



Mark Scheme

Additional Sample Assessment
Material

Pearson BTEC Level 3 - Sport and
Exercise Science

Unit 1: Sport and Exercise Physiology
(31813)

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Sample Assessment Materials

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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.
- 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.

BTEC Next Generation Mark Scheme Template

Sport and Exercise Physiology Unit 1 (SAM)

Question Number	Answer	Mark
1 (a)	<p>Award one mark for each stated cause of fatigue. Credit to a total of 3 marks.</p> <ul style="list-style-type: none">• Depletion of energy sources/glycogen• Accumulation of waste products• Accumulation of lactate/lactic acid• Accumulation of carbon dioxide• Depletion of acetylcholine <p>Accept other appropriate responses.</p>	(3)

Question Number	Answer	Mark
1 (b)	<p>Award one mark for identifying a nutritional strategy and one additional mark for justifying/rationalising the reason this strategy would improve her training run performance. Credit to a total of two marks.</p> <p>Scarlett could use carbohydrate gels <u>during</u> her training runs (1) to prevent depletion of glycogen stores so she can maintain her performance (1).</p> <p>Scarlett should make sure she rehydrates during the training sessions (1) to ensure nutrients can still be effectively transported in the blood (1).</p> <p>Accept other appropriate responses.</p>	(2)

Question Number	Answer	Mark
1 (c)	<p>Award one mark for identifying a reason for the overuse injury and up to two additional marks for justifying/rationalising the reason why this would cause this type of injury. Credit to a maximum of three marks.</p> <p>Scarlett had been overtraining (1) as she was not giving her body sufficient rest between training sessions (1) therefore her muscular system did not have time to repair from the previous session before running again, causing the overuse injury (1).</p> <p>Accept other appropriate responses.</p>	(3)

Question number	Indicative content
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>Reasons for reducing training</p> <ul style="list-style-type: none"> • so her body has time to recover from the training before running the marathon • so her muscles are not sore going into the race • so she can give her best performance on the day • so she does not feel tired from all the training she has been doing • so that mentally Scarlett will feel ready to race. <p>Recovery of energy systems</p> <ul style="list-style-type: none"> • during training Scarlett will be constantly depleting her energy stores • so time is needed for the body to replace these energy stores • marathon runners need a lot of glycogen to sustain their performance • therefore, if Scarlett trains less, but eats the same amount of carbohydrate as usual she will build up essential carbohydrate stores. <p>Recovery of musculoskeletal system</p> <ul style="list-style-type: none"> • collagen can be replaced in tendons and ligaments to increase their strength, repairing any damage caused by the training sessions prior to the marathon • will allow Scarlett to recover from DOMS so that her muscles are not tired or sore • therefore, by reducing training Scarlett is less likely to suffer muscle damage.

Level	Mark	Descriptor (Discuss)
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 discussion which contains generic assertions.
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 the question, and there will be clear links. • Displays a partially developed discussion which considers some different aspects.
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 the question, and there will be clear links. • Displays a developed and logical discussion considering different aspects.

Question Number	Answer	Mark
2 (a)	<p>Award one mark for identifying impact on blood pressure and up to two additional marks for justifying/rationalising the reason for this. Credit to a maximum of three marks.</p> <p>Kevin's blood pressure will increase when his muscles contract isometrically (1) this is because normal blood flow is temporarily impeded (1) but heart rate is increased due to activity therefore pressure increases (1).</p> <p>Kevin's blood pressure will increase as he lifts the weights (1) because when the muscles contract (to lift the weights) they restrict normal blood flow (1) which increases peripheral resistance (1).</p> <p>Accept other appropriate responses.</p>	(3)

Question Number	Answer	Mark
2 (b)	<p>Award one mark for each stated adaptation to the endocrine system. Credit to a total of two marks.</p> <ul style="list-style-type: none"> • Higher resting levels of testosterone • Higher resting levels of human growth hormone (HGH) • Higher resting levels of cortisol <p>Accept other appropriate responses.</p>	(2)

