Pearson Edexcel

# Mark Scheme (Results)

## Summer 2019

Pearson Edexcel GCE
In Physical Education (8PE0/01)
Component 1: Scientific Principles of Physical Education

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**General Marking Guidance**

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.

- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.

- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.

- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

**Section A**

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q01** | • Increasing the size/area of their base of support.<br>• Lowering height of the centre of mass above the base of support<br>• Reposition the centre of mass/line of gravity over the base of support | Accept examples, e.g. making feet wider, bending lower<br><br>Centre of gravity in place of centre of mass | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q02 (a)** | • Type I /Slow Twitch (oxidative) | | **(1)** |

| Question Number | Answer | | Additional guidance | Mark |
|---|---|---|---|---|
| **Q02 (b)** | **Characteristic** | **Explanation** | Answers must be linked together in order to gain marks<br><br>One mark for each listed characteristic along with its correct explanation<br><br>No marks will be awarded for a listed characteristic without its correct explanation | **(4)** |
| | Slow speed of contraction/low strength of contraction | Fatigue resistance | | |
| | High fatigue resistance | Run for longer before fatigue sets in | | |
| | High capillary density | Enables higher rate of Oxygen delivery / Higher rate of gaseous exchange / Greater rate of waste product removal | | |
| | Higher myoglobin content | Enables higher rate of Oxygen delivery | | |
| | High mitochondrial density | Higher rate of aerobic energy production | | |
| | Greater aerobic enzyme activity | Higher rate of aerobic energy production | | |
| | | | | |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q03 (a)** | • F =ma<br>=15 x 15<br>• F = 225N | Must use correct units for second mark<br>Can gain 2 marks for correct answer with units without showing working | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q03 (b)** | m= F/a<br>m= 75/3<br>m = 25 kg | Must use correct units for second mark<br>Can gain 2 marks for correct answer with units without showing working | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q04(a)** | (i)The gastrocnemius / soleus acts as the effort,<br>(ii) the ankle / ball of foot/ toe joint is the fulcrum<br>(iii) the body is the load | Do not accept calf for (i) | **(3)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q4(b)** | **Advantages**<br>• The load / resistance arm is shorter than the effort / force arm<br>• This allows a heavier load / resistance to be lifted by a smaller effort / force<br><br>**Disadvantages**<br>• Reduced range of movement<br>• Reduced speed of movement | Maximum of 2 marks can be awarded from each advantages and disadvantages | **(3)** |

