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GCE Physical Education 9PE0 01

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Introduction

To be successful in this paper, candidates need a broad range of knowledge from across the specification. This year, it is clear that many centres have been utilising the resources that Pearson has provided and those that have done well have been using the topic guides and the inside track magazine to support their learning.

There is intentionally no text book so that materials can be kept 'live' over the life of the specification. These resources are designed to support teachers. It seems apparent that some centres are not accessing these resources and consequently candidates have performed less well.

There was a large number of examples of learner work that was difficult to read, and centres must ensure that writing is legible as part of their preparation.

Some of the new topics in the specification had not been learned well: the priming exercise was an example of this. Some candidates even chose to write in their response that they had not been taught this.

Learning what each command word requires to ensure the answer is in the right depth, is critical to a good performance in the examination. Key terminology needs to be learnt from the specification and topic guides. There are straightforward marks to be gained from knowledge of definitions.

In 8 and 15-mark questions, a sustained response needed to be given. Candidates have done this well, and were able to structure answers appropriately, although there was a lack of analytical thinking amongst the more able candidates.

There was evidence of structure in answers, with introduction, conclusion and appropriate paragraphing in the 15-mark responses. There were some centres where candidates had been taught to attempt counter-arguments and pros and cons, or to provide an impact on performance, aiding their canididates to give more analysis and therefore access higher bands.

Question 1 (a)

The majority of candidates was able to define the term 'circumduction', usually likening it to a cone shape or a circle shape. Some errors confused this with rotation.

Definition questions are always accessible marks. Any key word in the specification can be tested. Both the glossary and the topic guides are essential reading in preparing candidates for this.

1 Define the following movements:

(a) circumduction

(1)

Circumduction involves flexion, extension, adduction and abduction creating a cone-like movement at the shoulder joint

ResultsPlus
Examiner Comments

This candidate has defines circumduction correctly, and therefore receives one mark.

1 mark

ResultsPlus
Examiner Tip

Use the glossary in the specification and the topic guide, to learn the definitions off-by-heart.

Question 1 (b)

In this question, there was some confusion between plantar flexion and dorsi flexion. It is essential that candidates know all the movement terminology. The topic guides and the specification, as well as the glossary in the specification, are the most useful resources for this.

As long as the movement was described accurately, some flexibility with the wording was permitted.

(b) plantar flexion

(1)

Pointing of the toes downwards.

ResultsPlus
Examiner Comments

This candidate defines plantar flexion accurately, and therefore is awarded 1 mark.

1 mark

(b) plantar flexion

(1)

The action of increasing the joint angle at the ankle and pointing the toes towards the ground e.g. Standing on tip toes.

ResultsPlus
Examiner Comments

This candidate also defines plantar flexion accurately and is awarded 1 mark.

1 mark

ResultsPlus
Examiner Tip

Check back through your answers to ensure you have not confused any terms

Question 2

Most candidates were able to talk about an isometric contraction as the muscle neither shortening or lengthening. Some examples did not reference a muscle group, referring, for example, to a plank or a rugby scrum. Marks were only awarded where the examples referred to the specific muscle that was contracting.

Some candidates talked about the action being still but did not reference muscle contraction: this would be too vague. The most common example was the plank, but only the best candidates included a muscle with this.

2 Using a sporting example, describe the term isometric contraction.

(2)

Isometric contraction is when a muscle ~~neither~~ sh neither shortens and lengths, for example when performing a plank the abdominals contract at constant.

ResultsPlus
Examiner Comments

This candidate receives 2 marks.

One mark is given for a muscle neither shortening or lengthening because the candidate also references them contracting in the example.

One mark is given for the muscle and movement - abdominals in 'the plank'.

2 marks

ResultsPlus
Examiner Tip

Ensure examples contain enough information to gain the mark: in this example, both the muscle and the sport were needed

2 Using a sporting example, describe the term isometric contraction.

(2)

Isometric contracion is when the ~~fe~~ muscle stays the same length under tension. A sporting example of isometric contracion would be doing the plank.

ResultsPlus
Examiner Comments

This candidate knows the definition, but the example is not specific enough.

It does not reference a muscle that is contracting whilst a person does the plank.

This response gains 1 mark for the description only.

1 mark

Question 3

In this question, most candidates knew the third law and were able to summarise it and could often apply it to an example. A few candidates confused it with different Newton's Laws.

