

# Mark Scheme (Results)

January 2018

BTEC Level 3 National in Sport

Unit 1: Anatomy and Physiology  
(31524H)



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## **Unit 1: Anatomy and Physiology – sample marking grid**

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### **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**

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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 <b>one</b> mark for correctly labelling each bone. <ul style="list-style-type: none"> <li>• Carpals – A</li> <li>• Metacarpals – B</li> <li>• Phalanges – C</li> </ul>	3

Question Number	Answer	Mark
1 (b)	Award <b>four</b> marks for explaining long-term skeletal adaptations that have taken place. <ul style="list-style-type: none"> <li>• Increased bone strength/increased bone density (1) due to the contact/impact when tackling (1)</li> <li>• Increased ligament strength (1) due to acting upon a resistance/participating in the scrum (1)</li> </ul> <p>Accept any other appropriate answer.</p>	4

Question Number	Answer	Mark
1 (c)	Award <b>one</b> mark for identification of the function of a bursa and <b>two</b> further marks for appropriate expansion. <p>Provides a cushion between bones and tendons/ muscles (1) which helps reduce friction (1) and allows for free movement (1) as well as reducing the risk of injury (1)</p> <p>Accept any other appropriate answer.</p>	3

Question Number	Answer	Mark
2	Award <b>one</b> mark for correctly labelling each muscle. <ul style="list-style-type: none"> <li>• Tricep – A</li> <li>• Wrist extensor(any of the wrist extensor group e.g. extensor carpi radialis ) - B</li> </ul>	2

Question Number	Answer	Mark
3 (a)	<p>Award <b>three</b> marks for explaining the role of a fixator muscle.</p> <ul style="list-style-type: none"> <li>Fixators contract isometrically (1) by stabilising the (origin) of the agonist/muscle (1) they help support the agonist to carry out the function by stopping unwanted movement/carry out the movement (1) which enables the weight to be lifted (1) and stops the weight from crashing down causing injury (1)</li> </ul> <p>Accept any other appropriate answer.</p>	3

Question Number	Answer	Mark
3(b)	<p>Award <b>two</b> marks for describing a concentric contraction.</p> <ul style="list-style-type: none"> <li>Increase of tension in the muscle (1) as it shortens in length (1)</li> </ul> <p>Accept any other appropriate answer.</p>	2

Question Number	Answer	Mark
3(c)	<p>Award <b>one</b> mark for explaining how a muscle increases its pliability. Award a further <b>two</b> marks for the effects of increased muscle pliability.</p> <ul style="list-style-type: none"> <li>Muscles will increase their pliability due to the increased temperature (1) therefore the muscle has a greater ability to stretch (1) and reduce the risk of injury (1)</li> </ul> <p>Accept any other appropriate answer.</p>	3

Question Number	Answer	Mark
4 (a)	<p>Award <b>one</b> mark for defining residual volume for a total <b>two</b> marks.</p> <ul style="list-style-type: none"> <li>The amount of <b>air</b> that is left in the lungs (1) after <b>fully</b> exhaling (1)</li> </ul> <p>Do <b>not</b> accept oxygen.</p>	2

Question Number	Answer	Mark
4 (b)	<p>Award <b>one</b> mark for providing an average residual volume for a healthy adult male.</p> <ul style="list-style-type: none"> <li>1.0-1.5 <b>L</b> / 1000-1500 <b>cm<sup>3</sup>/ ml</b> (1)</li> </ul>	1

Question Number	Answer	Mark
5(a)	<p>Award up to <b>four</b> marks for explaining the effects on the respiratory system of taking part in the race. <b>Two</b> marks are awarded for respiratory responses and <b>two</b> marks awarded for associated expansion. Maximum <b>two</b> marks for respiratory response.</p> <ul style="list-style-type: none"> <li>Increased breathing rate/breathe quicker (1) due to a greater demand for oxygen in the race/ to remove waste products (1)</li> <li>Increased tidal volume/depth of breathing/more air (1) due to a greater demand for oxygen in the race/to remove waste products (1)</li> </ul> <p>Accept any other appropriate answer.</p>	4