Question Number	Answer	Mark
2 (c)	<p>Award one mark for identifying the role/way the muscle spindles help prevent injury and up to two additional marks for further details of how this prevents injury. Credit to a maximum of three marks.</p> <p>The muscle spindles detect changes in the length of the muscle (1), as the muscle is stretched the muscle spindles also stretch (1) if the muscle is being stretched too far the muscle spindle relays information to the brain to cause the muscle to contract so the muscle does not stretch any further (1)</p> <p>Accept other appropriate responses.</p>	(3)

Question Number	Answer	Mark
2 (d)	<p>Award one mark for identifying likely changes to minute volume from pulse raiser to static stretching exercises and one additional mark for the variation from static stretching exercises to rugby specific drills. Credit to a maximum of two marks.</p> <p>Minute volume will drop during static stretching exercises (1) but increase as Kevin moves on to the rugby specific drills (1).</p> <p>Accept other appropriate responses.</p>	(2)

Question Number	Answer
2 (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>Muscular adaptations to aerobic training:</p> <ul style="list-style-type: none"> • Kevin's muscular endurance in his legs will increase from the training due to other adaptations. • There will be an increased number of mitochondria in Kevin's muscle cells so more places for aerobic respiration to take place. • Kevin will increase his myoglobin stores in his leg muscles so that oxygen is more readily available to the muscle. • Kevin's muscles will increase their ability to store glycogen and triglycerides providing further fuel sources for exercise. • Kevin's muscles will experience capillarisation, improving the blood flow through them. <p>Energy production:</p> <ul style="list-style-type: none"> • The training adaptations to Kevin's muscular system will improve the efficiency of his aerobic energy system, meaning that Kevin will be able to supply more energy to his muscles allowing him to work at the required intensity for longer. • Increasing mitochondria in the muscle increases the amount of energy that can be supplied aerobically, each mitochondria contributing to an increase in energy production. • With increased myoglobin more oxygen can be stored in the muscle, this is readily available for aerobic respiration to break down the increased stores of glycogen and triglycerides increasing energy available. • Capillarisation ensures that there is a good supply of oxygen to the muscle for aerobic respiration. <p>Rugby performance:</p> <ul style="list-style-type: none"> • By using Fartlek training Kevin is making sure that the adaptations from the training are relevant to his sport, rather than just using long continuous running which would not give the required adaptations for rugby. • By building in rest days he will give his body time to adapt and recover from previous sessions, avoiding injury from overtraining which would negatively impact on his fitness preparation and therefore performance. • Adaptations to the muscular system increase his muscular endurance so he can continue to maintain the quality of his running game for longer in a match before feeling the effects of fatigue. • These aerobic adaptations will also help Kevin recover after high intensity parts of the game as sufficient quantities of aerobic energy can be used to breakdown lactate reducing muscle fatigue. <p>Accept other appropriate responses.</p>

Level	Mark	Descriptor (Analyse)
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. • Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.
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.

Question Number	Answer	Mark
3 (a)	<p>Award one mark for each stated response of the body to high altitude. Credit to a total of 3 marks.</p> <ul style="list-style-type: none"> • Increased breathing rate • Increased heart rate • Reduced VO₂ max • Altitude sickness <p>Do not accept hypoxia as in question.</p> <p>Accept other appropriate responses.</p>	(3)

Question Number	Answer	Mark
3 (b)	<p>Award one mark for identifying why Stuart's tissues became hypoxic and up to two additional marks for justifying/rationalising the reason for this response to high altitude. Credit to a maximum of three marks.</p> <p>At high altitude there is a lower partial pressure of oxygen (1) therefore it is harder to extract the required amount of oxygen from the air (in the lungs) (1) which means that there will be a lack in the amount of oxygen reaching the tissues (1).</p> <p>Accept other appropriate responses.</p>	(3)

