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Edexcel

## Mark Scheme (Results)

Summer 2023

Pearson Edexcel Advanced Level  
In Physical Education (9PE0)  
Paper 01: 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       |
|-----------------|---|---|------------|
| <b>Q01i</b>     | A muscle which allows the prime mover to work more efficiently by <b>stabilising the joint</b> where the prime mover originates | Marks for stabilising another part of the joint but not for stabilising the prime mover/main muscle. Needs to include stabilising/fixing for the mark. Acceptable to say stabilise origin of agonist/or where it originates.<br>'Fixing the joint' where the muscle originates is acceptable. | <b>(1)</b> |
| Question Number | Answer  | Additional Guidance   | Mark       |
| <b>Q01ii</b>    | A muscle which <b>aids the action of a prime mover by stabilising the joint</b> at which the prime mover acts                   | Needs to include <b>helps/aids the prime mover/agonist.</b>   | <b>(1)</b> |
| Question Number | Answer  | Additional Guidance   | Mark       |
| <b>Q02i</b>     | Rectus Abdominus  | Alternative spelling of 'Rectus Abdominis' is acceptable. <b>Do not accept abdominals.</b>  | <b>(1)</b> |
| Question Number | Answer  | Additional Guidance   | Mark       |
| <b>Q02ii</b>    | Tibialis Anterior   | Must be spelt correctly.  | <b>(1)</b> |
| Question Number | Answer  | Additional Guidance   | Mark       |
| <b>Q02iii</b>   | <ul style="list-style-type: none"> <li>• Gastrocnemius</li> <li>• Soleus</li> </ul>   | Accept either answer for max 1 mark.<br>Must be spelt correctly for marks.  | <b>(1)</b> |

| Question Number | Answer  | Additional Guidance  | Mark       |
|-----------------|---|--|------------|
| <b>Q03</b>      | <ul style="list-style-type: none"> <li>• High in ATP</li> <li>• High in PC</li> <li>• Low in capillaries</li> <li>• High myosin content</li> <li>• Low in myoglobin</li> <li>• Large diameter</li> <li>• Large motor neurone size</li> <li>• Low mitochondrial density</li> <li>• Large motor unit size</li> <li>• High number of fibres per unit</li> <li>• High in ATPase</li> <li>• High in Glycogen</li> <li>• Narrow Z lines</li> <li>• High in Creatine Kinase</li> </ul> | <p>Do not award for functional such as:</p> <ul style="list-style-type: none"> <li>• High force production</li> <li>• High rate of relaxation</li> <li>• Low resistance to fatigue</li> <li>• Very high contractile speed</li> <li>• Fast nerve conduction</li> <li>• High glycolytic capacity</li> </ul> <p><b>Do not award for white in colour - not structural.</b></p> | <b>(5)</b> |

| Question Number | Answer  | Additional Guidance  | Mark       |
|-----------------|---|--|------------|
| <b>Q04</b>      | <ul style="list-style-type: none"> <li>• Stroke volume increased</li> <li>• Sub maximal exercise heart rate is reduced</li> <li>• Cardiac output increased during exercise</li> <li>• Bradycardia (lower resting heart rate)</li> <li>• Improved oxygen delivery</li> <li>• Faster recovery heart rate</li> <li>• Reduced blood pressure</li> <li>• Increased venous return</li> <li>• More forceful ventricular contraction</li> <li>• Increased ability to vascular shunt - due to increased ability to vasodilate/vasoconstrict.</li> <li>• Decreased End Systolic Volume (ESV)</li> <li>• Increased End Diastolic Volume (EDV)</li> </ul> | <p>Do not allow any structural changes:</p> <ul style="list-style-type: none"> <li>• Increased blood volume</li> <li>• Increased left ventricle size</li> <li>• Increased number of capillaries</li> <li>• Cardiac Muscle wall thickness increases</li> <li>• Increased elasticity of blood vessels</li> <li>• Cardiac Hypertrophy</li> <li>• Decreased thickness of artery walls</li> </ul> <p>If reference is made to 'at rest' then cardiac output is not increased then.</p> | <b>(4)</b> |

| Question Number | Answer   | Additional Guidance  | Mark       |
|-----------------|--|--|------------|
| <b>Q05</b>      | <ul style="list-style-type: none"> <li>• Kinetic energy – energy in moving objects, for example a player moving</li> <li>• Chemical -energy stored in the bonds of compounds, for example a player eating food and transferring to energy or e.g. change to chemical as acetyl choline released at synaptic cleft.</li> <li>• Potential - energy that has stored potential for future use e.g. a diver waiting at the top of a board</li> <li>• Mechanical - energy it has because of its motion, e.g. swinging a leg to kick a ball</li> <li>• Electrical - caused by moving electrons/message travelling down axon.</li> </ul> | <p>No marks for just naming.</p> <p>No marks for additional forms of energy that do not form part of this specification.</p> <p>Examples are needed to support each answer but the same sporting example can be used multiple times.</p> <p>Examples can be physiological examples not just sporting examples. For examples message travelling along axon is acceptable but light switch is not.</p> <p>CHECK information is correct as other correct examples can be credited.<br/>1 mark only per form of energy even if multiple examples are used.</p> | <b>(5)</b> |

