sometimes referenced, which was too vague for credit.

A 5-mark question needs five things to be said at least.

Give six or seven, to be sure, if there is time and you know them.

3 **Summarise the structural characteristics of fast glycolytic (type IIx) muscle fibres.**

(5)

A fast glycolytic (type IIx) muscle fibers ~~is composed of these muscle fibres with~~ have a large diameter, and large motor unit sizes. They have low mitochondrial density and high PC and glycogen stores. They have a low capilliary density, so appear white in colour. They also have low myoglobin stores. The mitochondria are also smaller.

ResultsPlus
Examiner Comments

Full marks for five points.

Total: 5 marks

3 Summarise the structural characteristics of fast glycolytic (type IIx) muscle fibres.

(5)

Fast glycolytic (FG) fibres have high Phosphocreatine Stores. They have high Stores of glycogen and a large Motor unit size. They have high initial stores of ATP and they have large amounts of actin and myosin for Sliding filament theory.

ResultsPlus
Examiner Comments

Five points are made.

Total: 5 marks

3 Summarise the structural characteristics of fast glycolytic (type IIx) muscle fibres.

(5)

Type IIx fibres have the largest motor unit size, for greatest force of contraction. They have large ATP stores for energy production, and high stores of PC for ATP resynthesis. They have a limited capillary network and small number of mitochondria, as most energy is produced anerobically for explosive activity.

ResultsPlus
Examiner Comments

This candidate makes five relevant points.

Total: 5 marks

3 Summarise the structural characteristics of fast glycolytic (type IIx) muscle fibres.

(5)

Type IIx fibres have a large fibre size / diameter. They also have large stores of ATP (adenosine triphosphate. Another characteristic is that they have large stores of phosphocreatine (pc). Type IIx fibres also have large glycogen stores. Type IIx fibres have lots of actin and myosin filaments. They have large motor neurones.

ResultsPlus
Examiner Comments

This is a clear, succinct answer.

Total: 5 marks

3 Summarise the structural characteristics of fast glycolytic (type IIx) muscle fibres.

(5)

Fast glycolytic (type II x fibres) are very large in size as these muscle fibres have a very large diameter which enables powerful and quick contraction. Each muscle fibre contains high proportion of PC (phosphocreatine). This is useful as it enables a quicker resynthesis of ATP. ~~Each~~ Type II x muscles also contain high proportion of ATP as these muscle fibre are suited to supporting components such as speed and power. As mentioned the type II x muscle fibres produce a very large contraction force which occurs due to large size of motor neurone. To further this type II x also have a very quick contraction speed. Type II x appear white in colour due to little amount of myoglobin present in muscle. Type II x also have very few mitochondria so would be considered to have a better Anaerobic capacity

ResultsPlus

Examiner Comments

This response makes five good points and gained maximum marks.

Total: 5 marks

3 Summarise the structural characteristics of fast glycolytic (type IIx) muscle fibres.

(5)

Type IIx muscle fibres are large diameter fibres.
They have little to no mitochondria.
They have little to no myoglobin.
They have high ATP stores.
They have high phosphocreatine stores.
They are surrounded by little to no capillaries.

ResultsPlus
Examiner Comments

Full marks gained here for five clear points in the mark scheme.

ResultsPlus
Examiner Tip

Set out the answers in a clear format so that the examiners can see the distinct points.

Question 4

Again, it was pleasing that structural answers did not tend to be used and that candidates could talk accurately about functional characteristics.

The most frequent answers used were stroke volume increase, cardiac output increase and bradycardia. All the answers on the mark scheme were utilised, with more forceful contraction and better oxygen delivery also being well-used responses.

These are all examples of candidates who have summarised well and gained maximum marks. Sometimes, the respiratory system was referenced, rather than the cardio-vascular system.

4 Summarise the chronic functional adaptations of the cardiovascular system to aerobic training.

(4)

~~Heart rate~~ Resting heart rate decreases leading to bradycardia ~~Diffus~~ Stroke volume increases aswell as an increase in end diastolic volume as a result of cardiac hypertrophy. Cardiac output increases. Diffusion gradient for gaseous exchange increases leading to more ~~to~~ oxygen delivery to muscles. Venous return increases aswell as blood pressure.

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 4 marks

ResultsPlus
Examiner Tip

Remember a summary requires more information than a list.

4 Summarise the chronic functional adaptations of the cardiovascular system to aerobic training.

(4)

An increase in stroke volume.

There will be an increase in cardiac output.

There will be a decrease in resting heart rate.

There will be a decrease in blood pressure.

ResultsPlus
Examiner Comments

This is a well laid-out answer, gaining all available marks.

Total: 4 marks

4 Summarise the chronic functional adaptations of the cardiovascular system to aerobic training.

(4)

A chronic functional adaptation is an increased end diastolic volume. This is because there is more blood in the ventricles after filling and before contracting. This results in an increased stroke volume and therefore an increased cardiac output due to the heart being able to pump out more blood per beat. Further resulting in the heart contracting with more force (Starling's law). This causes a deacrease in resting heart rate (bradycardia) as the heart does not need to beat as many times to reach the same cardiac output.

(Total for Question 4 = 4 marks)

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 4 marks

4 Summarise the chronic functional adaptations of the cardiovascular system to aerobic training.

(4)

cardiac muscle hypertrophy allows the heart to contract with greater force resulting in an increased stroke volume and cardiac output. This results in bradycardia which is a resting heart rate of 60 ~~bpm or~~ beats per minute or less. The myocardium receives greater volumes of oxygen so beats more efficiently and allows for a larger maximum heart rate as the heart can beat more times per minute.

(Total for Question 4 = 4 marks)

ResultsPlus
Examiner Comments

This is an example of a candidate achieving maximum marks.

Total: 4 marks

Question 5

This question was well-answered, with candidates very familiar with the energy types and having good examples to use from the specification, to support their answers.

The most frequent examples for chemical were the breakdown of ATP.

For electrical, the most frequent examples were the conduction of the heart and the transfer of messages down the axon or action potential.

Kinetic was well-answered, with multiple sporting examples used.

Mechanical is one area where candidates often did not have a clear example to use.

Potential was generally well-understood, with good examples such as the drawing back of the bow on an arrow ready to release or a diver waiting on the top of a board.

Better teaching of mechanical energy in future would be helpful. For example, applying the force onto the pedals of the bike to enable it to move forward, or a bowling ball hitting the pins uses mechanical energy to displace them.

These are examples of clear outlines for each of the given forms of energy, each gaining maximum marks.

5 Using sporting examples, outline how the **five** forms of energy are transferred.
Chem, kin, mech., electrical, potential

(5)

Chemical energy is stored between bonds within molecules such as ATP, this is released to allow for muscle contraction for example in a bicep curl, contraction of the bicep brachii. Staying with this example, chemical energy transfers to kinetic energy, which is the energy of movement of a body, in this case the arm. Mechanical energy is the energy of an object due to kinetic energy, therefore transferred from kinetic energy, fore example of a tenis racket in a serve (from kinetic energy of the arm). Electrical energy is energy of movement of charged particles, for example in nervous transmission of an impulse when contracting the bicep brachii. Potential energy is energy stored with potential to be released, it is transferred from chemical energy, at the bottom of a bicep curl potential energy is stored in bicep brachii and transfered to kinetic energy.

(Total for Question 5 = 5 marks)

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 5 marks

5 Using sporting examples, outline how the **five** forms of energy are transferred.

(5)

Initial chemical energy is released when enzymes e.g. ~~phosphocreatine breaks ... ...~~ ATPase hydrolyses the final bond in ATP to release chemical energy. This energy released allows an action potential to be set up in motor neurones transferring energy to electrical energy. This electrical energy is transferred to kinetic energy after sliding filaments theory takes place of the limb. This could then either be transferred to mechanical energy if a performer swings a bat for example or energy could be transferred to potential energy stored in the tendons during the eccentric phase of a muscle contraction.

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 5 marks

ResultsPlus
Examiner Tip

Take examples from the specification.

5 Using sporting examples, outline how the **five** forms of energy are transferred.

(5)

· Kinetic energy - transferred during movements such as running.
· Potential - energy that is present when a sprinter is in the starting blocks.
· Mechanical - energy that is present when moving an external object such as a barbell in bench press.
· Chemical - energy transferred during metabolic reactions such as the break down of ATP during muscular contraction
· Electrical - energy transferred via motor neurons to initiate an action potential, for example: electrical energy is transferred to motor neurons present at the bicep brachii during a bicep curl.

ResultsPlus
Examiner Comments

This is a good example of setting work out clearly. This gains maximum marks.

Total: 5 marks

5 Using sporting examples, outline how the **five** forms of energy are transferred.

(5)

~~[illegible]~~ Mechanical energy is the movement of an object. for example, ~~[illegible]~~ lifting a barbell. Electrical energy is energy transferred through an electrical form. for example, ~~the~~ an electrical impulse being sent to the motor neurone during ~~the~~ a neuromuscular action potential. Potential energy is the energy created when in ~~a~~ position. for example, the set position of a runner on the starting blocks on the track. Chemical energy would be ~~a~~ energy created through a chemical reaction. for example, the ~~[illegible]~~ release of Acetylcholine in the synaptic cleft. Kinetic energy refers to any movement. for example running.

(Total for Question 5 = 5 marks)

ResultsPlus
Examiner Comments

This response gains maximum marks and applies knowledge well to examples.

Total: 5 marks

ResultsPlus
Examiner Tip

Use examples when required by the question.

5 Using sporting examples, outline how the **five** forms of energy are transferred.

(5)

Chemical energy is transferred through the breaking of chemical bonds eg. ATP is broken down into ADP and a phosphate group, yielding energy for muscle contraction. Electrical energy is transferred through the passing of an electric current eg. the nerve impulse travelling down a motor neurone to cause muscular contraction.
Kinetic energy is transferred through movement eg. running
Potential energy is stored energy which is transferred when released eg. releasing a drawn back bow. Finally, mechanical energy is the sum of kinetic and potential energy eg. mechanical energy is at it's peak when a pole ~~vault~~ vaulter is at the top and is transferred into kinetic energy as they fall back down.

ResultsPlus
Examiner Comments

This is an example achieving full marks.

Total: 5 marks

ResultsPlus
Examiner Tip

When a question asks for examples, use a different example to support each point made.

Question 6

Generally, there was a good understanding of the terms vasoconstriction and vasodilation.

The understanding of the pre-capillary sphincter was only illustrated on the best answers. However, sometimes marks were lost by not substantiating with an example such as working muscles for dilated areas, and digestive system or similar for constricted areas.

The responses below are examples of good descriptions of vascular shunting, each scoring maximum marks.

Some candidates referenced action of veins, rather than arteries or arterioles. There was the occasional incorrect reference to venous return, so these terms may be confused by some candidates.

6 Describe vascular shunting.

(4)

Vascular shunting is the redistribution of blood. During exercise, working skeletal muscles need more O_2, so vessels will vasoconstrict (shrink) and prevent blood flow to digestive muscles and vasodialate (open) around working muscles. More O_2 is delivered and sweating can occur.

ResultsPlus
Examiner Comments

This is an excellent, succinct response covering all the key points and gaining maximum marks.

Total: 4 marks

ResultsPlus
Examiner Tip

Keep answers focussed on the question asked.

6 Describe vascular shunting.

(4)

Vascular shunting is the redistribution of blood ~~away f~~ towards the Skeletal muscles during exercise. Vasodilation ~~is the~~ increases blood flow to an area. ~~by~~ Vasoconstriction decreases blood flow to an area. During exercise, Vessels supplying blood to the skin, skeletal muscles, heart vasodilate while, vessels supplying blood to the digestive system, liver, etc. Vasoconstrict to allow more oxygenated blood to reach skeletal muscles for aerobic respiration

ResultsPlus
Examiner Comments

This example achieves maximum marks.

Total: 4 marks

6 Describe vascular shunting.

(4)

It is the change in diameter of arteries during exercise. Vasodilation is the increase in diameter to increase blood volume to working muscles to increase oxygen delivery. Vasoconstriction occurs to areas of low priority like the digestive system, where arteries get smaller to restrict blood flow.

ResultsPlus Examiner Comments

This answer gains maximum marks.

Total: 4 marks

6 Describe vascular shunting.

(4)

Vasculer shunting is a process regarding the flow of blood round the Body. Vasculer Shunting can occurring during exercise, in the heat or in the cold. Vasculer shunting involves the vasoconstriction of the lumen to certain areas of the body. For example inactive muscles during exercise recieve less oxygen due to arteries and other blood vessals narrowing. Vasculer shunting also invovls the vasodilation of blood vessels to areas of the body which require more blood. For example working muscles during exercise recive more oxygenated blood as blood vessals have Vasodilated meaning there lumen has ~~widened~~ increased in sise and diameter

ResultsPlus
Examiner Comments

This example gains maximum marks.

Total: 4 marks

6 Describe vascular shunting.

(4)

Vascular shunting is the redistribution of blood around the body. During exercise this will be the distribution of blood towards active areas like muscles and away from inactive areas like the digestive system. At the active areas the blood vessels will vasodialate to allow more blood to flow through them. At the inactive areas blood vessels will vasoconstrict which is where the lumen size decreases to push blood toward active areas. Vasodialation is when the lumen of the blood vessels widen

(Total for Question 6 = 4 marks)

to allow more blood to flow through. All of this is done to deliver more oxygen and nutrients to the areas that need it by taking it away from the areas of the body that don't need it.

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 4 marks

6 Describe vascular shunting.

(4)

vascular shunting is when blood vessels (arteries) redirect blood in the direction the body requires by, vasodilation which makes blood vessels bigger increasing blood flow to working muscle. while vasoconstriction makes blood vessels smaller restricting blood flow to less essential organs

ResultsPlus Examiner Comments

This example achieves maximum marks.

It gives all of the key terminology: two definitions of vasoconstriction (narrowing arteries) and vasodilation (opening arteries) and then two good examples.

Total: 4 marks

ResultsPlus Examiner Tip

Always support points with examples where possible.