Question Number	Answer	Mark
3 (c)	<p>Award one mark for identifying how to cause the equivalent adaptations to high altitude and one additional mark for justifying/rationalising the reason this alternate method would allow the body to adapt. Credit to a total of two marks per correct answer.</p> <p>Stuart could sleep in a hypoxic chamber (1) as this simulates being at altitude so the body will adapt while the athlete is in the chamber (1).</p> <p>Stuart could sleep at high altitude but train at lower altitude (1) as the body will still adapt whilst sleeping without impacting on the quality of the training he can do (1).</p> <p>Accept other appropriate responses.</p>	(4)

Question number	Indicative content
3 (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>Convection</p> <ul style="list-style-type: none"> • heat is lost by convection as the water or air flows over Stuart's skin • if Stuart's skin is hotter (due to exercise) than the surrounding air or water, heat is lost from the hotter area to the cooler • therefore, convection helps maintain Stuart's body temperature throughout the swim/race. <p>Conduction</p> <ul style="list-style-type: none"> • Stuart's body will conduct heat to whatever it is in contact with, so the air as his arm leaves the water, or the water during the swim. • heat loss when swimming would be much greater than when cycling or running as heat loss through conduction is much quicker in water than air, even if the air and water temperatures were the same • therefore, as the water Stuart swims in is often at a lower temperature than the air heat loss through conduction would be even greater during the swim. <p>Evaporation</p> <ul style="list-style-type: none"> • when he exercises Stuart will produce heat energy, if hot Stuart will need to lose this additional heat, therefore Stuart will begin to sweat. The sweat then evaporates from his skin, promoting heat loss • evaporation also occurs from wet clothing • therefore, in the swim stage of the race as Stuart's clothing will be wet, this will lead to evaporation. <p>Relevance to scenario</p> <ul style="list-style-type: none"> • as the water is cold in the swim stage of the race Stuart does need to be more careful about maintaining enough heat • as although the swimming action will generate heat, his body will respond by increasing blood flow to the capillaries that lie nearer to the skin • which in turn will have a cooling effect due to conduction and convection which could bring on hypothermia, • therefore, (if competition rules allow) he should wear a wet suit to help maintain body temperature whilst swimming as heat loss through convection and conduction would warm the water trapped in the suit which would help maintain his body heat.

Level	Mark	Descriptor (Assess)
Level 0	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> • Demonstrates isolated elements of knowledge and understanding. • Provides little or no reference to the context in the question. • A conclusion may be presented, but will be generic and the supporting evidence will be limited. Limited attempt to address the question. • Response is likely to lack clarity, organisation and the required technical language.
Level 2	4-6	<ul style="list-style-type: none"> • Demonstrates accurate knowledge and understanding. • Line(s) of argument occasionally supported through the application of relevant references to context in question. • Judgement is made from a partially-developed discussion, although the discussion may be imbalanced or superficial in places. Learners will produce some statements with development in the form of mostly accurate and relevant factual material leading to an assessment being presented. • The response may contain parts which lack clarity or organisation. There is evidence of correct technical language being used.
Level 3	7-8	<ul style="list-style-type: none"> • Demonstrates accurate knowledge and understanding. • Line(s) of argument supported throughout by sustained application of relevant references to context in the question. Might demonstrate the ability to integrate and synthesise relevant systems. • Arrives at a supported judgement from a well-developed and logical balanced discussion, containing logical chains of reasoning. Demonstrates an awareness of competing arguments using these to reach a valid assessment. • Response demonstrates good organisation, clarity and use of technical language.