| Question Number | Answer  | Additional Guidance   | Mark       |
|-----------------|---|---|------------|
| <b>Q06</b>      | <ul style="list-style-type: none"> <li>• Blood is redistributed to match demands/increased demand for oxygen in some areas of body</li> <li>• Vasoconstriction happens at areas not needed/narrowing of arteries/arterioles</li> <li>• Pre-capillary sphincter constricts to reduce blood flow in areas not required</li> <li>• Examples of where it is not needed are inactive muscles/digestive system</li> <li>• Vasodilation (widening of arteries/arterioles happens at active areas</li> <li>• Examples of where it is needed in exercise such as working muscles</li> <li>• Pre-capillary sphincter dilates to increase blood flow to working muscles</li> </ul> | Vasoconstriction and vasodilation as words on their own do not gain credit they need to be described. | <b>(4)</b> |

| Question Number | Answer | Additional Guidance                | Mark       |
|-----------------|--------|------------------------------------|------------|
| <b>Q07ai</b>    | Z line | Accept the Z band instead of line. | <b>(1)</b> |

| Question Number | Answer | Additional Guidance                                  | Mark       |
|-----------------|--------|--|------------|
| <b>Q07aia</b>   | Myosin | Do not accept thin/thick protein – it must be named. | <b>(1)</b> |

| Question Number | Answer | Additional Guidance                                  | Mark       |
|-----------------|--------|--|------------|
| <b>Q07aib</b>   | Actin  | Do not accept thin/thick protein – it must be named. | <b>(1)</b> |

| Question Number | Answer   | Additional Guidance                                  | Mark       |
|-----------------|--|--|------------|
| <b>Q07b</b>     | <ul style="list-style-type: none"> <li>• Z lines/bands move closer together</li> <li>• Sarcomere shortens</li> <li>• H zone shortens/disappears</li> <li>• A band remain same length</li> <li>• I band shortens</li> <li>• Myosin binds to actin (cross bridge formation)</li> <li>• Myosin pulls on actin to shorten the sarcomere (power stroke)</li> <li>• Myosin reattaches to next actin filament (ratchet mechanism)</li> <li>• Troponin removes tropomyosin from binding site</li> <li>• ATP is giving the energy to allow the contraction</li> </ul> | Release of calcium does not happen inside sarcomere. | <b>(5)</b> |

| Question Number | Answer  | Additional Guidance | Mark       |
|-----------------|---|---------------------|------------|
| <b>Q08</b>      | <ul style="list-style-type: none"> <li>• ATPase enzyme that catalyses it</li> <li>• ATP is broken down into ADP and Phosphate and releases energy<br/><b>ATP → P + ADP + Energy</b></li> <li>• Phosphocreatine is broken down into Creatine and Phosphate<br/><b>(accept PC → Pi + C + Energy)</b></li> <li>• Creatine Kinase is the enzyme which causes the breakdown of the PC</li> <li>• The energy from this reaction is enough to resynthesise 1ATP<br/><b>(ADP + Pi + Energy → ATP)</b></li> <li>• Lasts for approx. 10 seconds</li> <li>• Most of the phosphocreatine is re-synthesised in 2-3 minutes</li> <li>• Happens in sarcoplasm</li> </ul> |                     | <b>(4)</b> |



| Question Number | Answer  | Additional Guidance | Mark       |
|-----------------|---|---------------------|------------|
| <b>Q09</b>      | <ul style="list-style-type: none"> <li>• Oxidation of lactate (<b>removal of lactate</b>)</li> <li>• Re-synthesis of muscle glycogen</li> <li>• Re-synthesis of liver glycogen (Cori cycle)</li> <li>• Re-synthesis of (blood) glucose</li> <li>• Resynthesis of protein</li> <li>• Body temperature remains elevated and gradually returns to normal/thermoregulation</li> <li>• Circulation/heart rate/stroke volume remains elevated before gradually returning to normal/resting level</li> <li>• Oxygen uptake/respiration remains elevated before gradually returning to normal/resting level</li> <li>• Ventilation remains elevated before gradually returning to normal/resting level</li> </ul> |                     | <b>(4)</b> |

| Question Number   | Indicative Content  | Mark   |
|-------------------|---|--|
| <p><b>Q10</b></p> | <p><b>AO1 = 4 marks, AO3 = 4 marks</b></p> <p><b>AO3 marks will be rewarded by justification or exemplification of a point using analysis or evaluation.</b></p> <p><b>Reward acceptable answer. Responses may include, but are not limit to the following:</b></p> <p>An examination that gives all sides of the issue and any implications, including details about how and why the muscular and skeletal systems respond to a warm-up, that includes the following indicative content:</p> <p><b>Muscular</b></p> <ul style="list-style-type: none"> <li>• Flexibility increased - Elasticity of muscle fibres allow increased range of movement</li> <li>• Blood flow and oxygen saturation to muscles increase</li> <li>• Increased speed of nerve transmission to muscle fibres</li> <li>• Reduced risk of injury due to increase in blood flow</li> <li>• Increase in temperature allows increase enzyme activity</li> <li>• Delayed anaerobic energy contribution to exercise</li> <li>• An increase availability of oxygen in the fibres</li> <li>• Prepares tendons for exercise</li> <li>• Increased speed of muscular contractions</li> <li>• Increased strength/power of contractions</li> </ul> <p><b>Skeletal</b></p> <ul style="list-style-type: none"> <li>• There is an increase production of synovial fluid</li> <li>• Synovial fluid reduces friction in the joints</li> <li>• Synovial fluid near the cartilage reduces friction when the joint moves</li> </ul> <p>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.</p> <p>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, a response which nearly reaches the next level would receive the top mark in the level preceding it.</p> | <p style="text-align: right;"><b>(8)</b></p> |