| Question Number | Answer | | | Additional guidance | Mark |
|---|---|---|---|---|---|
| **Q05** | | **Structure** | **Function** | 1 mark for structure 1mark for related function NB answers must be linked to gain 2nd mark | **(6)** |
| | a) Artery | Elasticated walls | Allows them to cope with blood under high pressure | | |
| | | Smooth muscle | Allows vasoconstriction / dilation | | |
| | | Narrow lumen | Maintains pressure of blood | | |
| | b) Vein | Valves | To prevent backflow of blood | | |
| | | Wide lumen | Low resistance to blood flow | | |
| | c) Capillary | Narrow / thin / one cell thick walls | To facilitate gaseous exchange | | |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q06** | • Isotonic/Concentric contractions are those which cause the muscle to shorten as it contracts e.g. contraction of the Biceps (Brachii) muscle causes flexion at the elbow when lifting a dumbbell<br>• Isotonic/Eccentric contractions occur when the muscle lengthens as it contracts. E.g lowering the dumbbell down in a bicep curl exercise.<br>• Isometric contractions occur when there is no change in the length of the contracting muscle E.g. holding the dumbbell steady<br>• A stretch-shortening cycle (SSC) is an active stretch (eccentric contraction) of a muscle followed by an immediate shortening (concentric contraction) of that same muscle. E.g. performing long jump | One mark is awarded for description and a second mark is awarded for a correct example<br><br>No marks are awarded for an example without a description<br><br>No marks are awarded for naming of contractions only | **(4)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q07** | • A nervous impulse arrives at the neuromuscular junction, which causes a release of a chemical called Acetylcholine<br>• This causes the depolarisation of the motor end plate which travels throughout the muscle<br>• Calcium ($Ca^{+}$) is released (from the sarcoplasmic reticulum). (AO1)<br>• The $Ca^{+}$ binds to troponin. (AO1)<br>• Tropomyosin moves, exposing the active / binding site on the actin.<br>• The myosin filaments can now attach to the actin, forming a cross-bridge.<br>• The breakdown of ATP releases energy which enables the power stroke. (AO1)<br>• The breakdown of ATP releases <u>energy</u> which enables the Myosin to pull the Actin filaments inwards and so shortening the muscle.<br>• The Myosin detaches from the Actin and the cross-bridge is broken when an ATP molecule binds to the Myosin head.<br>• $Ca^{++}$ is removed and the process is repeated. (AO1)<br>• When the ATP is then broken down the Myosin head can again attach to an Actin binding site further along the Actin filament and repeat the 'power stroke'.<br>• This repeated pulling of the Actin over the myosin is often known as the ratchet mechanism.<br>• This process of muscular contraction can last for as long as there is adequate ATP and Ca+ stores.<br>• Once the impulse stops the Ca+ is pumped back to the Sarcoplasmic Reticulum and the Actin returns to its resting position causing the muscle to lengthen and relax. | Max 2 (AO1) | **(6)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q08** | **Reward acceptable answers. Responses may include, but are not limited to the following:**<br><br>**The cardiovascular system**<br><br>is made up of the heart and blood vessels and the heart is responsible for pumping the blood throughout the blood vessels (AO1)<br><br>Oxygenated blood, which is pumped through the body via the arteries, supplies the body's tissues with oxygen (AO1)<br><br>This oxygenated blood first needs to go to the capillaries, supplying the oxygenated blood to the tissues. (AO3)<br><br>The capillaries also absorb excess carbon dioxide into the blood and then deliver it to the veins, which then supply the blood back to the heart. (AO3)<br><br>When the heart receives blood that is low in oxygen and high in carbon dioxide, it pumps it to the lungs via the pulmonary arteries. (AO3)<br><br>Now that this blood has fresh oxygen in it, it returns to the heart and the heart then pumps it throughout the body to the working muscles (AO3)<br><br>**The respiratory system**<br><br>Comprises of airways, the lungs and the structures that move air in and out of the lungs. (AO1)<br><br>The intercostals and the diaphragm cause the lungs to expand and contract; leading to inhalation and exhalation (AO1)<br><br>The respiratory system is involved in supplying oxygen to the blood and removing carbon dioxide. (AO3)<br><br>The lungs expand, and oxygen is transferred into the low-oxygen blood, which also then sends some of its carbon dioxide back into the lungs. (Gaseous exchange) | AO1 4<br>AO3 8<br><br>Must relate to optimum performanc e by endurance athlete | |

| | | | |
|---|---|---|---|
| | The indicative content is a guide to the responses candidate may give. Other valid responses which answer the question correctly can be credited as appropriate.<br><br>The candidate's response must be read in conjunction with the level descriptor below in order to give the appropriate mark. For example, a response that is firmly in the level would receive the middle mark in the level, a response that is just into the level would receive the bottom mark in the level, | | **(12)** |

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | No rewardable material. |
| Level 1 | 1–3 | • Limited understanding of the factors that underpin performance and involvement in physical activity and sport. This is communicated in a basic way with simple or generalised statements (AO1).<br><br>• Limited analysis of the factors that underpin performance and involvement in physical activity and sport (AO3). |
| Level 2 | 4–6 | • Attempts some understanding of the factors that underpin performance and involvement in physical activity and sport and expresses ideas with some clarity (AO1).<br><br>• Attempts some analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).<br><br>• Analysis may not be used to make a clear judgement (AO3). |
| Level 3 | 7–9 | • Evidence of some understanding of the factors that underpin performance and involvement in physical activity and sport. Communicated in a logical writing structure (AO1).<br><br>• Good analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).<br><br>• Uses analysis to make a judgement but without full substantiation (AO3). |
| Level 4 | 10-12 | • Comprehensive understanding of the factors that underpin performance and involvement in physical activity and sport. Communicated in a logical, clear writing structure (AO1).<br><br>• Comprehensive analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).<br><br>• Uses analysis to make a clear judgement and supports this with examples (AO3). |