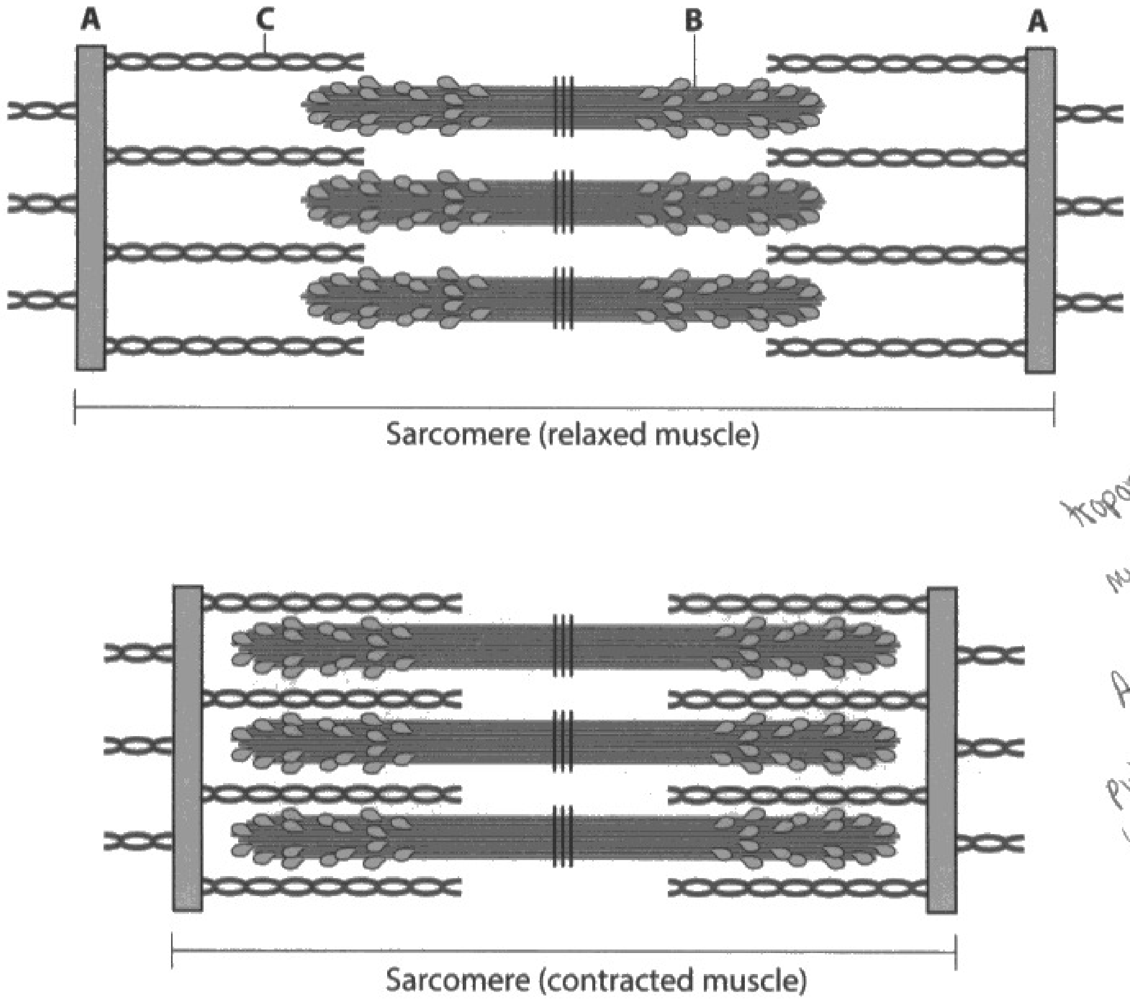
Question 7 (a)

This was a straightforward question. It is important that candidates are familiar with diagrams, as well as terminology, so that they can label diagrams where necessary.

The question was well-answered and candidates were familiar with this AO1 knowledge.

Below are examples of candidates with good AO1 knowledge. z lines was less well-known than actin and myosin.

7 **Figure 1** shows a muscle sarcomere.



tropomyosin
myosin heads
Actin
pull form a cross bridge

(Source: https://www.shutterstock.com/image-vector/detail-muscle-sarcomere-showing-thin-thick-1288781587)

Figure 1

(a) Name the parts in the diagram.

(i) A

(1)

z - line

(ii) B

(1)

myosin

(iii) C

(1)

Actin

ResultsPlus
Examiner Comments

This response receives maximum marks.

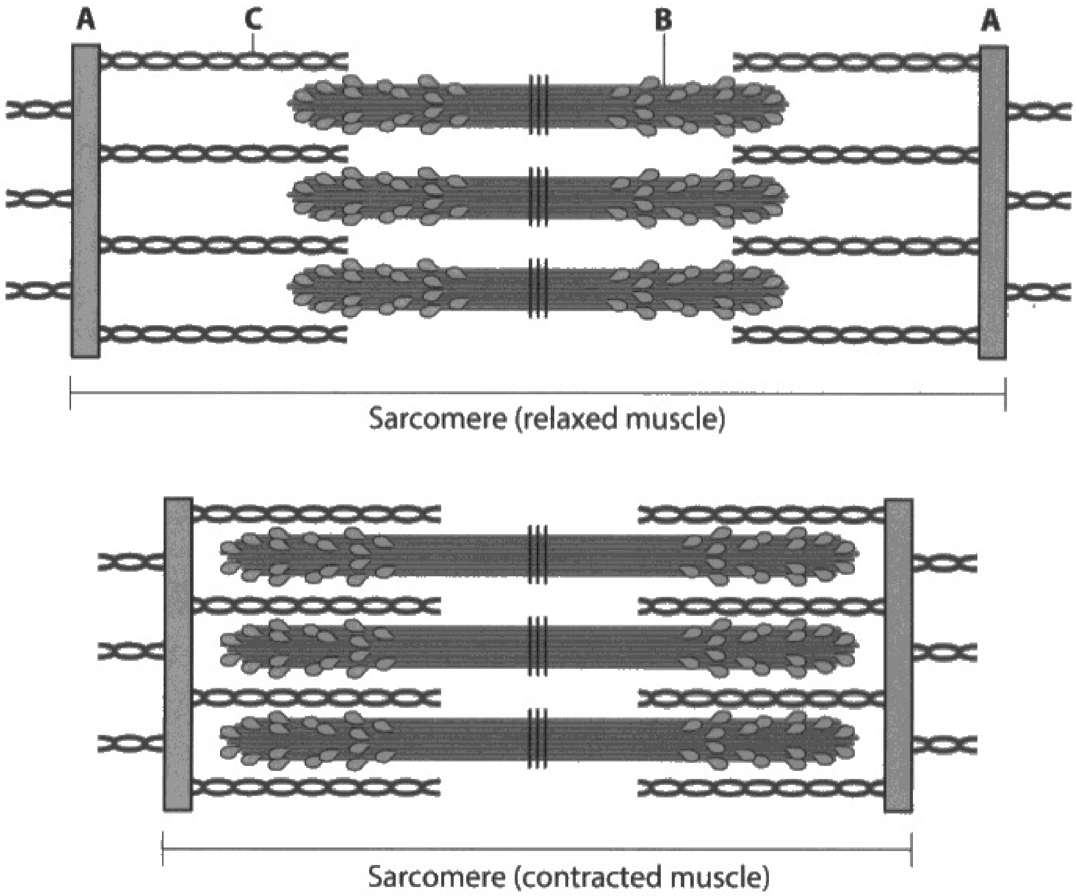
Total: 3 marks

ResultsPlus
Examiner Tip

Ensure you are able to label diagrams of key points in the specification.

Ensure that you spell key terms correctly. spelling errors in this response lost the candidate marks.

7 **Figure 1** shows a muscle sarcomere.



(Source: https://www.shutterstock.com/image-vector/detail-muscle-sarcomere-showing-thin-thick-1288781587)

Figure 1

(a) Name the parts in the diagram.

(i) A

(1)

Z - line

(ii) B

(1)

Myosin

(iii) C

(1)

Actin

ResultsPlus
Examiner Comments

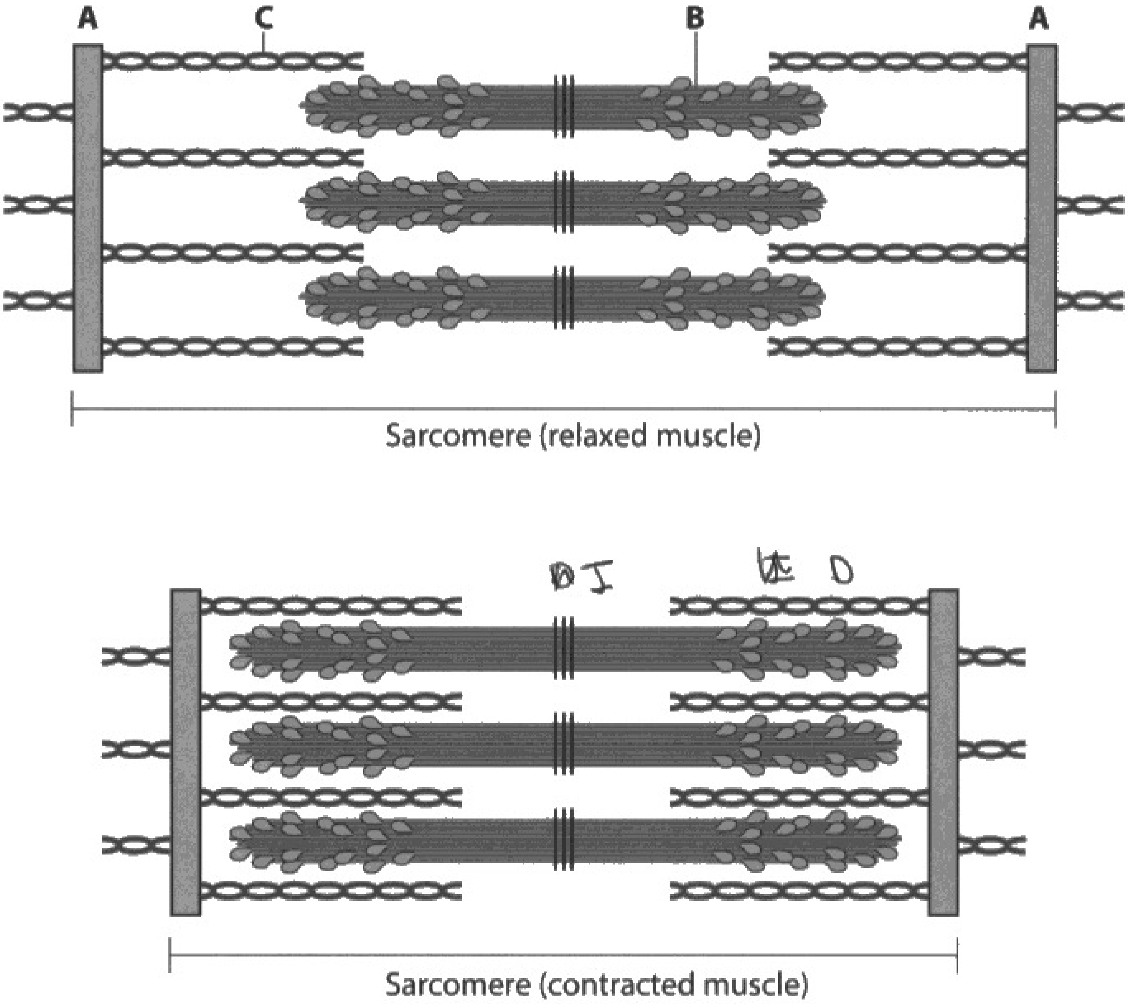
This response receives maximum marks.

Total: 3 marks

ResultsPlus
Examiner Tip

Learn the correct spellings.

7 **Figure 1** shows a muscle sarcomere.



(Source: https://www.shutterstock.com/image-vector/detail-muscle-sarcomere-showing-thin-thick-1288781587)

Figure 1

(a) Name the parts in the diagram.

(i) A

(1)

Z line

(ii) B

(1)

myosin filament

(iii) C

(1)

actin filament

ResultsPlus
Examiner Comments

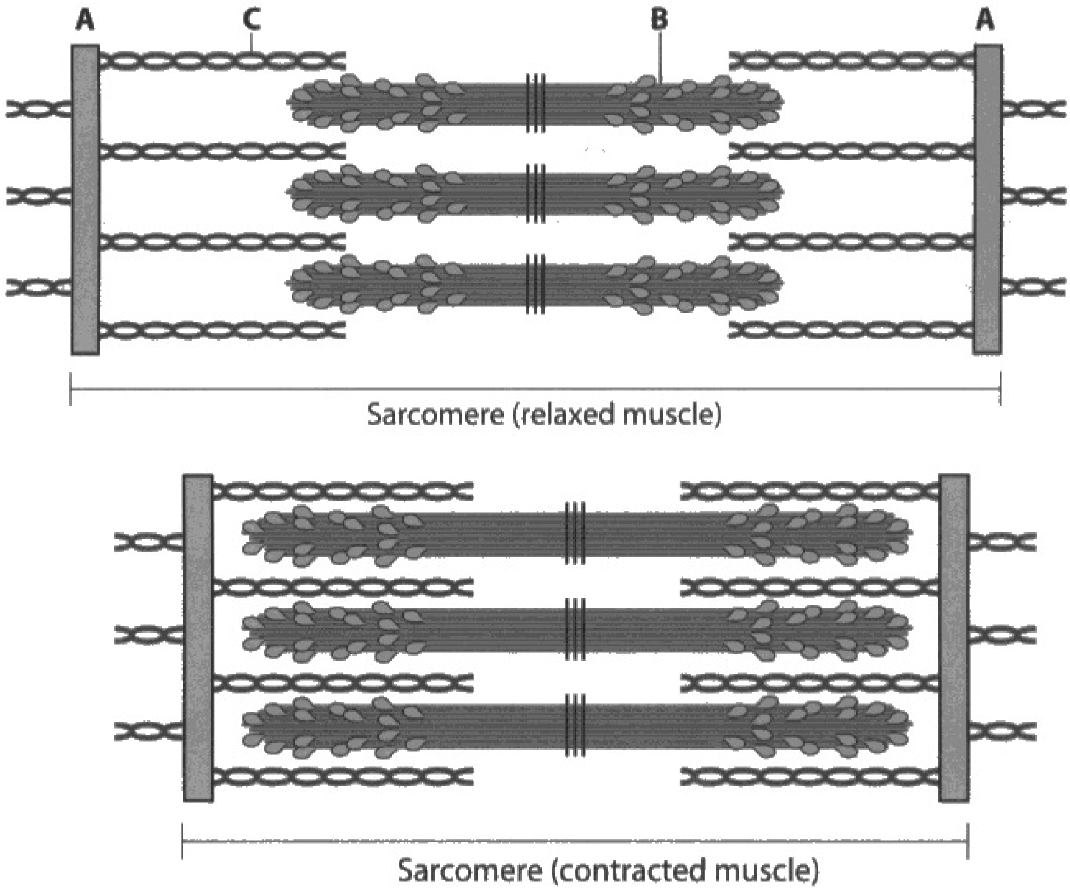
This response receives maximum marks.

Total: 3 marks

ResultsPlus
Examiner Tip

There are always AO1 marks on the paper for naming or defining – learn your key terminology.

7 **Figure 1** shows a muscle sarcomere.



(a) Name the parts in the diagram.

(i) A

(1)

Z line

(ii) B

(1)

Myosin

(iii) C

(1)

Actin

ResultsPlus
Examiner Comments

This response receives full marks.

Total: 3 marks

Question 7 (b)

The second half of the mark scheme was generally how candidates approached this question, using Myosin binding to actin, often calling this cross bridge formation. They tended to know that Myosin pulls on actin to shorten the sarcomere, often calling this the power stroke and they also knew that myosin reattaches to the next actin filament (ratchet mechanism).

