



Mark Scheme (Results)

June 2022

Pearson BTEC Nationals
In Sport and Exercise Science
Unit 1: Sport and Exercise Physiology (31813H)

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June 2022

Publications Code 31813H_01_MS

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Unit 1: Sport and Exercise 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.
- Mark 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 mark grid, not according to their perception of where the grade boundaries may lie.
- All marks on the mark grid should be used appropriately.
- All the marks on the mark 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 mark grid.
- Where judgement is required, a mark grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the mark grid to a learner's response, a senior examiner should be consulted.

Specific marking guidance

The mark grids have been designed to assess learners' work holistically.

Rows in the grids identify the assessment focus/outcome being targeted. When using a mark 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.

Qu Num	Answer	Mark
1 (a)	<p>Award one mark for identification and one additional mark for related explanation. Credit to a maximum of two marks.</p> <ul style="list-style-type: none"> Lubricates (the joint) (1) allowing full/better range of movement/better technique/free movement at joint (1) Reduces friction (1) allowing him pain free movement (1) <p>Accept other appropriate responses.</p>	(2)

Qu Num	Answer	Mark
1 (b)	<p>Award one mark for each linked descriptive point. Credit to a maximum of four marks.</p> <p>NB Any four linked points.</p> <ul style="list-style-type: none"> Osteoclasts destroy old bone (1) This tissue is reabsorbed by the body (1) Osteoblasts lay down collagen/minerals/new bone (1) Osteocytes form from osteoblasts (1) and there is an increased uptake of calcium/phosphorus/minerals (1) To make the bones stronger (1) <p>Accept other appropriate responses.</p>	(4)

Qu Num	Answer	Mark
1 (c)	<p>Award one mark for each identification. Credit to a maximum of two marks.</p> <ul style="list-style-type: none"> Diaphragm (1) Internal intercostal muscles (1) External intercostal muscles (1) <p>Accept other appropriate responses</p>	(2)

Qu Num	Indicative content EVALUATE
1 (d)	<p>Answers will be credited according to the learner’s demonstration of knowledge and understanding of the material using the indicative content and levels 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.</p> <p>Isolated elements of knowledge about muscle fibre types</p> <ul style="list-style-type: none"> • Type IIX are the fastest contracting of the muscle fibres/produce the most force • Type 1 fibres are resistant to fatigue • Type IIA can be trained to develop their aerobic or anaerobic capabilities <p>Applied knowledge to question context</p> <ul style="list-style-type: none"> • Type IIX are the fastest contracting of the muscle fibres/produce the most force therefore they would be ideal for the batter to hit the ball a long way • Type 1 fibres are resistant to fatigue so would be used by the wicketkeeper whilst they were waiting to catch the ball • Type IIA can be trained to develop their aerobic or anaerobic capabilities, in this case the batter will need them to work to completed repeated runs between the wickets <p>Evaluation</p> <ul style="list-style-type: none"> • Players need a mix of all 3 fibre types during the game based on the intensity of their movement. • Without all 3 fibre types, players would not be able to vary the intensity they work within the game • Type IIX are important to the WK as he will need to move explosively to catch the ball before it touches the floor to get the batsman out • Type 1 fibres are not as important as the other fibres for the batsman as the other fibre types allow him to score runs • Type IIA are not as important to the WK as their movements are low or high intensity rather than sustained moderate to high intensity <p>Accept other appropriate responses.</p>

Level	Mark	Descriptor (Evaluate)
Level 0	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> • Demonstrates isolated elements of knowledge and understanding. • Few of the points made will be relevant to the context in the question. • Limited evaluation which contains generic assertions leading to a conclusion that is superficial or unsupported.
Level 2	4-6	<ul style="list-style-type: none"> • Demonstrates some accurate knowledge and understanding. • Some of the points made will be relevant to the context in question, but the link will not always be clear. • 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.
Level 3	7-8	<ul style="list-style-type: none"> • Demonstrates mostly accurate knowledge and understanding. • Most of the points made will be relevant to the context in question, and there will be clear links. • Displays a developed and logical evaluation which clearly considers different aspects leading to a conclusion which considers different competing points in detail.