Question Number	Answer	Mark
5(b)	<p>Award up to <b>four</b> marks for explaining how increasing vital capacity aids performance.</p> <p>Due to the increased strength of the respiratory muscles (1) more air (carbon dioxide) can be expelled from the lungs (1) and more air (oxygen) can be inspired (1) to allow performance to be at a higher intensity/speed (1) without/delaying <b>fatigue</b> (1)</p> <p>Accept any other appropriate answer.</p>	4

Question number	Indicative content
5(c)	<p>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 learners should be rewarded for other relevant answers.</p> <ul style="list-style-type: none"> <li>• O<sub>2</sub>/CO<sub>2</sub> /gas moves from a high pressure/pp/Partial pressure/concentration to a low pressure/pp/Partial pressure/concentration</li> <li>• During the race there is a high ppO<sub>2</sub> in the alveoli</li> <li>• There is a low ppO<sub>2</sub> in the blood/capillary</li> <li>• Due to more oxygen being used for aerobic respiration</li> <li>• Causing a concentration/diffusion gradient</li> <li>• O<sub>2</sub> diffuses from the alveoli into the blood</li> <li>• There is a low ppCO<sub>2</sub> in the alveoli</li> <li>• There is a high ppCO<sub>2</sub> in the blood</li> <li>• As a result of CO<sub>2</sub> being produced as a by-product of aerobic respiration.</li> <li>• Causing a concentration/diffusion gradient</li> <li>• CO<sub>2</sub> diffuses from the blood into the alveoli and is expired</li> <li>• Steeper diffusion gradient is created during the race so the body's gas exchange becomes more efficient</li> </ul>

**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	<ul style="list-style-type: none"> <li>• Demonstrates isolated elements of knowledge and understanding.</li> <li>• Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question.</li> <li>• Limited analysis which contains generic assertions rather than interrelationships or linkages</li> </ul>
Level 2	3–4	<ul style="list-style-type: none"> <li>• Demonstrates some accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and some of the points made will be relevant to the context in the question.</li> </ul> <p>Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</p>
Level 3	5–6	<ul style="list-style-type: none"> <li>• Demonstrates mostly accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and most of the points made will be relevant to the context in the question.</li> <li>• Displays a developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner.</li> </ul>

Question Number	Answer	Mark
6	<p>Award <b>one</b> mark for identification of which component of blood carries most oxygen.</p> <ul style="list-style-type: none"> <li>Red blood cells/rbc/haemoglobin</li> </ul>	1

Question Number	Answer	Mark
7(a)	<p>Award <b>one</b> mark for stating the function of the pulmonary artery.</p> <ul style="list-style-type: none"> <li>Take <b>deoxygenated/oxygen poor</b> blood (from the heart) to the <b>lungs</b></li> </ul>	1

Question Number	Answer	Mark
7(b)	<p>Award <b>one</b> mark for stating the function of the tricuspid valve for a maximum <b>two</b> marks.</p> <ul style="list-style-type: none"> <li>Control blood flow between the <b>right</b> atrium and <b>right</b> ventricle/controls blood flow on the <b>right</b>-hand side of the heart (1) and prevent backflow (1)</li> </ul>	2

Question Number	Answer	Mark
8 (a)(i)	<p>Award up to <b>two</b> marks for explaining the changes in heart rate before, the training session.</p> <p>There is an <b>anticipatory rise</b> (1) caused by adrenaline (1)</p> <p>Accept any other appropriate answer.</p>	2

Question Number	Answer	Mark
8 (a)(ii)	<p>Award up to <b>three</b> marks for explaining the changes in heart rate during the training session.</p> <p><b>During</b> There is a <b>rapid/quick/fast</b> increase in heart rate in the first three minutes (1) due to a shortage of oxygen/oxygen deficit (1) the heart rate then <b>plateaus/steady state</b> (1) because oxygen supply has met demand (1)</p> <p>Accept any other appropriate answer.</p>	3