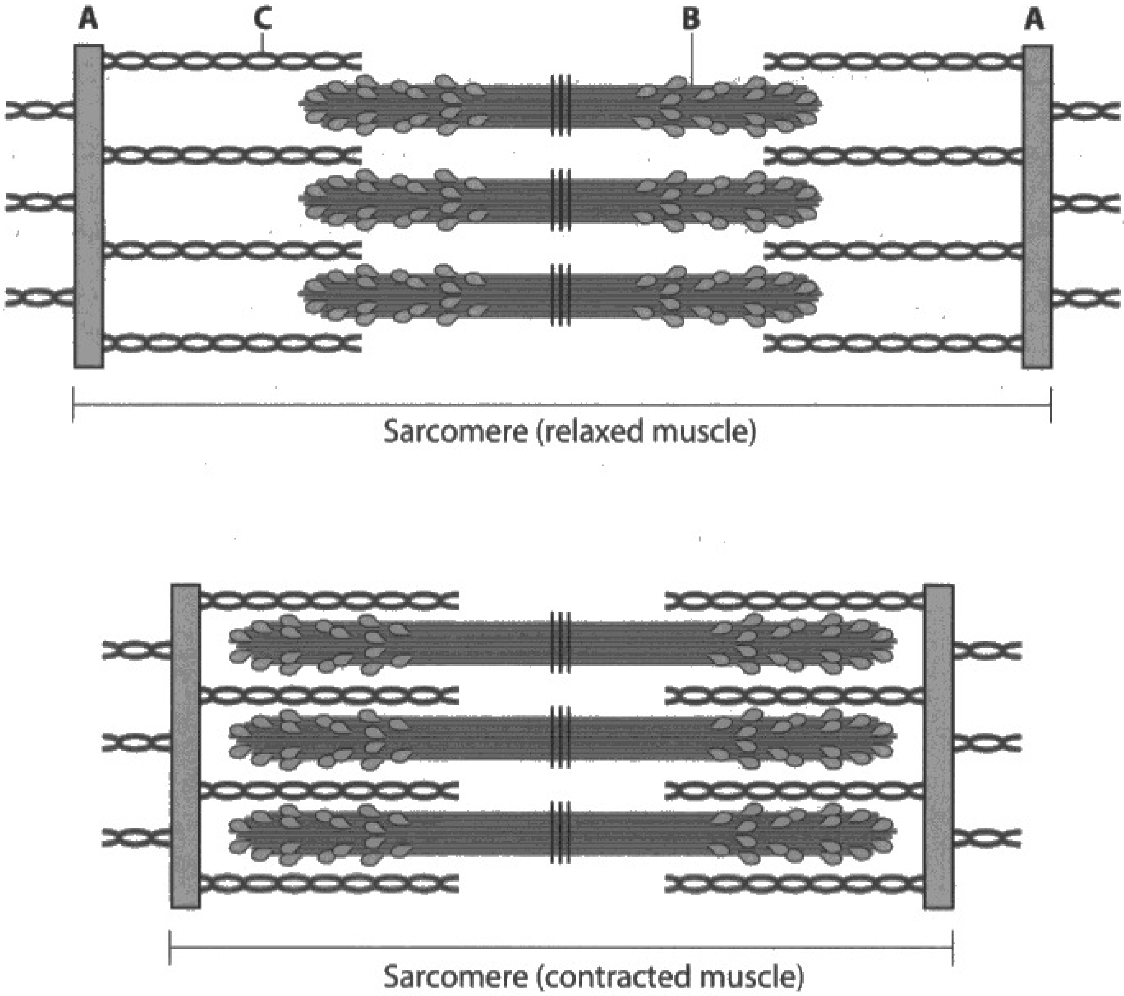
Other well-used points in the mark scheme were that Troponin removes tropomyosin from the binding site, although lower-achieving candidates sometimes confused these two terms. They also knew that ATP gives the energy to allow the contraction.

Candidates did not tend to use the knowledge that Z lines/band move closer together, sarcomere shortens, H zone shortens/disappears, A band remains same length and I band shortens. Perhaps the use of diagrams and improving this knowledge could be an area to address in teaching this area of the specification.

A few candidates did mention the excitation phase (which happens outside the sarcomere), so did not gain credit for this.

The responses below are all examples of maximum mark summaries.

7 **Figure 1** shows a muscle sarcomere.



(b) Summarise what happens within the sarcomere during a muscle contraction.

(5)

During a contraction, the z lines of a sarcomere become closer. This occurs by the sliding filament theory ~~the release of~~ Calcium ions which are then released & then bond with troponin. This then interacts with tropomyosin; a long threadlike globular structure which rolls out of the way to reveal / unblock the binding sites. This allows the myosin heads to bind to these sites resulting in the formation of cross bridges. These myosin protrusions then perform a power stroke bringing the z lines of the sarcomere together. ~~This pro~~ The cross bridges detatch in the presence of ATP. The whole process can only be repeated if Calcium ions continue to be realeased and ATP is there to end it.

(Total for Question 7 = 8 marks)

ResultsPlus
Examiner Comments

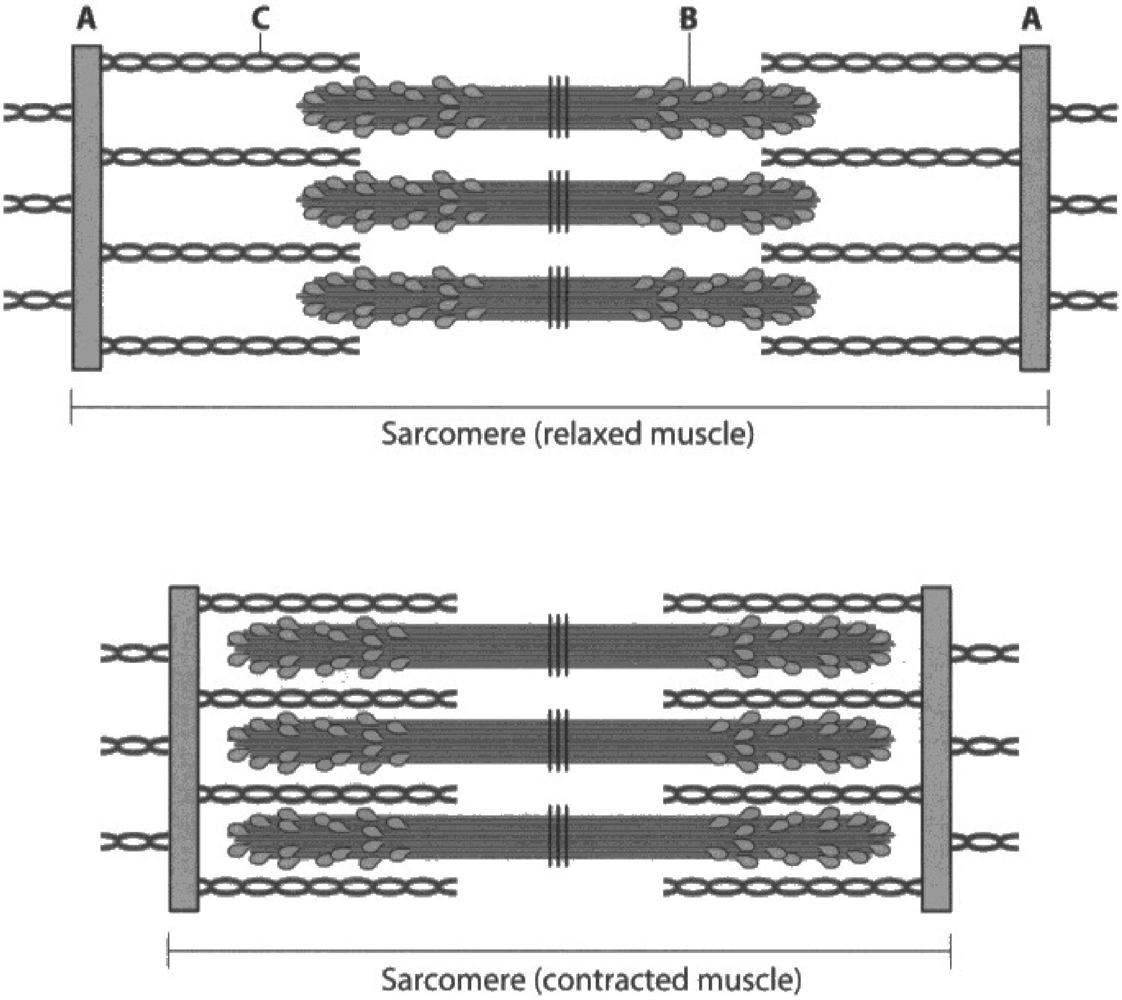
This is a maximum mark response, which sets out the answer logically and uses key terminology.

Total: 5 marks

ResultsPlus
Examiner Tip

Set out your answer in a logical order: in this case, the order in which it happens.

7 **Figure 1** shows a muscle sarcomere.



(b) Summarise what happens within the sarcomere during a muscle contraction.

(5)

within the sarcomere Ca^{++} is released from the sarcoplasmic reticulum. Ca^{++} binds to troponin leading to tropomyosin being pulled back, revealing actin binding sites. ATP allows for the myosin head to bind to the sites, creating the myosin actin cross bridge. ~~[illegible]~~ the myosin pulls the actin ~~[illegible]~~ inwards causing them to slide over each other shortening the sarcomere. This is called the power stroke. ATP reenergises the myosin head and process repeats. This is known as the sliding filament theory. The Z lines move closer towards each other

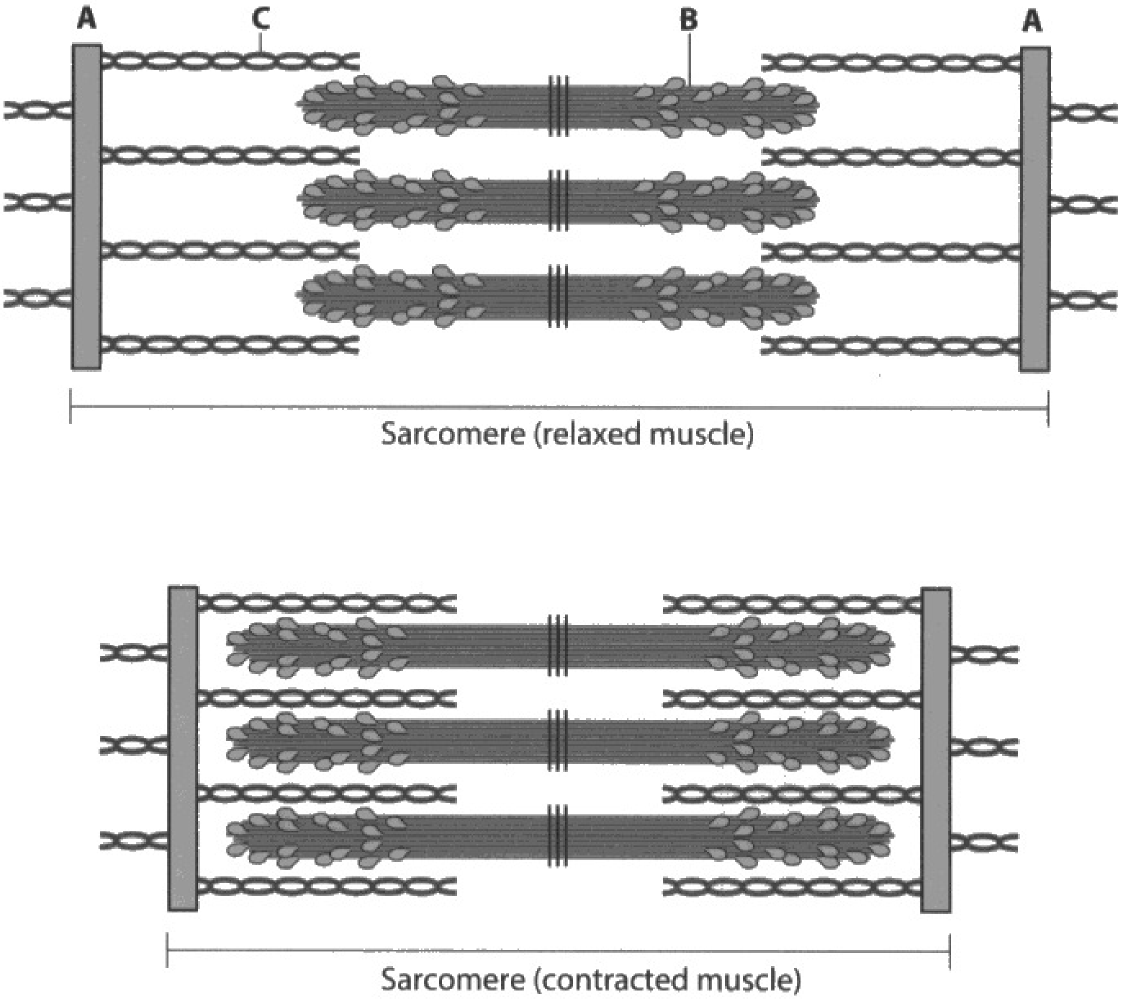
ResultsPlus
Examiner Comments

This response receives maximum marks.

'Summarise' is not a list. This candidates gives good sentences that summarise what happens in the sarcomere during a muscle contraction. Terminology is used correctly.

Total marks: 5

7 **Figure 1** shows a muscle sarcomere.



(b) Summarise what happens within the sarcomere during a muscle contraction.

(5)

The sarcomere is shortened and z lines come closer together, making the H band disappear. This is a result of sliding filament theory, when upon the release of calcium through T tubules, they bind with troponin which causes the tropomyosin to move revealing actin binding/active sites. Myosin heads will then enter the binding site to form a cross bridge, and then perform a power stroke pulling actin over the myosin as a rachet mechanism which causes the sarcomere to shorten in contraction. As the myosin head returns to it's start position ATP loses a phosphate, so it is resynthesised to begin the process again.

(Total for Question 7 = 8 marks)

ResultsPlus
Examiner Comments

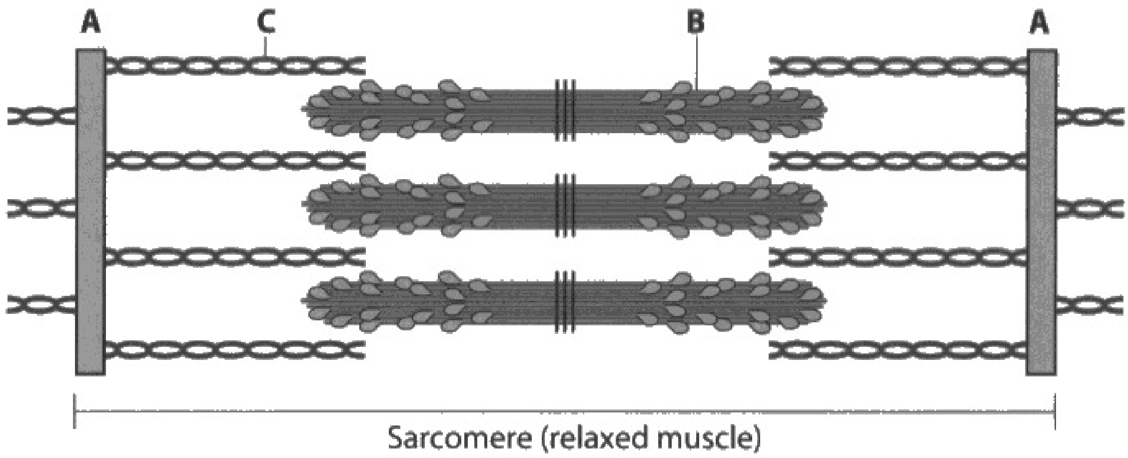
This response receives maximum marks.

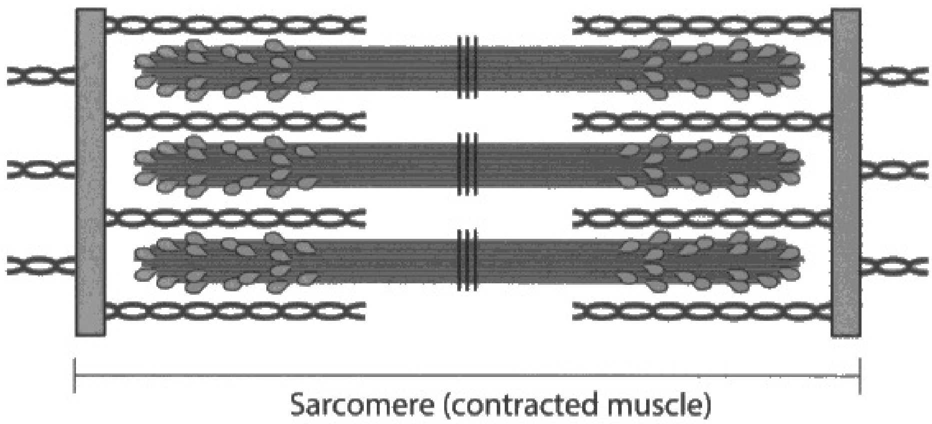
Check if there is a key point within each question. Here, the question focusses on 'within the sarcomere'.