Qu Num	Answer	Mark
2 (a) (i)	<p>Award one mark for identification.</p> <ul style="list-style-type: none"> Increases (1) Goes up (1) Raises (1) Levels become higher (1) <p>Accept other appropriate responses.</p>	(1)

Qu Num	Answer	Mark
2 (a) (ii)	<p>Award one mark for identification and one additional mark for related expansion. Credit to a maximum of two marks.</p> <ul style="list-style-type: none"> Promotes muscle growth/ (Produces) muscular hypertrophy (1) Due to protein synthesis (1) <p>Accept other appropriate responses.</p>	(2)

Qu Num	Answer	Mark
2 (a) (iii)	<p>Award one mark for identification.</p> <ul style="list-style-type: none"> Testosterone (1) 	(1)

Qu Num	Answer	Mark
2 (b) (i)	<p>Award one mark for identification</p> <ul style="list-style-type: none"> Maximal oxygen taken in and used/uptake (1) Aerobic capacity (1) Amount of oxygen consumed/utilised/used (1) Volume of oxygen consumed per minute per kilogram of body weight (1) <p>Accept other appropriate responses.</p>	(1)

Qu Num	Answer	Mark
2 (b) (ii)	<p>Award one mark for identification and one additional mark for related expansion. Credit to a maximum of two marks.</p> <ul style="list-style-type: none"> Anaerobic threshold will be delayed (1) as the body utilises more oxygen (1) <p>Accept other appropriate responses.</p>	(2)

Qu Num	Answer	Mark
2 (c) (i)	<p>Award one mark for each identification. Credit to a maximum of two marks.</p> <ul style="list-style-type: none"> Increased RBC (1) Increased haemoglobin (due to increased RBC) (1) <p>Accept other appropriate responses.</p>	(2)

Qu Num	Answer	Mark
2 (c) (ii)	<p>Award one mark for identification of advantage.</p> <ul style="list-style-type: none"> Blood viscosity is reduced (1) Blood flows more easily (1) <p>Accept other appropriate responses.</p>	(1)

Qu Num	Indicative content EVALUATE
2 (d)	<p>Answers will be credited according to the learner's demonstration of knowledge and understanding of the material using the indicative content and levels 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.</p> <p>Isolated elements of knowledge about responses</p> <ul style="list-style-type: none"> • Tidal volume is the amount of air breathed in and out per breath • Blood pH measures the acidity of the blood/will become more acidic during activity/blood pH will drop • Arteriovenous oxygen difference (a-vO₂ diff) is the difference in the amount of oxygen in the arteriole entering the muscle and venule leaving the muscle/shows oxygen uptake at the muscle <p>Applied knowledge to question context</p> <ul style="list-style-type: none"> • Tidal volume is the amount of air breathed in and out per breath, it will increase during exercise to increase oxygen intake/CO₂ removal • Blood pH measures the acidity of the blood/will become more acidic during activity due to increased amount of carbon dioxide produced during exercise • a-vO₂ diff is the difference in the amount of oxygen in the arteriole entering the muscle and venule leaving the muscle/shows oxygen uptake at the muscle, during exercise there should be a greater difference than at rest, i.e. more oxygen should be extracted <p>Evaluation</p> <ul style="list-style-type: none"> • Tidal volume is the amount of air breathed in and out per breath, it will increase during exercise to increase oxygen intake/CO₂ removal. This is critical so that Shawn has enough oxygen for energy production to meet the increased demands due to exercise • Blood pH measures the acidity of the blood/will become more acidic during activity due to increased amount of carbon dioxide produced during exercise, if blood acidity continues to rise this will cause fatigue preventing Shawn from working at a high intensity • a-vO₂ diff is the difference in the amount of oxygen in the arteriole entering the muscle and venule leaving the muscle/shows oxygen uptake at the muscle, during exercise more oxygen should be extracted to be used for aerobic energy production so Shawn can maintain work rate for longer <p>Accept other appropriate responses.</p>