Question Number	Answer	Mark
4 (a)	<p>Award one mark for identifying that heart rate changes as a response to exercise and up to three additional marks for justifying/rationalising these changes. Credit to a total of four marks.</p> <p>Before the swim there is an (anticipatory) rise in heart rate, caused by the release of adrenaline into the blood stream (1).</p> <p>As soon as Penny begins to swim there is a rapid increase in heart rate to increase cardiac output (1).</p> <p>The sharp decrease in heart rate after the swim is due to a reduction in physical demands/a reduced need for increased blood flow (1) however it is not yet back to resting heart rate as Penny still requires an elevated heart rate for oxygen transport/CO₂ removal to aid recovery (1).</p> <p>Accept other appropriate responses.</p>	(4)

Question Number	Answer	Mark
4 (b)	<p>Award two marks for identifying the chemicals detected by the chemoreceptors and two additional marks for justifying/rationalising how this alters heart rate. Credit to a total of four marks.</p> <p>Penny's chemoreceptors will detect changes in pH/acidity levels of her blood (1) due to a rise in carbon dioxide (1). Therefore, as the blood becomes more acidic/pH reduces her heart rate will increase (1) so more oxygen is transported to help neutralise the increase in acidity (1).</p> <p>Accept other appropriate responses.</p>	(4)

Question Number	Answer	Mark
4 (c)	<p>Award one mark for identifying likely change to blood flow from rest to exercise to the working muscles and one additional mark for the variation to the digestive system. Credit to a maximum of two marks.</p> <p>Blood flow to the working muscles will increase (1) whilst blood flow to inactive areas such as the digestive system decreases (1).</p> <p>Accept other appropriate responses.</p>	(2)

Question number	Indicative content
4 (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>VO₂ max</p> <ul style="list-style-type: none"> • measurement of the swimmers aerobic capacity • high aerobic capacity would be vital for endurance performance • as it is a measurement of the amount of oxygen the body can consume per minute • but not sprint events as they do not rely on aerobic energy systems <p>Anaerobic threshold</p> <ul style="list-style-type: none"> • Anaerobic threshold is normally expressed as a percentage of VO₂ max • It is the point where lactate begins to accumulate in the blood • lactate is produced faster in the body than it can be broken down • adaptations to the aerobic energy system will increase the percentage where the anaerobic threshold is reached • but this is not relevant to Penny as she is a sprint swimmer so this measurement would not be relevant <p>Anaerobic power</p> <ul style="list-style-type: none"> • This measurement focuses on the anaerobic energy systems • ATP-PC and lactate system • These are the energy systems that Penny will need to use in her event <p>Contribution to swimming performance</p> <ul style="list-style-type: none"> • Provides information about aspects of fitness which are relevant to swimming performance • so can use the data from these tests to focus on relevant areas of fitness • and to check training programmes are working • tests are normally laboratory based, therefore not necessarily specific to swimming • although field tests can be used that are designed for use in the pool • not all the tests are relevant to Penny's event, she requires anaerobic fitness rather than aerobic fitness

Level	Mark	Descriptor (To what extent)
Level 0	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> • Demonstrates isolated elements of knowledge and understanding. • Provides little or no reference to the context in the question. • A conclusion may be presented, but will be generic and the supporting evidence will be limited. Limited attempt to address the question. • Response is likely to lack clarity, organisation and the required technical language.
Level 2	4-6	<ul style="list-style-type: none"> • Demonstrates accurate knowledge and understanding. • Line(s) of argument occasionally supported through the application of relevant references to context in question. • Judgement is made from a partially-developed discussion, although the discussion may be imbalanced or superficial in places. Learners will produce some statements with development in the form of mostly accurate and relevant factual material leading to a reasoned conclusion being presented. • The response may contain parts which lack clarity or organisation. There is evidence of correct technical language being used.
Level 3	7-8	<ul style="list-style-type: none"> • Demonstrates accurate knowledge and understanding. • Line(s) of argument supported throughout by sustained application of relevant references to context in the question. Might demonstrate the ability to integrate and synthesise relevant systems. • Arrives at a supported judgement from a well-developed and logical balanced discussion, containing logical chains of reasoning. • Response demonstrates good organisation, clarity and use of technical language.

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