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Examiners' Report
June 2022

GCE Physical Education 9PE0 01

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Introduction

Candidates had prepared well for this examination. It was clear that the advance information had been used to good effect. There was a marked difference between those candidates who rote-learned information and scored AO1 marks, and those who applied it to the specific question that was being asked of them, which scored more highly.

Candidates will need to try to apply their knowledge and be saying to themselves "so what?" as they write down their factual AO1 knowledge. If knowledge is applied and they examine the information in more depth in levels-based answers, they will achieve marks higher up in the levels.

There were also very specific contexts given in some questions – for example, Question 11 concerned the coach, and Question 22 concerned the world championships or Olympics. Applying understanding to the specific context is crucial for achieving top-band answers.

Question 1 (i)

Generally this definition was well-learnt.

Less-able candidates sometimes used 'air' rather than 'blood'. Not all candidates mentioned the heart specifically.

1 Define the following:

(i) stroke volume

(1)

Amount of blood pumped by the heart per beat.

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Examiner Comments

This question scores a maximum mark, with the candidate identifying the heart, blood and one beat.

Total: 1 mark

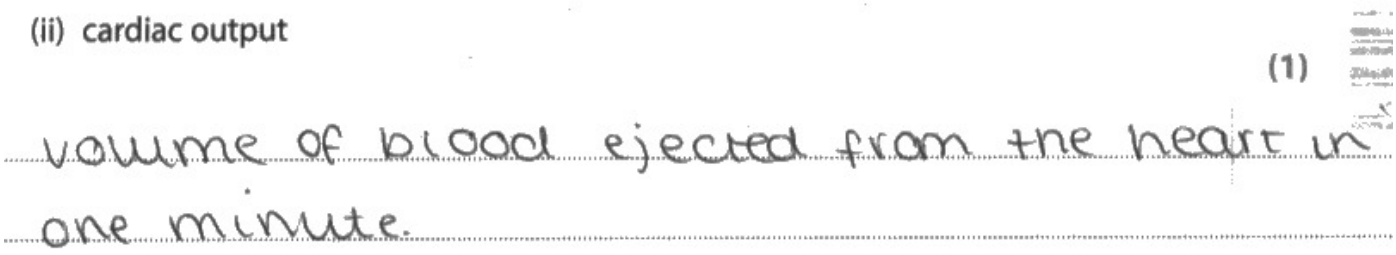
ResultsPlus
Examiner Tip

Ensure all definitions are learnt well.

Definitions can be asked of any term in the specification.

Question 1 (i)(i)

Cardiac Output was well known. Many candidates wrote the equation HRxSV but some wrote the definition out in full. Either was perfectly acceptable.



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Examiner Comments

This response scores a maximum one mark with the candidate writing the definition out in full, rather than the shortened HR x SV.

Total: 1 Mark

ResultsPlus
Examiner Tip

Learning a formula by heart is an easy way to access marks.

Question 2

'Explain' questions need linked points within the answer.

Many candidates understood that if venous return increased, that stroke volume increased (or were able to explain that if it was lower, then it was reduced). However, the link was less well-made with cardiac output, with the link to Stroke Volume increasing.

These, alongside the fact that one is dependent upon the other, were the most frequently-made points in the mark scheme. Knowledge of end diastolic volume and increase in contractile force was sparse.

2 Explain how venous return affects stroke volume and cardiac output.

(4)

An increased venous return leads to an increased blood supply back to the heart and therefore increases the end diastolic volume in the ventricles. This causes the ventricles to contract more forcefully so the larger ventricular contractility increases the volume of blood ejected in a single contraction which increases Stroke volume. As Stroke volume increases, cardiac output will also increase as more blood is ejected from the heart in a minute.

ResultsPlus
Examiner Comments

This response scores a maximum 4 points with four clear, linked points being made.

Total: 4 marks

ResultsPlus
Examiner Tip

Link points on 'explain' questions.

Question 3

Bradycardia was known well, but candidates defined it unnecessarily.

Stroke Volume, Cardiac hypertrophy and more forceful contraction were the answers that were used most frequently, with less understanding being demonstrated of the heart having to pump less often for cardiac output and capillarisation.

3 Summarise why an endurance athlete might have bradycardia.

(4)

Bradycardia is a resting heart rate below 60 bpm. An endurance athlete would get adaptations from the prolonged endurance training that would allow this. Hypertrophy of the cardiac muscle leads to a increased stroke volume. As a result it's more efficient, so doesn't need to contract as many times to pump out the same amount of blood. Increased red blood cells and haemoglobin increase the bloods oxygen carrying capacity, increasing oxygen delivery to muscles. Capillarisation increases gaseous exchange allowing more oxygen rich blood.

ResultsPlus
Examiner Comments

This response scores 4 marks making four clear points on the mark scheme.

Total: 4 marks

ResultsPlus
Examiner Tip

Set out answers clearly and legibly.

Check there are four points if the question is for 4 marks.

Question 4

Plantar and Dorsi flexion were well known. However, errors in spelling for key terms were not awarded marks and some candidates made mistakes with this.

Spelling of key terminology is important: where words are in the specification, they can be used. Rotation and Circumduction were often mentioned incorrectly for the third mark. The strongest candidates were aware of all terminology.

4 Identify **three** movements possible at the ankle joint.

(i) Plantar Flexion **(1)**

(ii) Dorsiflexion **(1)**

(iii) Eversion **(1)**

ResultsPlus
Examiner Comments

This response scores maximum marks.

Total: 3 Marks

ResultsPlus
Examiner Tip

Learn how to spell words in the specification.

Question 5

Candidates understood the three terms and were able to define them correctly.

The majority of errors in this question concerned candidates omitting either a muscle name or incorrectly explaining the movement. For example, saying "a squat", but not then saying if in the upward or downward phase and linking correctly with the quadriceps or the hamstrings. Another example was to say "plank" for isometric but then not naming a suitable muscle group such as the rectus abdominus (or abdominals).

The strongest candidates scored maximum marks on this question. Some candidates did not mention that the muscle was contracting, in the definitions.

5 Summarise, using **one** sporting example for each, the following types of muscle contraction: concentric, eccentric and isometric.

Type of muscle contraction	Summary of the muscle contraction	Sporting example
Concentric	A concentric contraction is where the muscle shortens while contracting. (1)	The upward (bicep brachii) phase of a bicep curl, as the weight is brought up, the bicep contracts concentrically At the bicep brachii (1)
Eccentric	An eccentric contraction is where a muscle lengthens while contracting. (1)	The downward phase of a bicep curl for the bicep brachii, as the bicep brachii is lengthening while contracting. (1)
Isometric	An isometric contraction is when a muscle stays the same length while contracting. (1)	A wall sit. This is because the quadricep group would be contracting but it stays the same length. (1)

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Examiner Comments

This answer has three accurate definitions and three examples that are specific, detailing upward or downward phase of the movement for concentric and eccentric, with a muscle name. This scores 6 marks.

Total: 6 marks

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Examiner Tip

Examples need to be very clear, with specific movement and muscles.

5 Summarise, using **one** sporting example for each, the following types of muscle contraction: concentric, eccentric and isometric.