Level	Mark	Descriptor (Evaluate)
Level 0	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> • Demonstrates isolated elements of knowledge and understanding. • Few of the points made will be relevant to the context in the question. • Limited evaluation which contains generic assertions leading to a conclusion that is superficial or unsupported.
Level 2	4-6	<ul style="list-style-type: none"> • Demonstrates some accurate knowledge and understanding. • Some of the points made will be relevant to the context in question, but the link will not always be clear. • 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.
Level 3	7-8	<ul style="list-style-type: none"> • Demonstrates mostly accurate knowledge and understanding. • Most of the points made will be relevant to the context in question, and there will be clear links. • Displays a developed and logical evaluation which clearly considers different aspects leading to a conclusion which considers different competing points in detail.

Qu Num	Answer	Mark
3 (a)	<p>Award one mark for each identification. Credit to a maximum of two marks.</p> <p>A – ATP-PC system (1) B – Aerobic system (1)</p> <p>Accept other appropriate responses.</p>	(2)

Qu Num	Answer	Mark
3 (b)	<p>Award one mark for identification and one additional mark for each related explanation. Credit to a maximum of three marks</p> <ul style="list-style-type: none"> • B/aerobic (energy system) (1) • as has a greater <u>energy</u> yield/34 (accept 32 to 39) ATP/provides most <u>energy</u>/provides <u>energy</u> for longer (1) • as uses oxygen/is aerobic/has no fatiguing by-product/no lactic acid accumulation (1) <p>Accept other appropriate responses.</p>	(3)

Qu Num	Answer	Mark
3 (c)	<p>Award one mark for each identification and one mark for each linked descriptive point. Credit to a maximum of four marks.</p> <p>Accept in any order</p> <ul style="list-style-type: none"> • Systole (1) Contraction phase/when blood is pumped from the heart (1) • Diastole (1) Relaxation phase/when the heart/chamber fills with blood (1) <p>Accept other appropriate responses.</p>	(4)

Qu Num	Answer	Mark
3 (d)	<p>Award one mark for identification.</p> <ul style="list-style-type: none"> • Accumulation/build-up of waste products (1) • (Accumulation of) carbon dioxide (1) • (Accumulation of) lactate (1) • Depletion of acetylcholine (1) <p>Accept other appropriate responses.</p>	(1)

Qu Num	Indicative content ANALYSE
3 (e)	<p>Answers will be credited according to the learner’s demonstration of knowledge and understanding of the material using the indicative content and levels 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.</p> <p>Isolated elements of knowledge</p> <ul style="list-style-type: none"> • Body temp should remain at 37° C • Nervous system uses receptors to collect internal measurements • Thermoreceptors detect changes in temperature • The CV system allows redistribution of blood flow to help control temperature <p>Applied knowledge to question context</p> <ul style="list-style-type: none"> • Thermoreceptors detect changes in temperature, so will detect the increase in temperature caused by exercise • The CV system allows redistribution of blood flow to help control temperature, in this case blood flow will be directed to blood vessels close to the skin by vasodilation <p>Linkages/interrelationships</p> <ul style="list-style-type: none"> • Thermoreceptors detect changes in temperature, so will detect the increase in temperature caused by exercise. This information will be relayed to the CNS to act on this information, impacting on the CV system • The CV system allows redistribution of blood flow to help control temperature, in this case blood flow will be directed to blood vessels close to the skin by vasodilation, this is controlled by the nervous system controlling the CV system • These two systems must work together, without information from the NS the CV system would not know to reduce heat through vasodilation <p>Accept other appropriate responses.</p>

Level	Mark	Descriptor (Analysis)
Level 0	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> • Demonstrates isolated elements of knowledge and understanding. • Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question. • Limited analysis which contains generic assertions rather than interrelationships or linkages.
Level 2	4-6	<ul style="list-style-type: none"> • Demonstrates some accurate knowledge and understanding. • Breaks the situation down into component parts and some of the points made will be relevant to the context in the question. <p>Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</p>
Level 3	7-8	<ul style="list-style-type: none"> • Demonstrates mostly accurate knowledge and understanding. • Breaks the situation down into component parts and most of the points made will be relevant to the context in the question. • Displays a developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner.

