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BTEC

# Mark Scheme (Results)

## Summer 2017

## BTEC Level 3 National in Sport

## Unit 1: Anatomy and Physiology (31524H)

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# Unit 1: Anatomy and Physiology

## General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Marking grids should be applied positively. Learners must be rewarded for what they have shown they can do, rather than be penalised for omissions.
- Examiners should mark according to the marking grid, not according to their perception of where the grade boundaries may lie.
- All marks on the marking grid should be used appropriately.
- All the marks on the marking grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks, if the learner's response is not rewardable according to the marking grid.
- Where judgement is required, a marking grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the marking grid to a learner's response, a senior examiner should be consulted.

## Specific marking guidance

The marking grids have been designed to assess learner work holistically.
Rows in the grids identify the assessment focus/outcome being targeted. When using a marking grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer, in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band, depending on how they have evidenced each of the descriptor bullet points.

| Question Number | Answer | Mark |
|---|---|---|
| 1 (a) | Award **one** mark for correctly labelling each region.<br>• B - Thoracic<br>• E - Coccyx | 2 |

| Question Number | Answer | Mark |
|---|---|---|
| 1 (b) | Award **four** marks for describing the process of bone growth.<br><br>Bones start as cartilage/hardens through **ossification** (1) osteoblasts form new bone (1) osteoclasts absorb debris/break down the old bone (1) and epiphyseal plates/growth plates are the site of bone growth/seal off once bone is fully developed (1)<br><br>**Accept any other appropriate answer** | 4 |

<table>
<tr><th>Question number</th><th>Indicative content</th></tr>
<tr><td>2</td><td>Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers.<br><br>Award up to six marks for analysing the shoulder joint for a cricketer when completing a bowling action<br><br>• Ball and Socket enables a wide range of movement when bowling.<br>• The movement that occurs is circumduction, which is flexion/extension/abduction and adduction<br>• Humerus and scapula are the articulating bones<br>• Ligaments that connect the articulating bones together provide stability, however the shoulder is unstable and therefore it is susceptible to dislocations<br>• Articular cartilage, found on the ends of bones, stops bones rubbing together and acts as a shock absorber<br>• Bursa, that are little fluid filled sacs, prevent friction to enable the shoulder to move freely when bowling<br>• Joint capsule holds the synovial fluid in place<br>• Synovial membrane secretes synovial fluid<br>• Synovial fluid keeps the joints lubricated and allows the cricketer to complete the bowling action</td></tr>
<tr><td colspan="2">Mark scheme (award up to 6 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.</td></tr>
<tr><td colspan="2"><table>
<tr><th>Level</th><th>Mark</th><th>Descriptor</th></tr>
<tr><td>Level 0</td><td>0</td><td>No rewardable material.</td></tr>
<tr><td>Level 1</td><td>1–2</td><td>• Demonstrates isolated elements of knowledge and understanding.<br>• Provides little or no reference to the components and actions of the shoulder joint.<br>• Generic statements may be presented, rather than linked factors/components being identified and explored in the context of the skeletal system. Limited attempt to address the question.<br>• Response is likely to lack clarity, organisation and the required technical language.</td></tr>
<tr><td>Level 2</td><td>3–4</td><td>• Demonstrates accurate knowledge and understanding.<br>• References to the components and actions of the shoulder joint<br>• Learners will identify linked factors/components, with some development in the form of mostly accurate and relevant factual material, leading to an analysis of the skeletal system in the context being presented. The accuracy in the detail on the factors identified is likely to vary.<br>• The response may contain parts that lack clarity or proper organisation. Evidence of correct technical language being used.</td></tr>
</table></td></tr>
</table>

| | | |
|---|---|---|
| Level 3 | 5–6 | • Demonstrates accurate knowledge and understanding.<br>• Sustained coverage of relevant components and actions of the shoulder joint. Might demonstrate the ability to integrate and synthesise relevant information about the skeletal system.<br>• A contextualised analysis of the skeletal system is developed using mostly coherent chains of reasoning, leading to a range of factors/components being present. Learners will demonstrate understanding of linkages and relationships between/within systems.<br>• Response demonstrates good organisation, clarity and use of technical language. |