Type of muscle contraction	Summary of the muscle contraction	Sporting example
Concentric	Muscle shortens under tension (1)	Upward phase of a bicep curl (1)
Eccentric	Muscle is lengthening under ~~pressure~~ tension (1)	Downward phase of a Squat (1)
Isometric	Muscle does not lengthen or shorten under tension ~~but~~ but does fatigue (1)	Front Plank (1)

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Examiner Comments

In this example, the candidate has detailed definitions and scores 3 marks but the examples do not indicate a muscle group. Therefore, in the concentric and eccentric example the answer could be wrong, depending on whether they are referencing the biceps or triceps muscle groups and they do not say which.

The same is true of the plank, where they do not reference the abdominal group.

Total: 3 Marks

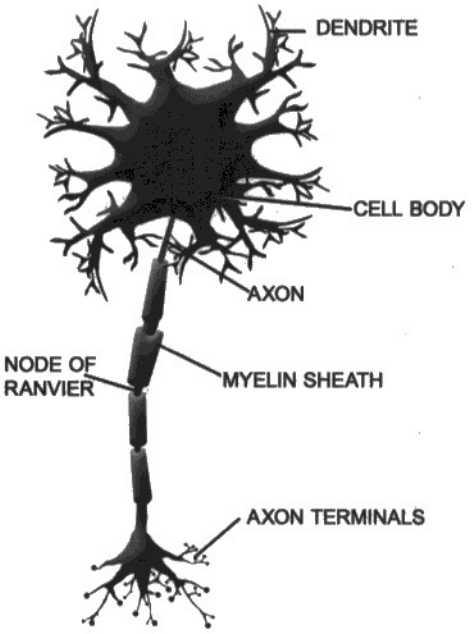
Question 6

This area of the specification was learnt well, with many candidates having a good understanding of each of the parts.

Functions of the myelin sheath and axon were the best-known parts but cell body and nodes of ranvier were less well-known.

If a question has 4 marks, the response needs four different points.

6 Summarise the function of any **four** of the labelled parts of a motor neurone.



(Source: © ducu59us/Shutterstock)

(4)

Dendrites carry ~~a~~ information or nerve impulses (like an action potential) from other neurons towards the cell body of a neuron for the impulse to be relayed to the next neuron via the axon. The axon carries the impulse away from the cell body towards the axon terminals so it can be passed on to other neurons by synaptic transmission.
The myelin sheath insulates the axon, which causes the impulse to travel quicker.
The nodes of ranvier are gaps in the myelin sheath which force the impulse to jump, further speeding up the rate of transmission for the impulse.

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Examiner Comments

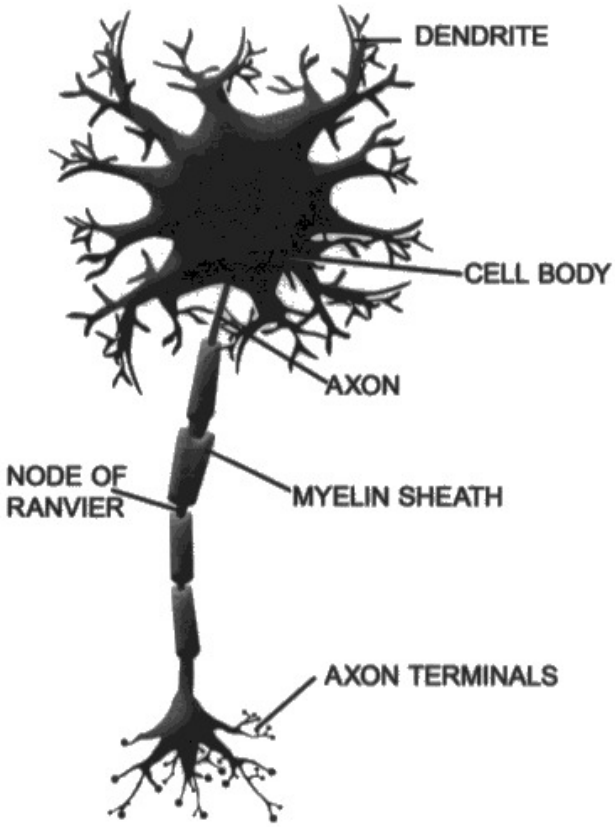
In this example, the candidate understands four parts of the neurone and summarises their functions accurately. This scores maximum marks.

Total: 4 Marks

ResultsPlus
Examiner Tip

Set out the answer as four clear points.

6 Summarise the function of any **four** of the labelled parts of a motor neurone.



(Source: © ducu59us/Shutterstock)

(4)

The nodes of ranvier increase the rate in which ~~an~~ electrical impulse travels. The dendrites detect electrical impulses and transport them into the cell body. The axon transports the electrical impulse in the motor neuron to the axon terminals. The myelin sheath insulates the axon preventing the impulse from escaping. The axon terminals are the site of which the impulse is released across a synapse to be transferred and depolarise cell.

ResultsPlus
Examiner Comments

This candidate chooses to go through each part to make sure of scoring the marks. This response scores maximum marks but makes five points worthy of marks (maximum scored at 4).

Total: 4 Marks

ResultsPlus
Examiner Tip

Providing five points on a 4-mark question increases your chance of scoring the marks.

Question 7

This was a well-answered question, with candidates able to access full marks and using the full scope of the mark scheme.

The most frequent answers were for diet, exercise, smoking and drinking. Some candidates made multiple points about diet, which only scored one mark eg reducing salt, reducing sugar. This information was known well.

7 Outline **four** possible healthy lifestyle changes to reduce the risk of cardiovascular diseases.

(4)

Stopping smoking will reduce the blood pressure, which will prevent cardiac drift, and ~~other~~ diet low in fat arteriosclerosis.

Having a healthy ~~lifestyle~~ will reduce the LDL cholesterol levels in the arteries.

Completing a high level of exercise will strengthen the cardias muscle and allow it to pump more blood.

Quitting alcohol will reduce the levels of LDL cholesterol in blood.

ResultsPlus
Examiner Comments

This response scores a maximum 4 marks and sets out four good points from the mark scheme.

Total: 4 Marks

ResultsPlus
Examiner Tip

Remember: an outline is not a list.

Question 8

Candidates had some understanding of muscular contraction but only the strongest candidates were able to apply this knowledge to the specific question that they had been asked. So often, candidates only scored one mark for the contraction stage.

The other stages were understood less well. However, the strongest candidates were able to apply their understanding to the specific question asked and set out their answer into the appropriate stages. It is important for candidates to read the question carefully and apply the specific knowledge for which they have been asked. The recharge stage was the least well known and recharge and relax were often missed.

8 Following the resting stage, describe the remaining **four** stages of muscle contraction.

(4)

next stage is excitation, (1) is where impulse from axon reaches motor plate creating an action potential in motor unit.

contraction phase, (1) is where myosin heads bind to actin binding sites and myosin head move forward creating ratchet mechanism.

then there is re-chase, (1) is where ~~ATP~~ ATP is re-synthesised and calcium ions are released again.

Final stage is relaxation, where impulse stops ~~are~~ or run out of ATP or calcium ions and myosin ~~heads~~ and actin return back to resting position.

(Total for Question 8 = 4 marks)

Resting
excitation
contraction
re chase
relaxation

ResultsPlus
Examiner Comments

The four stages are well-known and described, in order for a maximum mark.

In this example, the stages were needed, not a generic description of muscular contraction.

Set out the answer clearly, as in the example below.

Total: 4 marks

ResultsPlus
Examiner Tip

Apply knowledge to the specific question asked.