The most common accurate examples were a sprinter on the blocks or a dive at the start of a swim. These were very clear examples for candidates to demonstrate their understanding. When a simple example was used, it was easier for candidates to explain it more clearly.

3 Using a sporting example, summarise Newton's Law of Action and Reaction.

(3)

Newton's law of action and reaction stated every action has an equal and opposite reaction. For example, at the start of sprinting, the sprinter exerts force on the box downward and backward so the box exerts equal force, forward and upward This push the sprinter

ResultsPlus
Examiner Comments

This candidate summarises the Law clearly, and is able to apply both the action and reaction elements accurately, achieving maximum marks.

3 marks

ResultsPlus
Examiner Tip

Keep examples simple and straightforward so that you can both understand and recall them

Know an easy example for each Law

3 Using a sporting example, summarise Newton's Law of Action and Reaction.

(3)

This law states that for every action there is an equal and opposite reaction. An example of this would be a sprinter pushing down on the starting blocks, meaning the blocks would ~~go~~ push back the same force exerted by the athlete.

ResultsPlus
Examiner Comments

This candidate gains maximum marks. They summarise the Law clearly and are able to give an example with a clear action and reaction.

3 marks

ResultsPlus
Examiner Tip

Try to make examples straightforward and clear

Learn an example for each Law that you understand and can use

Question 4

Knowledge of this area of the specification was strong, with many candidates able to articulate their understanding.

Most candidates were able to outline the process accurately.

Generally, terminology for this was well-known. Those candidates receiving lower marks sometimes confused terminology eg diaphragm relaxing or moving up, rather than contracting and moving down. Pressure gradients are not always well-explained.

4 Outline the mechanical process of inspiration at rest.

(4)

When inspiring at rest the diaphragm will contract moving downwards. The external inter-costal muscles will also contract pulling the rib cage outwards creating more room in the thoracic cavity. More space means lower pressure, this means the higher pressure air from the environment can flow into the lungs.

ResultsPlus
Examiner Comments

This candidate achieves maximum marks.

4 marks

ResultsPlus
Examiner Tip

Ensure points are clear and straight-forward, so that the examiner can follow a logical step-by-step answer

Question 5

The knowledge of how the oxygen was passed was weaker on this question. Some candidates thought incorrectlythat the oxygen passed directly from the alveoli into the muscles, forgetting the path between. Knowledge of, and explanations of, pressure gradients or the structural path followed, was less common. Very few candidates explained diffusion of oxygen from the capillary into the muscle. Pressure gradients and haemoglobin were only referenced in the best answers.

5 Describe how oxygen is transferred from the alveoli to muscles at rest.

(4)

Oxygen concentration (pO_2) is higher in the alveoli than in the capillaries at the alveoli. Therefore, oxygen diffuses out of the alveoli into the capillaries, following a concentration gradient. Oxygen is transported in the blood by haemoglobin, which is found in the red blood cells. The muscle cells have a lower pO_2 than the oxygenated blood. This causes oxygen to dissociate from the haemoglobin and be released into the muscles.

ResultsPlus
Examiner Comments

This candidate achieves maximum marks.

4 marks

Question 6

The most frequent answers referred to increased heart rate and breathing rate.There seemed to be a lack of knowledge of other factors, although those candidates achieving the best marks were able to refer to vasodilation and vasoconstriction. There was little knowledge of increased blood pressure.

6 Summarise how oxygen delivery to the working muscles increases during exercise.

(4)

Blood is shunted to the working muscles from the organs. There is an increased oxygen uptake, meaning heart rate increases, so more blood can be pumped to the working muscles. The diffusion gradient is made steeper, so that diffusion happens at a faster rate. As well, temperature increases this causes vasodilation, so a higher volume of blood reaches the muscles.

ResultsPlus
Examiner Comments

This candidate achieves maximum marks.

There are marks for:

- the reference to blood being moved away from organs (vasoconstriction credited as shunting terminology used)
- heart rate increasing
- the diffusion gradient
- vasodilation

4 marks

6 Summarise how oxygen delivery to the working muscles increases during exercise.

(4)

As the breathing rate increases, this sees more oxygen enter the lungs. Therefore, there is an increase in Stroke Volume and Cardiac output as more oxygen is required in the muscles to support exercise. Thus, blood pressure also increases as the red blood cells carry the oxygenated blood, through the increased dilation of the arteries, which then, the Vascular Shunt mechanism dilates further allowing more oxygen to the capilaries, which transfer this to the muscles. There is also and increase in venuous return as deOxygenated blood returns quicker to the lungs.