| Question Number | Answer | Mark |
|---|---|---|
| 3 | Award **one** mark for stating the type of muscle tissue and **one** mark for stating its location.<br><br>**(Must have correct type of muscle tissue to be awarded location)**<br><br>• Smooth muscle (1) walls of Stomach/intestines/blood vessels (1)<br>• Cardiac muscle (1) myocardium/walls of the heart (1) | 2 |

| Question Number | Answer | Mark |
|---|---|---|
| 4 (a) | Award **one** mark for identification. Award up to **three** marks for expansion.<br><br>Cramp is an involuntary sustained skeletal muscular contraction/spasm (1) which prevents muscle movement (1) which occurs due to dehydration/a lack of electrolytes/salt (1) and this prevents the footballer from running/kicking the ball (1) | 4 |

| Question Number | Answer | Mark |
|---|---|---|
| 4 (b) | Award up to **four** marks for explaining how increasing myoglobin stores will be beneficial to performance.<br><br>Myoglobin carries oxygen (1) therefore muscles increase their oxidative capacity (1) and can work at a higher intensity for a longer duration within the game (1) before fatiguing/fatigue would occur later in the game/be able to play until the end (1).<br><br>**Accept any other appropriate answer** | 4 |

| Question number | Indicative content |
|---|---|
| 4 (c) | Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers.<br><br>Award up to **six** marks for analysing the press up for both phases of the movement<br><br>Upward Phase<br>• Pectoralis major (shoulder) is the agonist<br>• Tricep (elbow) is the agonist<br>• The agonists concentrically contract<br>• Trapezius/rhomboids and bicep are the antagonists<br>• The trapezius and rhomboids and bicep contract eccentrically<br>• Synergists support the agonist in the movement<br>• Deltoids are the synergists<br>• Deltoids concentrically contract<br>• Fixators prevent any unwanted movement<br>• Abdominals, obliques and quadriceps are the fixator muscles<br>• They are contracting isometrically<br><br>Downward Phase<br>• Pectoralis major (shoulder) is the agonist<br>• Tricep (elbow) is the agonist<br>• The agonists eccentrically contract<br>• Trapezius/rhomboids and bicep are the antagonists<br>• The trapezius and rhomboids and bicep contract concentrically<br>• Deltoids are the synergists and are contracting eccentrically<br>• Abdominals, obliques and quadriceps are the fixator muscles<br>• They are contracting isometrically |

**Mark scheme (award up to 6 marks)** refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

| Level | Mark | Descriptor |
|---|---|---|
| Level 0 | 0 | No rewardable material. |
| Level 1 | 1–2 | • Demonstrates isolated elements of knowledge and understanding.<br>• Provides little or no reference to the antagonistic muscle pairs and contractions for both phases of the press up<br>• Generic statements may be presented, rather than linked factors/components being identified and explored in the context of the muscular system. Limited attempt to address the question.<br>• Response is likely to lack clarity, organisation and the required technical language.<br>• |
| Level 2 | 3–4 | • Demonstrates accurate knowledge and understanding.<br>• Reference to the antagonistic muscle pairs and contractions for both phases of the press up<br>• Learners will identify linked factors/components, with some development in the form of mostly accurate and relevant |

| | | |
|---|---|---|
| | | factual material, leading to an analysis of the muscular system in the context being presented. The accuracy in the detail on the factors identified is likely to vary.<br>• The response may contain parts that lack clarity or proper organisation. Evidence of correct technical language being used. |
| Level 3 | 5–6 | • Demonstrates accurate knowledge and understanding.<br>• Sustained coverage of the antagonistic muscle pairs and contractions for both phases of the press up. Might demonstrate the ability to integrate and synthesise relevant information about the muscular system.<br>• A contextualised analysis of the skeletal system is developed using mostly coherent chains of reasoning, leading to a range of factors/components being present. Learners will demonstrate understanding of linkages and relationships between/within systems.<br>• Response demonstrates good organisation, clarity and use of technical language. |

| **Question Number** | **Answer** | **Mark** |
|---|---|---|
| 5a | Award **one** mark for stating the meaning of the term pulmonary ventilation.<br><br>• 'the total volume of gas/air inspired (breathed in) or expired (breathed out) per minute' (1)<br><br>Do **not** accept oxygen. | 1 |

| **Question Number** | **Answer** | **Mark** |
|---|---|---|
| 5b | Award **one** mark for providing a typical value at rest.<br><br>**(must have units to be awarded the mark)**<br><br>• 6-9 **L/min** (1) | 1 |

