Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

Summer 2019

Pearson Edexcel GCE

In Physical Education (8PE0)

Component 1: Scientific Principles of Physical Education

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Summer 2019
Publications Code 8PE0_01_1906_ER*

Introduction

Overall, candidates are showing a better understanding of key terminology in most areas. Candidates still need to ensure they understand what is expected of the command words as marks were often lost for not linking answers.

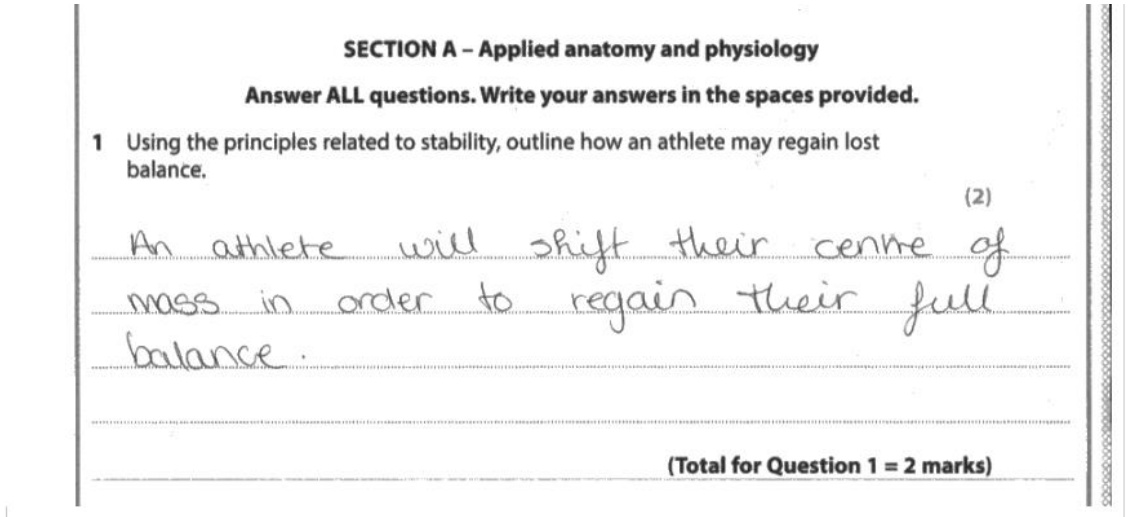
Most questions showed a good spread of marks with only two questions poorly answered by significant numbers of candidates (Q10: determinants of sprinting) and Q15 PNF stretching). The longer questions showed an improvement on the last series in terms of accessing more AO3 marks and were written in a far more logical manner. Few candidates are still accessing Level 4 due to lack of detailed analysis and conclusion or, in the case of the (*) question, still not including content from across the specification.

Centres are encouraged to continue to make good use of Inside Track and the topic guides to ensure candidates are aware of the expected depth and use of language.

8PE0_01_Q01

Most candidates were able to identify that the centre of mass/gravity played an important role in stability, but many failed to discuss in terms of principles of stability and where the centre of mass needed to be.

The following response shows some understanding but not enough detail to score any marks.



SECTION A – Applied anatomy and physiology

Answer ALL questions. Write your answers in the spaces provided.

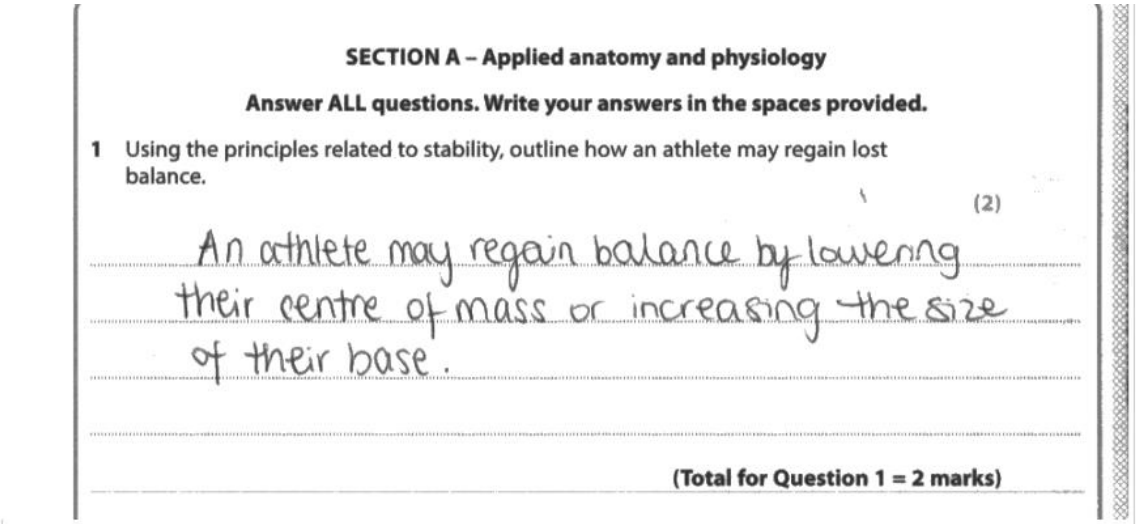
1 Using the principles related to stability, outline how an athlete may regain lost balance.

(2)

An athlete will shift their centre of mass in order to regain their full balance.

(Total for Question 1 = 2 marks)

The following response clearly identifies two principles of stability and scores 2 marks.



SECTION A – Applied anatomy and physiology

Answer ALL questions. Write your answers in the spaces provided.

1 Using the principles related to stability, outline how an athlete may regain lost balance.

(2)

An athlete may regain balance by lowering their centre of mass or increasing the size of their base.

(Total for Question 1 = 2 marks)

8PE0_01_Q02a

The vast majority of candidates correctly identified Type 1/slow titch/oxidative fibres.

8PE0_01_Q02b

The majority of candidates were able to identify that these muscle fibre types were resistant to fatigue, but many failed to link the explanation to a characteristic. Stronger candidates were able to identify several characteristics and link an explanation.

This response simply repeats the fact that there is a high resistance to fatigue but it is linked to the slow speed of contraction so scores 2 marks.

(b) Explain how the characteristics of these fibres are suitable for a marathon runner.

(4)

Type 1 muscle fibres are slow twitch fibres which work aerobically. This would be suitable for a marathon runner as they will be working aerobically for very long periods during the majority of the race. Due to the slow contractions of ~~this~~ these muscle fibres this allows them to endure longer periods of exercise for a longer time period. These muscle fibres would be extremely well suited to a marathon runner due to their need to work aerobically for long periods of time.

The following response covers a number of characteristics but also links the answer with a clear explanation of the suitability for a marathon runner and scores maximum 4 marks.

(b) Explain how the characteristics of these fibres are suitable for a marathon runner.

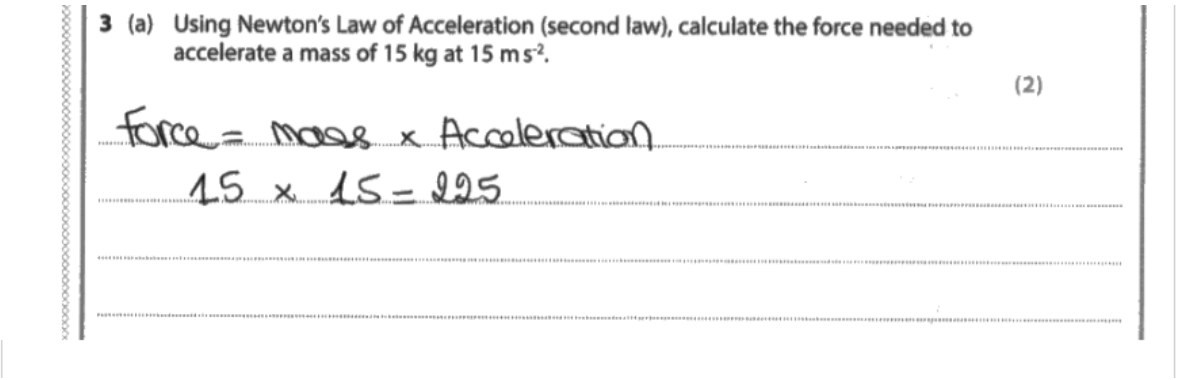
(4)

They are small in diameter which allows for a short diffusion distance. High capillary density so there is an increased oxygen supply and increased waste product removal which would make it easier to work for longer durations at higher intensities. Large and numerous mitochondria and high aerobic enzyme concentration so that ATP from aerobic respiration can be produced at a fast rate; providing the runner with energy.