Candidates sometimes lost marks for mentioning processes happening outside the sarcomere.

Total: 5 marks

7 **Figure 1** shows a muscle sarcomere.





(b) Summarise what happens within the sarcomere during a muscle contraction.

(5)

During a muscular contraction Ca^+ ions move into the sarcoplasmic reticulum. These bind to Troponin which rotates tropomyosin, exposing the myosin actin binding site on the Actin filament. A cross bridge forms between the myosin head and binding site releasing ATP. This performs a power stroke, pulling the actin filament. The myosin Head detaches with an ADP which is resynthesised to ATP and the process repeats. This is called a ratchet mechanism and shortens the sarcomere, creating a contraction.

ResultsPlus
Examiner Comments

This response receives maximum marks. Five succinct points are made in chronological order, which are clear and easy to understand.

Total: 5 marks

Question 8

This energy system was generally well-known, although sometimes marks were lost by the way responses were written out.

It would help in this system to use the equations to illustrate the reactions because a written sentence sometimes misses out parts of the reaction. This can lead to a loss of marks.

The responses below are all examples of excellent outlines of the ATP-PC system. An outline is not a list.

Some candidates gained marks for saying it lasted 8-10 seconds but sometimes the function of the system was used eg used by 100m sprinters, rather than focussing on processes.

8 Outline the ATP-PC system.

(4)

The ATP – PC system provides fastest energy release and is used first regardless of exercise intensity. It can last for roughly 10 seconds. ATP is broken down by ATP-ase enzyme to ADP + Pi (releasing energy). In the meantime PC is ~~broken~~ broken down by creatine kinase enzyme into P + C. Now, ADP + P → ATP (ATP resynthesis). The yield of this system is 1 ATP molecule.

ResultsPlus Examiner Comments

This candidate achieves maximum marks but the answer would have been better had it used the equations, written out in full.

Total: 4 marks

ResultsPlus Examiner Tip

Use the equations to answer questions on the ATP-PC system.

8 Outline the ATP-PC system.

(4)

Adenosine Tri phosphate (ATP) is broken down via ATPase to produce ADP, a phosphorous and energy. Phosphocreatine (PC) is broken down via creatine kinase to produce phosphorous and creatine. This phosphorous binds to the ADP to produce a new ATP molecule and the remaining phosphorous and creatine bind to make a new PC molecule. Hence, 1 ATP is produced.

ResultsPlus
Examiner Comments

This candidate chooses to write in full sentences but using the equations would have helped.

This response gains maximum marks.

Total: 4 marks

8 Outline the ATP-PC system.

(4)

ATP stores in the muscle are used first where ATP breaks down into adenosine diphosphate (ADP) and a single phosphate (Pi). The phosphocreatine (PC) stores are then used to resynthesise ATP to provide energy for further muscular contraction. PC is broken down into ~~phosphocreatine~~ creatine and phosphate and the energy released allows ATP resynthesi[s] through bind ADP and Pi, catalysed by ATPase. This provides energy for 5-8 seconds of excercise and needs 2 minutes to replenish. It is the first energy system relied on in excercise.

![ResultsPlus Examiner Comments]

ResultsPlus
Examiner Comments

This response gains maximum marks but would have benefitted from using the equations.

Total: 4 marks

8 Outline the ATP-PC system.

(4)

the atp-pc system is after ATP has been broken down by atpase to form energy ~~the~~ it loses a pi making it become ADP adenosine diphosphat atp is then resynthesised when the p from phospho creatine stores binds with the adp using energy from breakdown of carbs ~~cabs~~ to fuel reaction it binds wit ADP forming ATP which can be used at high intensities and last around 10 seconds

ResultsPlus
Examiner Comments

This response achieves maximum marks.

It is a good response, with four clear points in a logical order.

Total: 4 marks

8 Outline the ATP-PC system.

(4)

The ATP-PC system is the bodies first energy source. For the first 2-3 seconds the bodies ATP stores are broken down (facilitated by ATPase) into ADP and a phosphate group, releasing energy. ~~Aft~~ For the next ~~8~~ 8-10 seconds Phosphocreatine stores are broken down, releasing energy and a phosphate group to facilitate the resynthesis of ATP stores which serve as the bodies energy currency. One phosphocreatine molecule yields only 1 ATP molecule, however it ~~is~~ ~~fast~~ supplies energy ~~is~~ ~~at the f~~ immediately.

ResultsPlus
Examiner Comments

This response achieves maximum marks.

Again, it would have been easier had the candidate used equations to support the written elements of the answer.

Total: 4 marks

Question 9

There was excellent knowledge by some candidates about the fate of lactate and how it is oxidised and some converted to glycogen, glucose and protein.

The candidates were not-so-able to discuss the specifics of remaining elevated before the return to homeostasis of body temperature, respiration and stroke volume. They seemed to discuss it incorrectly, as lowering more commonly, although there did seem to be an understanding of thermoregulation. Some answers incorrectly referenced things that would happen in the fast component.

Below are some examples of excellent summaries.

Read the question carefully and see if there is anything narrowing it down.

Here, it requires only the slow component, but some candidates take a 'write all you know approach' and include fast component elements.

9 Summarise the physiological processes occurring in the slow component of recovery. **(4)**

One physiological process is the removal of ~~lactate~~ lactate and H+ ions. This can be done in a few ~~ways~~ ways. firstly, it could ~~being~~ oxidised in the liver ~~to~~ ~~used~~ into amino acids. It can also be broken down into glycogen for energy use. lastly It can ~~also~~ be broken down into CO_2 and water to be safely removed. Another physiological process is during the 2 hour window of opportunity. ~~levels of mitochondria~~ Myoglobin stores are replenished with oxygen due to the depletion of O_2 during exercise. this can be done by consuming a meal high in carbohydrate. Body cells and tissues are also replenished because the body is rehydrated, providing the enzymes and body with the electrolytes needed to recover. Another physiological process is thermoregulation. The body uses cooling mechanisms stimulated by the medulla oblongata in order to return the body temperature back to preexercise values (homeostasis). lastly is the

(Total for Question 9 = 4 marks)

48 hour window of opportunity. During this time, the muscles are also replenished with glycogen stores.

ResultsPlus
Examiner Comments

This response achieves maximum marks.

It gives a lot of detail. Some of this knowledge is outside the scope of the question.

Total: 4 marks

ResultsPlus
Examiner Tip

Read the question carefully.

9 Summarise the physiological processes occurring in the slow component of recovery.

(4)

Firstly EPOC is occuring. This means that an ~~EP~~ Excess post oxygen consumption is occuring as when exercise has occured a large amount of O_2 is required to repay the oxygen dept caused via a Oxygen Deficit During Exercise. Due to the onset of blood lactate accumulation (OBLA) in the blood breakdown of lactate can take a long time and will often take 60 mins +. During this time the lactate is being broken down by O_2 via oxidation to form H_2O and ~~+~~ CO_2 (carbon dioxide). Lactate can also broken down to form glycogen which is then stored in the muscles or liver, to further this oxygen can further break down lactate into glucose and proteins which can be used withing cellular activities for acts such as respiration

ResultsPlus
Examiner Comments

This is a succinct response but makes four clear points about lactate and the fate of lactate.

Total: 4 marks

ResultsPlus
Examiner Tip

Lactate not Lactic Acid!

9 Summarise the physiological processes occurring in the slow component of recovery.

(4)

The slow component of recovery is the slow lactacid component of ~~#~~ EPOC (Excess post exercise oxygen consumption). This process can take an hour or sometimes longer to be completely finished. In this component of recovery, ~~lactic acid is~~ 65% of lactic acid is oxidised for energy, 35% of lactic acid is converted back to glycogen to be stored ~~and~~ energy and 10% of lactic acid is converted into proteins for growth and repair. The slow component of recovery also ~~used~~ ~~the~~ ~~fatter~~ replenishes myoglobin stores. In addition this component of recovery brings heart rate, breathing rate and body temperature back to their resting level. In addition ~~glycolyt~~ enzyme activity (such as glycolytic enzymes) is reduced back to its resting level. For this reason the EPOC is typically larger than the oxygen deficit from anaerobic activity

ResultsPlus

Examiner Comments

Four good points make for full marks.

Total: 4 marks

9 Summarise the physiological processes occurring in the slow component of recovery.

(4)

The lactacid component of recovery occurs after the fast component (after first 3minutes). Thermoregulation helps to reduce core temperature to resting levels. At first, enzyme and hormones levels remain high so there is an initial high intake of Oxygen (5-8 litres required) Lactate removal is mostly due to ~~[illegible]~~ oxidation, but some is recycled back into pyruvate and then glycogen as a result of the lactate shuttle. Restoration of myoglobin using oxygen and resaturation of haemoglobin occurs. Hydrogen ions (H⁺) also need to be removed as they decrease blood pH; they are oxidised to produce water. The slow component will slowly return the body to homeostasis (resting levels) by reducing temperature, enzyme levels, hormone levels and cardiac output/ Stroke volume.

ResultsPlus
Examiner Comments

This response receives maximum marks.

Total: 4 marks

9 Summarise the physiological processes occurring in the slow component of recovery.

(4)

In the lactacid or slow component of recovery, the body is removing lactic acid and replenishing glycogen stores in the body. To remore lactic acid from the body, the heart rate and stroke volume continues to increase to help increase blood flow to working muscles. As muscles receive more oxygenated blood, this can help purge the oxygen debt. Lastly, the lactic acid is then converted into glycogen, glucose or protein.

ResultsPlus
Examiner Comments

The last sentence gains 3 of the marks.

The response gains maximum marks because it also references removal of lactate.

Total: 4 marks

Question 10

The best answers were able to refer both to the skeletal and muscular systems. In an examination, this requires some application and a knowledge of why this would be of benefit to the athlete.

The most frequent answers were an increase in:

- muscle temperature
- muscle elasticity
- synovial fluid

Weaker answers focussed incorrectly on cardiovascular responses or did not include both muscular and skeletal responses.

Some benefits to performance were vague statements without clarification. Sometimes other systems were included, such as respiratory.

Band 3 responses needed both systems included.

10 Examine how the muscular and skeletal systems respond to a warm-up.

(8)

- One way the muscular system responds to warm up is by an increase in temperature. This allows the muscles to have an increased speed and force of contraction in exercise, ~~as well as decreasing~~ by increasing ~~...~~ the agility and flexability of muscles during a contraction. This also decreases the chance of injury as the muscles are more agile.
- Another way the muscular system responds to warm up is increased enzyme activity. This ~~means~~ allows for greater enzyme activity ~~as there is~~ during the aerobic pathway of enzymes such as PFK and GPE to convert glycogen to pyruvic acid before producing ATP, increasing readily avaible energy.
- One way the skeletal system responds to warm up is increasing the synovial fluid producing. This allows for an increased lubrication of the bones and ~~increased~~ smoother muscle contraction.
- Another way the skeletal system responds is increased flexability resulting in an increased range of motion.
- There is also an increased strength in both the tendons and ligaments ~~...~~ to increase range of motion while decreasing chance of injury.

ResultsPlus
Examiner Comments

This answer contains some good information on both muscular and skeletal systems.

It contains a high level of accurate and relevant knowledge. However, it lacks the application for the top mark.

Total: 7 marks

10 Examine how the muscular and skeletal systems respond to a warm-up.

(8)

The muscular system responds to warmup by increasing muscle elasticity which leads to a greater speed and strength of contraction. Muscle temperature increases which decreases blood viscocity allowing more blood to be transported to the muscles, and also increased muscle temperature increases enzyme activity which increases rate of energy production. Increased blood flow to muscles increases oxygen delivery to the muscles which delays the onset of lactic acid and enables the performer to work for longer at higher intensities. Also there is greater coordination between antagonistic muscle pairs due to decreased blood viscocity which helps a more efficient technique for a movement. Also warm up increases the rate of response of the central nervous system so muscles are stimulated more quickly so reaction times are improved. There is a reduced risk of muscle tear / strain after warm up due to increased range of movement of muscles.

The skeletal system responds to warm up by increasing synovial fluid production in joints. This lubricates joints and stops bones from rubbing together, allowing a smoother movement. Also, the range of movement at joints is increased which decreases risk of injury during the event / competition / training session.

ResultsPlus
Examiner Comments

This is a Band 3 response.

It has much AO1 knowledge and contains good technical information from both of the correct systems.

The application is not fully detailed. There is some, but the response would have been improved if this candidate had gone further into how that would impact on the performance.

Total:7 marks

Question 11

Generally, this question was well-answered, with key technical terminology used and an understanding of how these nodes caused the heart muscle to contract. Most candidates were able to examine the key components including the SA and AV nodes.

A few candidates confused the order of events and perhaps over-focussed on the cardiac cycle, rather than the conduction system. The words systole and diastole are key terminology to understand.

These responses achieved maximum marks.

11 Examine how the anatomical structures labelled in **Figure 2** cause the heart muscle to contract.

(8)

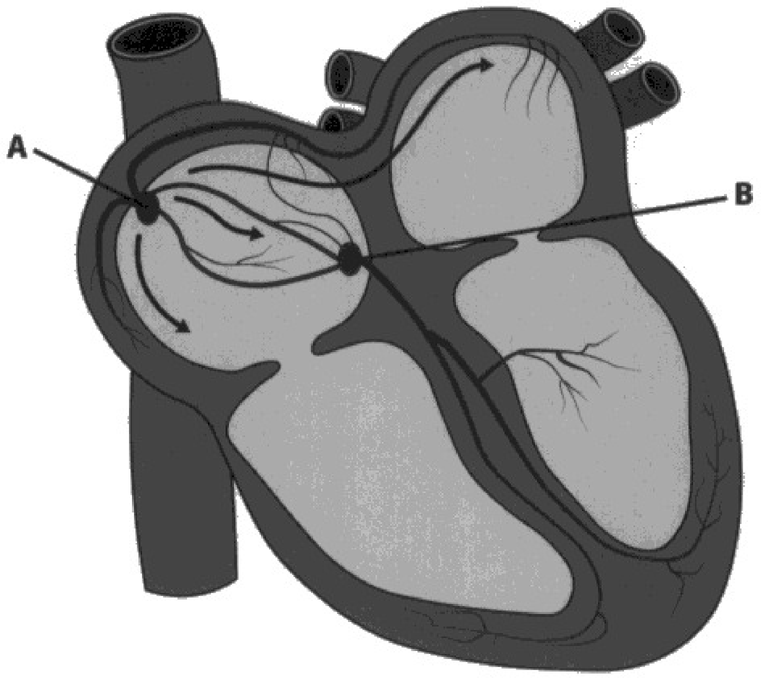


Figure 2

(Source: https://www.shutterstock.com/image-vector/conduction-system-heart-showing-sa-av-228014488)

A is the sinoatrial node and B is the atrioventricular node. The sinoatrial node (SA node) receives impulses from the medulla oblongata of the brain. These impulses are passed along a nerve ~~the~~; either the sympathetic nerve or the vagus nerve, which is a parasympathetic nerve. When the impulse reaches the SA node, this causes the atria to contract and atrial systole occurs. Blood is forced from the atria into the ventricles through atrioventricular valves. Both atria contract at the same time. After this the impulse is sent to the atrioventricular node (AV node) which then causes ventricles to contract, after a short delay. The delay ensures that the ventricles have filled completely with blood and ensures that atrial systole has finished. The AV node conducts impulses to the apex of the heart through Purkyne fibres; this is to ensure that the electricle impulse travels up the ventricles so that as much blood as possible is ejected from the ventricles. Depolarisation of ventricular muscle cells occurs as the impulse is conducted up the ventricles. This causes ventricular systole where ventricles contract and blood is forced into arteries through semilunar valves. After this cardiac diastole occurs where the heart muscle is relaxed. Heart muscle is myogenic which means it can contract without concious thought from the brain.