Question 9

The range of adaptations was known here, but the depth of application is the important part. In the weakest answers, candidates were able to list some adaptations but not to explore them in detail. Such answers were simply a list of adaptations.

Candidates should then ask themselves: “so what?”, "why is this useful?"

9 Following a period of strength training, an athlete may have more powerful muscular contractions.

Examine the structural adaptations that would enable this to occur.

(8)

Strength training increases and strengthens type IIx glycolytic muscle fibres. Anaerobic training occurs which is with the absence of oxygen. ~~The~~ Hyperplasia occurs where there is an increase in number of myofibrils and hypertrophy where there is an increase in size of the muscle (myofibrils). This ~~occurs~~ is as there is an increase in size and strength of actin and myosin, ~~so~~ more motor units ~~muscles~~ ~~do~~ firing can occur leading to greater contractions and an increase in size means the contractions become bigger and more powerful. There are increased stores of anaerobic enzymes like (PFK) or (CK) meaning that more reactions can be catalysed, leading to greater ATP produced and ~~not~~ faster contractions can occur. Also strength training will convert previously type IIa muscle fibres into type IIx, meaning there ~~are~~ is more strength and power produced due to more fibres being stimulated. Also they become more accustomed to lactate production meaning that lactate accumulation reduces and the onset of OBLA occurs later on and is delayed. Meaning that power contractions can be sustaining for slightly longer without becoming fatigued. Increased ATP-PC ~~store~~ stores in cells allows for more energy generated for more powerful, repeated contractions. An example of strength training that could be used is weight training, resistance, plyometrics or sprint interval training.

ResultsPlus
Examiner Comments

This response has a good range of structural adaptations, which are clearly understood, and scores in the top band.

However, there could have been more expansion of the application part. What does this allow the athlete to do? This response scores 7 out of 8 marks.

Total: 7 Marks

ResultsPlus
Examiner Tip

Apply your knowledge: eg this allows greater strength and power, and what an athlete can do with this, using practical examples from sport.

Question 10

Restoring phosphagen and myoglobin were the most commonly-known answers, but again, to score more highly candidates need to examine this more – why is that important for an athlete? The best answers were able to examine in depth and cover a wide range of answers.

10 Examine the physiological processes occurring in the fast component of recovery.

(8)

The fast component of recovery occurs immediately after exercise and before the slow component. It is the alactic component of EPOC, also known as oxygen debt, which is increasing levels of oxygen needed to restore the ATP-PC system. After exercise, there is a high rate of respiration, high temperature high circulation to allows for increased oxygen intake to help rephosphorylation of ATP-PC and resaturation of myoglobin stores.

Rephosphorylation takes 30 seconds for half to be resynthesised and 2-3 mins for full restoration. It requires 2-3 litres of oxygen and carbohydrates (glucose) are broken down into CO_2 and H_2O to provide energy for ADP and P_i to join to ATP. ATP can be utilised to form PC.

This can be carried out during rest periods in interval training to restore phosphogen levels. However as this continuous to occur the amount of phosphogen restored decreased meaning there's reduced energy available. This process forces more ATP to be stored in cells.

Resaturation of myoglobin takes 2 minutes to occur and is the storing of oxygen in muscles. For this high oxygen levels are required.

This is a very rapid process.

Lactic acid removal and breakdown, and restoration of glycogen stores occurs in the slow component, between 2-48hours after exercise.

(Total for Question 10 = 8 marks)

ResultsPlus
Examiner Comments

This answer has excellent knowledge of the processes occurring but does not quite go far enough, with the examination of why this is important. What does this mean for the athlete? This response scores 7 out of a possible 8 marks.

Total: 7 Marks

ResultsPlus
Examiner Tip

'Examine' means you need to use analysis – ask yourself: "Why is this important?"

Question 11

This question was very specifically about what the *coach* needed to do.

This element was missed by many, who focussed on the athlete themselves. 'Cool down' was mentioned frequently, incorrectly. It is important that candidates can identify the focus area of the question.

Many of the stronger candidates chose to structure their answer into three separate sections: before, during and after. This worked well as a structure for this question, ensuring that candidates were able to cover the range of answers.

The strongest answers were able to centre on the coach taking actions such as calling times-out, or use of stoppages and use of substitutes.

Weaker responses focussed more on the nutritional aspects and around the athlete themselves, or changing from recovery to performance. Again, some candidates listed strategies but did not examine them in detail.

This answer focusses specifically on what the coach can do. It is set out well, in sections: before, during and after. It links to the actions the coach can take, such as substitutions, but also has some deeper analysis such as that the coach can do more things in game play rather than, say, a 1500 metres race.

① before ② during. periods of rest, time out, half play ③ after physio, cryotherapy

11 Examine the strategies a coach can use before, during and after a competition to enhance recovery processes.

(8)

Before a competition, the coach can ensure that athletes have good nutrition and general fitness levels to ensure effective and efficient recovery. Using methods like supplements and hydration drinks to ~~ensure~~ enhance the speed of recovery.

During a competition, the coach can implinent tactial. This can include holding the ball during play in a games match like football. They could also allow the athlete periods of rest through substitutes, and ensuring athletes have access to methods like massages in half time. However, these are mainly applicable to games sports. A coach would have greater difficulty implmenting recovery strategies for a ~~sport~~ endurance sport, like a 1500m race or a marathon. Things like sports gels and drinks could be handed out to restore electrolytes and enhance recovery.

After competition, the coach can use strategies and methods for recovery such as oxygen tents. This ~~as~~ speeds up recovery by having an increased level of oxygen which goes to the muscles, and can also enter the plasma. Other methods like cryotherapy allow the muscles to experience greater vasoconstriction, increasing oxygen intake and therefore allowing a more effective removal of lactic acid.

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Examiner Comments

This is another excellent example, where the candidate focusses on what the coach can do such as tactical play, gamesmanship and substitutions.

Total: 8 Marks

Question 12

This question allowed candidates to go into detail about their knowledge of the two systems.

The majority of candidates were able to write well about each system individually. The strongest candidates were able to discuss how they linked together and this demonstrated who had that deeper knowledge. Many candidates only discussed structures of the heart and pathway of air and did not identify the function of each system. Stronger answers identified functions of each system, then how the structure aids the function, before going into how they linked together.

12 Discuss how the cardiovascular and respiratory systems function both individually and in conjunction with each other.

(15)

The Cardiovascular and respiratory System both perform key roles in on the body individually but also together as one Cannot function Without the other.

The Cardiovascular System is the System of blood leaving and entering the heart. The heart is made up of 4 Chambers, The left atrium, the right atrium, left Ventricle and right Ventricle. Each play a key role in the Cardiovascular System. The left side of the heart is Where oxygenated blood enters through the pulmonary vein and is ejected to go around the Systemic ~~Circuit~~ Circuit. (to the body) This allows Muscles to receive oxygenated blood. The atriums are responsible for the filling of the heart as it is the recieving Chambers. Whereas the Ventricles are responsible for the ejecting of blood from the heart. The right side of the heart is Where deoxygenated blood ~~goes~~ goes. This is When the blood get ejected to the lungs to become oxygenated (Pulmonary Circuit). The Cardiovascular System "goes through 2 Main functions. Systole and diastole. The Diastole is the heart filling With blood and Systole is the heart ejecting blood. These Contractions are Controlled by the SA node Which is the pacemaker of the heart Causing the heart to Contract and relax. The average resting heart rate is 70 bpm. The rest to Stroke Volume

Where it is how much Lits of blood is pumpe around per minute beat. The aves is 70ML. This can change based off how physis fit your body is.