8PE0_01_Q03a & 8PE0_01_Q03b

The vast majority of candidates were able to identify the correct formula and units of measurement with many scoring maximum marks. Those who did not score maximum either confused the units or gave no units with only a very few using the incorrect formula.

This response shows a clear understanding of how to calculate but as no units are used it only scores 1 mark.



3 (a) Using Newton's Law of Acceleration (second law), calculate the force needed to accelerate a mass of 15 kg at 15 $m s^{-2}$.

(2)

Force = mass x Acceleration

15 x 15 = 225

8PE0_01_Q04a

Most candidates were able to correctly identify the three components.

8PE0_01_Q04b

Many candidates were able to identify both advantages and disadvantage of this type of lever although some were confused as to which arm was shorter and incorrectly identified advantages and disadvantages.

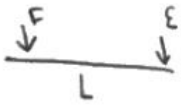
The following response correctly identifies arm length and then highlights both an advantage and disadvantage to score maximum 3 marks.

(b) Describe the advantages and disadvantages of a second class lever.

(3)

A second class lever has mechanical advantage because the effort arm is always larger than the load arm. This is an advantage because large loads can be carried with minimal effort. However a disadvantage is that loads can not be carried at a fast rate.

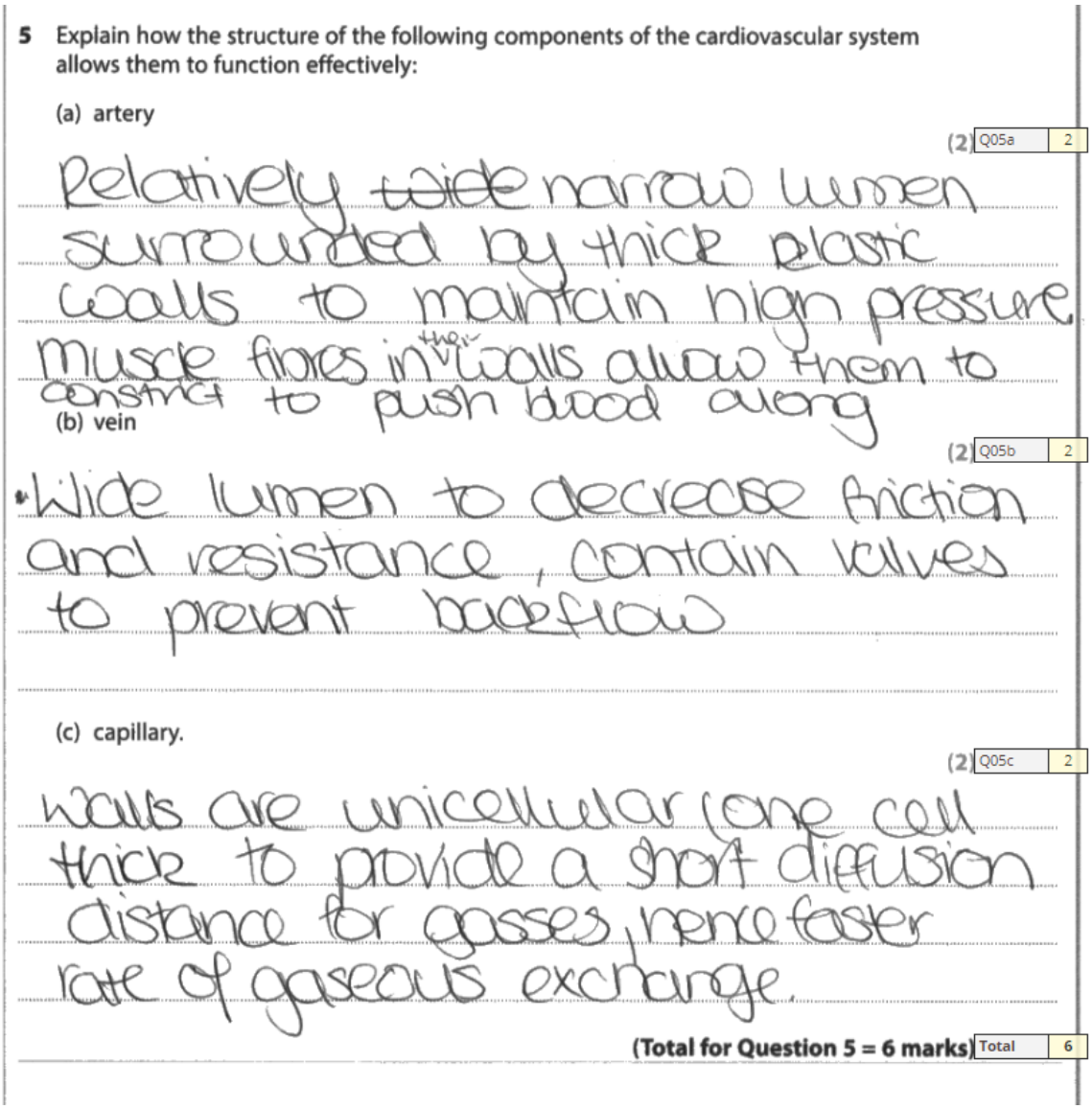
(Total for Question 4 = 6 marks)



8PE0_01_Q05

Most candidates were able to identify characteristics and function of most vessels. Some candidates showed confusion over the difference between diameter of the vessel and size of the lumen.

The following response clearly describes at least one characteristic of each vessel and how that aids its function.



5 Explain how the structure of the following components of the cardiovascular system allows them to function effectively:

(a) artery

(2) Q05a 2

Relatively ~~wide~~ narrow lumen surrounded by thick elastic walls to maintain high pressure. Muscle fibres in the walls allow them to constrict to push blood along

(b) vein

(2) Q05b 2

Wide lumen to decrease friction and resistance, contain valves to prevent backflow

(c) capillary.

(2) Q05c 2

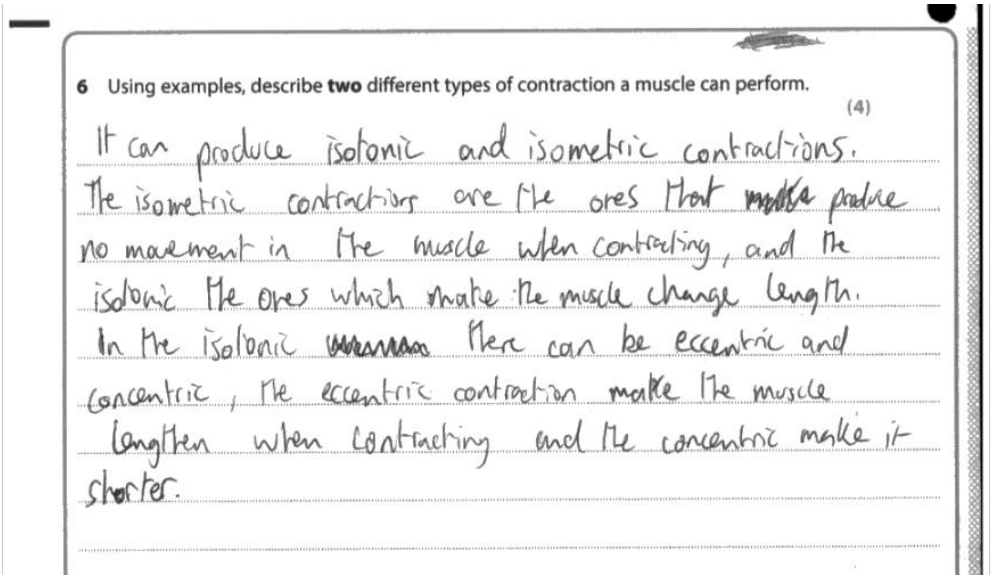
walls are unicellular (one cell thick to provide a short diffusion distance for gasses, hence faster rate of gaseous exchange.