(Total for Question 6 = 4 marks)

ResultsPlus
Examiner Comments

This response achieves maximum marks, making clear and straightforward points.

This candidate gains marks for:

- increased breathing rate
- increased stroke volume (cardiac output is a repeat point in the mark scheme)
- blood pressure increase
- vascular shunting

4 marks

Question 7

Candidates did not have a clear understanding of the differences between structural and functional adaptations. Too many candidates were talking about hypertrophy, which is a structural change.

Candidates were very familiar with the terms bradycardia, increased stroke volume and increased cardiac output, but need to be more familiar with other elements of the mark scheme.

7 Summarise the functional adaptations to the heart as a result of aerobic training.

(6)

Aerobic training is submaximal and uses aerobic respiration. As a result of training the heart experiences myocardial hypertrophy making contractions more forceful. The heart also becomes more densely capillarised which means it can respire and contract more efficiently. The left ventricle becomes thicker for more forceful ventricular systole. Lower resting heart rate occurs and in some cases bradycardia where heart rate is below 40 bpm. The heart will have increased myoglobin content and higher mitochondria density for increased aerobic respiration. Lower blood pressure but increased stroke volume, cardiac output, more efficient at removing waste products, higher resistance to fatigue to work for longer. Lower resting heart rate, faster recovery rate due to efficiency of recov-

(Total for Question 7 = 6 marks)

ResultsPlus
Examiner Comments

This candidate begins with much irrelevant material referencing structural changes but does, in the end, comments on functional changes as well.

Marks are awarded for:

- lower resting heart rate (bradycardia)
- more forceful contractions
- increased stroke volume
- increased cardiac output
- faster recovery

5 marks

ResultsPlus
Examiner Tip

Bullet points would have made this answer clearer

Candidates may use bullet points in questions to ensure they have made six valid points

7 Summarise the functional adaptations to the heart as a result of aerobic training.

(6)

After a long term training programme the heart will experience cardiac hypertrophy which results in the heart beating more forcefully. This increase therefore an athletes stroke volume, cardiac output, ~~XXX~~ end diastolic volume & end systolic volume. The athlete will experience a faster recovery rate after exercise and may also experience bradicardia (a hr under 60bpm).

ResultsPlus
Examiner Comments

This answer achieved full marks: it was very straightforward and clear to mark.

Marks are awarded for:

- stroke volume
- cardiac output
- end diastolic volume all increasing
- faster recovery rate
- bradycardia
- greater force of contraction

6 marks

Question 8

Those candidates who performed well on this question were able to approach both elements of the question. The excitation phase was less well-known, whereas more candidates were familiar with all the elements in the contraction phase.

Candidates need to recognise where questions have elements to them and focus their answer to the appropriate parts. Less-able candidates knew key words but applied them incorrectly. For example, some used an incorrect phrase such as 'tropomyosin binding with myosin'.

8 Outline the stages of excitation and contraction during a muscular contraction.

(6)

During a muscular contraction an action potential arrives at a motor neurone end plate where cat ions are released into membrane of neurone causing vesicles with the neurotransmitter to be released. The neurotransmitter, acetylcholine is released into gap between nob and sarcoplasm and binds to Nat receptors on sarcoplasm. This causes cat ions to be released down t-tubules. The cat ions bind to troponin on the actin filament which causes a change in shape of the tropomyosin. This exposes the myosin binding sites on the actin filament. The myosin head is attached to an ATP molecule where it becomes unstable and binds to the actin filament forming a cross bridge. The myosin pulls the actin filament with a powerstroke movement. As the myosin head releases ADP + Pi is released.

ResultsPlus
Examiner Comments

This example achieves maximum marks and outlines elements in both stages.

6 marks

8 Outline the stages of excitation and contraction during a muscular contraction.

(6)

Excitation → The impulse arrives at the motor end plate and moves across the ~~sy~~ neuromuscular junction, causing the release of Calcium ions from the sarcoplasmic reticulum. These Ca^+ then bind to Tropanin, ~~to~~ and disfigures it, causing Tropomyosin to shift on the thin Actin filament to uncover the binding site for the myosin head, where it attatches itself.