| Level   | Mark | Descriptor  |
|---------|------|---|
|         | 0    | <ul style="list-style-type: none"> <li>• No rewardable material</li> </ul>  |
| Level 1 | 1-2  | <ul style="list-style-type: none"> <li>• Some accurate and relevant knowledge (AO1).</li> <li>• Simple or generalised statements supported by limited evidence (AO1).</li> <li>• Limited balancing of ideas against each other (AO3).</li> <li>• Limited evaluative statement (AO3).</li> </ul>   |
| Level 2 | 3-5  | <ul style="list-style-type: none"> <li>• A good level of accurate and relevant knowledge (AO1).</li> <li>• A line of reasoning is presented and supported by some evidence (AO1).</li> <li>• Examines a wide range of ideas, balancing ideas against each other (AO3).</li> <li>• An evaluative statement which is relevant (AO3)</li> </ul>                                      |
| Level 3 | 6-8  | <ul style="list-style-type: none"> <li>• A high level of accurate and relevant knowledge (AO1).</li> <li>• Articulates a clear viewpoint with clarity and precision which is well substantiated (AO1).</li> <li>• Critically examines a wide range of issues balancing ideas against each other (AO3). Clear evaluative statement which is thorough and focussed (AO3)</li> </ul> |

| Question Number | Indicative Content  | Mark       |
|-----------------|---|------------|
| Q11             | <p><b>AO1 = 4 marks, AO3 = 4 marks</b></p> <p><b>AO3 marks will be rewarded by justification or exemplification of a point using analysis or evaluation.</b></p> <p><b>Reward acceptable answer. Responses may include, but are not limit to the following:</b></p> <p>An examination that gives all sides of the issue and any implications, including details about how and why the anatomical structures labelled in Figure 2 cause the heart muscle to contract, that includes the following indicative content:</p> <ul style="list-style-type: none"> <li>• The SA node is the pacemaker of the heart / electrical impulses are sent from the SA node /delay between end of one impulse and the next to allow diastole</li> <li>• Pulse carried down bundle of His to purkinje fibres</li> <li>• SA node impulse controlled by sympathetic (speeds up) and parasympathetic (slows down) nervous systems</li> <li>• The impulse from the SA node causes the atria to contract</li> <li>• Atrial contraction pushes blood into the ventricles</li> <li>• The electric signal arrives at the AV node which is located between the two atria</li> <li>• There is a short delay in the signal at the AV node to allow emptying of atrial blood to ventricles</li> <li>• The impulse from the AV node causes the ventricles to contract</li> </ul> <p>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.</p> <p>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, a response which nearly reaches the next level would receive the top mark in the level preceding it.</p> | <b>(8)</b> |

| Level   | Mark | Descriptor   |
|---------|------|--|
|         | 0    | <ul style="list-style-type: none"> <li>• No rewardable material</li> </ul>   |
| Level 1 | 1-2  | <ul style="list-style-type: none"> <li>• Some accurate and relevant knowledge (AO1).</li> <li>• Simple or generalised statements supported by limited evidence (AO1).</li> <li>• Limited balancing of ideas against each other (AO3).</li> <li>• Limited evaluative statement (AO3).</li> </ul>  |
| Level 2 | 3-5  | <ul style="list-style-type: none"> <li>• A good level of accurate and relevant knowledge (AO1).</li> <li>• A line of reasoning is presented and supported by some evidence (AO1).</li> <li>• Examines a wide range of ideas, balancing ideas against each other (AO3).</li> <li>• An evaluative statement which is relevant (AO3)</li> </ul>   |
| Level 3 | 6-8  | <ul style="list-style-type: none"> <li>• A high level of accurate and relevant knowledge (AO1).</li> <li>• Articulates a clear viewpoint with clarity and precision which is well substantiated (AO1).</li> <li>• Critically examines a wide range of issues (link to why these are important) balancing ideas against each other (AO3).</li> <li>• Clear evaluative statement which is thorough and focussed (AO3)</li> </ul> |