(Total for Question 5 = 6 marks) Total 6

8PE0_01_Q06

Most candidates were able to correctly identify different types of contractions but not all gave a detailed enough description or example to clarify this.

The following response gives a clear description of three different types of contractions but no examples so only scores 2 marks.

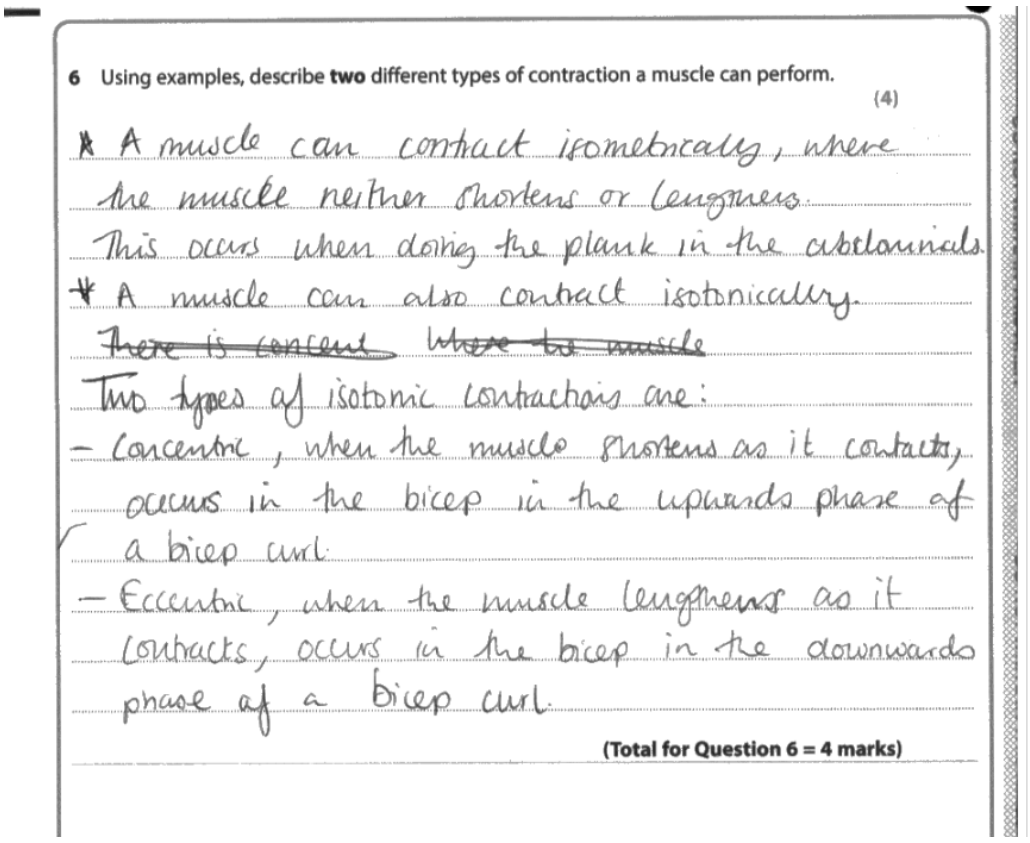


6 Using examples, describe **two** different types of contraction a muscle can perform.

(4)

It can produce isotonic and isometric contractions. The isometric contractions are the ones that produce no movement in the muscle when contracting, and the isotonic the ones which make the muscle change length. In the isotonic there can be eccentric and concentric, the eccentric contraction make the muscle lengthen when contracting and the concentric make it shorter.

The following response also gives a clear description of three different types of contractions with suitable examples and scores a maximum of 4 marks. (Only two types were needed so maximum was scored with first two descriptions and examples)



6 Using examples, describe **two** different types of contraction a muscle can perform.

(4)

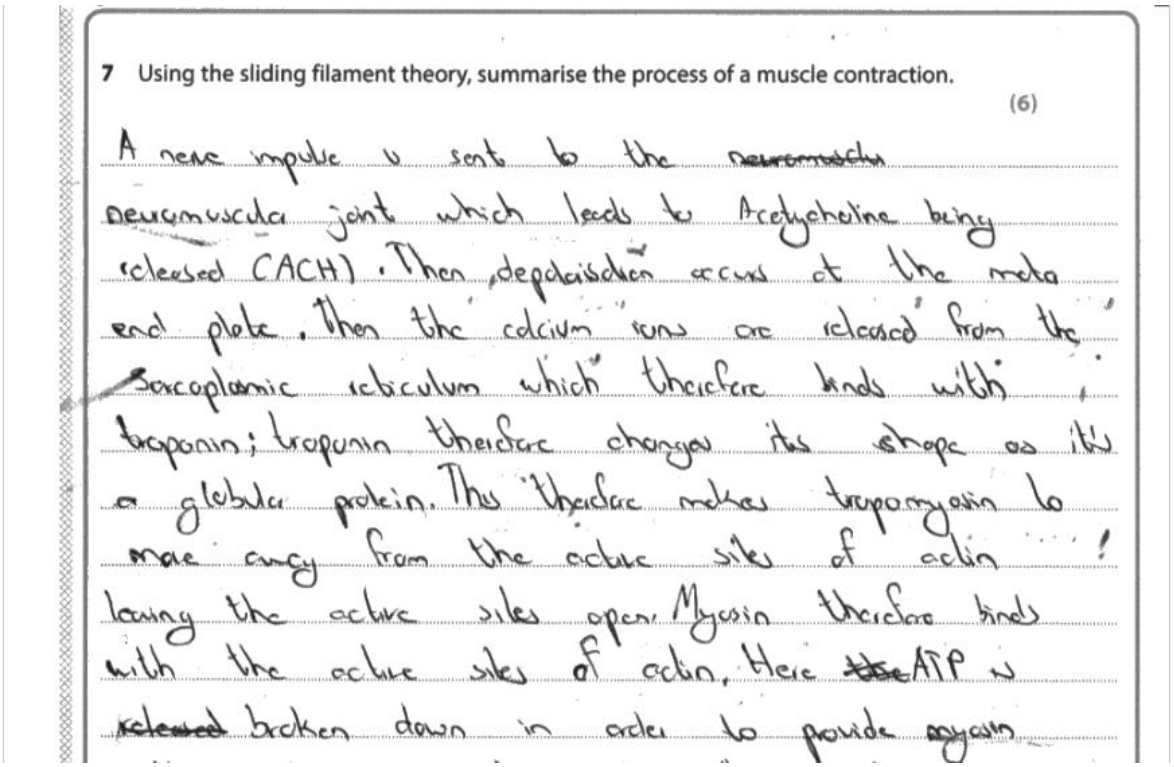
* A muscle can contract isometrically, where the muscle neither shortens or lengthens. This occurs when doing the plank in the abdominals.
* A muscle can also contract isotonically. ~~There is concent where the muscle~~ Two types of isotonic contractions are:
- Concentric, when the muscle shortens as it contracts, occurs in the bicep in the upwards phase of a bicep curl.
- Eccentric, when the muscle lengthens as it contracts, occurs in the bicep in the downwards phase of a bicep curl.

(Total for Question 6 = 4 marks)

8PE0_01_Q07

Many candidates gave an extremely detailed, well-organised answer showed a clear understanding of the sliding filament theory. Others showed some knowledge of the area but confused some of the stages.

The following response summarises the process in a logical well-structured way and scores maximum (6) marks.