| Question Number | Answer | Mark |
|---|---|---|
| 6(a) | Award up to **four** marks for explaining the role of the intercostal muscles in breathing.<br><br>**Two** marks are awarded for **inspiration** and **two** marks awarded for **expiration**<br><br>**Inspiration**<br>External intercostals **<u>contract</u>** and internal intercostals **<u>relax</u>** (1) to lift the ribs/thoracic cavity **<u>up</u>** and **<u>out</u>** (1)<br><br>**Expiration**<br>External intercostals **<u>relax</u>** and internal intercostals **<u>contract</u>** (1) to pull the ribs/thoracic cavity **<u>down</u>** and **<u>in</u>** (1) | 4 |

| Question Number | Answer | Mark |
|---|---|---|
| 6(b) | Award up to **four** marks for explaining the process of gaseous exchange of $O_2$ at the alveoli<br><br>$ppO_2$ (Partial Pressure of Oxygen) /concentration/levels of oxygen in the alveoli is high (1)<br>$PP0_2$ (Partial Pressure of Oxygen) concentration /levels of oxygen in the blood is low (1)<br>This creates a steeper diffusion gradient/ oxygen diffuses quicker (1) oxygen moves from the alveoli **<u>into the blood</u>** (1) | 4 |

<table>
<tr><th>Question number</th><th colspan="2">Indicative content</th></tr>
<tr><td>6(c)</td><td colspan="2">Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers.<br><br>Award up to six marks for assessing how the respiratory system adapts following the completion of a 6 month extensive endurance training programme.<br><br>• Maximal breathing rate increases; this enables more air to move in and out of the lungs allowing for a more efficient gas exchange<br>• Increased lung capacity; therefore allowing a greater quantity of air to move in and out.<br>• Increased tidal volume; the amount of air breathed in and out per breath<br>• Increased pulmonary ventilation (V̇E); the amount of air breathed in and out in a minute<br>• Increased strength of the respiratory muscles allows them to breathe in more air and withstand fatigue for longer<br>• Greater capillarisation enables more blood to flow in and out of the lungs to provide a greater surface area for haemoglobin to bind with the blood<br>• Increased number of alveoli enables more gas exchange to occur<br>• Steeper diffusion gradient created which enables more oxygen to be used in the tissue and the body gas exchange becomes more efficient<br><br>Accept any other appropriate answer</td></tr>
<tr><td colspan="3">Mark scheme (award up to 6 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.</td></tr>
<tr><td>Level</td><td>Mark</td><td>Descriptor</td></tr>
<tr><td>Level 0</td><td>0</td><td>No rewardable material.</td></tr>
<tr><td>Level 1</td><td>1–2</td><td>• Demonstrates isolated elements of knowledge and understanding.<br>• Provides little or no reference to relevant respiratory system adaptations following the completion of his 6 month extensive endurance training programme<br>• Generic statements may be presented, rather than linked factors/components being identified and explored in the context of the respiratory system. Limited attempt to address the question.<br>• Response is likely to lack clarity, organisation and the required technical language.</td></tr>
<tr><td>Level</td><td>Mark</td><td>Descriptor</td></tr>
<tr><td>Level 2</td><td>3–4</td><td>• Demonstrates accurate knowledge and understanding.<br>• References to relevant respiratory system adaptations following the completion of his 6 month extensive endurance training programme<br>• Learners will identify linked factors/components, with some development in the form of mostly accurate and relevant</td></tr>
</table>

| | | |
|---|---|---|
| | | factual material, leading to an analysis of the respiratory system in the context being presented. The accuracy in the detail on the factors identified is likely to vary.<br>• The response may contain parts that lack clarity or proper organisation. Evidence of correct technical language being used. |
| Level 3 | 5–6 | • Demonstrates accurate knowledge and understanding.<br>• Sustained coverage of relevant respiratory system adaptations following the completion of his 6 month extensive endurance training programme Might demonstrate the ability to integrate and synthesise relevant information about the respiratory system.<br>• A contextualised analysis of the respiratory system is developed using mostly coherent chains of reasoning, leading to a range of factors/components being present. Learners will demonstrate understanding of linkages and relationships between/within systems.<br>• Response demonstrates good organisation, clarity and use of technical language. |