Question Number	Answer	Mark
8 (b)	<p>Award up to <b>five</b> marks for describing how nervous control of the cardiac cycle decreases heart rate.  <b>Must be in correct order.</b></p> <ul style="list-style-type: none"> <li>• Initiated by the parasympathetic nervous system (1) message sent down the vagus nerve (1)</li> <li>• Which reduces the firing rate/number of impulses (1) of the sinoatrial node/SA node/SAN (1)</li> <li>• Sending impulses to the atrioventricular node/AV node/AVN (1)</li> <li>• To the bundle of His (1) and Purkinje fibres (1)</li> </ul> <p>Accept annotated diagram/flow chart.  Accept any other appropriate answer.</p>	5

Question Number	Answer	Mark
8 (c)	<p>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 learners should be rewarded for other relevant answers.</p> <ul style="list-style-type: none"> <li>• Hypothermia is a reduced core body temperature/body temperature below 35°</li> <li>• Due to hypothermia there will be a vasoconstriction of blood vessels near to the skin and extremities (fingers and toes)</li> <li>• To avoid or reduce further heat loss</li> <li>• There will be a reduced blood flow to muscles, therefore less oxygen delivered</li> <li>• Due to hypothermia there will be a vasodilation of blood vessels near to the vital organs</li> <li>• To maintain core temperature (37°)</li> <li>• There will be an increased heart rate to try and get blood around the body</li> <li>• There will be a rise in blood pressure to try and get the blood around the body</li> <li>• (Severe) hypothermia can cause decreased blood pressure</li> <li>• (Severe) can cause a decreased heart rate</li> <li>• Which leads to cardiac arrhythmias</li> <li>• Could result in a cardiac arrest/heart attack</li> </ul>	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	<ul style="list-style-type: none"> <li>• Demonstrates isolated elements of knowledge and understanding.</li> <li>• Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question.</li> <li>• Limited analysis which contains generic assertions rather than interrelationships or linkages</li> </ul>
Level	Mark	Descriptor
Level 2	3–4	<ul style="list-style-type: none"> <li>• Demonstrates some accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and some of the points made will be relevant to the context in the question.</li> <li>• Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</li> </ul>
Level 3	5–6	<ul style="list-style-type: none"> <li>• Demonstrates mostly accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and most of the points made will be relevant to the context in the question.</li> <li>• Displays a developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner.</li> </ul>

Question Number	Answer	Mark
9	<p>Award <b>one</b> mark for each correctly stated chemical source and amount of ATP produced for a maximum of <b>four</b> marks.</p> <p><b>ATP-PC system</b></p> <ul style="list-style-type: none"> <li>• (Chemical source/fuel) Phosphocreatine/PC/creatine phosphate/CP (1)</li> <li>• (ATP produced) 1(ATP) (1)</li> </ul> <p><b>Aerobic system</b></p> <ul style="list-style-type: none"> <li>• (Chemical source/fuel) fats/fatty acids/triglycerides (1)</li> <li>• (ATP produced) 36-39 (ATP) (1)</li> </ul>	4

Question Number	Answer	Mark
10	<p>Award up to <b>five</b> marks for describing the Krebs cycle. <b>Must be in logical order.</b></p> <p>Occurs in (the matrix) of the mitochondria (1)  pyruvate combines with CoA (1)  to create Acetyl CoA (1)  Acetyl CoA combines with oxaloacetic acid/OAA (1) to  make citric acid (1)  and the by-product is carbon dioxide/CO<sub>2</sub> (1) H<sup>+</sup> is  produced (1) and passes onto the electron transport  chain/ETC (1)  the reaction yields 2 ATP (1)</p> <p>Accept annotated diagram/flow chart.</p>	5

Question Number	Answer	Mark
11	<p>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 learners should be rewarded for other relevant answers.</p> <p><b>Why ATP-PC system might not be considered important</b></p> <ul style="list-style-type: none"> <li>• ATP-PC energy system is used for high intensity work, marathon is low/medium intensity exercise</li> <li>• ATP-PC energy system used for working over a short duration, (e.g.)100 m. Marathon is a long duration/elite performers complete it in just over 2 hours</li> </ul>	6

	<ul style="list-style-type: none"> <li>• ATP-PC energy system is typically used by power athletes, marathon runners are endurance athletes</li> <li>• ATP-PC energy system would not be able to provide enough energy therefore the aerobic energy system would be used during the activity</li> </ul> <p><b>Why ATP-PC system might be considered important</b></p> <ul style="list-style-type: none"> <li>• To be able to change pace when breaking away from the field</li> <li>• To perform a sprint finish if it is required/overtake somebody</li> <li>• To support the partial regeneration of PC stores</li> <li>• Marathon runner will not focus solely on training their anaerobic energy pathways, therefore they will not be as efficient as that of an power athlete</li> </ul>	
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**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\*.