7 Using the sliding filament theory, summarise the process of a muscle contraction.

(6)

A nerve impulse is sent to the ~~neuromuscular~~ neuromuscular joint which leads to Acetylcholine being released (ACH). Then depolarisation occurs at the motor end plate. Then the calcium ions are released from the Sarcoplasmic reticulum which therefore binds with troponin; tropunin therefore changes its shape as it's a globular protein. This therefore makes tropomyosin to move away from the active site of actin leaving the active sites open. Myosin therefore binds with the active sites of actin. Here ~~the~~ ATP is ~~released~~ broken down in order to provide energy with enough energy to make it possible for myosin to pull on to the actin leading to the muscle shortening. This process will continue ~~being~~ continuously as long as there is enough ATP and calcium being released by the body. When there is no more ATP and calcium being released to bind with troponin then this leads to the muscle relaxing.

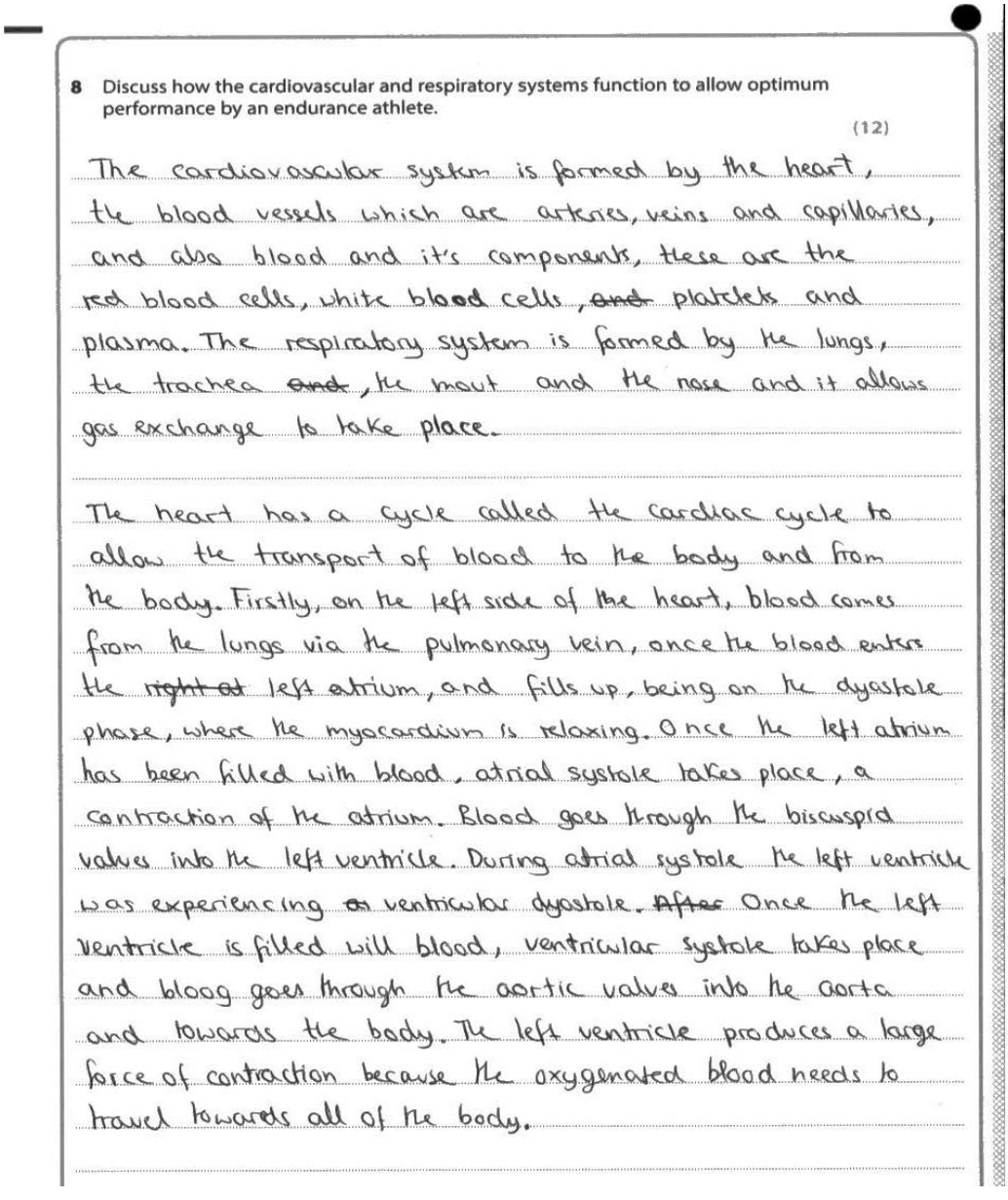
(Total for Question 7 = 6 marks)

The sliding filament theory has 5 steps which are Rest → Excitation → Contraction → Recharge → Relaxation.

8PE0_01_Q08

Many candidates showed a clear understanding of how both the cardio vascular system and the respiratory work. Many candidates also discussed how both can be improved through training. In both cases, candidates clearly described the impact this had on performance and consequently many candidates accessed Level 3 scores for this question. However, only some actually linked how the systems worked together as the question asked, and therefore only a very few accessed Level 4.

The following response shows a comprehensive understanding of the workings of both the cardio vascular and respiratory systems with frequent referral to how performance is affected. This gained a Level 4 score but still lacked depth in the analysis so didn't score maximum marks.



8 Discuss how the cardiovascular and respiratory systems function to allow optimum performance by an endurance athlete.

(12)

The cardiovascular system is formed by the heart, the blood vessels which are arteries, veins and capillaries, and also blood and it's components, these are the red blood cells, white blood cells, ~~and~~ platelets and plasma. The respiratory system is formed by the lungs, the trachea ~~and~~, the mouth and the nose and it allows gas exchange to take place.

The heart has a cycle called the cardiac cycle to allow the transport of blood to the body and from the body. Firstly, on the left side of the heart, blood comes from the lungs via the pulmonary vein, once the blood enters the ~~right at~~ left atrium, and fills up, being on the dyastole phase, where the myocardium is relaxing. Once the left atrium has been filled with blood, atrial systole takes place, a contraction of the atrium. Blood goes through the biscuspid valves into the left ventricle. During atrial systole the left ventricle was experiencing ~~an~~ ventricular dyastole. ~~After~~ Once the left ventricle is filled will blood, ventricular systole takes place and blood goes through the aortic valves into the aorta and towards the body. The left ventricle produces a large force of contraction because the oxygenated blood needs to travel towards all of the body.

On the left side of the heart the same process, ~~takes place but~~ atrial and ventricular systole and diastole, but the vessels and blood are different. The blood is deoxygenated and comes from the body via the vena cava and goes through the tricuspid valves. Blood on the left side of the heart leaves through the pulmonary valves into the pulmonary artery to the lungs.

Arteries carry oxygenated blood at high pressure to reach the capillaries as fast as possible and has thick walls so the walls don't break to reach the capillaries. Once in the capillaries ~~blood~~ gaseous exchange takes place because of the thin walls of capillaries. This allows faster gas exchange so the athlete can have ~~more~~ oxyge faster and therefore sustain longer periods of exercise without fatigue.

The respiratory system is adapted for endurance athletes due to the demands of oxygen.
Oxygen reaches the lungs through the branches, into the branchi and to the alveoli. In the alveoli oxygen is diffused into the blood and carbon dioxide from the blood into the alveoli. This allows oxygen to travel faster to the muscles. By having more alveoli, more oxygen can be diffused.