Contraction → The myosin head contains ATP, and as the myosin cross bridge flexes, ATP is used, allowing the myosin head to move up the Actin filament drawing the Z lines closer together in the sarcomere. ADP is resynthesised to ATP and the movement - a power stroke is repeated. This is called a ratchet mechanism and will be repeated until there is insufficient ATP or Ca^+

ResultsPlus
Examiner Comments

This candidate also achieves maximum marks, by ensuring that they cover both elements of the question.

6 marks

Question 9

Those answers which were not so strong were not able to focus solely on the muscular system. Better performance came from those candidates who read the question carefully and were able to focus their answer on the muscular system.

Responses rarely followed on with any depth and detail. Key subject-specific terminology was lacking to substantiate the response and move the answer through the mark bands. The best answers were able to follow on with a link to performance, which meant that analysis could begin.

9 Examine how the muscular system responds to a warm-up.

(8)

A warm up is used in order to stimulate low level muscular contractions without fatigue.

Muscles will experience an increase in contractile strength and speed as a result of a warm up as muscle viscosity decreases allowing a smooth sliding of filaments which cause contraction.

The warming of muscles will also lead to enhanced enzyme activity which will result in better speed and strength of contraction also as ATP will be broken down at an enhanced rate in order to provide energy that is sufficient for contraction.

Muscles will also increase in flexibility which will reduce the risk of soft tissue injuries due to enhanced muscle elasticity as fibres will be warmer and therefore more supple.

Furthermore, the muscular system will increase its demand for oxygen as proprioceptors detect changes in fibre stress and muscle activity. This information is relayed to the brain which will utilise the sympathetic nervous system in order to increase heart rate through the release of noradrenaline. This will give the muscles sufficient oxygen to respire with which will not only reduce ~~and~~ the onset of fatigue but also delay ~~prevent lactate~~ and the onset of blood lactate accumulation as oxygen levels will be sufficient to remove any build up.

ResultsPlus
Examiner Comments

This response gains maximum marks.

The answer focusses on the muscular system and contains technical terminology.

The candidate discusses many elements and then links the answer back to performance.

8 marks

Question 10

The best answers were able to move beyond only the removal of lactate. There are many elements. Too many candidates are still referring to lactic acid, rather than lactate.

The slow component of recovery encompasses many elements and candidates needed to refer to a variety of issues. Stronger answers also substantiated why these processes happen and not just the processes themselves.

10 Examine how the slow component of recovery returns the body to homeostasis.

(8)

The slow component of post exercise excess oxygen recovery is the lactacid component, meaning sufficient lactate was accumulated during anaerobic exercise which now needs to be removed. The removal of lactic acid is largely due to oxidation, and therefore requires large amounts of oxygen above resting values, therefore hormones and temperature remain high, though falling, to keep metabolic rate, heart rate and breathing rate high to accomodate for increased O_2 uptake. Oxidation muches the lactate shuffle, whereby the process of glycolysis is reversed, using ATP to convert lactate back in to glucose. Removal of lactic acid also involves buffering, which is where the increase in H^+ ions are taken up to decrease the acidity. Here, haemoglobin takes up the H^+ ions of lactic acid and forms temporary haemoglobinic acid so that lactate levels in the blood are reduced. Gradually, as this can take up to 2 hours for full recovery, the body is returned to its resting state. This means decrease in metabolic rate, heart rate and breathing rate as the need for O_2 is now at resting level.

ResultsPlus
Examiner Comments

This answer achieves maximum marks.

It contains many elements and technical language.

8 marks

ResultsPlus
Examiner Tip

Lactic Acid should now be referred to as lactate

Question 11

Priming exercise was not well known. There was an obvious distinction between those candidates who had been taught this and those who had not, with many candidates leaving this question blank altogether.

Some candidates knew this referenced warming up but were not able to respond with any technical knowledge or understanding.

11 Examine how priming exercise affects subsequent performance.

(8)

Priming exercise is a way of manipulating the aerobic system to get the aerobic system to start at the onset of exercise by manipulating the pulse raiser section of the warm up. This helps with the O_2 kinetics which is when the delivery of oxygen meets the demand of oxygen. By speeding up the O_2 kinetics it means that the aerobic system is already working and is the predominant provider of ATP so there is more ATP produced and to be used. This means the performer can start with myoglobin fully saturated with oxygen so more oxygen can be used by the muscle. This means the athlete will not fatigue as quickly because they are respiring aerobically so they do not get the accumulation of lactic acid which would inhibit muscle action so this allows athlete to compete for longer so they have a greater chance of success. Priming exercise is affected by 3 factors. Intensity of priming exercise, intensity of exercise and time gap between the end of priming exercise and start of exercise.