| **Question Number** | **Answer** | **Mark** |
|---|---|---|
| 7(a) | Award up to **two** marks for describing how Carbon Dioxide ($CO_2$) is transported in the blood<br><br>• dissolved in water / as carbonic acid ($H_2CO_3$) (1)<br>• combined with haemoglobin / as carbaminohaemoglobin ($HbCO_2$) (1)<br>• dissolved in plasma (1) | 2 |

| **Question Number** | **Answer** | **Mark** |
|---|---|---|
| 7(b) | Award a maximum of **five** marks for explaining how Carbon Dioxide ($CO_2$) is removed from the body<br><br>• $CO_2$ diffuses from the muscle to the blood (1)<br>• $CO_2$ is transported to the heart via the vena cava/veins/venules (1)<br>• The Pulmonary Artery transports $CO_2$ to the lungs (1)<br>• Gases diffuse from high partial pressure or concentration to low partial pressure or concentration (1) causing a diffusion or concentration gradient (1)<br>• $CO_2$ diffuses/gaseous exchange from the blood to the alveoli where it is breathed out (1) | 5 |

| Question Number | Answer | Mark |
|---|---|---|
| 8 | Award **one** mark for stating what blood vessel is responsible for transporting oxygen from the left ventricle.<br><br>• Aorta | 1 |

| Question Number | Answer | Mark |
|---|---|---|
| 9 (a)(i) | Award **one** mark for defining blood pressure.<br><br>• Force exerted by the blood on **the vessel walls** | 1 |

| Question Number | Answer | Mark |
|---|---|---|
| 9 (a)(ii) | Award **one** mark for providing a value of someone who is suffering with hypertension **(must have units to be awarded the mark)**<br><br>• 140/90 - 190/100 **mmHg** | 1 |

| Question Number | Answer | Mark |
|---|---|---|
| 9(b) | Award up to **five** marks for describing the process of blood clotting.<br><br>Platelets attach together to form a plug (blood clot)(1) the platelets then release fibrin (1) and seal the wound/ stop any further bleeding (1) the fibrin traps red blood cells (rbc)/ plasma/ white blood cells (1) to repair the wound (1) | 5 |

| Question Number | Answer | Mark |
|---|---|---|
| 9 (c) | Award **one** mark for stating which part of blood fights infections.<br><br>White blood cells (1) | 1 |

| Question Number | Answer | Mark |
|---|---|---|
| 9 (d) | Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers.<br><br>Award up to **six** marks for analysing how an increased stroke volume will help to improve the quality of Jose's cycling performance.<br><br>• Increased stroke volume is dependent on venous return (Starling's Law)<br>• Increased venous return (VR) causes stretch of atrial wall<br>• Due to increased blood volume<br>• Excitation of sino-atrial (SA) node which increases heart rate<br>• Stretch of ventricle walls/more forceful contraction of heart or ventricle walls<br>• Increased stroke volume will increase cardiac output (Cardiac output = stroke volume x heart rate / Q = SV x HR)<br>• **More** or **faster** blood or oxygen pumped to the working muscles, therefore increases performance<br>• Increased performance -aerobic respiration can work for longer / **increases** the time or intensity for exercise or respiration / **more** aerobic respiration takes place<br>• Delays fatigue allowing him to work at a higher intensity for a longer duration<br>• Reduced build up or faster removal of lactic acid or carbon dioxide<br><br>**Accept any other appropriate answer** | 6 |

**Mark scheme (award up to 6 marks)** refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

| Level | Mark | Descriptor |
|---|---|---|
| Level 0 | 0 | No rewardable material. |
| Level 1 | 1–2 | • Demonstrates isolated elements of knowledge and understanding.<br>• Provides little or no reference to relevant effects of an increased stroke volume to improve the quality of performance.<br>• Generic statements may be presented, rather than linked factors/components being identified and explored in the context of stroke volume. Limited attempt to address the question.<br>• Response is likely to lack clarity, organisation and the required technical language.<br>• |