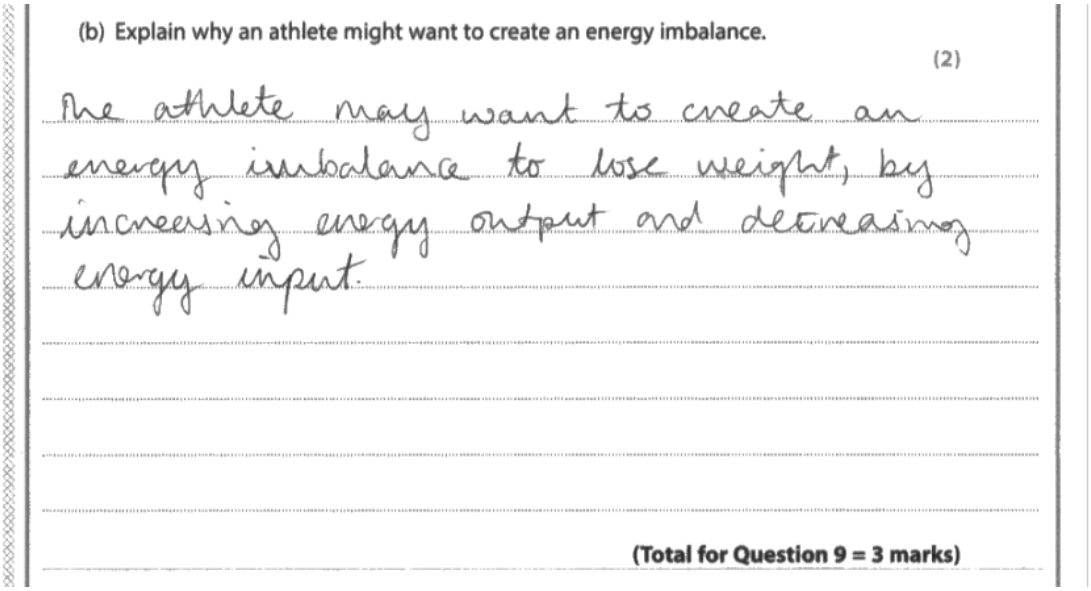
In the muscle cells the oxygen diffuses into the cells for respiration and the carbon dioxide into the blood as it is a waste product. The oxygen allows muscles to ~~have~~ produce ATP, therefore producing more energy and sustaining exercise for longer periods of time.

In conclusion the cardiovascular system can transport oxygen to muscles and allow the diffusion of oxygen faster.
The respiratory system can recieve higher amount of oxygen to be transported to the muscles and therefore produce more ATP.

8PE0_01_Q09a and 8PE0_01_Q09b

Most candidates were able to clearly define the term energy balance and explain how to both loose weight and gain weight. Some students only referred to either gaining or losing weigh and not both and therefore did not score the second mark.

In this response, the candidate simply repeats the way in which an athlete could lose weight and so scores only 1 mark.



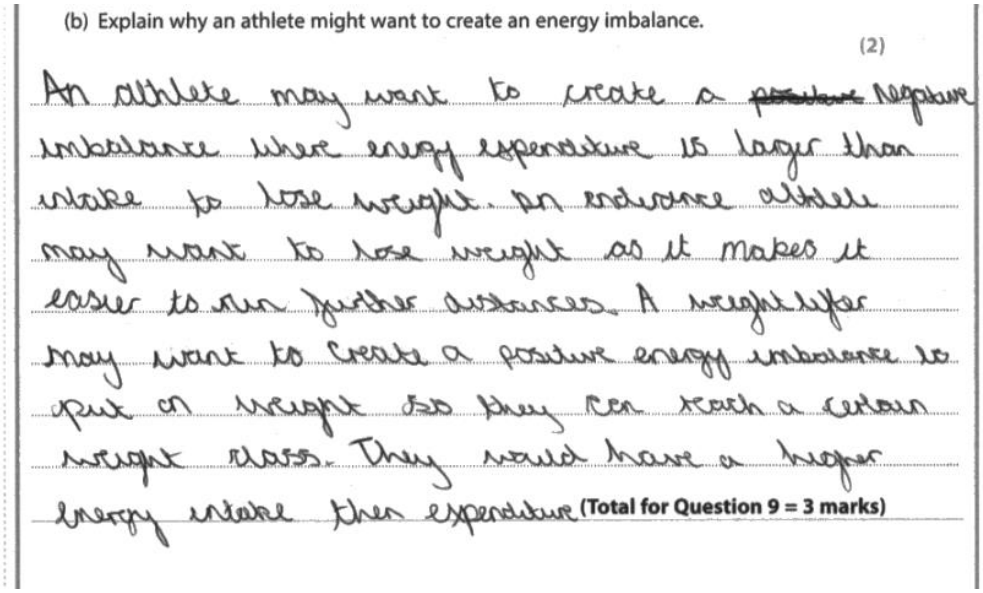
(b) Explain why an athlete might want to create an energy imbalance.

(2)

The athlete may want to create an energy imbalance to lose weight, by increasing energy output and decreasing energy input.

(Total for Question 9 = 3 marks)

In this response the candidate clearly identifies both gaining and losing weight as a result of energy imbalance.



(b) Explain why an athlete might want to create an energy imbalance.

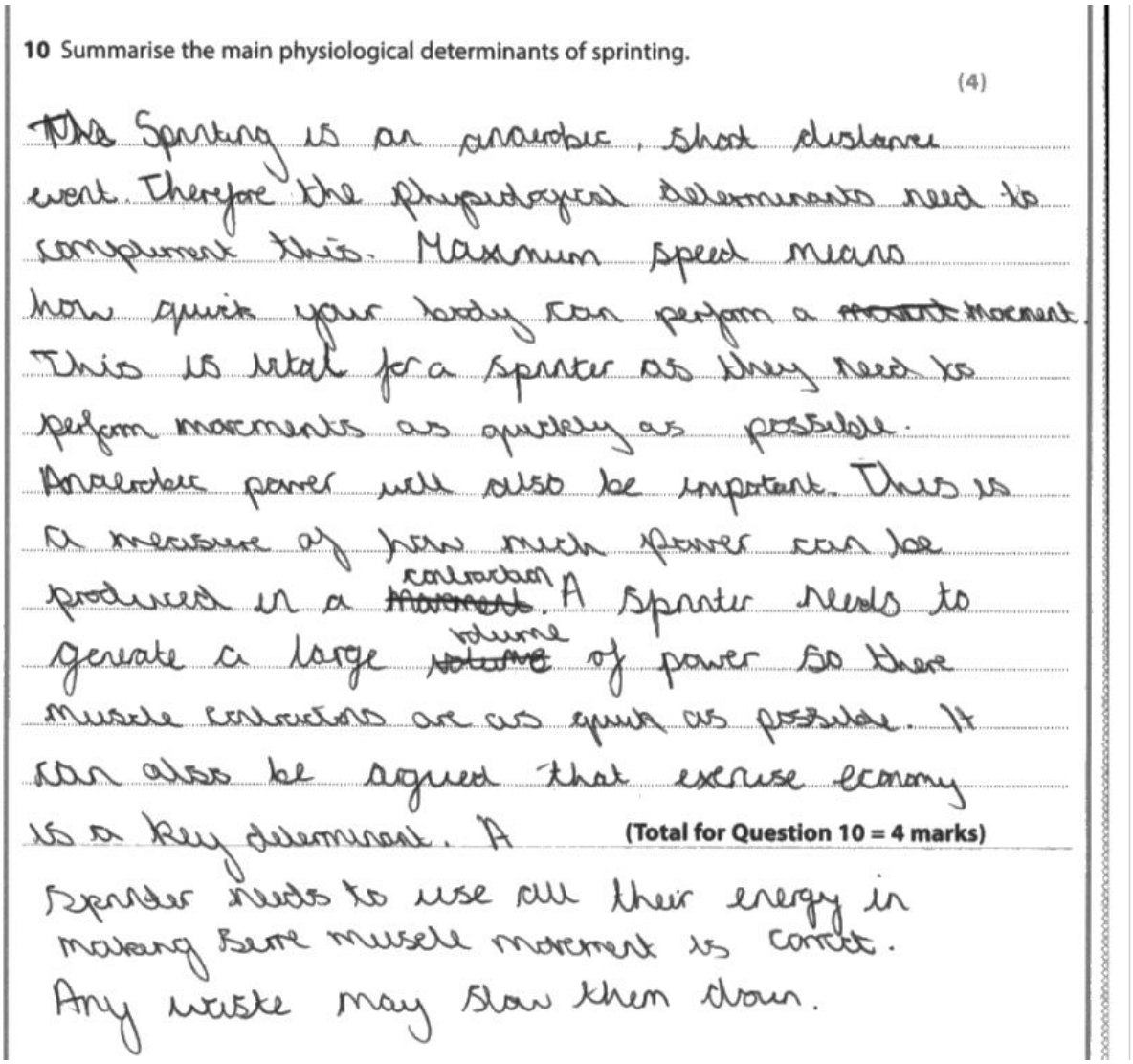
(2)

An athlete may want to create a ~~positive~~ Negative imbalance where energy expenditure is larger than intake to lose weight. An endurance athlete may want to lose weight as it makes it easier to run further distances. A weight lifter may want to create a positive energy imbalance to put on weight so they can reach a certain weight class. They would have a larger energy intake than expenditure (Total for Question 9 = 3 marks)

8PE0_01_Q10

This was a very poorly answered question with most students lacking the correct technical language in their response. This is a new part of the specification that has been included in questions in prior exam series and centres/candidates are advised to look at previous examiner reports and use the topic guide to ensure the correct terminology is used in answers.