| Question Number | Indicative Content   | Mark |
|-----------------|--|------|
| Q12             | <p><b>A02 = 5 marks, A03 = 10 marks</b></p> <p><b>A03 marks will be rewarded by examining something methodically and in detail typically in order to explain and interpret it.</b></p> <p><b>Reward acceptable answer. Responses may include, but are not limit to the following:</b></p> <p>A discussion that gives all sides of the issue and any implications, including details about how and why Newton’s three laws of motion apply to sport, that includes the following indicative content:</p> <p><b>Newton’s Law of Inertia/1<sup>st</sup> Law</b><br/> Either:</p> <ul style="list-style-type: none"> <li>• An object in motion will remain in motion until a force act on it</li> </ul> <p>Or</p> <ul style="list-style-type: none"> <li>• An object will remain stationary until a force act on it</li> </ul> <ul style="list-style-type: none"> <li>• Any suitably applied example such as a golf ball will stay still unless a force applied by the golf club makes it move or it will move at constant velocity unless a force acts on it to slow it down such as wind resistance or change its direction (gravity) e.g. sprinter leaving the blocks</li> </ul> <p><b>Newton’s Law of Acceleration/2<sup>nd</sup> Law</b></p> <ul style="list-style-type: none"> <li>• An increase in the velocity of the moving object is directly proportional to the force applied and inversely proportional to the object’s mass / The object will accelerate in the direction of the external force / <math>F=Ma</math></li> <li>• Any suitable Applied example. E.g. If you throw a larger object with the same force the net force is less and it will not accelerate as much and not go as far. E.g. a bowling a heavier ball e.g. If a ball is hit with double the force the rate at which it accelerates (speeds up) will be doubled</li> </ul> <p><b>Newton’s Law of Action and Reaction/3<sup>rd</sup> Law</b><br/> For every action there is an equal and opposite reaction. For example, in weightlifting the lifter exerts a force into the ground which is greater than the weight resulting in the weight being lifted off the ground. E.g. a swimmer propels herself through the water because the water offers enough counter force to oppose the action of the hands.</p> |      |

|  |  |             |
|--|--|-------------|
|  | <p>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.</p> <p>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, a response which nearly reaches the next level would receive the top mark in the level preceding it.</p> | <b>(15)</b> |
|--|--|-------------|

| Level   | Mark  | Descriptor   |
|---------|-------|--|
|         | 0     | <ul style="list-style-type: none"> <li>• No rewardable material</li> </ul>   |
| Level 1 | 1-3   | <ul style="list-style-type: none"> <li>• There are limited links between theory and practice. Limited technical language supports isolated elements of knowledge and understanding (AO2).</li> <li>• Limited analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li> <li>• Analysis is not used to make a judgement (AO3).</li> </ul>                     |
| Level 2 | 4-6   | <ul style="list-style-type: none"> <li>• Makes few links between theory and practice. Basic technical language supports some elements of knowledge and understanding (AO2).</li> <li>• Attempts some analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li> <li>• Analysis may not be used to make a clear judgement (AO3).</li> </ul>                   |
| Level 3 | 7-9   | <ul style="list-style-type: none"> <li>• Makes some links between theory and practice. Some appropriate technical language supports a good knowledge and understanding (AO2).</li> <li>• Good analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li> <li>• Uses analysis to make a judgement but without full substantiation (AO3).</li> </ul>           |
| Level 4 | 10-12 | <ul style="list-style-type: none"> <li>• Makes strong links between theory and practice. Appropriate technical language supports a very good knowledge and understanding (AO2).</li> <li>• Comprehensive analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li> <li>• Uses analysis to make a clear judgement and supports this with examples</li> </ul> |

|         |       |  |
|---------|-------|--|
| Level 5 | 13-15 | <ul style="list-style-type: none"><li>• Makes many insightful and significant links between theory and practice. Appropriate technical language supports a significant level of knowledge and understanding (AO2).</li><li>• Sophisticated analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li><li>• Uses analysis to make a fully informed judgement and supports this with examples (AO3).</li></ul> |
|---------|-------|--|



## Section B

| Question Number | Answer   | Additional Guidance   | Mark       |
|-----------------|--|---|------------|
| <b>Q13</b>      | <p>Power is</p> <ul style="list-style-type: none"> <li>• (force x distance)/time</li> <li>• Power= work /time</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Strength/force x speed</li> <li>• The rate of doing work (work is force x distance)</li> </ul> | <p>Accept definition or equation.</p> <p>Combination of speed and strength is too vague.</p> <p>Accept Power is the rate at which force is produced</p> <p>If they say exert force quickly there must be an element of distance (e.g. speed=dist./time) but not 'quickly' as only includes time not distance.</p> <p><b>Rate at which energy is produced is not accepted - this is anaerobic power.</b></p> | <b>(1)</b> |

| Question Number | Answer  | Additional Guidance  | Mark       |
|-----------------|---|--|------------|
| <b>Q14</b>      | <ul style="list-style-type: none"> <li>• <b>Static stretching:</b> a stretch that is held in a challenging but comfortable position for a period of time, usually somewhere between 10 to 30 seconds.</li> <li>• <b>Ballistic:</b> the use of momentum of a body or limb to force it beyond its normal range of motion.</li> <li>• <b>Proprioceptive neuromuscular facilitation (PNF):</b> a muscle group is passively stretched, then contracts isometrically against a resistance while in a stretched position and is then passively stretched again.</li> </ul> | <p>Do not accept naming alone an example can help to substantiate.</p> <p>Will accept dynamic stretching: as a movement - based stretch/stretch position is not held/involves moving muscles to their full range of movement at a controlled speed.</p> <p><b>Yoga/pilates are not types of flexibility training they are classes.</b></p> | <b>(3)</b> |

| Question Number | Answer  | Additional Guidance | Mark       |
|-----------------|---|---------------------|------------|
| <b>Q15i</b>     | <ul style="list-style-type: none"> <li>• Margaria Kalamen</li> <li>• 20m Acceleration Sprint</li> </ul> |                     | <b>(1)</b> |