ResultsPlus
Examiner Comments

This answer receives maximum marks.

Total: 8 marks

ResultsPlus
Examiner Tip

Use the technical terminology from the specification.

11 Examine how the anatomical structures labelled in **Figure 2** cause the heart muscle to contract.

(8)

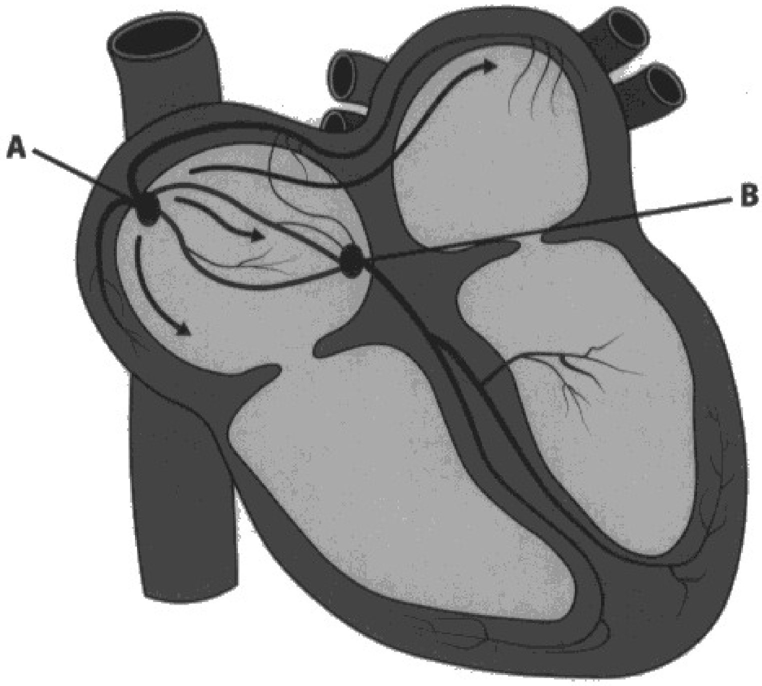


Figure 2

(Source: https://www.shutterstock.com/image-vector/conduction-system-heart-showing-sa-av-228014488)

Anatomical structure 'A' is the ~~sion~~ sinoatrial node (SAN). The SAN acts as the hearts pacemaker and initiates impulses that spread across the heart, meaning it is myogenic. The SAN dictates heart rate according to stimulation by the sympathetic and parasympathetic nervous system.

This impulse spreads across the atraria, causing atrial systole, blood is forced down a pressure gradient throug the atrioventricular valve into the vetricles. This impulse is delayed by structure 'B', which is the atrioventricular node (AVN). This delay allows passive movement of blood into vetricles to occur.

This impulse then travels along the ~~purkinjee fibres~~ bundle of his to the purkingjee fibres, once it reaches the apex of the heart, the impulse spreads across the ventricles.

The ~~ventricles~~ ~~are~~ ventricular muscles are, therefore, stimulated ~~to~~ to contract, forcing blood to leave the heart via the aorta and the pulmonary artery. & This is ventricular systole.

The SAN therefore stimulates atrial systole ~~whilst~~ and the AVN prevents ~~both~~ the ventricles ~~entering~~ beginning systole at the same time, as this would prevent a pressure gradient forming.

ResultsPlus
Examiner Comments

This response achieves maximum marks, with good subject-specific terminology and knowledge throughout.

11 Examine how the anatomical structures labelled in **Figure 2** cause the heart muscle to contract.

(8)

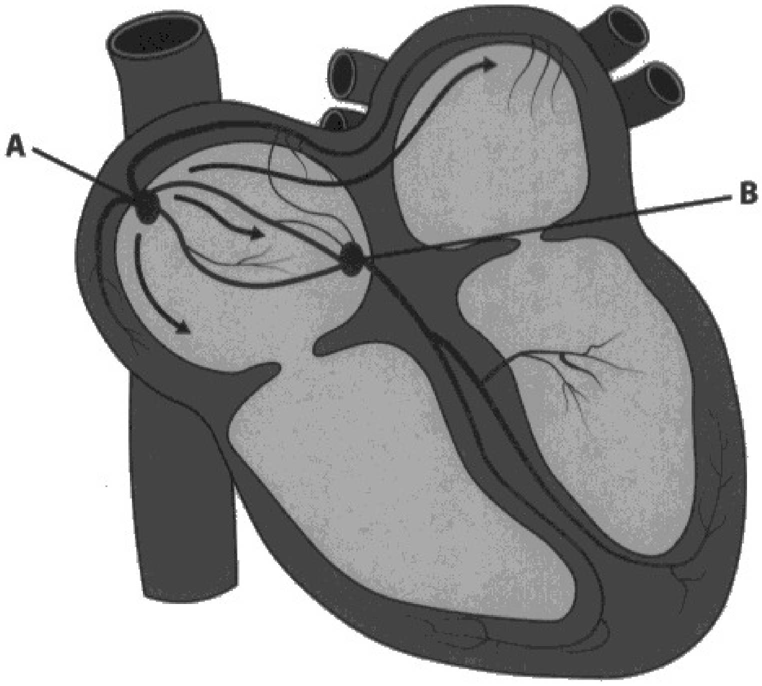


Figure 2

(Source: https://www.shutterstock.com/image-vector/conduction-system-heart-showing-sa-av-228014488)

The heart is controlled by the conduction system and cardiac cycle. A is the SAN which acts as the pacemaker and initiates the heart beat. The SAN receives information from the medulla oblongata. This is because there are 3 control centres (CCC, VCC and RCC). These either speed up the HR or slow it down depending on intensity of exercise. The SAN sends a wave of depolarisation across the atria which initiates atrial systole. Subsequently, Blood leaves the atria and enter the ventricles. Then the impulse travels to the atrioventricular node (AVN), where the impulse is stopped briefly to allow blood to fill up the ventricles. After a fraction of a second the AVN sends another impulse down the bundle of His through the septum and across the purkinje fibres. The purkinje fibres distribute the impulse across the ventricle walls and myocardium which initiates ventricular systole. As a result, blood is ejected from the right ventricle out from the pulmonary artery ~~to deliver oxygenated~~ and from the left ventricle out from the aorta to deliver oxygenated blood to respiring tissue and transport deoxygenated blood to the lungs. To speed up the conduction system the athlete can increase intensity of exercise. This is because temperature increases. As a result muscle fibre ~~greater~~ conduction speed increases which allows faster transmission of impulses across the heart and heart rate increases. ~~The~~ This would be used to increase O_2 delivery to muscles.

(Total for Question 11 = 8 marks)

ResultsPlus
Examiner Comments

Good detailed knowledge and application mean this response achieves full marks.

Total: 8 marks

Question 12

Most candidates were able to name the three laws.

Answers that achieved more highly had well-applied examples and, into the top bands, had an analysis to say why this is useful for the athlete. For example, sports performers or coaches would use their knowledge of Newton's first law to reduce or counteract the external forces that might slow them down or that might reduce the distance they throw.

A cyclist would use wind tunnels to assess their aerodynamics and look to reduce air resistance and drag force (the external forces that would slow them down). Modifying their body position, wearing skin suits with dimples and adapting equipment are all ways that have been used by professional cyclists to reduce external forces.

A discus thrower would use the "angle of attack" to cause high pressure below the discus and create lift force to counteract the effect of gravity and keep the discus in the air for longer. A discus thrower would also use Newton's 2nd law and would look to increase arm speed during the throwing action to increase the force they create in the throw and therefore throw further.

A footballer, taking a free kick, might look to manipulate the ball to create external forces to affect the flight of the ball. Applying side spin or producing a knuckle ball would create external forces that would change the flight path of the ball. This would make it harder for the goalkeeper to judge where the ball is going and make the save.

An elite performer would use Newton's 3rd law in tennis by using a top spin shot to make it harder for the opponent to return the shot. Because the ball drops sharply, the angle of incidence of the bounce is higher, so the equal and opposite reaction means the ball will bounce higher.

If a sprinter does not set up their starting blocks correctly at the right angle, or does a crouch start without blocks, the equal and opposite reaction from the start will not be in a horizontal direction, so the acceleration and power from the start will not be as effective.

A snooker player would use Newton's 3rd law to judge the angles when playing a shot off a cushion. The angle of rebound off the cushion would be equal and opposite to the angle it hits the cushion. Judging this correctly means the player will be able to hit the right ball with the right amount of force.

It is this application that takes a candidate into the top band. In teaching this, Law 2 seemed the least well-understood and some examples were not the best to illustrate the laws. Candidates need to know several good examples for each one.

12 Using examples, analyse how Newton's **three** Laws of Motion apply to sport.

(15)

Newtons 3 laws of Motion are as follows: ~~Th~~ 1: An object will remain in Motion unless acted upon by an opposing force. 2: Force = Mass x Accelleration. 3: Every Action has an equal and opposite reaction. All 3 laws canbe applied to Sport.

The first law applies to Football, as without opposing forces, a pass from teammate to teammate across the floor would not Slow down at all. The Player uses power to kick the ball, however the friction of the playing surface as well as Drag slow the ball down, therefore the player must put enough force behind the ball so it reaches his teammates. Law 1 can also be applied to American Football. The Quarterback throws the ball at around a 45 degree angle. Drag slows the ball down, and Gravity pushes the ball downward, when done well the ball lands in the recievers hands, however without gravity or drag, the ball would continue rising at the throwing angle forever. This shows The First law of motion is relevant in Sport

The Second law of motion, ~~F=Ma~~ Force = Mass x Accelera is best shown in a sport like Rugby. A player with large mass running at high speed would generate a lot of force should they try to tackle you. You would almost certainly go to the ground. On the other hand a smaller mass player running slowly would not generate as much force in the tackle, increasing the likelihood you are unaffected by the tackle. Law 2 can also be demonstrated in boxing. A fast punch from a heavyweight's fist would generate significantly more force than a slow punch from a lightweight. The heavyweights punch is much more likely to result in a knockout.

Newtons 3rd law is best shown in High Jump. When the performer pushes their legs into the ground the ground responds with an equal and opposite reaction force to combat the weight of the performer. It is this reaction force that enables a high jumper to jump as high as they do. The 3rd law is also shown in combat sports like mixed marshall arts. Fighters wear gloves not to add force, but to protect their knuckles. The area being punched would respond with an equal and opposite force onto the knuckles and could result in broken bones, hence the need for Gloves.

In Conclusion. It can be seen that all 3 of Newtons laws of motion are very relevant in sport and sport would not be the same if they were not true. American football would be impossible to play, Boxing weight classes would become irrelevant, and High Jump Athletes would not be jumping so high, as well as many other sporting impacts.

ResultsPlus
Examiner Comments

This essay is marked in the top of Band 4. There is not enough sophisticated analysis and application for the very top band.

However, there are strong links between theory and practice, with all three laws being understood and supported with examples. Detailed analysis is lacking, to achieve a higher mark.

The candidate has used sensible sports to try to explain each law, rather than using only one activity. This is good and they know the definitions well.

Total: 12 marks

Question 13

Strength x Speed was the most frequent correct response to this question.

Some candidates stated a combination of strength and speed, which was too vague and incorrect. Other candidates were confused with the anaerobic power definition or sometimes included a time only (eg quickly) rather than a distance and time-(ie speed-) based reference, and thus were not specific enough.

Key terms must be learnt from memory. Answers may be written as equations or in full sentences. The strength definition was often used incorrectly. This was not well known.

The responses below are all examples of correct definitions.

13 Define the term power.

(1)

Power = Strength x Speed

ResultsPlus
Examiner Comments

This response receives the mark.

Total: 1 mark

ResultsPlus
Examiner Tip

Learn your equations.

This candidate has made sure of success by writing a sentence and giving the equation. Both will be marked.

13 Define the term power.

(1)

Power = Speed x strength

Power is the explosive strength of the body

ResultsPlus
Examiner Comments

This response achieves the mark.

Total: 1 mark

13 Define the term power.

(1)

Power is the rate at which force can be exerted. It is the product of strength and speed.

ResultsPlus
Examiner Comments

This response receives a mark.

Total: 1 mark

13 Define the term power.

(1)

Powe is the ability to exert ~~force~~ strength and on an object ~~and~~ at a high speed. Powe is strength times speed.

ResultsPlus
Examiner Comments

This response receives the mark.

Total: 1 mark

13 Define the term power.

(1)

Power is strength x speed

ResultsPlus
Examiner Comments

This response receives a mark.

Total: 1 mark

Question 14

Most candidates were not familiar with the types of stretching. Some only named them but an outline was required to achieve the mark.

Some candidates used exercise classes incorrectly, such as yoga and pilates, which are not identified on the specification as methods of training for flexibility as examples. Also, the sit and reach test was identified incorrectly, sometimes, as well.

It is important that candidates understand that the tests themselves are not a training method. Sometimes training methods to improve flexibility were used, rather than flexibility training methods. PNF was known but its definition was often not clear enough.

These responses are all examples of maximum-mark answers, which are set out clearly.

14 Outline **three** different types of flexibility training.

(3)

one type of flexibility training is static stretching. A stretch is held in a challenging but comfortable position for 10-30 seconds. A second type is ballistic as this is the use of momentum of a body or limb to push the muscle beyond it's normal range of movement. The third type is PNF (proprioceptive neuromuscular facilitation.) This involves stretching a muscle/muscle group passively, then holding the stretch in an isometric contraction, and then stretching passively again.

(Total for Question 14 = 3 marks)

ResultsPlus
Examiner Comments

This response receives maximum marks.

Total: 3 marks

ResultsPlus
Examiner Tip

Set out your answer clearly.

14 Outline **three** different types of flexibility training.

(3)

Proprioceptive Neuromuscular Facilitation (PNF) training is a static stretch, followed by another person pushing the athlete into an isometric stretch for about 10 seconds and then the athlete returns to the static stretch with an increased range of motion for 30 seconds. Ballistic Stretching is the use of momentum to move into a stretch, such as leg swings. An active static stretch is when an athlete holds themselves in a stretched position for around 30 seconds, such as ~~the~~ sitting in a straddle toe touch.

ResultsPlus
Examiner Comments

This response receives maximum marks.

Total: 3 marks

ResultsPlus
Examiner Tip

If 3 marks are available, give at least three different points – perhaps four, to be sure.

14 Outline **three** different types of flexibility training.

(3)

Proprioceptive Neuromuscular Facilitation (PNF) : uses a passive stretch, followed by an active isometric contraction followed by a passive stretch to improve flexibility.

Ballistic : using momentum to force a joint beyond it's normal range of movement.

Static : performing a challenging but not uncomfortable isometric contraction and holding it for 10-30 seconds to improve flexibility

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 3 marks

ResultsPlus
Examiner Tip

Underlining to separate the points is a good technique, enabling the examiner see what your answers are.

Remember in 'outline' questions that you are not listing or naming – you need more information.