The following response shows a good understanding of the terminology required and scored 3 marks.



10 Summarise the main physiological determinants of sprinting.

(4)

This Sprint is an anaerobic, short distance event. Therefore the physiological determinants need to complement this. Maximum speed means how quick your body can perform a ~~movement~~ movement. This is vital for a sprinter as they need to perform movements as quickly as possible. Anaerobic power will also be important. This is a measure of how much power can be produced in a ~~movement~~ contraction. A Sprinter needs to generate a large ~~volume~~ burst of power so their muscle contractions are as quick as possible. It can also be argued that exercise economy is a key determinant. A Sprinter needs to use all their energy in making sure muscle movement is correct. Any waste may slow them down.

(Total for Question 10 = 4 marks)

8PE0_01_Q11

Most candidates were able to identify contemporary technology with most identifying advantages of their use with variety of display and accuracy being the most common areas discussed. However, many candidates failed to highlight any disadvantages or discussed the use of technology in areas other than in measuring fitness.

In this response, the candidate gains 2 marks for the description of 2 contemporary technologies uses, however the response gains no marks for the force plates example as they are clearly used in terms of technique and not fitness.

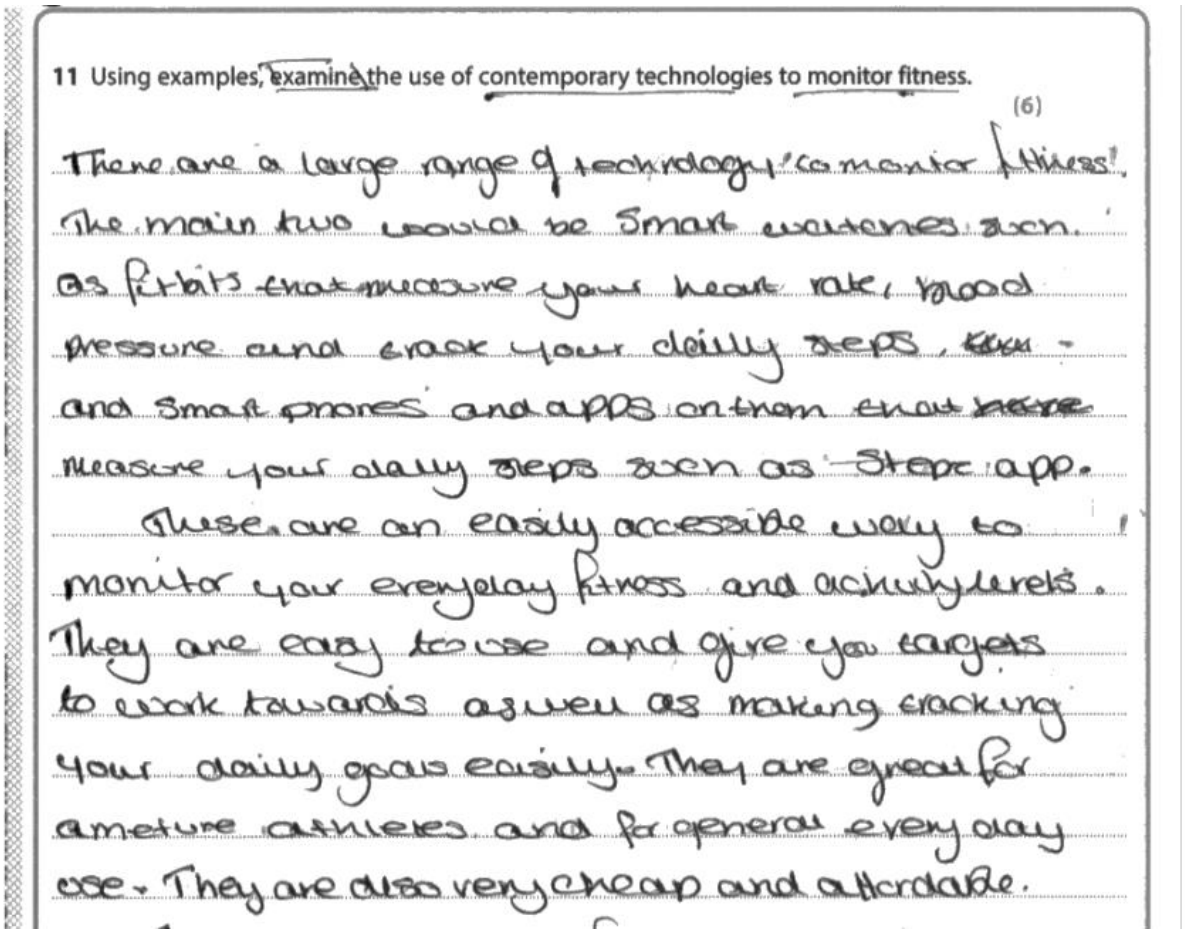
11 Using examples, examine the use of contemporary technologies to monitor fitness.

(6)

Contemporary technologies are used to monitor fitness especially more now in the modern days. A contemporary technology is a pedometer this will count the amount of steps an athlete is doing so you can check if you're reaching the average goal which is 10,000 steps a day and can set your own goals. An example of this is a fitbit. Fitbits can now also check your heart rate so you can monitor the rate of your heart during exercise and see if it's too high or too low and if it's decreasing as your training and fitness increases overtime. Another example is force plates, force plates examine the force exerted during movements from the foot. This can help coaches examine an athlete when jumping as they can see if the athelete is exerting the right amount of force on the right area at the right time of the jump.

(Total for Question 11 = 6 marks)

This response highlights a number of advantages of the use of technology with good examples, but also highlights disadvantages and scores 6 marks.



11 Using examples, examine the use of contemporary technologies to monitor fitness.

(6)

There are a large range of technology to monitor fitness. The main two would be Smart watches such as fitbits that measure your heart rate, blood pressure and track your daily steps, ~~and~~ and Smart phones and apps on them that measure your daily steps such as Steps app.

These are an easily accessible way to monitor your everyday fitness and activity levels. They are easy to use and give you targets to work towards as well as making tracking your daily goals easily. They are great for ameture athletes and for general every day use. They are also very cheap and affordable.