ResultsPlus
Examiner Comments

This is an excellent example of a sustained response, answering the question with clear technical knowledge.

It achieves maximum marks.

8 marks

ResultsPlus
Examiner Tip

Teachers should be using the topic guides and the *Inside Track* magazine to inform planning

There is no text book endorsed by the Principal examiner

Question 12

The most basic responses were not able to link their answers to the cardiovascular system and simply repeated back the information given in the table. Most students could link the effects of obesity, smoking, diet, alcohol and lack of exercise to the CV system but very few went beyond just stating the physiological effects.

There was little evidence of analytical thinking or links made between the issues in the table. Knowledge of unhealthy lifestyles was strong. Candidates often wrote very lengthy responses, often with multiple extra pages added. These did not add to the quality of the responses, and, in most cases, simply involved repetition of the points already made.

Tip – the amount of space in the answer booklet, should indicate how much to write

Tip – structure answers in clear paragraphs

Tip – present a conclusion

Question 13

Very few candidates were able to provide a technically-correct definition.

13 Define the term submaximal aerobic fitness.

(1)

The ability to maintain a high percentage of $VO_{2\,max}$ for a sustained period of time.

ResultsPlus
Examiner Comments

An accurate definition, gaining 1 mark.

1 mark

ResultsPlus
Examiner Tip

Use the Specification glossary and Topic Guides for definitions

13 Define the term submaximal aerobic fitness.

(1)

The ability to maintain a high percentage of VO_2max for an extended period of time

ResultsPlus
Examiner Comments

A correct definition, gaining one mark.

1 mark

Learn definitions - they give easy marks

Question 14

This question was misinterpreted by some candidates who referredincorrectly to the adaptations derived from interval training, rather than the advantages of this method of training.

14 An athlete might use interval training to improve their aerobic fitness.

Outline the advantages of this type of interval training.

(4)

Aerobic interval training for a number ay reasons. The method is veg cheap as it often does not requiree require any specialist equipment which can be expencive. The technique also does not depend on lots of equipment or facilities, meaning it can be done by most athletes almost anywhere. The aerobic interval training is also very adaptable, meaning it can be applied and made specific to almost any sport the user requires. The intensity is variable so it can be applied eg. low intensity and long duration intervals to target the aerobic energy system.

ResultsPlus
Examiner Comments

This response achieves maximum marks.

It references:

- versatility to different sports
- cheapness
- lack of equipment
- intensity being adjusted for the aerobic system

4 marks

Read the question carefully

Question 15 (a)

This question was answered well, with the majority of candidates knowing what 1RM is. Those who did not gain the mark were often not specific enough about it being a **singular** maximal effort.

15 (a) Define **one** repetition maximum.

(1)

The largest (maximum) amount of force that can be exerted in one single effort.

ResultsPlus
Examiner Comments

An accurate definition, gaining 1 mark.

1 mark

15 (a) Define **one** repetition maximum.

(1)

One repetition maximum is the greatest amount of force you can ~~exe~~exert in one muscle contraction

ResultsPlus
Examiner Comments

Another accurate answer achieving 1 mark.

1 mark

Question 15 (b)

Many answers focussed on 1RM as a fitness test, rather than as a method for calculating exercise intensity. The most frequent answer referred to the risk of injury but other points on the mark scheme were less well-known.

Candidates need to be taught about different ways to calculate the intensity of exercise.

(b) Describe **three** problems in using the one repetition maximum method to calculate the intensity of training.

(3)

Dangerous, can lead to muscle tears.
Can be inaccurate or imprecise as weights may not go up in small enough intervals.
May not give a true representation of strength due to incorrect technique.

ResultsPlus
Examiner Comments

This response achieves maximum marks and is set out for ease of marking.

3 marks

ResultsPlus
Examiner Tip

Set out answers clearly, so that you know you have made three distinct points for a 3-mark question.

Question 16

Knowledge of the injuries was good, but the question was sometimes misinterpreted and explanations about how the injuries occurred were given, rather than describing the injuries themselves. For example, some candidates said a fracture was caused by a hard rugby tackle, rather than describing that it was a break in a bone. Sometimes not enough injuries were referenced.

A four-mark question required knowledge of four injuries.

A common error was to confuse the terms 'strain' and 'sprain'.