**Section B**

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q09(a)** | • Energy balance is where energy input = energy expenditure | Accept explanation of the formula | **(1)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q09(b)** | Gain body mass<br>• An athlete who wanted to gain mass e.g. sumo wrestler would take in more energy (food) than he expends.<br>Lose body mass<br>• Whereas an athlete who wanted to lose mass e.g. a jockey would ensure expenditure was higher than input. | Max 1 mark per bullet point<br>The explanation does not have to be an example, it can be further explanation of the point | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q10** | • Exercise economy: energy required to maintain a constant velocity of movement.<br>• This is the ability to transfer energy into movement. For example, if two people running at the same speed, one of them could be using less energy than the other because they are more economic.<br>• Anaerobic capacity: the amount of energy obtained from anaerobic sources (creatine phosphate breakdown and anaerobic glycolysis) in a single bout of exercise.<br>• This is the greatest amount of energy that can be released from the anaerobic system. There is only a limited amount of energy that can be produced anaerobically, when it is used up the athlete must slow down however it can be (partially) replenished during rest intervals<br>• Anaerobic power: the rate at which energy is produced. This is the fastest rate at which energy (ATP) can be produced anaerobically during an activity.<br>• If two athletes are equal in terms of movement economy, then the athlete with greatest anaerobic power will be the fastest. It is an important factor in sprint speed but not the only factor.<br>• Maximum speed: time taken to move a body (part or whole) through a movement over a pre-determined distance OR speed (distance divided by time). This is the fastest sprint speed attainable<br>• It is determined not only by the rate of ATP production but also by fast twitch fibre recruitment and force production. | Underlined words must be used in answer | **(4)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q11** | Examples for AO1<br>• Fitness trackers<br>• Fitness apps<br>• Garmin Fitness monitors<br>• Heart Rate Monitors<br>• Strava<br>Examples for AO3<br>Positives<br>• Cost: constantly decreasing so now becoming more available to all and not just the wealthy<br>• Accuracy: removes the risk of human error<br>• Speed of results: data can be ongoing and rapidly assessed at the end of an activity<br>• Instant info: can help athlete to adjust work rate as necessary to ensure correct intensity levels<br>• Ease of use: most devices now are self-explanatory and do not require a wealth of technological experience.<br>• Variety of displays to show progress: most devices can now display e.g. current speed/average speed/fastest speed<br>Negatives<br>• Technology can fail due to loss of battery/loss of signal<br>• Limited battery power may not be useful for longer training sessions if recharge unavailable<br>• Technology glitches can sometimes give wrong data for no apparent reason<br>• Ease of use/technology usage competence as some devices may require more technical expertise than others | Max3 AO1<br>Accept other suitable examples of contemporary technology<br>Must relate to monitoring **fitness** | **(6)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q12** | • Frequency is how often you train e.g. twice a week<br>• Intensity is how hard you train e.g. 80% max<br>• Time is how long you train for e.g. 1 hour<br>• Type is the sort of training you use e.g. circuit training | Must give example for each mark<br>e.g. *Frequency is how often you train* would receive no marks – it requires the example of *twice a week* (or other) to achieve the mark | **(4)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q13** | • Hypertonic sports drinks contain a high concentration of salt and sugar (AO1)<br>• Hypertonic sports drinks contain higher levels of carbohydrate than isotonic drinks. (AO1)/Hypertonic sports drinks are used to supplement daily carbohydrate intake normally after exercise, in order to top up muscle energy stores. (AO2)<br>• A hypertonic drink generally has more than 8g of sugar (carbohydrates) per 100ml and greater osmotic pressure than bodily fluids. (AO1)/It is primarily intended to supply energy. The thirst