The respiratory System is responsible for the amount of oxygen inspired and CO_2 expired. There are 2 main entry points of oxygen in to body the Nasal Cavity and Mouth. This oxygen inspired travels down thru the larynx, phagins, trachea to the bronchi which lead to bronchioles. The bronchids lead to the alveoli Where diffusion happens. During inspiration the thoracic cavity expands allowing more oxygen to be taken in. When this happens the diaphragm Straights allowing for a greater Surface area for oxygen. As this happes the thoracic cavity is pushed up and out by the intercostal Muscles Contracting. Supporting Muscles Such as the Sternocleidomastoid and Pectorals also push the thoracic Cavity further up and out allowing for an increase pressure gradient of low pressure in the body and high pressure outside allowing the flow of oxygen in to the body. During expiration at the point of diffusion at the alveoli We breath the CO_2 out. During this the diaphragm relaxes returning to its dome Shape causing a decrease in the ~~bargin~~ area of the thoracic Cavity. This is also ~~there~~ further helped by the abdominals bring the thoracic Cavity downwards. This Causes a pressure greater out side the body allowing O_2 to easily

Where both systems work in conjunction together is at the alveoli where there is diffusion and at the muscles. With the oxygen inspired travelling down to the Alveoli a Capillary gives out CO_2 and relieves O_2. This blood is then returned to the left side of the heart ready to be ejected to the muscles. When blood is travelling at the muscles attaches to haemoglobin diffusion happens again especially during exercise releasing CO_2 into the capillary and oxygen into the muscle. This deoxygenated blood is then ejected to the lungs to then go through diffusion again to relieve more oxygen for the body.

Overall, both systems are extremely important individually as well as working in conjunction with one another.

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Examiner Comments

This is a top-band answer, with detailed knowledge and understanding of both systems and how they link together.

It does not quite have the depth of knowledge of how they link, as it does in the other two sections, to score at the maximum 15 marks and gained 13 marks.

Total: 13 Marks

Look to see what the question is asking. There are three parts here – cardiovascular system, respiratory system and how they work in conjunction. Many candidates missed part 3.

12 Discuss how the cardiovascular and respiratory systems function both individually and in conjunction with each other.

(15)

The cardiovascular system transports blood from the heart to the body whereas the respiratory system focuses on respiration. The systems work together during gaseous exchange. The cardiovascular system works individually during transporting blood around the body and the respiratory system works individually during inhalation and exhalation.

One way the cardiovascular and respiratory system work together is through gaseous exchange. Gaseous exchange occurs when the heart sends deoxygenated blood to the lungs in order to get oxygenated. The lungs will take the deoxygenated blood and through the alveoli, carbon dioxide will be taken out of the deoxygenated blood and oxygen will be transferred through diffusion and the gases will switch from an area of low concentration to an area of high concentration. This will allow the blood to be oxygenated and taken to the muscles where gaseous exchange will occur again through the capillaries to red blood cells to oxygenate the muscles. This will benefit performance when exercising because they are able to get oxygenated blood quickly and efficiently to their working muscles in order to slow down the effects of fatigue and

be able to perform for longer and quicker

One way the cardiovascular system works individually is through transporting blood around the body through the cardiac cycle. This allows blood to get transported from the heart to the ~~working~~ muscles and areas where blood is needed. This beneficial for a performer because when they start exercising, their heart rate increases meaning Stroke volume increases. This will allow the performer to get oxygenated blood to the muscles that require them allowing them to have more energy when performing and be able to perform at a higher intensity for longer

One way the respiratory system works individually is through inhalation and exhalation. This is the process of respiration where you get ~~oxygen~~ ~~blood~~ from inspiring and the removal of waste products, mainly carbon dioxide, when expiring. This is beneficial to a performer because when they are ~~working~~ exercising they are going to need more oxygen for the working muscles so their breathing rate is going to increase so that they can get more oxygen in the body and remove carbon dioxide. This will mean by getting more oxygen the in their body their working muscles can get more energy and be more resistant to fatigue and be able

to perform at a higher intensity for longer

In conclusion, although the systems both work individually, without either of them an athlete wouldn't be able to exercise at a good intensity because they need both systems to get oxygenated blood to the working muscles to stop the build of lactic acid happening to quickly and be able to perform at a higher intensity for long periods of time

ResultsPlus
Examiner Comments

This is a top-band essay, because it understands the link between the two systems and gives detailed knowledge of this.

Total: 13 Marks

ResultsPlus
Examiner Tip

Read the careful carefully.

12 Discuss how the cardiovascular and respiratory systems function both individually and in conjunction with each other.

(15)

The cardiovascular system contains the heart, capillaries, veins and arteries. The heart functions by allowing blood to flow in and out the chambers. This is known as the cardiac cycle. During the cardiac cycle the atrias go through atrial diastole which is where the atrias fill with blood. This then flows through the tricuspid or bicuspid valves in the heart and ventricular diastole occurs. Following this, ventricular systole occurs which is where the blood exits the heart and enters the lungs through the right ventricle and the body through the left ventricle. The blood vessels of the cardiovascular system are suited to their role through specific structural adaptations. The capillaries are one cell thick which allows diffusion of blood to occur easily at the muscles. Additionally the veins ~~are~~ have valves which prevent backflow of the blood. Furthermore the arteries have a thick lumen to allow maintence of blood pressure. The respiratory system functions by providing gaseous exchange and works in conjunction with the cardiovascular system to provide oxygen to the working muscles.

The respiratory system functions by air travelling into the nasal cavity which is filled with cilia in order to filter out unwanted particles. The oxygen then passes through the pharynx, larynx and trachea where the oxygen is then transferred to the lungs. In the lungs the air passes down the bronchi and into the bronchioles where it is passed to the alveoli. The alveoli is where gaseous exchange takes place. Here oxygen diffuses into the capillaries and the carbon dioxide diffuses out to enable the this gas to be exhaled. Exhalation is possible due to the high pressure that has been created in the lungs and as ~~pressure moves from high to low~~ the external pressure is lower than the pressure ~~outside the lungs~~ inside the lungs, this process is possible.

The cardiovascular and ~~cardio~~respiratory systems function together when the right ventricle ejects blood to the lungs in order for oxygen to dissociate into the blood stream. This occurs through diffusion. The deoxygenated blood is transferred to the ~~blood~~ capillaries and the oxygen diffuses into the blood as the pressure moves from high to low.

During exercise the cardiovascular system and ~~the~~ respiratory system work in conjunction in order to have more oxygen present at the muscles. This occurs by the ~~the~~ sympathetic nervous system recieving an impulse which then is parsed to the SA node in the heart which stimulates an increased heart rate. Due to an increased heart rate the breathing rate must also increase to allow sufficient oxygen to bind to the haemoglobin in the blood. In order to do this the medulla oblongata sends an impulse to the pneumotaxic centre which controls frequency of breathing rate. Therefore as frequency of breathing increases more oxygen will be available for the muscles and this can bind ~~the~~ to haemoglobin. This will then be transported to the working muscle in the blood stream and dissociate to buffer lactate. This would reduce fatigue in the athlete.