14 Outline **three** different types of flexibility training.

(3)

Static stretching is where a muscle is ~~taken~~ stretched beyond ~~to~~ its comfortable ~~limit~~ but within safe levels and held for 10-30 seconds.

PNF stretching is when a muscle is passively stretched, contracted isometrically against resistance (and held), before being passively stretched again.

Ballistic stretching is use of momentum to move a joint past its normal range of motion.

(Total for Question 14 = 3 marks)

ResultsPlus
Examiner Comments

This response achieves maximum marks.

Total: 3 marks

Question 15

15a The correct scores were identified by the majority of candidates as the sprint, or the Margaria Kalamen, as the scores the athlete should improve.

15b Part B was an explain question. For two marks, two linked points were required.

Too often, the wording in the question was used. Candidates simply repeated the question back ‘to improve his performance in the long jump’ without the specifics of how this would work, such as: improved power leads to a greater height jumped, which means that they can jump further. The linked points were something candidates seem to forget for 'explain' questions. Perhaps using phrases such as ‘this leads to’ or ‘so that’ might help in their preparation for these questions.

The following examples are all maximum-mark responses.

15 A 20 year-old male long jumper completes a series of fitness tests. The results are shown in **Table 1**.

Test	**Result**	**Rating**
Cooper 12 Minute Run	2350 metres	Average
Margaria Kalamen Test	1,563 watts	Average
20 m Acceleration Sprint	4.1 seconds	Above average
Yo Yo Intermittent Recovery Test	16.3	Average

Table 1

(i) Using the results from **Table 1**, identify **one** score that he should aim to improve.

(1)

~~Cooper 12 minute run 2350 metres.~~

20m acceleration Sprint - 4.1 seconds.

(ii) Explain how an improvement in this test could improve his performance in the long jump.

(2)

an improvement in this ~~the~~ test will increase the speed of the ~~pe~~ athlete allowing him to have a quicker run up to the board and have more acceleration when jumping off the board, to get the furthest distance possible.

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 3 marks

ResultsPlus
Examiner Tip

For explain questions you must link points.

15 A 20 year-old male long jumper completes a series of fitness tests. The results are shown in **Table 1**.

Test	Result	Rating
Cooper 12 Minute Run	2350 metres	Average
Margaria Kalamen Test - power	1,563 watts	Average
20 m Acceleration Sprint	4.1 seconds	Above average
Yo Yo Intermittent Recovery Test	16.3	Average

Table 1

(i) Using the results from **Table 1**, identify **one** score that he should aim to improve.

(1)

Margaria Kalamen test

(ii) Explain how an improvement in this test could improve his performance in the long jump.

(2)

because the long jumper needs more power to push off the ground with meaning he could jump further.

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 3 marks

15 A 20 year-old male long jumper completes a series of fitness tests. The results are shown in **Table 1**.

Test	**Result**	**Rating**
Cooper 12 Minute Run	2350 metres	Average
Margaria Kalamen Test	1,563 watts	Average
20 m Acceleration Sprint	4.1 seconds	Above average
Yo Yo Intermittent Recovery Test	16.3	Average

Table 1

(i) Using the results from **Table 1**, identify **one** score that he should aim to improve.

(1)

20m Accleratin Sprint

(ii) Explain how an improvement in this test could improve his performance in the long jump.

(2)

Improvement in 20m Accleratin Sprint would result in better Accleration this would mean that the long jumper could reach a higher speed in the run resulting in greater force in the jump and an increase length/score

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 3 marks

15 A 20 year-old male long jumper completes a series of fitness tests. The results are shown in **Table 1**.

Test	**Result**	**Rating**
Cooper 12 Minute Run	2350 metres	Average
Margaria Kalamen Test	1,563 watts	Average
20 m Acceleration Sprint	4.1 seconds	Above average
Yo Yo Intermittent Recovery Test	16.3	Average

Table 1

(i) Using the results from **Table 1**, identify **one** score that he should aim to improve.

(1)

maragaria kalamen test

(ii) Explain how an improvement in this test could improve his performance in the long jump.

(2)

can improve power out allow long jump distance to increase being able to jump off with more power, increasing hight of release and distance

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 3 marks

15 A 20 year-old male long jumper completes a series of fitness tests. The results are shown in **Table 1**.

Test	Result	Rating
Cooper 12 Minute Run	2350 metres	Average
Margaria Kalamen Test	1,563 watts	Average
20 m Acceleration Sprint	4.1 seconds	Above average
Yo Yo Intermittent Recovery Test	16.3	Average

Table 1

(i) Using the results from **Table 1**, identify **one** score that he should aim to improve.

(1)

The Margaria halamen test.

(ii) Explain how an improvement in this test could improve his performance in the long jump.

(2)

This test is a measure of power in watts so if improved power linking in to Newtons third law more force he can exert therefore he would recieve more force off the ground increasing his lift so more hang time therefore lengthening of parabolic curve and his performance would increase

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 3 marks

15 A 20 year-old male long jumper completes a series of fitness tests. The results are shown in **Table 1**.

Test	**Result**	**Rating**
Cooper 12 Minute Run	2350 metres	Average
Margaria Kalamen Test	1,563 watts	Average
20 m Acceleration Sprint	4.1 seconds	Above average
Yo Yo Intermittent Recovery Test	16.3	Average

Table 1

(i) Using the results from **Table 1**, identify **one** score that he should aim to improve.

(1)

The Margaria Kalamen Test – 1,563 watts.

(ii) Explain how an improvement in this test could improve his performance in the long jump.

(2)

This test measures power. This will improve his performance in the long jump as he will be able to leave the ground with a greater force, hopefully enabling him to ~~tea~~ gain a greater distance

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 3 marks

For 'explain' questions link points together – using the term 'therefore' helps this.

15 A 20 year-old male long jumper completes a series of fitness tests. The results are shown in **Table 1**.

Test	Result	Rating
Cooper 12 Minute Run	2350 metres	Average
Margaria Kalamen Test	1,563 watts	Average
20 m Acceleration Sprint	4.1 seconds	Above average
Yo Yo Intermittent Recovery Test	16.3	Average

Table 1

(i) Using the results from **Table 1**, identify **one** score that he should aim to improve.

(1)

Margaria Kalamen test

(ii) Explain how an improvement in this test could improve his performance in the long jump.

(2)

Improvement in this test means his power would be increased, allowing him to have a more powerful/ explosive take-off, therefore allowing increased jump distance

ResultsPlus
Examiner Comments

This is a good example of a response linking points.

This response gains maximum marks.

Total: 3 marks

Question 16

This test was well-known and answers were clear, often achieving high marks and using all the points in the mark scheme.

The lowest-marked responses sometimes confused this test with the Margaria Kalamen test.

These responses are all examples of maximum-mark responses.

16 Describe the protocol for the Cunningham and Faulkner test.

(4)

In this test, anaerobic capacity is the component of fitness tested.
Athlete firstly warms up, before completing test.
The athlete will run in a treadmill at a pace of 8 mph at an incline of 20%. Athlete runs until exhaustion.
Once athlete has finished, distance ran is recorded and compared.

ResultsPlus
Examiner Comments

A succinct but accurate response, set out in a logical order.

This response gains maximum marks.

Total: 4 marks

16 Describe the protocol for the Cunningham and Faulkner test.

(4)

~~An athlete runs~~ The Cunningham and Faulkner test assess anaerobic endurance. ~~An athlete sets a treadmill~~ A treadmill is set to 8 miles/hour with an 11.3° incline. An athlete then runs on the treadmill until they reach exhaustion (this is usually about 40-50 seconds). Their result is then recorded and compared to normative data to assess their anaerobic endurance.

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 4 marks

16 Describe the protocol for the Cunningham and Faulkner test.

(4)

- Athlete warms up
- Tredmill is used
- Speed is set to 8 mph
- A 20% incline is set
- Athlete runs until exhaustion
- Time is recorded

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 4 marks

16 Describe the protocol for the Cunningham and Faulkner test.

11.3
8m/h

(4)

- Cunningham and Faulkner test is done on a treadmill. The treadmill should have a 11.3% incline and move at 8m/h or 12km/h speed. The athlete should ensure to have the saftey stop clip on - ~~Rum~~ And a timer should start when the athlete starts running. The athlete should run for as long as possible. As soon as the athlete stops the timer should ~~st~~ be stopped too. An assistant can be behind the athlete incase the athlete falls.

(Total for Question 16 = 4 marks)

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 4 marks

16 Describe the protocol for the Cunningham and Faulkner test.

(4)

-A treadmill is set to 8km/h at a 20% incline
-The timer starts as soon as the athlete steps onto the treadmill.
- They continue to run until failure or until they touch the rails at the side of the treadmill.
-Their time is then taken from this (Aim to have the highest time possible)

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 4 marks

Question 17

This question was well-understood by candidates, with all of the mark scheme being accessed.

However, sometimes validity and reliability were not substantiated, for example, only saying a test is not very reliable without saying why – such as time-keeping inaccuracies.

There were many vague responses to this question such as 'lack reliability'.

The examples below are of maximum-mark responses.

17 Outline **four** disadvantages of fitness testing.

(4)

Fitness tests require motivation to carry out to ensure the subject achieves the best result. They may also rely on human decision through manual timers on when the test is completed, causing error and reducing reliability. A fitness test may not be sport specific so may lack validity as it may not measure the appropriate muscle groups. A fitness test is restricted to equipment available, which means athletes may not be able to use the most appropriate test.

ResultsPlus
Examiner Comments

A very clear answer, with four concise points made.

This response gains maximum marks.

Total: 4 marks

ResultsPlus
Examiner Tip

4 marks needs four different points.

17 Outline **four** disadvantages of fitness testing.

(4)

- They can be demotivating for performer.
- They often require equipment which is expensive or hard to access.
- They are not always sports specific.
- There can be human error when recording results.

ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 4 marks

ResultsPlus
Examiner Tip

Separating your points like this helps the examiner to see there are four distinct points being made.

Question 18

Candidates were familiar with the idea of pressure being higher above the ball and lower below. Sometimes they talked about the pressure moving from high to low rather than this causing the ball to move and dip.

They were comfortable with the idea of the ball dipping and the best candidates could discuss that therefore they could hit the ball harder. Candidates did not appear to have been taught about the effects of this on the bounce of the ball and did not use these elements of the mark scheme.

18 Summarise the effects of topspin on a tennis ball.

(5)

When there is topspin on a tennis ball the magnus affect causes its usual flight path to change. Topspin means the air underneath the ball has a high velocity and a low pressure. The air above the ball has a low velocity but a higher pressure. As air moves along the gradient from high to low concentration the air pushes the ball down and causes it to dip. This means the ball dips quicker and has a fast bounce. A tennis player would use this to play a fast speedy shot.

(Total for Question 18 = 5 marks)

ResultsPlus
Examiner Comments

This response gains maximum marks.

- Low pressure underneath (1)
- High pressure above (1)
- Playing a speedy shot – being able to hit the ball harder (1)
- The ball dips (1)
- The ball moving from the area of high pressure to low pressure (1)

Total: 5 marks

ResultsPlus
Examiner Tip

Try to set the answer out clearly – perhaps using bullet points to separate points in 'summarise' questions.

Question 19 (i)

Units must be used. Too many candidates missed them off completely, which meant that the marks were not given.

When using units, candidates also need to use the correct units and to be precise with this, for example this is $m.s^{-1}$ and not m/s. This was also given in the table in the question.

19 Data from a 400 m athletics race is shown in **Table 2**.

Distance (–metres)	**Time taken (seconds)**	**Speed (ms^{-1})**
100	12.1	8.3
200	22.7	8.8
300	37.8	7.94 ms
400	52.3	7.7

Table 2

(i) Calculate the athlete's average speed at 300 m.

(1)

Speed = $\frac{d}{t}$

$S = \frac{300}{37.8}$

7.94 ms^{-1}

ResultsPlus
Examiner Comments

This response gains the available mark.

Total: 1 mark

ResultsPlus
Examiner Tip

Always include units.

19 Data from a 400 m athletics race is shown in **Table 2**.

Distance (–metres)	Time taken (seconds)	Speed (ms^{-1})
100	12.1	8.3
200	22.7	8.8
300	37.8	7.9
400	52.3	7.7

D/T

Table 2

(i) Calculate the athlete's average speed at 300 m.

(1)

7.9 (ms^{-1})

ResultsPlus
Examiner Comments

This response gains the available mark.

Total: 1 mark

19 Data from a 400 m athletics race is shown in **Table 2**.

Distance (–metres)	Time taken (seconds)	Speed (ms^{-1})
100	12.1	8.3
200	22.7	8.8
300	37.8	7.9
400	52.3	7.7

Table 2

(i) Calculate the athlete's average speed at 300 m.

(1)

7.9 ms^{-1}

ResultsPlus
Examiner Comments

This response gains the available mark.

Total: 1 mark

ResultsPlus
Examiner Tip

Notice if the correct units are given in the question or data anywhere.

Question 19 (ii)

There were errors made on this question by graphing one of the other components, for example, candidates drawing distance-time or distance-speed incorrectly, rather than speed-time.

Most candidates were able accurately to plot the graph. There were very few errors with lines of best fit being drawn, rather than linking up the points.

Scales were largely sensible and most had accurate labels on axes.

Candidates must use a ruler for these questions. Sometimes marks were lost by inaccurate drawing from free-hand joining of points. Consideration of the scale of the graph needs to be made, to ensure the accuracy of plotting is possible.

The responses below all received maximum marks.

19 Data from a 400 m athletics race is shown in **Table 2**.

Distance (–metres)	Time taken (seconds)	Speed (ms^{-1})
100	12.1	8.3
200	22.7	8.8
300	37.8	7.9
400	52.3	7.7

Table 2

(i) Calculate the athlete's average speed at 300 m.

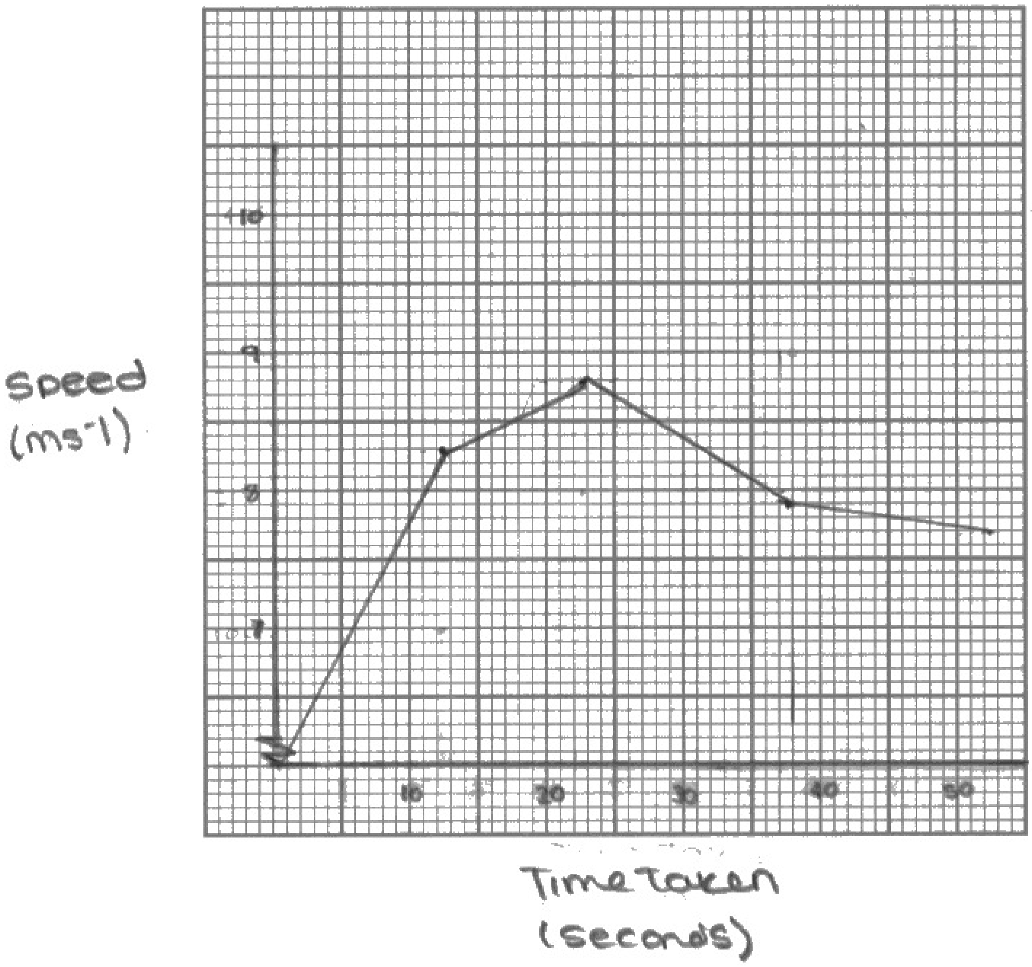
(1)

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

7.9 ms^{-1}

(ii) Using the information in **Table 2** plot a speed-time graph for the 400 m race.