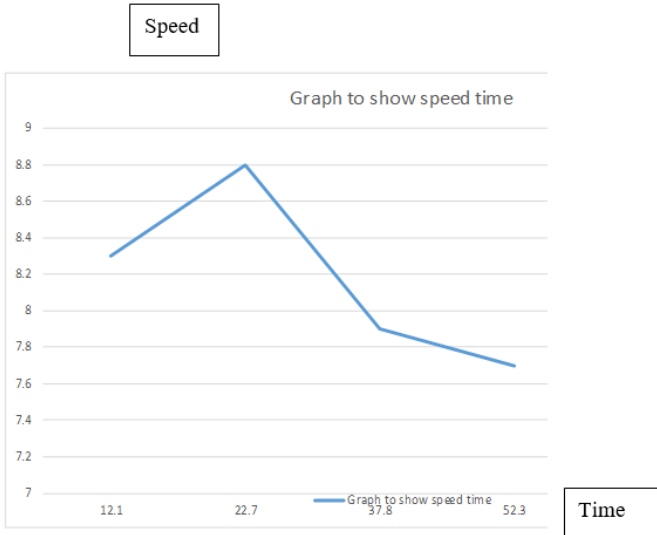
| Question Number | Answer   | Additional Guidance | Mark       |
|-----------------|--|---------------------|------------|
| <b>Q15ii</b>    | <p><b>Sprint</b></p> <ul style="list-style-type: none"> <li>• A better sprint will allow the athlete to gain a more powerful run up</li> <li>• The faster the run up the greater the horizontal velocity so greater distance jumped</li> </ul> <p>OR</p> <p><b>Margaria Kalamen</b></p> <ul style="list-style-type: none"> <li>• Margaria Kalamen improvement would allow greater elastic strength of muscle fibres and power which would allow more drive off the take-off board</li> <li>• Greater power gives greater height which allows a greater distance to be jumped.</li> </ul> | Linked points.      | <b>(2)</b> |

| Question Number | Answer   | Additional Guidance | Mark       |
|-----------------|--|---------------------|------------|
| <b>Q16</b>      | <ul style="list-style-type: none"> <li>• The test is conducted on a treadmill</li> <li>• The treadmill incline is set to 20% / 11.3 degrees</li> <li>• The treadmill speed is set to 8 miles/hour or 12.9 km/hour</li> <li>• The time (in seconds) is the score</li> <li>• Timed from when they are running unsupported</li> <li>• Completed to exhaustion /grab hand rail to stop test</li> </ul> |                     | <b>(4)</b> |

| Question Number | Answer   | Additional Guidance   | Mark       |
|-----------------|--|---|------------|
| Q17             | <ul style="list-style-type: none"> <li>• Tests are often not sports specific/too general</li> <li>• Tests do not replicate movements of the activity/sport</li> <li>• Tests do not replicate competitive scenarios</li> <li>• Many do not use direct measuring/some tests predict the result/scores based on estimates or averages</li> <li>• Some tests require motivation to get your best score/maximal tests require motivation to complete to exhaustion</li> <li>• Some tests are not very reliable e.g. time keeping inaccuracy/errors in recording/equipment not calibrated correctly/could be issues with replication/weather could influence results</li> <li>• Submaximal tests are less accurate</li> <li>• Some tests are very expensive to conduct/require expensive equipment/may not be accessible</li> <li>• Some tests require highly trained staff to conduct</li> <li>• Timing test right so as not to interfere with training</li> <li>• Mental health impact due to pressure of testing/can be demotivating</li> </ul> | <p>Validity needs to be substantiated e.g. it is not a valid test because it doesn't replicate the movement of the sport etc.</p> <p>Reliability needs to be substantiated e.g. time keeping errors/calibration errors etc.</p> | <b>(4)</b> |

| Question Number | Answer   | Additional Guidance                         | Mark       |
|-----------------|--|---|------------|
| <b>Q18</b>      | <ul style="list-style-type: none"> <li>• Ball spins forwards faster</li> <li>• Top spin brings the ball down to the ground sooner /drops shorter/downwards swerve</li> <li>• Player can hit the ball harder (because it is brought to the ground more quickly).</li> <li>• (When the ball spins, the air molecules surrounding the ball spin with it). This boundary layer causes a decrease in velocity and therefore high pressure above the ball</li> <li>• Lower pressure under the ball</li> <li>• Magnus force pressure on opposite sides of the ball makes the ball move from high to low pressure</li> <li>• Effect on bounce - e.g. bounces higher (due to angle of incidence)</li> <li>• Effect on bounce is kicks forward more (due to vertical component reducing compared to horizontal due to spin/friction)</li> <li>• Increased stability in flight, reducing turbulence.</li> </ul> | Fully annotated diagrams would be accepted. | <b>(5)</b> |