Qu Num	Answer	Mark
4 (a)	<p>Award one mark for identification and one additional mark for related explanation. Credit to a maximum of two marks</p> <ul style="list-style-type: none"> • Use supplements/example supplement (1) as they will restore/maintain energy/glucose (during the race) • Consume carbohydrate during the race (1) as the body's stores of these will be insufficient to last the length of the race (1) • Carbohydrate load/increase carbohydrate intake (before event) (1) to ensure muscle glycogen stores are full (1) <p>Accept other appropriate responses.</p>	(2)

Qu Num	Answer	Mark
4 (b)	<p>Award one mark for identification and one additional mark for each related explanation. Credit to a maximum of three marks</p> <ul style="list-style-type: none"> • Needs to replace fluids /prevent dehydration (1), otherwise, they will be unable to continue to sweat/unable to regulate body temp through sweat (1) so will overheat/fatigue (1) • (Without sufficient fluids she will) dehydrate (1) causing increased viscosity of the blood/loss of blood plasma (1) which will reduce her ability to sweat/reduce cardiac output/reduce intensity she can work at (1) <p>Accept other appropriate responses.</p>	(3)

Qu Num	Answer	Mark
4 (c) (i)	<p>Award one mark for each identification. Credit to a maximum of two marks</p> <ul style="list-style-type: none"> • $V_E = BR (1) \times TV (1)$ • = frequency (of breathing) (1) \times depth of breathing (1) <p>Accept other appropriate responses.</p>	(2)

Qu Num	Answer	Mark
4 (c) (ii)	<p>Award one mark for identification and one additional mark for related explanation. Credit to a maximum of two marks</p> <ul style="list-style-type: none"> • Increased oxygen intake (1) so, increased diffusion gradient/more oxygen to the muscle (1) delaying (muscle) fatigue (1) • Increased CO₂ breathed out (1) so, decreased CO₂ levels in the blood (1) delaying muscle fatigue (1) <p>Accept other appropriate responses.</p>	(3)

Qu Num	Indicative content ANALYSE
4 (d) Expert	<p>Answers will be credited according to the learner’s demonstration of knowledge and understanding of the material using the indicative content and levels 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.</p> <p>Isolated elements of knowledge about training adaptations</p> <ul style="list-style-type: none"> • Strength – hypertrophy/increase in muscle size • Strength – hyperplasia/splitting of fibres/increase in number of fibres • ME – increased resistance of muscles to fatigue • ME – increased mitochondria • ME – increased myoglobin • ME – capillarisation • ME – increased glycogen/triglyceride stores <p>Applied knowledge to question context</p> <ul style="list-style-type: none"> • Strength training will result in greater force being applied, useful on inclines • ME training adaptations (any from list) will increase aerobic energy production during the race/aerobic capacity (of type I/IIa fibres) • ME leads to increased myoglobin so more oxygen can be stored in the muscle to maintain pedalling through the race/delay fatigue. <p>Linkages/interrelationships</p> <ul style="list-style-type: none"> • Strength training will result in greater force being applied, useful on inclines as she will not need to slow down, to complete this section of the race • The increase in aerobic energy production within the muscles is essential for an event over 700 km so the muscles can continue to contract, without the need for frequent rests/allows her to maintain speed between climbs • The adaptations from strength and muscular endurance training combined will give the best outcome as without strength she could not complete the hill climbs and without endurance she would not be able to cover the distance at a reasonable pace. • Given the length of the race she would also need an effective nutritional strategy to keep fuelling the muscles for this period <p>Accept other appropriate responses.</p>

Level	Mark	Descriptor (Analysis)
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Level 2	4-6	<ul style="list-style-type: none"> • Demonstrates some accurate knowledge and understanding. • Breaks the situation down into component parts and some of the points made will be relevant to the context in the question. <p>Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</p>
Level 3	7-8	<ul style="list-style-type: none"> • Demonstrates mostly accurate knowledge and understanding. • Breaks the situation down into component parts and most of the points made will be relevant to the context in the question. • Displays a developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner.



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom