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Examiner Comments

This is an excellent top-band answer, which has detailed understanding about both systems and then details how they link together.

This response demonstrates excellent knowledge and understanding. It has a coherent writing structure going through each system in turn, and then explaining how they link together.

This scored 14 out of 15 marks.

Total: 14 Marks

Question 13 (i)

Distance/time was not well known. Candidates who had rote-learnt this were able to score the mark.

Often, candidates using equations scored more highly than those who wrote a description.

13 Define the following:

(i) speed

(1)

Speed = distance ÷ time

ResultsPlus
Examiner Comments

This candidate has set out the equation clearly.

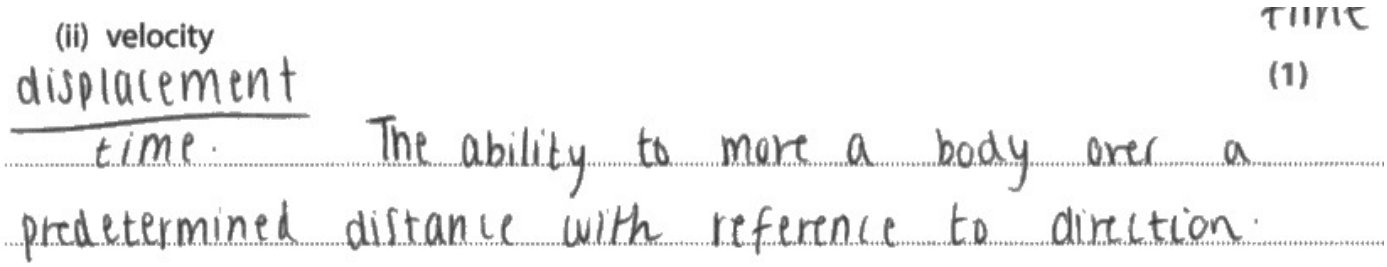
Total: 1 Mark

ResultsPlus
Examiner Tip

Learn equations off-by-heart. A defintion can be an equation.

Question 13 (i)(i)

Speed in a direction was not known well by candidates. Those who tried to write a description tended to make errors, versus those who wrote a formula and were more likely to achieve a correct response.



ResultsPlus
Examiner Comments

This response scores the available mark.

This candidate has made sure by writing both the equation and the description.

Total: 1 Mark

Question 13 (i)(ii)

Acceleration was a less well-known definition. Some candidates knew the formula but many had confused it with velocity. A small minority used force/mass.

The most successful responses had learnt a formula, rather than a definition.

(iii) acceleration

(1)

change in velocity ÷ time OR (final velocity − initial velocity) / time

ResultsPlus
Examiner Comments

This response scores the available mark.

Total: 1 Mark

ResultsPlus
Examiner Tip

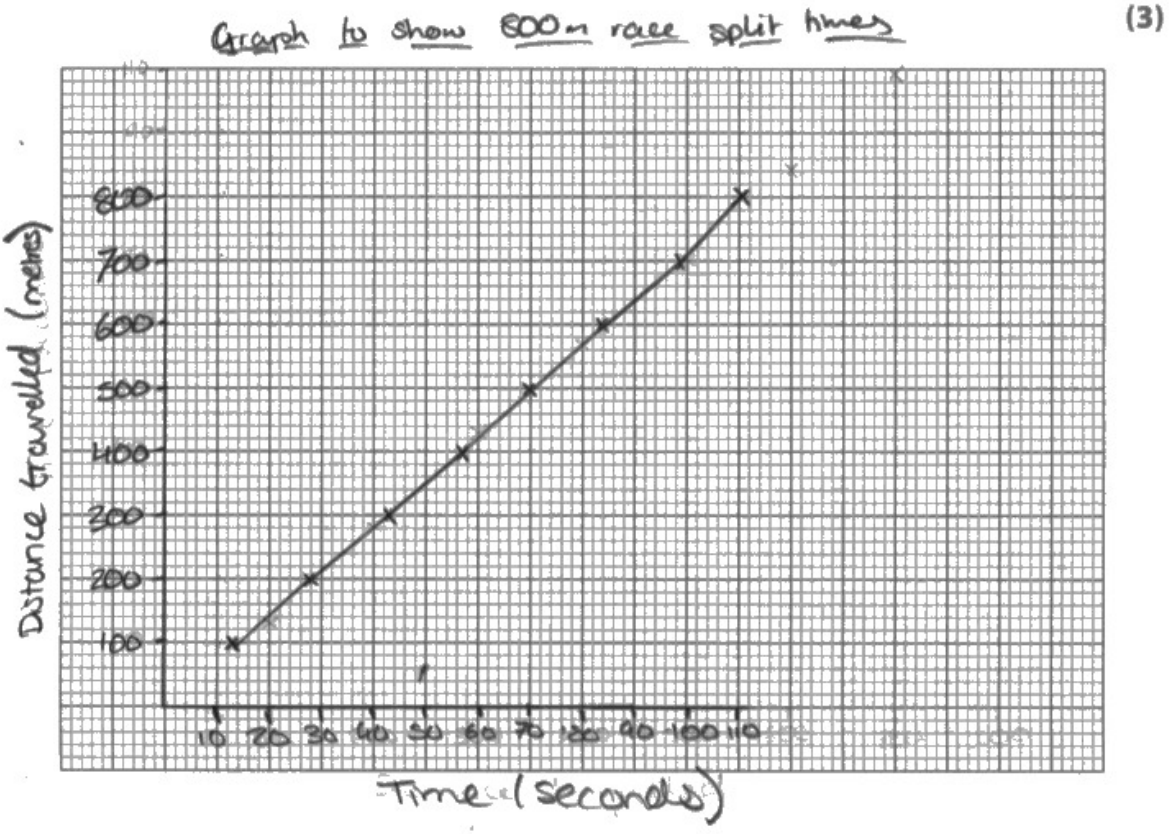
Learning a formula and setting it out clearly enables easy access to 'definition' marks.

Question 14 (a)

Generally, the graphs were plotted accurately. Some candidates did not gain the final mark, because they drew a line of best-fit, rather than joining the points. Others did not take care in the joining of the curve.

Most candidates were able to work out an appropriate scale.

(a) Plot a graph of distance against time for this data set. (3)



ResultsPlus
Examiner Comments

This response scores maximum marks.

Total: 3 Marks

ResultsPlus
Examiner Tip

Take care when plotting points on a graph.

Bring pencils to the exam.

Question 14 (b)

This calculation was completed well, with very few candidates forgetting units or calculating the answer incorrectly.

(b) Calculate the speed of the athlete at 600 m and 800 m.

Speed at 600 m	speed = distance ÷ time 600 ÷ 84 Speed = 7.14 m/s (1)
Speed at 800 m	S = d ÷ t 800 ÷ 110 speed = 7.27 m/s (1)

ResultsPlus
Examiner Comments

This candidate shows the working out clearly, which is useful in case of an error and uses the right units.

Total: 2 Marks

ResultsPlus
Examiner Tip

Always show the units.

Question 14 (c)

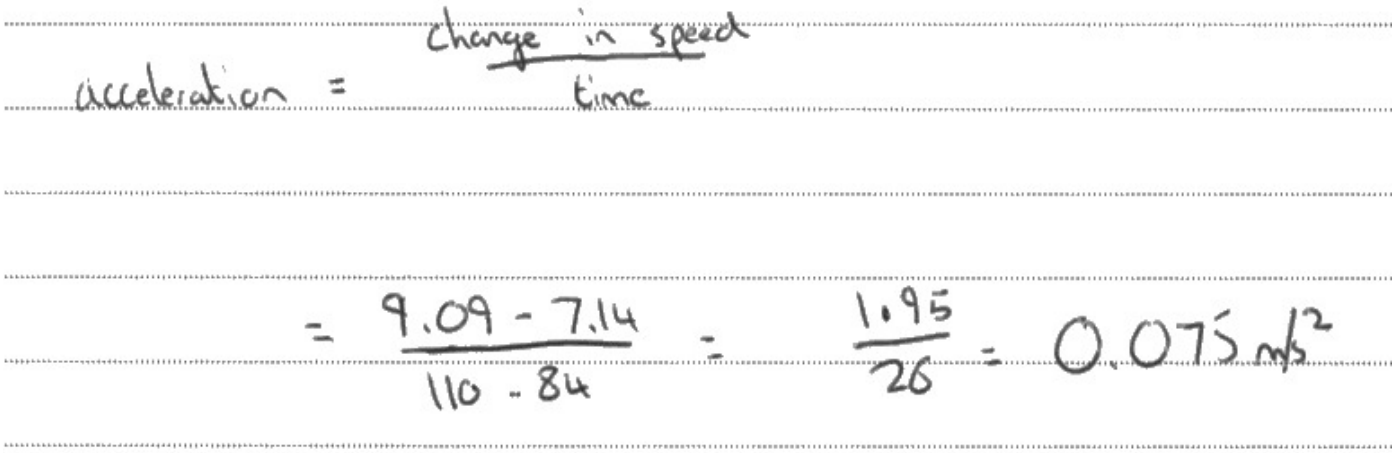
The strongest candidates were able to complete this question accurately, using the formula.

A small minority had obviously not brought a calculator to the examination and had written out the formula correctly in full, gaining two marks, but had not been able to do the final calculation. It is important that candidates always have access to a calculator in this examination. This was not well-understood.

Very few candidates gained full marks in this question, combining all their knowledge and achieving a correct calculation.

(c) Calculate the average acceleration between 600 m and 800 m.

(3)



ResultsPlus
Examiner Comments

A clearly set-out example, showing full working out.

Total: 3 Marks

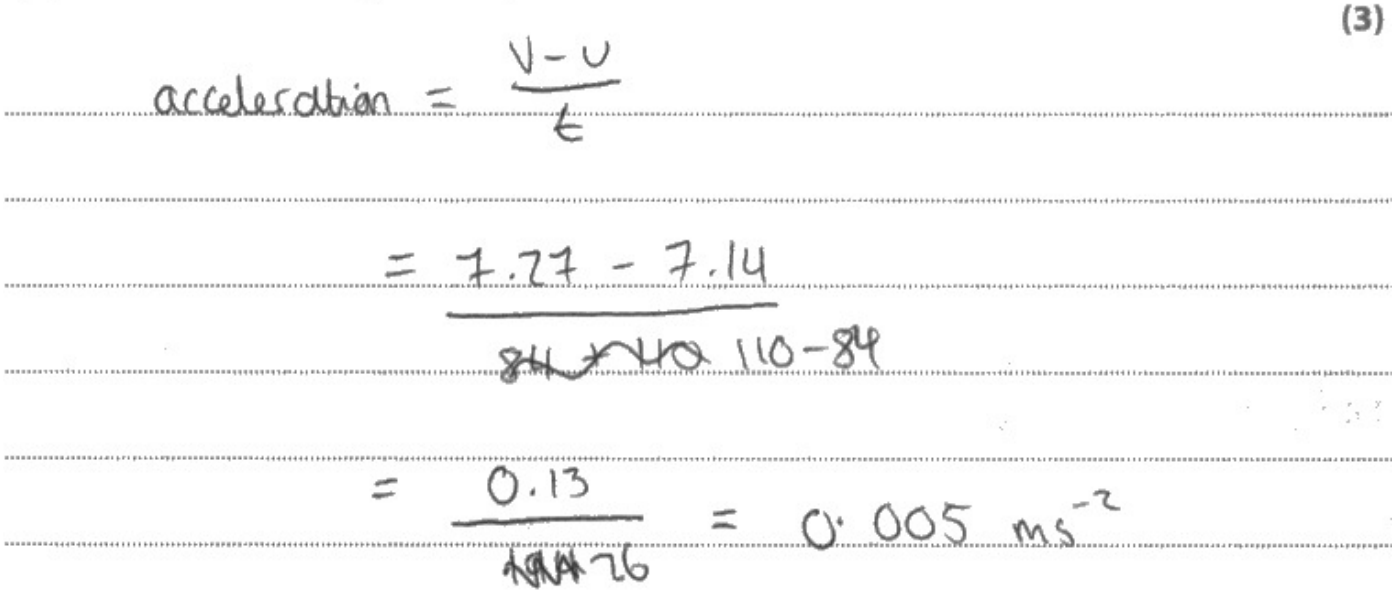
ResultsPlus
Examiner Tip

Remember to bring calculators.

There were different methods to calculate this answer and either was appropriate.

(c) Calculate the average acceleration between 600 m and 800 m.

(3)



ResultsPlus
Examiner Comments

This response shows full working out and units.

This candidate has not used the rounded answer from part b, but they could have done so.

Total: 3 Marks

Question 15

This question was well-answered, with candidates covering all areas of the mark scheme and able to use examples to support their answers.

The most frequent answers were warming up, protective equipment and technique.

The most usual incorrect answer linked to performing a cool down.

15 Outline **five** strategies that can be used to prevent sporting injuries.

(5)

protection equipment - for example cricket pads to protect legs from ball.

Conditioning - making sure you have trained to be at the right level physically for competition standards

Technique - Good technique can prevent ~~allow~~ any muscle tears or strains.

muscle balance - Having a good combination between muscle pairs and alignment.

Risk management - making sure the activities are acceptable for the athlete's training / games / event. For example using the correct surface for a football game. Just reducing as many risks as possible.

(Total for Question 15 = 5 marks)

ResultsPlus
Examiner Comments

This response scores maximum marks, setting out five clear points, which are outlined and easy to interpret.

Total: 5 Marks

ResultsPlus
Examiner Tip

Use a clear structure to set out your answer.

15 Outline **five** strategies that can be used to prevent sporting injuries.

(5)

Managing risks is one technique, this involves identifying potential hazards in a sport and putting measures in to place to mitigate them. For example, identifying signs of fatigue in a player and remaing them from play before their fatigue cause a mistake to be made which could injure them. Another is conditioning. This is preparing and training your body to be durable enough to withstand the level of performance required which reduces chances of injury. Another ~~technique~~ method is using correct technique. This reduces the changes of the performer being in incorrect positions and situations which could expose them to a higher risk of injury. For example, a rugby player not bending at the knees in rugby, increases risk of both injury. Another example is protective equipment. This ensures the performer is appropriately kitted for the conditions of that sport which reduces risk of injury. And finally muscle balance can prevent one side being weaker than the other which reduces risk of injury.

(Total for Question 15 = 5 marks)

ResultsPlus
Examiner Comments

This candidates makes five very clear, succinct points, which outline the strategies.

Total: 5 Marks

Question 16

This area of the specification was well-known and generally candidates scored well on this question.

The errors in application came on optimal loading (sometimes mistaken for overloading) and perhaps in listing rather than outlining.

There were some errors in not mentioning that swelling was reduced with elevation and with simply a description of elevating the body part and not why.

16 Outline the **five** stages of POLICE in the rehabilitation of injuries.

(5)

Protection – after the injury, the area must be covered to prevent further damage.

Optimal Loading – weight must gradually be applied in rehabilitation, e.g. learning to walk again after a broken leg. This promotes blood flow to area to promote healing.

Ice – Ice must be applied to area to reduce blood flow, reducing swelling and inflammation.

Compression – pressure must be applied to area to reduce blood flow, reducing swelling and inflammation.

Elevation – area of injury must be raised, usually above the heart, this reduces blood flow, reducing swelling and then inflammation.

ResultsPlus
Examiner Comments

This scores maximum marks, outlining each point.

Total: 5 Marks

ResultsPlus
Examiner Tip

Remember that 'outline' is not a list – you need a little more information on each one.

Question 17

This test was well-understood and well-known. There were a couple of descriptions of the yo-yo test but usually, candidates were able to score marks for the 20m distance, running between the cones/lines, and then marks for progressive and maximal being the most frequent. There was not enough detail applied in many cases to score maximum marks, despite this being known well.

Candidates did not use the responses *maximal* and *vo2 max* very often.

17 Outline the protocol for the multi-stage fitness test.

(5)

A Measure out 20m and place two cones at either end.
It is led by an audio player and the speed gradually increases.
The athlete runs to the other cone before the beep and then runs to the other end before the next beep.
The athlete is withdrawn from the test if they miss the signal twice.
The test goes up in levels, and increases then When the athlete finishes they compare their score to the national average.

ResultsPlus
Examiner Comments

This scores maximum marks and sets out the protocol in a sensible order.

Total: 5 Marks

ResultsPlus
Examiner Tip

Ensure you make at least five points if it is a 5-mark question – ideally six or seven, if you know them.

Question 18 (a)

This definition was not well-known at all. There was a general description of jumping on and off things, from the weaker candidates.

Eccentric and concentric were occasionally in the wrong order and therefore not credited.

18 (a) Define plyometric training.

(1)

involves

Eccentric contraction immediately before concentric contraction.

Used to improve power.

ResultsPlus
Examiner Comments

This is a clear definition, scoring the available mark.

Total: 1 Mark

ResultsPlus
Examiner Tip

Learn all the key terms in the specification.

Question 18 (b)

Candidates were able to talk of advantages and disadvantages, with *power*, *doms*, *risk of injury*, *cheap*, *little equipment* and *sports specific* being the most answers used most frequently.

It is important that candidates ensure they make enough points for the marks available. Those who set out their responses clearly were more able to check they had made enough points, perhaps splitting them into two paragraphs: one for advantages and one for disadvantages.

Apart from injury, few disadvantages were known, as compared with advantages.

(b) Summarise the advantages and disadvantages of plyometric training.

(6)

The advantages of plyometric training include the fact that it can develop power. It increases the speed of muscle firing patterns whilst also developing the speed of the neuromuscular pathway. Plyometric training requires minimal equipment and can be sport specific. Some of the disadvantages of plyometric training include the fact that the sudden bout of movement could cause injury due to the sudden impact. Furthermore, it is relatively unsuitable for novice performers due to its demanding nature. Finally, it may require specialist knowledge of the method of training. It may also require equipment.

ResultsPlus
Examiner Comments

Two clear paragraphs are used to summarise the advantages and disadvantages, with enough points being made for each, to avoid the submax score being applied.

ResultsPlus
Examiner Tip

Separate your response into advantages and disadvantages if asked to do so. Here is another example of an answer set out clearly as advantages and disadvantages scoring maximum marks.

Question 19

This question was very well-understood, with a large number of candidates scoring maximum marks.

If injuries were named as the classification, this response did not score further marks

19 Using examples, summarise the **two** main classifications of common sporting injuries and their causes.

Classification of common sporting injuries	Cause	Example
Acute - occurs at an instant at a specific moment in time (1)	sudden impact or stress on the body such as a collision with opponents (1)	concussion (1)
chronic - develop overtime due to repetitive and overuse of the same muscles and joints (1)	repeatedly using entirely the same muscles with poor technique and form (1)	tennis elbow - when (1)

ResultsPlus
Examiner Comments

This response scores maximum marks and is very clear to understand.

Total: 6 Marks

ResultsPlus
Examiner Tip

Give specific sporting examples when asked to do so.

19 Using examples, summarise the **two** main classifications of common sporting injuries and their causes.

Classification of common sporting injuries	Cause	Example
Acute (1)	Harsh/sudden contact or movement (1)	Fracture. (1)
Overuse (1)	repeated use/strain on muscle/tendon/ligament/bone. (1)	periostitis (1)

ResultsPlus
Examiner Comments

This response scores maximum marks.

Total: 6 Marks

ResultsPlus
Examiner Tip

You do not have to write extensively, if the information is accurate.

19 Using examples, summarise the **two** main classifications of common sporting injuries and their causes.

Classification of common sporting injuries	Cause	Example
Chronic ~~result~~ (1)	sustained stress to the body (1)	Shin Splints (1)
Acute (1)	sudden stress to the body (1)	dislocation of shoulder (1)

ResultsPlus
Examiner Comments

This response scores maximum marks.

Total: 6 Marks

Question 20

Many candidates were able to identify the correct types of test, and wrote well about MSFT, steps tests, cooper and yo yo most frequently.

The important part of this question was the examination – which are the most suitable tests and why? There were some errors, with candidates identifying anaerobic tests rather than aerobic. However, those candidates who did identify the correct test, focussed on protocol rather than an examination of their suitability.

This is an area for candidates to develop, in being able to examine their thoughts about suitability in depth. For example, are some tests more suitable for some activities – tests where running or cycling are required, for example, or is equipment easily accessible and so on.

20 Examine different fitness tests used to measure aerobic power. (8)

Aerobic power refers to the ability to sustain a high intensity before moving into the anaerobic system.

Cooper run tests how far a person can run in 12 minutes, which is valid to ecvalue power by demonstrating a prolonged high intensity. Equally, this test is easily available to anyone as it includes no equipment, so results can be easily compared and representable. Although, you could argue it isn't always sport specific for perhaps a runner or cyclist. Therefore, a cyclist may benefit from the gas analysis, whereby the composition of air expired is analysed through a specialist hood, whereby its contents are analysed to determine individuals VO2 max. This is also a good fitness test for exercise economy. However, it requires specialist equipment and is not easily accessible or cheap. Though its mainly done through cycling and running, it can be conducted through other ways, therefore has potential for it to be sport specific.

Another fitness test for aerobic power includes the step tests. This requires person to maintain in a constant rate of 22 steps up and down each minute for 3 minutes (264 steps for men). Once this has completed, heart rate is recorded and ordered using a fitness index. This can be used to determine personalised training zones, along with Ventilatory threshold fitness test, which measures at an athletes VO2A point, ultimately determining a persons aerobic power.

(Total for Question 20 = 8 marks)

ResultsPlus
Examiner Comments

This is an example of work that *examines* well.

It examines:

- why a test might be useful
- to which activity it is suited
- the cost and accessibility of the machines

This scores maximum marks.