| Level | Mark | Descriptor |
|---|---|---|
| Level 2 | 3–4 | • Demonstrates accurate knowledge and understanding.<br>• References to relevant effects of an increased stroke volume to improve the quality of performance.<br>• Learners will identify linked factors/components, with some development in the form of mostly accurate and relevant factual material, leading to an analysis of the effects of exercise on stroke volume in the context being presented. The accuracy in the detail on the factors identified is likely to vary.<br>• The response may contain parts that lack clarity or proper organisation. Evidence of correct technical language being used. |
| Level 3 | 5–6 | • Demonstrates accurate knowledge and understanding.<br>• Sustained coverage of relevant effects of an increased stroke volume to improve the quality of performance. Might demonstrate the ability to integrate and synthesise relevant information about the cardiovascular system.<br>• A contextualised analysis of the cardiovascular system is developed using mostly coherent chains of reasoning, leading to a range of factors/components being present. Learners will demonstrate understanding of linkages and relationships between/within systems.<br>• Response demonstrates good organisation, clarity and use of technical language. |

| Question Number | Answer | Mark |
|---|---|---|
| 10 (a) | Award a maximum of **five** marks for describing how ATP re-synthesises during the cycle using the ATP/PC system.<br><br>• It is a coupled reaction (1) that takes place in the sarcoplasm (1)<br>• The fuel used is phosphocreatine (PC) (1)<br>• PC breaks down into creatine **and** phosphate with energy (1) using the enzyme **creatine kinase** (1)<br>• 1 ATP is resynthesised per 1 molecule of PC (1)<br>• ADP + P = ATP (1) | 5 |

| Question Number | Answer | Mark |
|---|---|---|
| 10 (b) | Award a maximum of **five** marks for explaining the main processes involved in the alactacid component of Clarissa's recovery process.<br><br>• The alactacid component takes between two and three minutes for full recovery (1)<br>• Uses up to 4 litres of oxygen (1)<br>• Oxygen consumption remains high (1)<br>• To restore the ATP (1) and PC stores depleted during exercise (1)<br>• This energy is provided by the break-down of fats and carbohydrate (1)<br>• Using the aerobic system (1)<br><br>**Accept any other appropriate answer** | 5 |

| Question Number | Answer | Mark |
|---|---|---|
| 10 (c) | Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers.<br><br>Award up to **six** marks for evaluating how Oxygen ($O_2$) availability and fuel availability determine which energy system is used.<br><br>**Oxygen**<br>• If there is $O_2$ available then the aerobic system would be predominantly used.<br>• If there is no $O_2$ available then the anaerobic energy system (ATP-PC / lactic acid) would be predominantly used.<br>• If an activity is short duration (10 seconds)/high intensity then the predominant system is the ATP-PC<br>• Aerobic threshold will occur if $O_2$ levels fall below the requirements of the aerobic system then the lactic acid system will be predominant.<br><br>**Fuel Availability**<br>• If there are sufficient PC stores then the ATP-PC will be predominant for high intensity short duration (<10 seconds).<br>• PC stores deplete quickly during very high intensity meaning the ATP-PC cannot be predominant after 10 seconds unless recovery to resynthesise. | 6 |

| | | |
|---|---|---|
| | • If glycogen/carbohydrate is present and it is high intensity then the lactic acid system will be used.<br>• If glycogen/carbohydrate is present and is low intensity then the aerobic system will be used.<br>• The greater the glycogen stores then the longer the aerobic system can be predominant.<br>• If intensity is low fats are the predominant fuel source for the aerobic system.<br><br>**Accept any other appropriate answer** | |

**Mark scheme (award up to 6 marks)** refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

| **Level** | **Mark** | **Descriptor** |
|---|---|---|
| Level 0 | 0 | No rewardable material. |
| Level 1 | 1–2 | • Demonstrates isolated elements of knowledge and understanding.<br>• Provides little or no reference to how Oxygen availability and fuel availability determine which energy system is used.<br>• Generic statements may be presented, rather than linked factors/components being identified and explored in the context of Oxygen and fuel availability. Limited attempt to address the question.<br>• Response is likely to lack clarity, organisation and the required technical language. |
| **Level** | **Mark** | **Descriptor** |
| Level 2 | 3–4 | • Demonstrates accurate knowledge and understanding.<br>• References to how Oxygen availability and fuel availability determine which energy system is used.<br>• Learners will identify linked factors/components, with some development in the form of mostly accurate and relevant factual material, leading to an analysis of the energy system used in relation to Oxygen and fuel availability. The accuracy in the detail on the factors identified is likely to vary.<br>• The response may contain parts that lack clarity or proper organisation. Evidence of correct technical language being used. |
| Level 3 | 5–6 | • Demonstrates accurate knowledge and understanding.<br>• Sustained coverage of how Oxygen availability and fuel availability determine which energy system is used.<br>• Might demonstrate the ability to integrate and synthesise relevant information about the energy systems.<br>• A contextualised analysis of the Oxygen and fuel available is developed using mostly coherent chains of reasoning, leading to a range of factors/components being present. Learners will demonstrate understanding of linkages and relationships between/within systems.<br>• Response demonstrates good organisation, clarity and use of technical language. |