(3)



ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 3 marks

ResultsPlus
Examiner Tip

Be sure to label axes and consider the scale of your graph.

Check carefully what you are being asked to graph, if multiple data is available.

Take care when plotting the points. Be accurate.

19 Data from a 400 m athletics race is shown in **Table 2**.

Distance (–metres)	Time taken (seconds)	Speed (ms^{-1})
100	12.1	8.3
200	22.7	8.8
300	37.8	7.9
400	52.3	7.7

Table 2

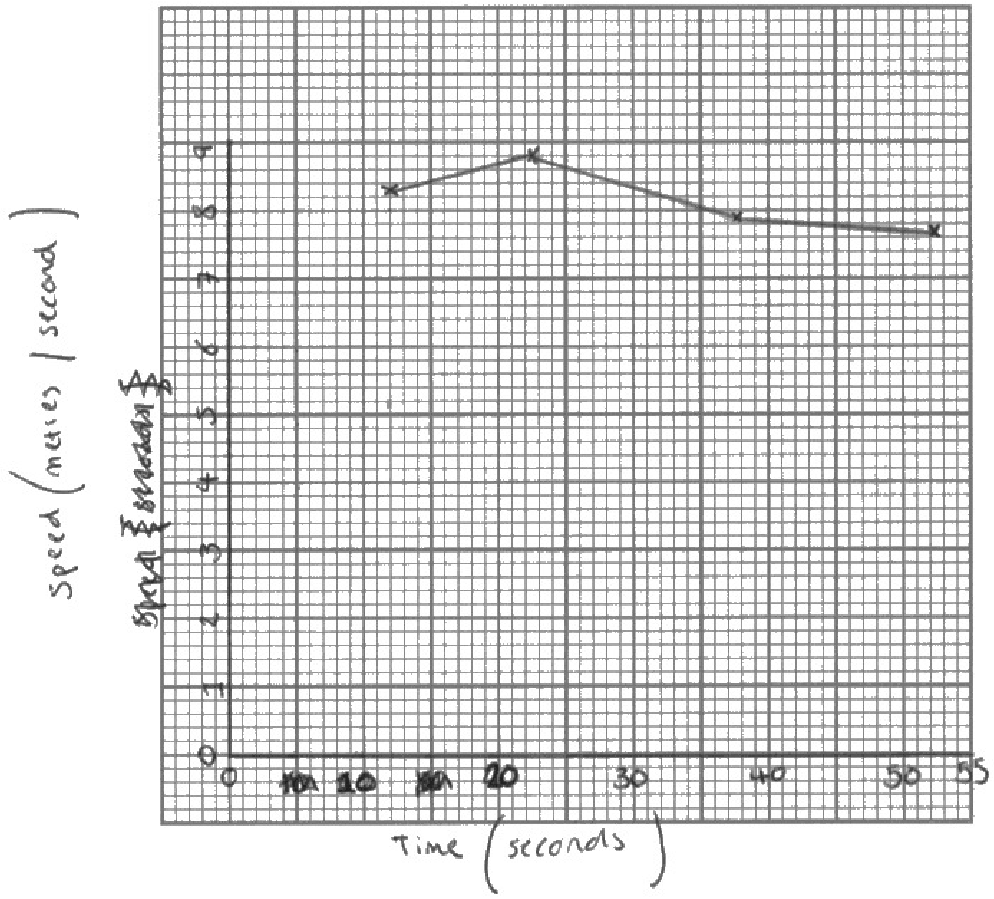
(i) Calculate the athlete's average speed at 300 m.

(1)

$S = \frac{D}{T}$ ..... 7.9 m/s^{-1}

(ii) Using the information in **Table 2** plot a speed-time graph for the 400 m race.

(3)



ResultsPlus
Examiner Comments

This response gains maximum marks.

Total: 3 marks

19 Data from a 400 m athletics race is shown in **Table 2**.

Distance (–metres)	Time taken (seconds)	Speed (ms^{-1})
100	12.1	8.3
200	22.7	8.8
300	37.8	
400	52.3	7.7

Table 2

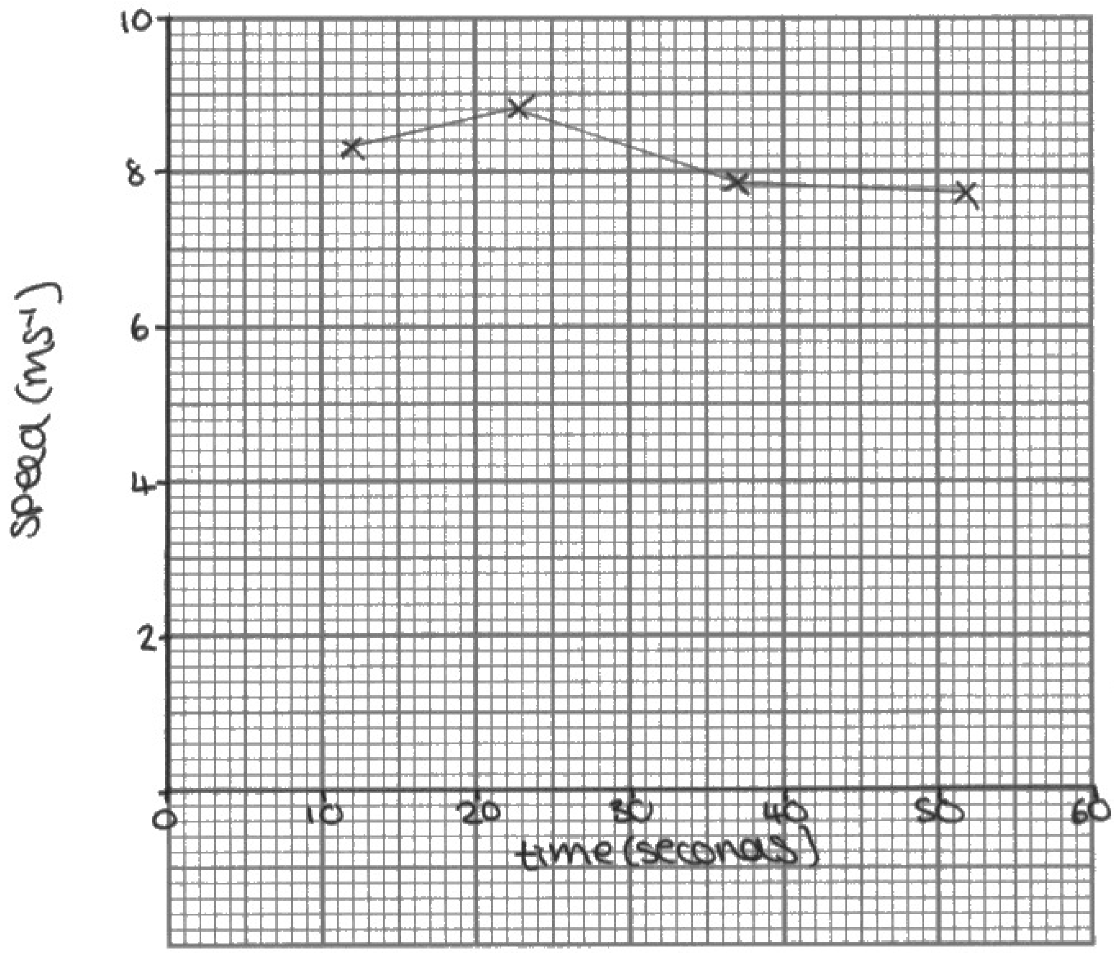
(i) Calculate the athlete's average speed at 300 m.

(1)

7.9 ms^{-1}

(ii) Using the information in **Table 2** plot a speed-time graph for the 400 m race.

(3)



ResultsPlus
Examiner Comments

This response receives maximum marks.

Total: 3 marks

ResultsPlus
Examiner Tip

Join up the points using your ruler.

19 Data from a 400 m athletics race is shown in **Table 2**.

Distance (–metres)	Time taken (seconds)	Speed (ms^{-1})
100	12.1	8.3
200	22.7	8.8
300	37.8	
400	52.3	7.7

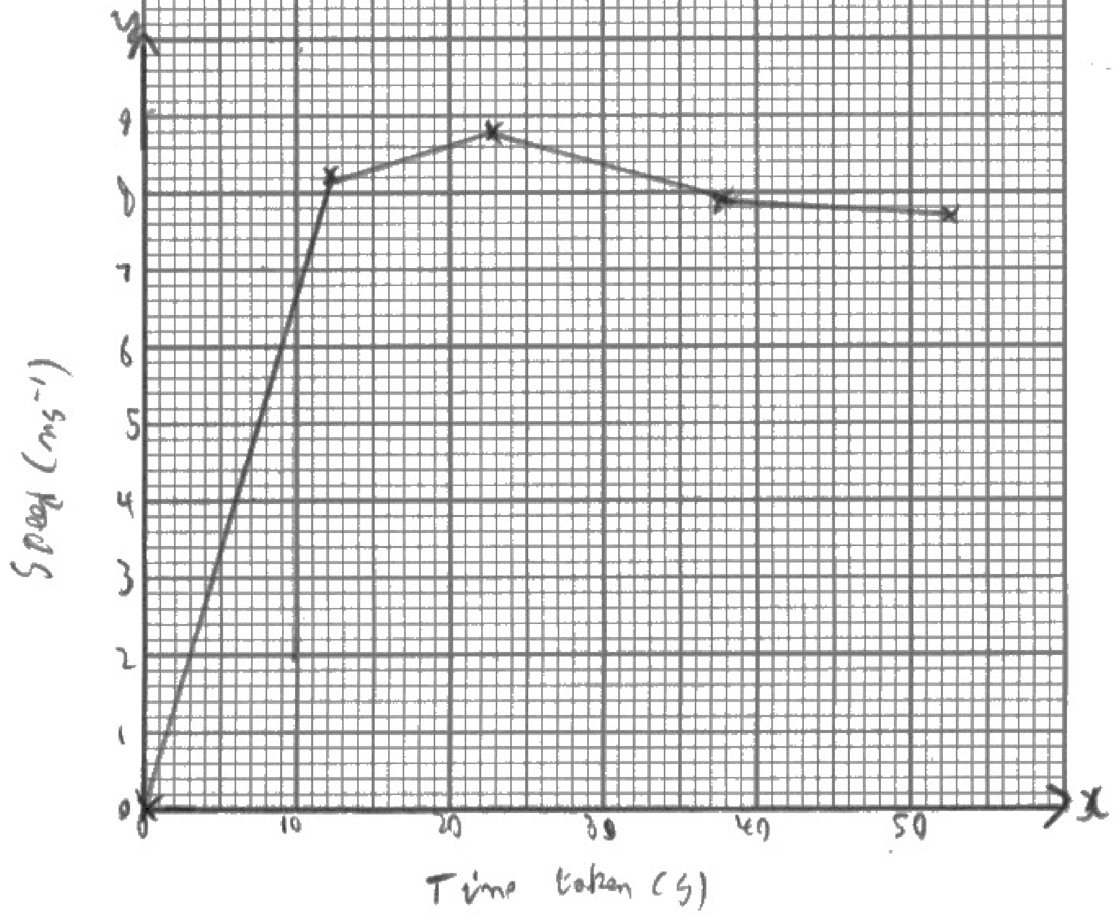
Table 2

(i) Calculate the athlete's average speed at 300 m. **(1)**

$\frac{300}{37.8} = 7.9365...$ $= 7.9\ ms^{-1}$ (1 d.p.)

(ii) Using the information in **Table 2** plot a speed-time graph for the 400 m race. **(3)**

Speed-time graph of the 400m race



ResultsPlus
Examiner Comments

This response receives maximum marks.

Total: 3 marks

ResultsPlus
Examiner Tip

Bring a ruler to the exam – and use it.

Question 19 (i)(ii)

This is an 'explain' question and, as such, one that candidates found to be the most challenging.

Candidates were able to name systems used at each part in the race, although there seemed to be a misconception that runners can 'choose' what system they use, rather than linking it to particular strategies around speed and intensity.

This was designed as a challenging question to differentiate for the highest-scoring candidates. This is how this question performed.

Candidates found it difficult to link the part of the race to the particular strategy. They also thought that runners could 'save' their ATP PC system for the end of the race. Alternatively, candidates thought that it would have restored in time for the end of the race for a sprint finish. Neither of these is true.

Candidates forgot to use the figure provided earlier in the question and answered as if it were a generic race and not with the specific times from at the start of the question.

Where data is given, candidates need to remember to use it. Candidates could link the energy system to the stage in the race, but not to the strategy or tactics used by the runner as per the question.

This is a candidate who has tried to link the points to the place on the race and the system with the strategy.

(iii) Explain how the race strategy used by the athlete would have affected the use of the energy systems at each 100 m in the race.

(4)

At 100m the athlete wouldhave used there Atp and Atp-pc system allowing them to have reach upto maximal perfomance During 200m the treshold would have moved to the latic acid system allowing to reach 95% maxmal perfomance still wonerng anaerobically 300m the athlete would begin to feel a build up of latic acid not enough to slow down yet. 400m Athlete would have used there aerobic system allowing oxygen into the muscle however they would have slowed down due to latic acid build up in the muscle

ResultsPlus
Examiner Comments

This candidate gains marks for the 100, 200 and 400 comments. If they had said they would slow down due to the lactate in the 300 comment, they would have received maximum marks.

Some good linked points are made and the response is set out clearly at each 100 metre mark.

Total: 3 marks

Question 19 (iv)

This is another 'explain' question that was designed to be challenging.

The linked point was for candidates to link to the part in the race and how it would have been run more effectively. Only the highest-achieving candidates were able to link the knowledge of the systems and apply it to a real example.

Very few candidates could link the principles of the continuum with the tactics of the race. Most referenced them saving ATP-PC for the end of the race. They did not have the knowledge about how to manage lactate build up and reduce fatigue in the race context.

This question was not well-answered.

(iv) Explain how the athlete might have run the race more effectively using knowledge of energy systems.