| Question Number | Answer  | Additional Guidance   | Mark       |
|-----------------|---|---|------------|
| <b>Q19i</b>     | Distance/time - $300/37.8 = 7.9\text{m.s}^{-1}$ | <p>Allow m/s as unit of measurement.</p> <p><b>Do not allow 8 as this would be rounded incorrectly.</b></p> <p><b>NO units = no mark.</b></p> | <b>(1)</b> |

| Question Number | Answer  | Additional Guidance  | Mark       |
|-----------------|---|--|------------|
| Q19ii           | <ul style="list-style-type: none"> <li>• Both axes labelled correctly</li> <li>• Points plotted correctly</li> <li>• Drawn accurately</li> </ul>  | <p>1 mark per bullet point.</p> <p>Graph may be to a different scale and can start at 0,0.</p> <p><b>No mark for drawing distance time graphs.</b></p> | <b>(3)</b> |

| Question Number | Answer  | Additional Guidance  | Mark       |
|-----------------|---|--|------------|
| Q19iii          | <ul style="list-style-type: none"> <li>• The first 100m athlete needs energy quickly to accelerate fast so uses CP/ATP PC system</li> <li>• (between 100-200) At 200m/2<sup>nd</sup> 100 phosphocreatine system has been depleted and glycolysis is working at max rate to allow them to hit top speed</li> <li>• At 300m/3<sup>rd</sup> 100 the lactate begins to build up so they start to slow down.</li> <li>• At 400m/4<sup>th</sup> 100 the athlete slows because glycolysis slows due to lactate build up but the aerobic system would be also in use here.</li> </ul> | <p>Answers must link to a specific 100m in the race.</p> <p>This is about the race strategy not for naming the systems used at each point in the race.</p> | <b>(4)</b> |

| Question Number | Answer  | Additional Guidance  | Mark       |
|-----------------|---|--|------------|
| <b>Q19iv</b>    | <ul style="list-style-type: none"> <li>• A better strategy may be to run the first 100m/start of race slightly slower so that less demand placed on CP system</li> <li>• By starting slower lactate accumulates more slowly enables a faster finish</li> <li>• The next 100m/up to 200m would therefore be able to use more CP without fully using the lactate system/retain pace for the end</li> <li>• At 300m/second half of race the lactate system would contribute more, athlete could slow (to around 80% max speed) to lessen the impact of lactate/retain pace for end</li> <li>• At 400m/end of race therefore the impact of the lactate would not be as much so deceleration would not be as great/could have a faster finish</li> <li>• Priming could delay fatigue by getting the aerobic system contributing earlier therefore reducing/delaying use of glycolysis/build up of lactate</li> </ul> | The link is to the energy system not the part of the race. | <b>(3)</b> |

| Question Number | Indicative Content   | Mark       |
|-----------------|--|------------|
| Q20             | <p><b>A01 = 4 marks, A03 = 4 marks</b></p> <p><b>A03 marks will be rewarded by justification or exemplification of a point using analysis or evaluation. Negatives of these supplements could also be examined.</b></p> <p><b>Reward acceptable answers. Responses may include, but are not limited to the following:</b></p> <p>An examination that gives all sides of the issue and any implications, including details about how and why different dietary supplements effect power athletes, that includes the following indicative content:</p> <ul style="list-style-type: none"> <li>• Creatine would help to increase muscle mass, strength and power. Would enable lifting of heavier weights in training which would then increase performance.</li> <li>• Also replenishes ATP stores so allows the ATP system to last for longer therefore an athlete can remain in this system for longer which could be an advantage as not entering lactate system as early.</li> <li>• Whey protein / protein shakes or drinks would aid an athlete in regaining protein to aid recovery with repair of tissues.</li> <li>• Amino Acids / BCAAs (branched chain amino acids) / HMB to assist in the repair of muscles after training sessions.</li> <li>• Cherry juice speeds up recovery from muscle damage</li> <li>• Caffeine increases force production/being alert</li> <li>• Bicarbonate will buffer lactate so athlete can train at the same intensity for longer with lactate or higher intensity for same length of time</li> </ul> <p>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.</p> <p>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, a response which nearly reaches the next level would receive the top mark in the level preceding it</p> | <b>(8)</b> |

| Level   | Mark | Descriptor   |
|---------|------|--|
|         | 0    | <ul style="list-style-type: none"> <li>• No rewardable material</li> </ul>   |
| Level 1 | 1-2  | <ul style="list-style-type: none"> <li>• Some accurate and relevant knowledge (AO1).</li> <li>• Simple or generalised statements supported by limited evidence (AO1).</li> <li>• Limited balancing of ideas against each other (AO3).</li> <li>• Limited evaluative statement (AO3).</li> </ul>  |
| Level 2 | 3-5  | <ul style="list-style-type: none"> <li>• A good level of accurate and relevant knowledge (AO1)</li> <li>• A line of reasoning is presented and supported by some evidence (AO1).</li> <li>• Examines a wide range of ideas, balancing ideas against each other (AO3).</li> <li>• An evaluative statement which is relevant (AO3).</li> </ul>   |
| Level 3 | 6-8  | <ul style="list-style-type: none"> <li>• A high level of accurate and relevant knowledge (AO1)</li> <li>• Articulates a clear viewpoint with clarity and precision which is well substantiated (AO1).</li> <li>• Critically examines a wide range of issues balancing ideas against each other (AO3).</li> <li>• Clear evaluative statement which is thorough and focussed (AO3).</li> </ul> |