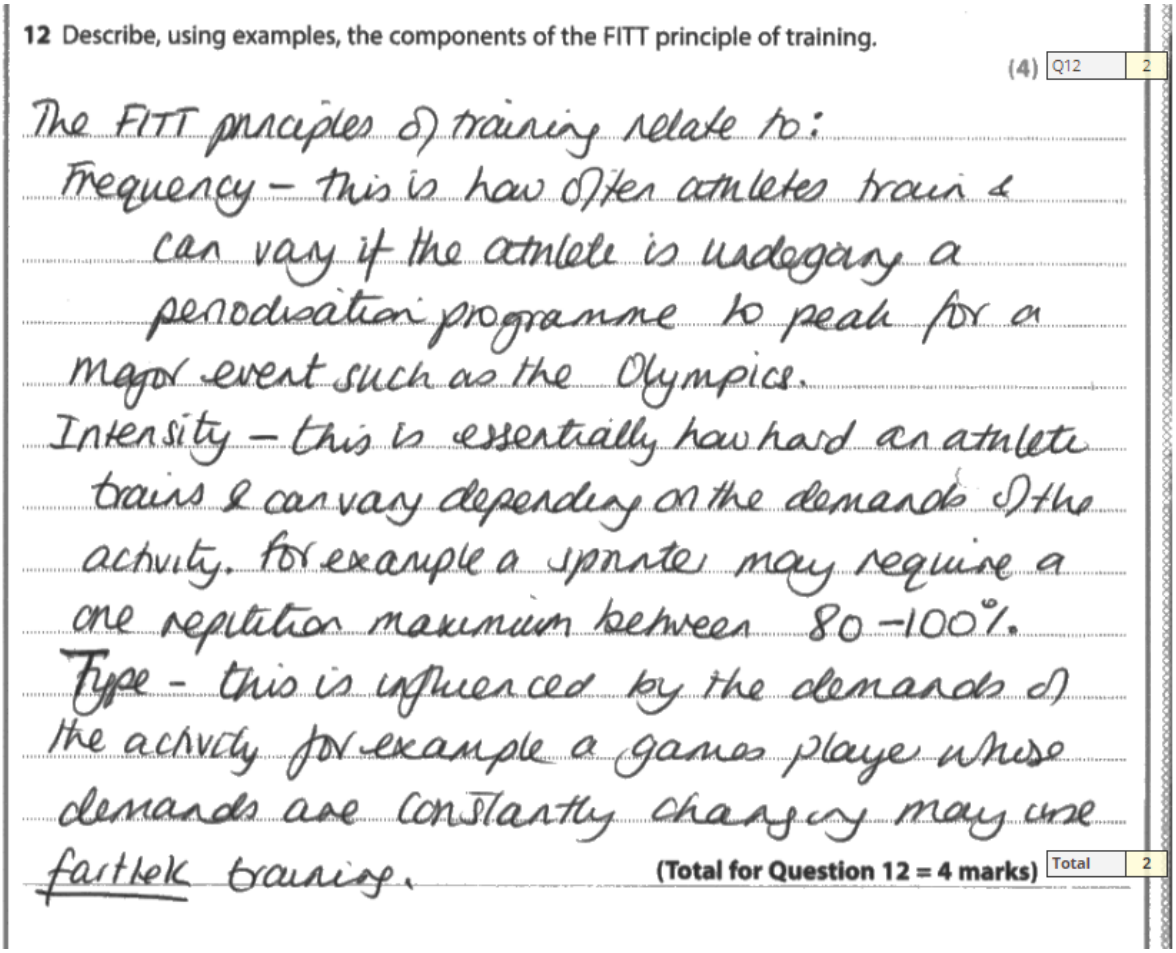
They are not great for top level professional athletes as they have been proven to be very inaccurate and are not a correct measure of fitness or activity levels. There is the risk of informational breaches allowing for peoples personal fitness data to be shared or stolen. There are many new technologies such as GPS trackers that are more accurate and allow for greater representation of activity levels and fitness tracking.

(Total for Question 11 = 6 marks)

8PE0_01_Q12

Most candidates were able to identify the components of the FITT principle, but a significant number failed to use an appropriate example to show their understanding for all components and therefore scored no marks.

The following response clearly shows the candidate gaining two marks for expanding the answer for intensity and type with good examples, but no mark for frequency as no detailed example is given.



12 Describe, using examples, the components of the FITT principle of training.

(4) Q12 2

The FITT principles of training relate to:
Frequency – this is how often athletes train & can vary if the athlete is undergoing a periodisation programme to peak for a major event such as the Olympics.
Intensity – this is essentially how hard an athlete trains & can vary depending on the demands of the activity. for example a sprinter may require a one repetition maximum between 80–100%.
Type – this is influenced by the demands of the activity for example a games player whose demands are constantly changing may use fartlek training.

(Total for Question 12 = 4 marks) Total 2

8PE0_01_Q13

This was a well answered question with most candidates showing some understanding of the use of both hypertonic and isotonic sports drinks. Many referred to osmotic pressure and the consideration of timing of consumption.

The following response refers to osmotic pressure, timing of consumption and the benefit of each type of drink and gains maximum marks. (6)

13 Examine the use of hypertonic and isotonic solutions by athletes.

(6)

Athletes use hypertonic drinks to replenish glucose / fill up with glucose. These drinks contain around 20% glucose/ sugars, so are great for short-term energy but not quenching your thirst. Typically consumed before an event to give a boost of energy. E.g. lucozade sport, Powerade

Isotonic drinks are the middle man of sports drinks, they contain around 5-7% glucose/sugars ~~aa~~ but also help quench thirst. These are usually consumed during and after events. Because they give a slight boost in energy and quench an athletes thirst.

(Total for Question 13 = 6 marks)

8PE0_01_Q14

This question was not well answered with many candidates showing confusion over what the method was. Candidates who showed a clearer understanding of RPE were able to highlight many disadvantages in good detail, but advantages were often vague.

The following response highlights 2 advantages and 2 disadvantages in just enough depth to gain 4 marks.

14 The rate of perceived exertion (RPE) is often used to measure the intensity of physical activity.

Examine the advantages and disadvantages of using this method.

(6) Q14 4

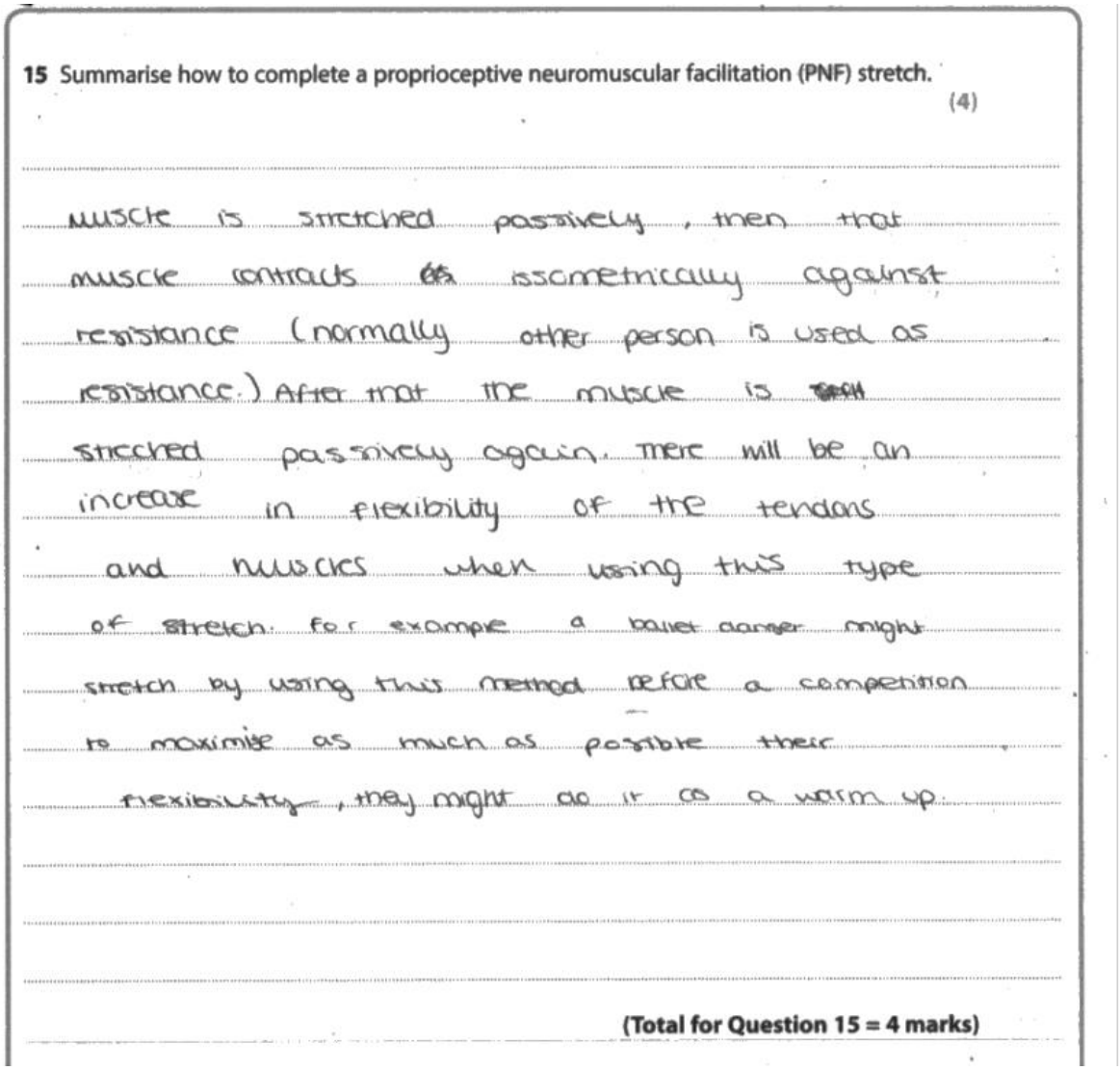
~~After an aerobic activity eg~~ After continous training, athletes will be given a 20 point Borgs scale which allows the athlete to indicate how they feel at that parhicular point in time. 1 being the lowest and 20 the highest. The method is very easy to use and cheap. It does not need ~~be~~ special equipment or specialists. It gives an immediate and quick results, because the athlete will be ~~made~~ told ~~to~~ ~~to~~ told, to measure their rate of percieved exertion right after activity in order to make results accurate as possible. Although this test is subjective, so one can lie about how hard their working which can limit improvement in performance. Although Coaches can check ~~this~~ if they are being honest by checking the athletes heart rate.