(3)

The athlete may have run the first 100m slightly slower to use the glycolytic system and maintain a better average speed before using the ATP-PC system at the end of the race to produce a faster finish in the last 5-10 seconds. This would avoid the ~~be~~ ~~violent~~ steep build up of lactic acid which could ~~impact~~ increase fatigue at the end of the race.

ResultsPlus
Examiner Comments

This candidate gains two of the three marks available.

- Lower at the start linked to using glycolytic system and less demand on the ATP-PC (1)
- Avoiding build up of lactate by slowing down enabling a faster finish (1)

Total: 2 marks

Question 20

Candidates had some good knowledge of relevant supplements and, in many cases, were able to apply this knowledge to the specific power athlete that the question referenced.

The best candidates were able to use several examples and to apply them to performance detailing how this would benefit them. They linked it to the training or perhaps examined the negatives effects as well.

The application to sporting examples was lacking in the lower-achieving examples.

The most usual supplements examined were bicarbonate, creatine, protein and caffeine. Most candidates only described what these do and could not give the application to power athletes in detail.

20 Examine the effects of different dietary supplements on power athletes.

(8)

Power athletes may use bicarbonate of soda as a supplement. This will increase blood pH, allowing the athlete to ~~&~~ not feel the effects of lactate (which lowers blood pH) for a longer amount of time. However, bicarbonate of soda has negative effects attached to supplementing it such as acute vomiting after consuming.

Supplementing creatine (which is a natural substance in the body) will allow muscles to make phosphocreatine molecules to be used to resynthesise ATP The supplementation of creatine will therefore extend the length of time the ATP-PC system can work for without fatiguing. Within the power exercises the athlete will therefore be able to produce a higher power output for an increased period of time.

Whey protein may also be beneficial to power athletes as this supplement will promote muscle repair. This would be beneficial to these athletes because muscle damage may be caused by this activity, so whey protein will allow them to recover quicker to train again.

ResultsPlus
Examiner Comments

This response gains maximum marks.

There is good technical knowledge of three different supplements, the negative effects of them and application to power athletes' performance.

Total: 8 marks

20 Examine the effects of different dietary supplements on power athletes.

(8)

Power athletes can use ~~whey protein~~ creatine as it boosts phosphocreatine stores. This allows them to use the ATP PC system for longer ~~a~~ meaning they can have high intensity, forceful ~~bursts for con~~ contractions for longer. ~~It also~~ However if over used then it can cause the athlete to feel nausea or get headaches so it should be used in good measure.

Another suppliment they can use is whey protein. This decreases muscle damage and reduces recovery time so therefore increasing muscle mass. This can increase a power athletes force production and muscle strength. However, some people say that athletes don't need added protein in their diet so the effects may not be as benefitial as expected.

They could also increase caffeine intake. This can improve their nerve stimulation and reduce their percieved rate of effort so they will be able to work for longer with less effort ~~How~~ which is benefitial to power athletes whos bodys are used to short durations. However ~~this may can cause~~ if consumed too much it may cause irritation and loss of sleep which could in turn worsen performance.

ResultsPlus
Examiner Comments

This response gains maximum marks.

Three supplements are examined. The effects of them are noted, with some negatives and also application for them all to power athletes.

Total: 8 marks

ResultsPlus
Examiner Tip

Look for a context – in this case, the power athlete – and try to apply the work to the context.

20 Examine the effects of different dietary supplements on power athletes.

(8)

A power athlete would use creatine powder – this would help to increase their energy stores by increasing how long the ATP – PC system would work for from 8-10 seconds to 10-12 secs. This would allow for greater force production without lactic acid building up enabling athlete to perform at maximal intensity for longer, improving their power performance.

Protein such as whey protein could be used to increase their muscle growth so muscle hypertrophy can occur more quickly. This will help an athlete build power through increasing the force of contraction.

Bicarb of soda can be used to help ~~may~~ delay the lactate threshold so an athlete can perform at maximal intensity for longer without OBLA / lactic acid building, meaning that there will be reduced fatigue.

Caffeine can help an athlete with concentration + stop fatigue meaning that they can perform at their highest intensity for longer.

Overall, there are many different dietary supplements that can be taken to help improve performance of power athletes. However, dietary supplements can have negative effects on athletes such as caffeine causing insomnia + bicarb of soda causing gastrointestinal + stomach problems which could lead to lower / reduction in performance as a result.

ResultsPlus
Examiner Comments

This response gains maximum marks.

Several supplements have been examined here.

There are positives and negatives, and specific application to power events.

Total: 8 marks

Question 21

Some candidates were familiar with the methods of training at the high altitude venue and use of an altitude chamber, but fewer were familiar with the LHTL and LHTH methods.

Some candidates used the physiology of the effects but did not adhere to the methods. It is important to read the question carefully and to focus on the scope of the question. This question was specific to the methods used. A wide range of methods was needed, rather than only discussing the physiological adaptations.

Candidates must read the question carefully – there is often a specific part of the specification referenced. In this instance 'how' they prepare, not the effects of the preparation.

21 Examine how an athlete could prepare for performance at altitude.

(8)

Training at altitude decreases the driving pressure for oxygen. The greater the altitude, the more hypoxia that occurs. One way an athlete may prepare is by training high, and living high. This involves both training and living at altitude. This way the body is always adapting, however training intensity must be decreased, and this can't be sustained for a long period of time. Therefore, it may be more useful to do this in pre-season to establish base levels of fitness. Another method an athlete may use is train low, live high. This is shown to have improvements in breathing efficiency by promoting capillarisation and therefore more red blood cells and more efficient gaseous exchange. However, a disadvantage of this method is that the adaptations that occur are not significant and therefore won't have an important role in promoting the body to adapt for altitude. The most common, and most efficient method is train high, live low. This means the body is able to adapt and recover when back at sea level after training. This method can also be sustained for a longer period of time, allowing more adaptations to occur when the body is resting. The athlete may also use oxygen tents which are easier to use as you can use them in your own home, and you can change the oxygen concentration to what the athlete desires.

(Total for Question 21 = 8 marks)

ResultsPlus
Examiner Comments

This response receives maximum marks.

It demonstrates a high level of accurate and relevant knowledge. It also examines different methods.

It does go into the physiology but examines multiple methods about 'how' the athlete can train including oxygen tents, LLTH and LHTH.

Total: 8 marks

21 Examine how an athlete could prepare for performance at altitude.

(8)

An athlete could prepare for performance at altitude by using hyperbaric tents. These decrease the level of oxygen in the air which aids preparation & by increasing red blood cells. Athletes can sleep in these tents and train normally the next day without reducing the intensity and duration of training. The tents are cost effective, ~~the~~ accessible and mean the athlete does not have to move away from home, and can maintain usual training. However, whilst the tents are less expensive than ~~moving~~ living in altitude for a few weeks, they ~~still they~~ are still expensive.

An athlete may also move to an area of altitude. This must happen at least 14 days before competition for adaptations to be made and maintained. Athletes may choose to live at altitude and train at altitude. Whilst this would prepare for competition at altitude, the athlete would have to heavily decrease ~~his~~ their training while they adjust to the ~~climate~~ altitude. Their demand for oxygen would increase and more red blood cells would be made to transport as much oxygen as possible. As they alter their training, detraining may occur as a consequence. An ~~ath~~ athlete can also choose to live at altitude and train at sea level. This would ensure detraining does not occur and that training can be maintained whilst adapting to altitude outside of training. However this may take up a lot of travelling time and would likely cost a lot of money. Whilst both options are expensive, this would cost more due to travelling, but detraining does not occur.

ResultsPlus
Examiner Comments

This response gains maximum marks.

It is an examination of the different methods of preparation and includes pros and cons.

There is a high level of accurate and relevant knowledge.

Total: 8 marks

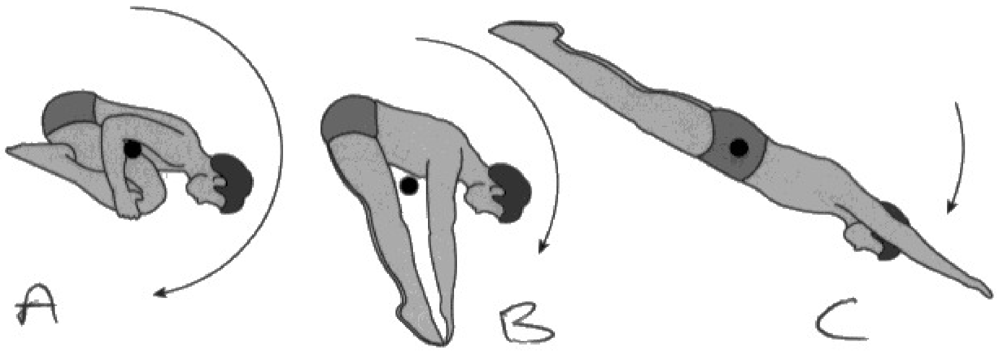
Question 22

Candidates were familiar with the term 'angular velocity' and many were able to examine how it changed in the images shown. They used key terms such as moment of inertia and linked this to body positions such as tuck or piked shapes. The application part, here, would access the highest marks.

Not everyone applied it to the dive: for example, the idea of being able to change if a diver were under-rotating or over-rotating and opening or closing their shape to gain the perfect entry to the water. Neither did candidates apply it to different athletes with different body shapes, such as a taller diver having a greater moment of inertia.

The understanding that angular velocity decreases from tuck to pike to straight was there and this was linked to moment of inertia.

22 Using examples of different body positions, examine how angular velocity would change during a dive from a 10 m platform as shown in **Figure 3.**



(Source: https://qualifications.pearson.com/content/dam/pdf/A%20Level/Physical%20Education/2016/Teaching%20and%20learning%20materials/Topic-guide-3-Biomechanical-Movement-final.pdf)

MI = moment of inertia
AV = Angular velocity.

Figure 3

(8)

~~aa~~ Angular velocity is the speed at which a body/object rotates around an axis. At point ~~A~~ A in a tucked position, the AV is likely to increase as the moment of inertia is smaller. This is a decreased spread of the body from the ~~point~~ axis of rotation and so allows the body to rotate faster. This can be because there is less ~~to~~ air resistance and more compact decreasing MI and increasing AV. This will ~~allow~~ allow the diver to do more rotations whilst falling, gaining a higher points from the judges for doing a more complex skill, giving them the competitive advantage. At point B in a pike position the athlete has increased the spread of the body from axis of rotation increasing moment of inertia. This will decrease ~~the~~ AV as the body will now move slower due to more air resistance and less compact which causes the diver to do less rotations and control themselves. At point C in the fully extended spread position the ~~to~~ diver decreases with maximum slow down the AV as they have the largest spread from the axis rotation. This increases MI and decreases angular velocity and angular velocity. This leads to the athlete being in the correct straight position, perpendicular to the pool to enter with minimal splash and gain maximum points.

ResultsPlus Examiner Comments

This response receives maximum marks.

It has a high level of accurate and relevant knowledge. It has good technical terminology and is applied to the athlete.

Total: 8 marks

ResultsPlus Examiner Tip

Apply your technical terms.

Question 23

Answers often referenced cardiovascular endurance, which is not a term recognised by this specification. It is still being taught, wrongly, as a correct term in some centres.

Many answers here were very generic. For example, a football player needs speed so would need a sprint test, and needs agility so would do the agility run, or a netball player who has to dodge players and therefore needs the Illinois agility run. Only the highest-scoring candidates were able to apply this knowledge to evaluate why some tests might be better than others.

Some candidates referred incorrectly to the methods of training rather than fitness tests, and therefore gained no marks at all.

Below are examples of extracts from a candidate who has evaluated different tests:

"As a basketball player I would need to change direction laterally so therefore a test that allows for changes in direction such as lateral, forward and backward might better such as a T test over an Illinois agility test because it replicates movements in the game more than an Illinois test".

"As basketball player I will need anaerobic capacity for high intensity sprints for the ball and to defend. There are many tests of anaerobic capacity. Wingate, RAST, Cunningham and Faulkner are examples. The Wingate is less relevant as this is based on a bike and basketball requires running not bike riding. The RAST test is most relevant as the sprints are short and have a recovery in between, this more replicates a game situation in basketball when you have to defend and attack. Although the Cunningham and Faulkner is running based it is on a treadmill which would not be accessible to me so I would choose the RAST".

"A basketball player also requires maximal aerobic fitness. There are many tests for this. Gas analysis is not accessible to me due to cost. The 12 minute cooper run does not replicate a game situation as it is more stop start to defend and attack rather than continuous running. So for this I would choose the yo yo test. This is like basketball where you have to do repeated sprints intervals over an extended period, though a disadvantage is it is linear and not in the zig zag pattern you would run in a real game. "

Too many candidates only referenced one fitness test for each component of fitness and therefore could not make comparisons between them relating to their validity.

*23 Evaluate the most suitable fitness tests for a team game of your choice.

Use your knowledge and understanding from across the course of study to answer this question.

(15)

The team game I will focus on will be football. A football player will utalise multiple components of fitness like speed, agility, muscular endurance, muscular strength, VO2 max. A player will also use all three energy systems during a football match to optimise performance.

Firstly, the 12 minute cooper run tests the performers aerobic capacity and muscular endurance which are critical to football. The 12 minute cooper run is a sustained run at a speed of the performers maximum to identify how many laps they can perform. The high intensity of a football match is perfectly resembled in the 12 minute cooper run however in football there is a focus on changing intensity and tempo in which the 12 minute cooper run does not meet. Furthermore, the 12 minute cooper run is only 12 minutes whilst a football match is 90, this high intensity and shorter period does not meet the

Specifics of football due to a football match lasting 90 minutes with a changing pace of play.

Secondly, the illinois agility test / T-Test can be used to test a footballers agility. Agility is the performers ability to maintain speed by changing direction and not loosing balance. In football agility is crucial in attacking (dribbling and running past defenders) to open up attacking phases but also defending. This makes agility extremely important in football. I would say that the T-test is more suitable to a footballer due to the changing direction and style of running. Football involves jockeying and running backwards which is utalised in the T-Test. The illinois agility test does not meet that criteria as the performer is facing the same direction constantly through the figure of 8. Therefore, I would say that the T-Test is more ~~spe~~ suitable for football as it involves different turns, directions which translate to a footballer and especially a defender.

Thirdly, the ~~30m~~ ~~spr~~ Wingate test can be used to test VO2 Max which can be used in football ~~expon~~ due to the extreme high intensity for short periods of time that are no more than 30s long due to the style of football. This makes the Wingate test good for footballers. However, the Wingate test is on a bike and is using different muscle groups intensily which does not translate to footballs running motion. This makes this test more unsuitable for football.

In conclusion, all tests do test appropriate components of fitness to football. However, I would say the T-Test is the most specific to a footballer due to the intensity and movements and turns resembling that of a fullback, midfielder and a centre back. It tests acceleration, balance, co ordination as well as agility which are all significantly used in football. Unlike other tests that test only one component of fitness. The 'T-Test' utalises multiple including agility which make it most suitable for a footballer.

(Total for Question 23 = 15 marks)

ResultsPlus
Examiner Comments

This response begins to have the analysis and debate required of the top band.

For example, it discusses that a Wingate test is on a bike, which is not as relevant, and the movements needed in the T test being more specific to the sport.

Total: 13 marks

Paper Summary

For further improvement candidates should:

- always bring rulers and calculators, and use them
- use the data given to answer the questions
- learn to spell key words in the specification
- in levels-based answers, apply the answers to different sporting situations using the terms 'so what', 'this leads to' and 'so that' to help them extend their answers
- read the question carefully so they do not make unnecessary mistakes eg draw a distance-time graph rather than a speed-time graph.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London WC2R 0RL.