| Question Number | Indicative Content   | Mark       |
|-----------------|--|------------|
| Q21             | <p><b>AO1 = 4 marks, AO3 = 4 marks</b></p> <p><b>AO3 marks will be rewarded by justification or exemplification of a point using analysis or evaluation.</b></p> <p><b>Reward acceptable answer. Responses may include, but are not limit to the following:</b></p> <p>An examination that gives all sides of the issue and any implications, including details about how and why an athlete could prepare for performance at altitude, that includes the following indicative content:</p> <ul style="list-style-type: none"> <li>• How long before the event/where and when is the event – adaptation might take up to 4 weeks.</li> <li>• LHTH – live high and train high</li> <li>• LHTL – live high and train low – can keep the intensity of training</li> <li>• Different types of athletes will have more impact – e.g. anaerobic events little impact other than to get over altitude sickness if arriving early.</li> <li>• Biggest impact is in aerobic activities with better oxygen carrying capacity in red blood cells.</li> <li>• Other things can also achieve this e.g. hypoxic chambers/tents/intermittent hypoxia training</li> <li>• Depends on the type of event/energy system used</li> <li>• Compete within 24 hours</li> <li>• Increase the percentage of training to endurance based</li> </ul> <p>Illegal methods do not form part of this answer.</p> <p>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.</p> <p>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, a response which nearly reaches the next level would receive the top mark in the level preceding it.</p> | <b>(8)</b> |

| Level   | Mark | Descriptor  |
|---------|------|---|
|         | 0    | <ul style="list-style-type: none"> <li>• No rewardable material</li> </ul>  |
| Level 1 | 1-2  | <ul style="list-style-type: none"> <li>• Some accurate and relevant knowledge (AO1).</li> <li>• Simple or generalised statements supported by limited evidence (AO1).</li> <li>• Limited balancing of ideas against each other (AO3).</li> <li>• Limited evaluative statement (AO3).</li> </ul>   |
| Level 2 | 3-5  | <ul style="list-style-type: none"> <li>• A good level of accurate and relevant knowledge (AO1).</li> <li>• A line of reasoning is presented and supported by some evidence (AO1).</li> <li>• Examines a wide range of ideas, balancing ideas against each other (AO3).</li> <li>• An evaluative statement which is relevant (AO3).</li> </ul>   |
| Level 3 | 6-8  | <ul style="list-style-type: none"> <li>• A high level of accurate and relevant knowledge (AO1).</li> <li>• Articulates a clear viewpoint with clarity and precision which is well substantiated (AO1).</li> <li>• Critically examines a wide range of issues balancing ideas against each other (AO3).</li> <li>• Clear evaluative statement which is thorough and focussed (AO3).</li> </ul> |

| Question Number | Indicative Content   | Mark |
|-----------------|--|------|
| Q22             | <p><b>A01 = 4 marks, A03 = 4 marks</b></p> <p><b>A03 marks will be rewarded by justification or exemplification of a point using analysis or evaluation.</b></p> <p><b>Reward acceptable answer. Responses may include, but are not limit to the following:</b></p> <p>An examination that gives all sides of the issue and any implications, including details about how and why different body positions would change angular velocity during a dive from a 10m platform, that includes the following indicative content:</p> <ul style="list-style-type: none"> <li>• Angular velocity is the rate of spin/turn - (rate of change of angular displacement)</li> <li>• Slow rates of spin linked to extended body shapes e.g. straight body shape/arms wide</li> <li>• Faster spinning with tucked shapes/arms pulled in</li> <li>• Angular velocity would start slow and then speed up as the diver tucks and then slow again as they open out/hit the water</li> <li>• Moment of inertia starts high (body straight) then becomes low (tucked) and then high again as they hit the water with body straight.</li> <li>• Angular momentum is constant - body position changes moment of inertia and angular velocity</li> <li>• The greater the mass (heavier diver) the greater the moment of inertia</li> <li>• The further the mass moves from the axis of rotation the greater the moment of inertia</li> <li>• The taller the diver the greater the moment of inertia</li> <li>• Tucked - low moment of inertia</li> <li>• Piked - moderate level of inertia</li> <li>• Straight - high moment of inertia</li> <li>• High moment of inertia =high resistance to rotation and low angular velocity</li> <li>• Low moment of inertia=low resistance to rotation and high angular velocity</li> </ul> |      |