<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
Level 0	0	No rewardable material.
Level 1	1–2	<ul style="list-style-type: none"> <li>• Demonstrates isolated elements of knowledge and understanding.</li> <li>• Few of the points made will be relevant to the context in the question.</li> <li>• Limited evaluation which contains generic assertions leading to a conclusion that is superficial or unsupported.</li> </ul>
<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
Level 2	3–4	<ul style="list-style-type: none"> <li>• Demonstrates some accurate knowledge and understanding.</li> <li>• Some of the points made will be relevant to the context in the question, but the link will not always be clear.</li> <li>• Displays a partially developed evaluation which considers some different aspects leading to a conclusion which considers some different competing points, although not always in detail.</li> </ul>
Level 3	5–6	<ul style="list-style-type: none"> <li>• Demonstrates mostly accurate knowledge and understanding.</li> <li>• Most of the points made will be relevant to the context in the question, and there will be clear links.</li> <li>• Displays a developed and logical evaluation which clearly considers different aspects leading to a conclusion which considers different competing points in detail.</li> </ul>

Question Number	Answer	Mark
12	<p>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 learners should be rewarded for other relevant answers.</p> <p>Cardiovascular system adaptations</p> <ul style="list-style-type: none"> <li>• <b>Cardiac hypertrophy</b> will make the heart stronger, which will result in an increased stroke volume</li> <li>• <b>Increase in stroke volume</b> will cause an increase in cardiac output, thus supplying more oxygen to the working muscles</li> <li>• <b>Increased blood volume</b> generates an increased blood flow to the muscles</li> <li>• More oxygenated blood to muscles and reduced lactic acid build up in muscles</li> <li>• Supports the removal of carbon dioxide and lactic acid/waste products out of the blood stream</li> <li>• <b>Increased capillarisation of skeletal muscle and alveoli</b> resulting in an increased delivery of oxygen</li> <li>• <b>Decreased heart rate recovery time</b>, to enable Paula to produce high intensity movements repeatedly</li> </ul> <p>Energy system adaptations</p> <ul style="list-style-type: none"> <li>• <b>Increased creatine stores</b>, providing more energy and supporting recovery from high intensity runs around the pitch</li> <li>• <b>Increased tolerance to lactate</b> will enable the player to keep moving quickly around the pitch once they are fatigued</li> <li>• <b>Increased use of fats as an energy source</b>, so that glycogen can be used later in the game and Paula will last the duration</li> <li>• <b>Increased storage of glycogen</b> to provide energy for ATP production</li> <li>• <b>Increased number of mitochondria</b> will increase the amount of ATP production to support an increased demand for energy</li> <li>• More efficient energy systems</li> <li>• Accept any relevant football applied points, e.g. last the full game delaying fatigue/delays OBLA, be able to work at a high intensity throughout, maintain quality of performance</li> </ul>	8

<p><b>Mark scheme (award up to 8 marks)</b> refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.</p>		
<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
Level 0	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> <li>• Demonstrates isolated elements of knowledge and understanding.</li> <li>• Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question.</li> <li>• Limited analysis which contains generic assertions rather than interrelationships or linkages</li> </ul>
<b>Level</b>	<b>Mark</b>	• <b>Descriptor</b>
Level 2	4-6	<ul style="list-style-type: none"> <li>• Demonstrates some accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and some of the points made will be relevant to the context in the question.</li> <li>• Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</li> </ul>
Level 3	7-8	<ul style="list-style-type: none"> <li>• Demonstrates mostly accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and most of the points made will be relevant to the context in the question.</li> <li>• Displays a developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner.</li> </ul>

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