16 Describe **four** acute injuries.

(4)

Acute injuries are compact injuries.
Breaking one's femur as a result of a huge tackle, in rugby, is an example of an acute injury. The force of the tackle must be stronger than that of the femur, to for an acute injury to occur.
If I broke my finger as a result of being stamped on in a ruck, it would be an acute injure.
I could fracture my jaw in boxing as a result of a high force punch, and I could also shatter my ~~to~~ patella as a result of falling from a ~~hig~~ height onto my feet, from the gymnastic rings.

ResultsPlus
Examiner Comments

This candidate has mis-understood the question and describes how the injuries occur, not what they are.

0 marks

ResultsPlus
Examiner Tip

Read the question carefully. Twice

Fracture Strain
Sprain Dislocation

16 Describe **four** acute injuries.

(4)

- Dislocation - When the articulating bones come away from each other (out of position in the joint) leading to a mis shapen limb and extreme pain
- Fracture - The breaking of a bone (can be simple - within the skin or compound - out of the skin)
- Strain - Tears form in the muscle fibre causing [redacted] pain and tenderness
- Sprain - Tearing of a ligament resulting in pain and instability at a joint. In the knee commonly the cruciate ligaments (ACL, PCL MCL, LCL)

ResultsPlus
Examiner Comments

This response is set out well and gives a clear description of each injury. A four-mark question and four good descriptions. Maximum marks awarded.

4 marks

ResultsPlus
Examiner Tip

Look at how many marks the question is worth and make the same, or more, points in your answer

Set them out clearly

16 Describe **four** acute injuries.

(4)

Dislocation - where a bone becomes displaced from its joint.

Fracture - Small crack or break in a bone which can pierce the skin or remains internal

Achilles tendon injury - A tear of the achilles tendon which connects the calcaneus to the soleus.

~~Sprain~~ ~~Strain~~

(Total for Question 16 = 4 marks)

Strain - tearing or pulling of a muscle.

ResultsPlus
Examiner Comments

Another clearly set-out response, achieving maximum marks.

4 marks

Question 17

Those candidates who knew what this test was, gained marks easily. There was some inaccuracy of distances and times.

However, many candidates were not familiar with this test at all and did not attempt this question.

17 Describe the protocol for the RAST fitness test.

(4)

During a Repeated anaerobic sprint test ~~is a four set up of a 3~~ you run a length of 35m six times with 10 second rest in between each run. A timer times each run and therefore your speed, as well as a timer recording rest breaks to ensure correct amount of rest.

ResultsPlus
Examiner Comments

This candidate knows the test and gives enough accurate detail for maximum marks.

4 marks

ResultsPlus
Examiner Tip

Candidates need to be familiar with every fitness test on the Specification

17 Describe the protocol for the RAST fitness test.

(4)

Repeated Anaerobic sprint test. This is when a performer sprints for 35m as fast as they can, with a 10 second rest in between each sprint. They repeat this 6 times.

ResultsPlus
Examiner Comments

This response achieves maximum marks.

4 marks

ResultsPlus
Examiner Tip

Quality is more important than quantity in a response

Question 18

The vast majority of candidates knew what POLICE was and was able to explain it.

Errors were more frequent with the term 'optimal loading', with some candidates confusing overload or progressive overload with optimal loading.

18 Outline POLICE as a strategy for recovery from injury.

(5)

POLICE usually used for injuries like soft tissue damage. P is for protection and include stopping activity so that no futher damage can be done. O+L is optimal loading this is where once the injured area has begun to heal more challenging exercises can be used in order to regain strength and mobility in the injured area. I is ice, this keeps swelling and inflammation reduced. C is compression and stops swelling on injured area by causing vasoconstriction of blood vessels. Elevation helps by keep injured body part above heart to reduce blood flow to that area and therefore swelling.

(Total for Question 18 = 5 marks)

ResultsPlus
Examiner Comments

This response achieves maximum marks.

5 marks

Question 19

Candidates who received lower marks were able to talk about 'tucking up' or 'opening out' but not able to reference the technical terminology.

In better answers, 'over rotation' and 'under rotation' were explained and linked points were made with examples to support this.

Technical language was used such as 'moment of inertia' and 'angular velocity'. Answers needed to link explicitly either to over or to under rotation.

Some candidates only explained how to do a somersault but without linking it to over or under rotation.

19 When performing a somersault, an athlete may over or under-rotate. Using examples, explain how each of these can occur.