(Total for Question 14 = 6 marks) Total 4

8PE0_01_Q15

This was a very poorly answered question with most candidates describing passive stretching as opposed to PNF stretching. Many described the benefits in terms of increasing flexibility and rehabilitation but failed to explain the process of the stretch itself.

The following response highlights the important contraction of the muscle against a resistance and scores 3 marks.



15 Summarise how to complete a proprioceptive neuromuscular facilitation (PNF) stretch. (4)

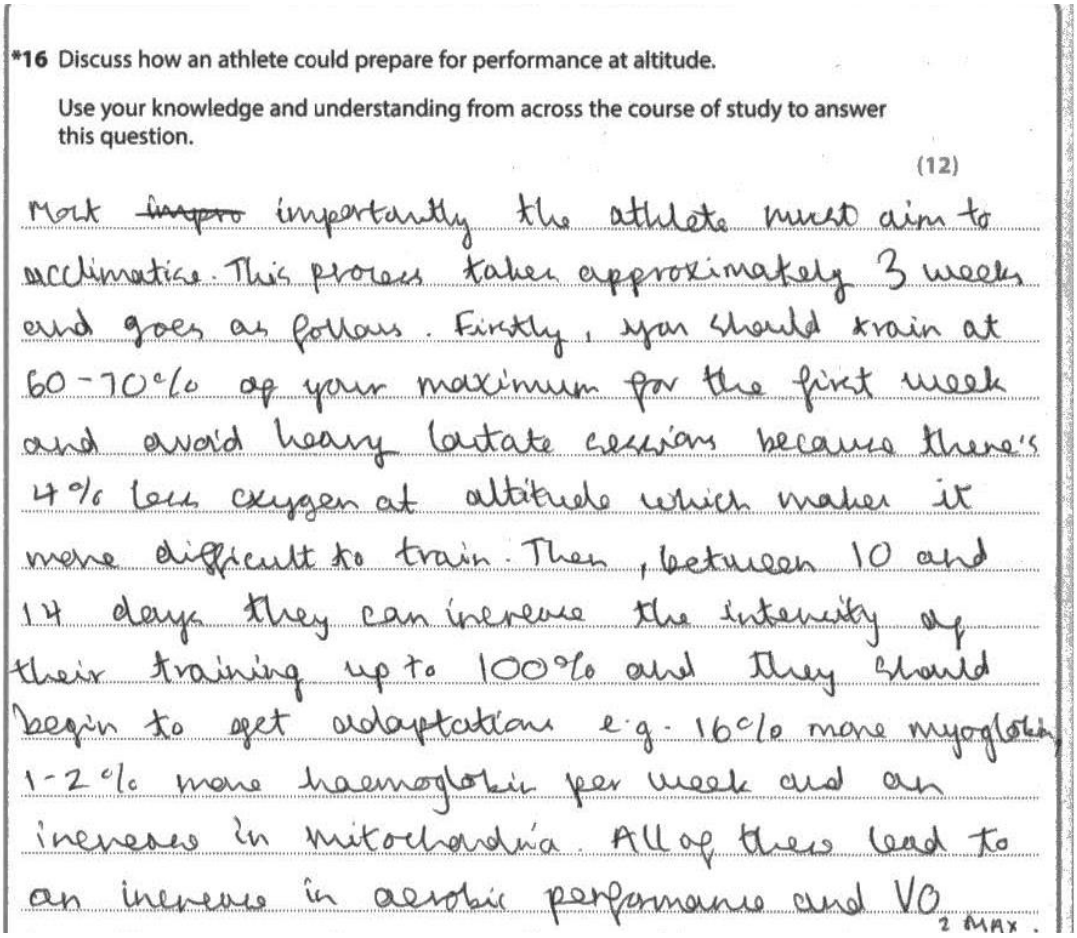
muscle is stretched passively, then that muscle contracts isometrically against resistance (normally other person is used as resistance.) After that the muscle is stretched passively again. There will be an increase in flexibility of the tendons and muscles when using this type of stretch. For example a ballet dancer might stretch by using this method before a competition to maximise as much as possible their flexibility, they might do it as a warm up.

(Total for Question 15 = 4 marks)

8PE0_01_Q16

Most candidates were able to discuss some strategies for training, with many focussing on altitude training in different forms. Most candidates were able to describe the adaptations of altitude training in some depth to access A03 marks. However, a lot of candidates focussed solely on this and therefore only discussed one strategy. This was also the asterisk question and candidates were therefore expected to discuss strategies from across the specification with only a few candidates discussing strategies such as diet, hydration, use of technology, and psychological strategies.

The following response shows comprehensive understanding of some of the factors with good analysis, in particular the physiological aspects. The candidate does bring in areas from across the specification but does not discuss these in the same amount of depth. This was a good top level 3 answer.



***16** Discuss how an athlete could prepare for performance at altitude.

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

(12)

Most ~~impro~~ importantly the athlete must aim to acclimatise. This process takes approximately 3 weeks and goes as follows. Firstly, you should train at 60-70% of your maximum for the first week and avoid heavy lactate sessions because there's 4% less oxygen at altitude which makes it more difficult to train. Then, between 10 and 14 days they can increase the intensity of their training up to 100% and they should begin to get adaptations e.g. 16% more myoglobin, 1-2% more haemoglobin per week and an increase in mitochondria. All of these lead to an increase in aerobic performance and VO_2 MAX.

Secondly the athlete could use the principle of periodisation if they know about this event in advance. They could do 2 4-6 week blocks during the year to get ~~them~~ their body used to the condition followed by 2-3 weeks before the event as their body will acclimatise much faster and they will have a reduce effect of altitude sickness.

Altitude training occurs at above 2000m from sea level, however it can be very expensive for athletes to train in these conditions. Because of this they could use hypobaric chambers at sea level which ~~to~~ have a ~~lower~~ higher pO_2 and air pressure within. Therefore, when training at sea level you will recieve the same adaptations. As well as this, the athlete could sleep in a hypoxic tent which contains air infused with additional ~~oxygen~~ nitrogen reducing pO_2 and allowing hypoxic adaptations as ~~the~~ you sleep. You could also use IHT which involves training at varying intensities with varying pO_2. This requires a gas analyser and mask but can develop the same effects.

The athlete should also visit the place they are competing at in advance to reduce the anxiety associated with it as this could lead to choking or catastrophe. They should also go in advance to allow themself the recover from sleep deprivation and fatigue.

Finally, they should look at how their sport relates to the effects of altitude training. If they have an anaerobic activity they won't require as much acclimatisation.

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