Total: 8 marks

ResultsPlus
Examiner Tip

To *examine* something you have to ask yourself – so what? Why is it a suitable test?

Question 21

The best candidates were able to discuss a range of supplements and make the specific link to how performance improves.

The weaker candidates were not able to link them to the performance with practical examples: they only listed supplements and what they did.

There was also an over-reliance on herbal remedies, rather than supplements that have an evidence-base. There was a lack of critical thought. It would be good to hear that there is a lack of evidence for some of these supplements.

Some candidates did examine how the supplements enhanced performance but very few used sporting examples to support the points that they made.

21 Using examples, examine how dietary supplements can be used to enhance sporting performance.

(8)

and delay fatigue

One dietary Supplement such as Caffine can be used to increase reaction time. This enhances performance in sports such as game-play sports like football and rugby as it requires quick reactions to the speed of play. However, it is a diuretic which can cause weight loss and dehydration. Another Supplement such as Creatine can be used to enhance Sporting performance. This is because it can increase Atp-pc Stores in the Muscles. As well as this it will allow the athlete to use the systems for longer as they usually depete after 10-12 seconds. This will be useful in More explosive sports such as weightlifting and Sprinting. However it can lead to weight gain and Another dietary Supplement that can be used to enhance Sporting performance is ~~hypertonic drinks~~ omega-3 fish oils. This is because it help loosen up joints allowing for more allowing body Movems. This is used in sports where there is alot of flexible Movems with joints such as gymnastics One last dietary Supplements that can be used to enhance Sporting performance is hypertonic drinks. These have higher glucose levels than blood glucose levels allowing them to have More energy in performance which can help delay fatigue so persons can carry on for longer. These drinks are like lucozade. This is good for long distance athletes or games players.

(Total for Question 21 = 8 marks)

ResultsPlus
Examiner Comments

This gives detail about why supplements are useful. For example, taking creatine allows athletes to stay in the ATP PC system for longer and then applies it to sports where this is useful. This scores a top mark.

In this example, the candidate has a very clear application for each supplement and examines why this is useful.

21 Using examples, examine how dietary supplements can be used to enhance sporting performance.

(8)

Caffeine can be used to increase the reaction time of an athlete. This is extremely useful for 100 metre sprinters who will need to react as quickly as possible to the sound of the gun so that they can get an edge over their competents and have a higher chance of finishing the race in a quicker time than their opponents. Protein supplementation is extremely important for any strength or power athlete as they will want protein synthesis to occur more efficiently in order for muscular hypertrophy to occur, meaning they will have higher levels of force output for ~~events~~ events such as triple jump. It will also result in hyperplasia and as the muscles will recover from high intensity activity at a quicker rate, this means that they will be able to get back to training quicker and therefore will be able to train and perfect the skills of their events more, in order to optimise performance. Creatine is another supplement which can be used to enhance the performance of power athletes. This is because it can increase the duration of the PC energy system for an extra 2 seconds, this would be very significant in enhancing a 100m sprinter's performance as ~~they~~ with creatine supplementation they will be able to work at maximal intensity for potentially 12 seconds as opposed to 8-10. This enhances performance, as it means they will not decelerate as quickly as other athletes.

ResultsPlus
Examiner Comments

This is another top-band answer, where the application is clear, especially in the point relating to creatine, at the end. This explains why creatine is useful for the sprinter.

Total: 8 Marks

Question 22

Candidates have a good understanding of periodisation but were not as strong at linking it to the specific context of the question.

They knew the terminology, such as macro cycle, meso cycle, competition phase and transition phase. However, general and specific phases were less well-explained.

This question was specifically linked to world championships or Olympic games and that very specific context was not well-enough utilised. For example the two – or four-year preparation times, or the extension to five years, with Covid-19.

Very few examples of athletes or sports were used in answers to support the points being made, which would have improved the answers. There was some discussion about football seasons, which was not relevant. Candidates did not always know what were Olympic sports, to support answers.

Always read the context of the question – in this case, an Olympic or World Championship event.

Try to apply your understanding to the specific context.

***22** Analyse how an athlete can use periodisation to prepare for an Olympic or World Championship event.

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

(15)

Periodisation consists of ~~mesocycles~~ macrocycles, mesocycles and microcycles.

Firstly, in the general Preparation Phase, athletes will work to improve their general fitness. A team sprinter would use strength and Plyometric training to improve their strength and Power. This will benefit them in the Competition Phase. A microcycle at this stage will include a training plan consisting of different strength and Weights exercises. They may use technology such as force plates in the general Preparation Phase inorder to track Progress of Power. This will help to keep their motivation high while training since it allows them to see their Progress. In this Phase, the intensity and Volume of training are high inorder to be Prepared for the Competition Phase later on in the season. They may Work with a Physiotherapist at this time as it is Crucial to avoid overtraining and injury when Preparing for a Competition Phase. This general Prep will be Place for an olympic athlete 4 years before the olympics since they will work on a longer cycle between the olympics & Commonwealth games.

Next, in the Specific Preparation Phase they will start to focus on technique and more short Specific exercises. This will allow them

to refine technique initially. For example, a Netball player would take part in circuit training. This would allow them to maintain their fitness while focusing on a variety of different skills such as shooting, defending and footwork in corners for example. At this stage the intensity of training is highest as they are close to the competition phase. A Coach or trainer would be focusing on their technique at this stage, using video analysis in order to compare techniques to other elite athletes and see how they can improve. A mesocycle lasts a few weeks, at this stage each mesocycle may have a component of fitness or aspect of the skill they have set in that they should aim to improve. Maintain A marathon runner may use aerobic when preparing for a marathon to have increased glycogen stores

For

Furthermore, the competition phase is where they take part in the event. And At this point training volume decreases. This is in order to reduce the risk of injury when competing. Another study strategy can a marathon runner would use to avoid injury is tapering. This is where two-three days before competition they stop training. This allows the body to be fully recovered and refreshed for when they take part in the marathon. The main aim in the competition phase is to maintain fitness level, refine technique and ensure an athlete is prepared for the event. In this phase, a Netball team competing in or the World Cup would use GPS/Post technology tracker to track how their individual athletes. It can also identify to a coach an athlete that may be at a higher risk of injury. They can therefore rest them may for the next match. Rest is crucial in this stage to help muscle and prevent injuries.

Finally, in the transition phase, an athlete will recover from the competition phase by taking part in light aerobic exercise. They may use a heart rate monitor in order to track the intensity they are working at. In this stage the training intensity and volume are low so an athlete can fully recover. The transition phase is the link between two training cycles. The process starts over. ~~Marathon~~ runner ~~[illegible]~~

Overall, an athlete can use many strategies and technologies when preparing for a large event. Technology is important to help track progress and ensure an athlete is working at the correct intensity so they get the most from training. The programme depends on the sport. A sport such as tennis will have a much more individual programme than a football player since they work by themselves and do not need to build strategies with their team mates. An athlete should vary training when preparing for a competition as it will increase motivation since there will be less boredom.

ResultsPlus
Examiner Comments

This scores in the top band, with 13 marks.

Total: 13 Marks

ResultsPlus
Examiner Tip

Read the question carefully

Paper Summary

For further improvement, candidates should :

- Learn to 'examine' by unpicking the issue in greater detail
- Support points made with practical examples
- Be able to apply their understanding to the specific scenario or question given

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