(6)

Angular momentum = angular velocity x moment of inertia.
Angular velocity is the speed of turning and moment of inertia is the resistance to movement.
An athlete may over rotate when moment of inertia is decreased, which increases angular velocity, and so the performer spins too much.
This is based on the conservation of momentum, where if angular velocity increases, moment of inertia would be decreased. An example of this is the athlete having the body tucked in during the somersault which increases velocity.
An athlete may under rotate when moment of inertia is increased, which decreases angular velocity, and so the performer doesn't spin enough.
An example is the athlete having their arms and legs out during the somersault which decreases velocity.

(Total for Question 19 = 6 marks)

ResultsPlus
Examiner Comments

This candidate achieves maximum marks by linking their comments to under and over rotation.

Technical knowledge is identified clearly.

6 marks

19 When performing a somersault, an athlete may over or under-rotate. Using examples, explain how each of these can occur.

(6)

- Over rotation may occur if the athletes limbs are too close to his centre of mass for example if he's too tightly tucked. This decreases his moment of inertia which increases his angular velocity (momentum) causing him to rotate faster.

- Under rotation may occur if the athletes mass is distributed away from his centre of mass for example a gymnast in a layout position. This increases his moment of inertia and therefor decreases his angular velocity and so he spins slower.

ResultsPlus
Examiner Comments

This 'explain' question is linked to under and over rotation and therefore achieves maximum marks.

Setting out the response in two paragraphs helps to make the link clearer.

6 marks

Question 20

Very few candidates referred to how the magnus effect was caused, instead focussing on the spin on the ball. Many answers believed that the magnus effect caused the spin, rather than the spin itself changing pressures around the ball.

Some candidates had errors with where the high and low pressure were, getting them the wrong way around. Most candidates focussed only on top spin or back spin but were not always able to link to how this was useful for the performer.

Tip - diagrams are always acceptable if annotated accurately to support your answer. This is often useful in Biomechanics questions.

Question 21

Most candidates were able to reference carbo-loading and therefore to score at least one mark.

Very few candidates were able to reference much beyond explanations of depletion and repletion of carbohydrate, or a high carb meal immediately before performance. The key part of the question was that this referenced pre-race and therefore references to during and after performance would not be credited.

Water seemed to be forgotten as a nutritional element by many candidates. Knowledge of the function of protein pre-race was not well known.

21 Explain how an athlete can manipulate their diet to prepare for a marathon run. **(5)**

An athlete can carbo-load in preperation for a marathon to maximise glycogen stores to increase the amount of time they can run before fatiguing. They can deplete carbohydrate stores and then compensate by intaking high volumes of carbohydrate rich foods like pasta to boost stores of glycogen in the muscles. They can intake caffeine which is a stimulant to give a small boost in energy levels right before a marathon run.

The athlete would drink lots of water to ensure they are well hydrated and could potentially drink hypotonic drinks, isotonic drinks and hypertonic drinks to manage their level of hydration and energy stores.

ResultsPlus
Examiner Comments

This response achieves maximum marks.

Linked points are used well to explain the dietary elements and why the athlete needs them.

Marks are given for:

- caffeine reducing fatigue
- carboloading to boost glycogen
- depletion and repletion
- water for optimal hydration
- sports drinks to boost energy

5 marks

ResultsPlus
Examiner Tip

In this 'explain' question, five linked points are needed

Question 22

Candidates wrote most about heart rate monitors, pedometers,fit-bits and GPS trackers. Almost all candidates had a range of technology to bring to the discussion,but too much emphasis was placed on what they do, rather than their benefits to monitor exercise and performance.

Counter-arguments were not well-utilised to help access the highest band. More needed to be made of application and implications, rather than only a description of each example of technology.

GPS -HM

22 Assess the use of wearable technology to monitor activity.

(8)

A GPS can be worn by athletes to track their acceleration, agility, speed and contact. For example a rugby player could wear a GPS on his shirt to inform his coach of his performance in certain areas, his coach can then use this information to adapt training sessions according to what the rugby player needs to work on. ~~For~~ An example could be that the GPS showed slow acceleration of the rugby player and therefore the coach focusses training on reaction time and acceleration skills. ~~This~~ The GPS is useful in monitoring game activity which can then be used to adapt training sessions. However, it is expensive and therefore not available to all and also not ~~also~~ always accurate.