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|  | <p>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.</p> <p>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, a response which nearly reaches the next level would receive the top mark in the level preceding it.</p> | <b>(8)</b> |
|--|--|------------|

| Level   | Mark | Descriptor   |
|---------|------|--|
|         | 0    | <ul style="list-style-type: none"> <li>• No rewardable material</li> </ul>   |
| Level 1 | 1-2  | <ul style="list-style-type: none"> <li>• Some accurate and relevant knowledge (AO1).</li> <li>• Simple or generalised statements supported by limited evidence (AO1).</li> <li>• Limited balancing of ideas against each other (AO3).</li> <li>• Limited evaluative statement (AO3).</li> </ul>  |
| Level 2 | 3-5  | <ul style="list-style-type: none"> <li>• A good level of accurate and relevant knowledge (AO1).</li> <li>• A line of reasoning is presented and supported by some evidence (AO1).</li> <li>• Examines a wide range of ideas, balancing ideas against each other (AO3).</li> <li>• An evaluative statement which is relevant (AO3).</li> </ul>  |
| Level 3 | 6-8  | <ul style="list-style-type: none"> <li>• A high level of accurate and relevant knowledge (AO1).</li> <li>• Articulates a clear viewpoint with clarity and precision which is well substantiated (AO1).</li> <li>• Critically examines a wide range of issues balancing ideas against each other (AO3).</li> <li>• Clear evaluative statement which is thorough and focussed (AO3).</li> <li>• Technical terminology is good - high level</li> <li>•</li> </ul> |

| Question Number | Indicative Content  | Mark |
|-----------------|---|------|
| *Q23            | <p><b>A02 = 5 marks, A03 = 10 marks</b></p> <p><b>A03 marks will be awarded by evaluating which are the most suitable tests.</b></p> <p><b>Reward acceptable answers. Responses may include, but are not limited to the following:</b></p> <p>A discussion that gives all sides of the issue and any implications, including details about evaluating the most suitable fitness tests for a team game of your choice., that includes the following indicative content:</p> <ul style="list-style-type: none"> <li>• Specificity</li> <li>• Suitability of the test to the activity – anaerobic/aerobic</li> <li>• Anaerobic activity – e.g. Wingate, MAOD, RAST, Cunningham/Faulkner</li> <li>• Speed related – sprint tests</li> <li>• Anaerobic Power – jump tests, Margaria Kalamen /agility tests</li> <li>• Maximal aerobic fitness – Cooper, YoYo, Gas analysis, MSFT, step tests</li> </ul> <p>Correct components of fitness used and linked to the sport:</p> <ul style="list-style-type: none"> <li>• Validity/reliability of the test</li> <li>• Does the test match the type of activity e.g. sitting for seated sports, running for running based sports, on a bike for cycling activity etc.</li> <li>• Suitability of submaximal versus maximal tests</li> <li>• Different versions of different tests e.g. intermittent recovery in YoYo test for games players due to the stop start nature of the sport or the swim specific MSFT</li> <li>• Adaptations of tests to include surface, footwear etc</li> <li>• Limitations of tests e.g. technique, learning effect etc.</li> <li>• <b>Tests not on the specification can be included and credited in answers where they are appropriate</b></li> </ul> <p>Answers must link to the correct activities in terms of suitability.</p> <p>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.</p> |      |

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|  | <p>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, a response which nearly reaches the next level would receive the top mark in the level preceding it.</p> | <b>(15)</b> |
|--|--|-------------|

| Level   | Mark  | Descriptor  |
|---------|-------|---|
|         | 0     | <ul style="list-style-type: none"> <li>No rewardable material</li> </ul>  |
| Level 1 | 1-3   | <ul style="list-style-type: none"> <li>There are limited links between theory and practice. Limited technical language supports isolated elements of knowledge and understanding (AO2).</li> <li>Limited analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li> <li>Analysis is not used to make a judgement (AO3).</li> </ul>                            |
| Level 2 | 4-6   | <ul style="list-style-type: none"> <li>Makes few links between theory and practice. Basic technical language supports some elements of knowledge and understanding (AO2).</li> <li>Attempts some analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li> <li>Analysis may not be used to make a clear judgement (AO3).</li> </ul>                          |
| Level 3 | 7-9   | <ul style="list-style-type: none"> <li>Makes some links between theory and practice. Some appropriate technical language supports a good knowledge and understanding (AO2).</li> <li>Good analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li> <li>Uses analysis to make a judgement but without full substantiation (AO3).</li> </ul>                  |
| Level 4 | 10-12 | <ul style="list-style-type: none"> <li>Makes strong links between theory and practice. Appropriate technical language supports a very good knowledge and understanding (AO2).</li> <li>Comprehensive analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li> <li>Uses analysis to make a clear judgement and supports this with examples (AO3).</li> </ul> |
| Level 5 | 13-15 | <ul style="list-style-type: none"> <li>Makes many insightful and significant links between theory and practice. Appropriate technical language supports a significant level of knowledge and understanding (AO2).</li> <li>Sophisticated analysis of the factors that underpin performance and involvement in physical activity and sport (AO3).</li> </ul>   |

|  |  |   |
|--|--|---|
|  |  | <ul style="list-style-type: none"><li>• Uses analysis to make a fully informed judgement and supports this with examples (AO3).</li></ul> |
|--|--|---|

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