quenching effect is secondary. (A02)<br>• Hypertonic drinks are taken up more slowly than water. (AO1) Ideal for use 30 to 60 minutes before sports/training/exertion and immediately after sports/training/exertion. (AO2)<br>• An isotonic drink generally contains between 4g and 8g of sugar (carbohydrates) per 100ml and has about the same osmotic pressure as bodily fluids. (AO1)/ Hypertonic drinks are also useful for athletes or workers who find that they need a bit more energy during their training/competition/ exertion. (AO2)<br>• An isotonic drink is taken up by the body about as quickly as water. (AO1)/They are intended to quench thirst and provide energy to the body. Ideal for endurance sports. (AO2) | Max 3 AO1<br>Max 3 AO2 | **(6)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q14** | **<u>Advantages</u>**<br>• Free (AO1)<br>• Available to everyone irrespective of wealth (AO3)<br>• Easy to understand (AO1)<br>• Clear wording to help individual understand what each number on the scale correlates to in terms of how hard they are working (AO3)<br>• Universally applied (AO1)<br>• Allows for comparisons as there is evidence to suggest a close correlation between RPE and actual HR<br>• Can be used by large groups at the same time (AO1)<br><br>**<u>Disadvantages</u>**<br>• Subjective (AO1)<br>• Athlete may feel they are working much harder than HR would show (AO3)<br>• Inconsistent rating (AO1)<br>• RPE may be affected by lack of sleep or muscle soreness (AO3<br>• Affected by when measurement occurs (AO1)<br>• as an athlete may give a different score if assessment takes place after an hour or immediately after activity (AO3) | Accept other appropriate responses | **(6)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q15** | • Proprioceptive Neuromuscular Facilitation (PNF) involves the use of muscle contraction before the stretch in an attempt to achieve maximum muscle relaxation.<br>• You move into the stretch position so that you feel the stretch sensation<br>• Your partner holds the limb in this stretched position<br>• You then push against your partner by contracting the antagonistic muscles for 6 to 10 seconds and then relax.<br>• During the contraction, your partner aims to resist any movement of the limb.<br>• Your partner then moves the limb further into the stretch until you feel the stretch sensation<br>• Repeat this procedure 3 or 4 times before the stretch is released | | **(4)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **Q16** | AO1 = 4 marks, AO3 = 8 marks<br><br>Students who only show achievement against AO1 will not be able to gain marks beyond Level 1.Students who only draw their answer from one area of study will not be able to gain marks beyond Level 3.<br><br>Reward acceptable answers. Responses may include, but are not limited to the following:<br><br>Altitude<br>• How long before performance<br>• Evidence suggests no adaptations in first two weeks and 4 weeks would show the adaptations (AO3)<br>• How high in terms of altitude (AO1)<br>• Where training at altitude occurs e.g. live high train low / live high train high<br>• LH/TL allows you to experience the adaptations but maintain intensity of training (AO3)<br>• LH/TH allows you to experience adaptations but may struggle to maintain intensity of training (AO3)<br>• Some sports do not require adaptation to altitude e.g. sprinting (AO1)<br>• No real" bonus" for anaerobic events but early arrival may still be advised to cope with altitude sickness (AO3)<br>• Physiological effects of training /living at altitude. E.g. increased red blood cells (AO1)<br>• Which allows the cells to carry more oxygen and increase performance (AO3)<br>• Use of alternate methods of replicating altitude effects e.g. Chambers / tents / masks etc.(AO1)<br>• Barometric pressure is kept the same but oxygen content is reduced, reducing the partial pressure of oxygen and allowing the same adaptations (AO3)<br>• Nutritional strategies e.g. hydration / iron supplementation / carbohydrate intake / increase calorie intake (AO1)<br>• Sleep – Recovery and sleeping at altitude can be made more difficult (AO1)<br>• Psychological strategies<br>E.g. positive self-talk(AO1) feeling fatigue because of the effects of altitude not lack of fitness (AO3)<br>Preparation – knowing the effects and being prepared to cope with them (A03) | AO1 4<br>AO3 8 | **(12)** |

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