A heart rate monitor is another type of wearable technology. This measures the heart rate of a performer. This could be used on a long distance runner or even a beginner who is training to monitor their progression of fitness. This is a useful method of measuring activity as it gives an idea of health as well as performance and is useful in comparing to results of other athletes and previous results. Although, like most wearable technology its expensive and also a long process of getting set up.

ResultsPlus
Examiner Comments

This response achieves 7 marks.

The structure of this response is good.

There are two clear paragraphs with counter-arguments presented for both.

7 marks

ResultsPlus
Examiner Tip

In an extended answer, is there a counter-argument that you can use?

22 Assess the use of wearable technology to monitor activity.

(8)

Heart rate monitors can be worn by athletes to monitor their heart rates during their session, and accurately see whether they're heart rate is meeting what or their target zone. If the heart rate isn't what they wanted it to be, they could then adapt their sessions to make them more appropriate.

GPS could be used on players such as rugby players. This will track where the player moved and their activity during the game. This would be beneficial as it could allow the player and coach to analyse the performance and produce new tactics and strategies.

Fit bits could be worn, ~~this too~~ these watches can measure heart rate, ~~therefore the~~ the app could be linked to a phone allowing for quick and easy comparison.

All of these technologies allow us to monitor activity and so where improvements could be made. However athletes may not feel comfortable wearing these and may feel physically restricted, therefore their performance may decrease more than normal, so it may not be an accurate representation of their performance ability.

However, this technology allows for quick and easy monitoring, and results could be recorded and compared to see if training adaptations have occurred.

ResultsPlus
Examiner Comments

This answer achieves 7 marks.

It has some counter-arguments.

It also talks about why the technology is used and its application to performance.

7 marks

22 Assess the use of wearable technology to monitor activity.

(8)

Wearable technology can be seen as pedometers or GPSports. Pedometers are worn on a waist or an athlete and can measure the number of steps. The use of this technology can be beneficial as it allows coaches to measure the athletes stride length and it can be used to change an athletes stride. It is also useful as it allows coaches to measure an athletes total energy output which can help with pacing of a race. Nowadays more modern methods are can also monitor heart rates. This in turn is useful as it allows coaches to monitor the athletes training zones and measure their maximal heart rates. They can also be negative however as athletes and coaches may become to reliant on the technology.

Another form of wearable technology is GPSports. This is a piece of equipment that is placed on athletes during sports events. ~~Next~~ This can be useful as it allows coaches to distinguish the speed, movements and strengths of a performer. This can be used in sports such as football and rugby where athletes can be monitored. It is also useful as it is a live and current display of an athlete and so can be monitored easily. It also allows coaches to affect players if fatigue levels are the right rate when to bring that player off as they may have noticed a decrease in average speed.

ResultsPlus
Examiner Comments

This response achieves maximum marks.

It highlights how the information can be used by coaches and teams to monitor activity, rather than being a simple discussion about what the technology does.

There is also discussion of some negative aspects of using such devices.

8 marks

Question 23

The vast majority of candidates did not know the difference between oxygen tents and hyperbaric chambers and simply wrote about them as the same thing. There was very little in terms of discussion.

The most common negative centred around cost. This question is linked to recovery: only the best responses noticed this aspect of the question.

Question 24

Those candidates who scored highest were able to reference more than simply travel to the venue and hydration strategies. The full scope of the mark scheme was utilised by top-performingcandidates.

Some candidates focussed on the effects of exercise in hot conditions, rather than preparation strategies. The word 'climatisation' is being used incorrectly and candidates should refer to 'acclimatisation'.

There was confusion over reference to preparing for altitude, rather than for heat, in some responses. Often candidates lacked scientific detail to back up their suggested strategies. Very few candidates provided a comprehensive range of strategies. Analytical skills have been lacking in longer responses.

Tip – Does your extended answer show analysis?

Paper Summary

Based on their performance in this paper, candidates are offered the following advice:

- Structure responses with logical paragraphing to include introduction and conclusion. Candidates should try to be analytical in these responses, perhaps linking to a counter-argument
- Candidates should be access Pearson online resources to support their revision
- Key technical terminology should be referenced in answers
- The space available for writing should be enough: there is no need for extra sheets and longer answers. Writing of high quality is more important than the length of response
- Candidates must look at the number of marks available and the command word. The command word will tell you the type of response required
- Writing must be clear and legible. Centres need to check this is the case by practising time-pressured writing before the examination season

Grade Boundaries

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

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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