| Question Number | Answer | Mark |
|---|---|---|
| 11 | Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers.<br><br>Award up to **eight** marks for analysing the impact of a warm up on the muscular and cardiovascular systems.<br><br>**Muscular System**<br><br>• Reduces risk of injury muscle strains/pulls/tears increased elasticity of muscle tissue<br>• Increased flexibility<br>• Extensibility of muscle<br>• Increases temperature of muscle<br>• Decreases muscle viscosity<br>• Increases speed and strength of contraction<br>• Increases enzyme/metabolic activity<br>• Increases ATP production<br>• Increases activation of neural pathways<br><br>**Cardiovascular System**<br><br>• Increases heart rate/ stroke volume/ cardiac output<br>• More oxygenated blood to muscles<br>• Reduced lactic acid build up in muscles<br>• Increased removal of carbon dioxide and waste products out of the blood stream<br>• Activates vascular shunt mechanism<br>• Vasomotor control centre (VCC)/Medulla Oblangata<br>• Redistributes blood from nonessential organs to the working muscles<br>• Vasodilation of arterioles leading to the working muscle<br>• Vasoconstriction of arterioles leading to the non-essential organs<br>• Therefore, more oxygen can be supplied to sustain energy production during the activity<br>• Increases blood temperature<br>• Reduces blood viscosity<br>• Increases diffusion of oxygen from haemoglobin to muscles<br>• Steeper diffusion gradient causes increased diffusion rate of oxygen into the blood stream.<br>• Increases venous return | 8 |

| | | |
|---|---|---|
| | ▪ Skeletal Muscle pump squeezes veins forcing blood back towards the heart<br>▪ Respiratory pump contraction of respiratory muscles forces blood back to the heart<br>• Starling's law of the heart/increased venous return increases stroke volume<br><br>**Accept any other appropriate answer** | |

**Mark scheme (award up to 8 marks)** refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

| **Level** | **Mark** | **Descriptor** |
|---|---|---|
| Level 0 | 0 | No rewardable material. |
| Level 1 | 1–2 | • Demonstrates isolated elements of knowledge and understanding.<br>• Provides little or no reference to interrelationships between the relevant body systems<br>• Generic statements may be presented, rather than linked factors/components being identified and explored in the context of the body systems mentioned. Limited attempt to address the question.<br>• Response is likely to lack clarity, organisation and the required technical language. |
| Level 2 | 3–4 | • Demonstrates accurate knowledge and understanding but may contain lapses.<br>• References to relevant interrelationships between the body systems are present<br>• Learners will identify linked factors/components, with some development in the form of mostly accurate and relevant factual material, leading to an analysis of the adaptations to training in the context being presented. The accuracy in the detail on the factors identified is likely to vary.<br>• The response may contain parts that lack clarity or proper organisation. Evidence of correct technical language being used. |
| Level 3 | 5–6 | • Demonstrates accurate knowledge and understanding.<br>• Sustained coverage of relevant interrelationships between the body systems is present.<br>• Might demonstrate the ability to integrate and synthesise relevant information about the relevant body systems<br>• A contextualised analysis of the interrelationships between the body systems is developed using mostly coherent chains of reasoning, leading to a range of factors/components being present. Learners will demonstrate understanding of linkages and relationships between/within systems.<br>• Response demonstrates good organisation, clarity and correct use of technical language. |
| Level 4 | 7-8 | • Demonstrates accurate and thorough knowledge and understanding.<br>• Sustained coverage of relevant interrelationships between the body systems is present.<br>• Demonstrates the ability to integrate and synthesise relevant information about the relevant body systems<br>• Displays a well developed contextualised analysis of the interrelationships between the body systems is developed |

| | | |
|---|---|---|
| | | containing logical chains of reasoning throughout. Learners demonstrate thorough understanding of linkages and relationships between/within systems.<br>• Response demonstrates good organisation, clarity and correct use of technical language. |

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