Mark Scheme (Final)

June 2018

Pearson BTEC Level 3 - Sport and Exercise Physiology

Unit 1: Sport and Exercise Physiology (31813)

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June 2018
Publications Code xxxxxxxx*

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if a candidate's response is not worthy of credit according to the mark scheme.
- Where some judgment is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt about applying the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Phonetic spelling should be accepted.

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

Sport and Exercise Physiology Unit 1 Series 1806 (Live paper)

Question Number	Answer	Mark
1 (a) EXPT	Award **one** mark for each correct identification of a response to high altitude. Credit to a total of **three** marks. • reduced oxygen carrying capacity (1) • reduced extraction of oxygen from the blood (1) • altitude sickness (1) Accept other appropriate responses.	(3)

Question Number	Answer	Mark
1 (b) EXPT	Award **one** mark for identifying the reason why breathing rate increases and **one** mark for each related explanation up to **two** additional marks. Credit to a maximum of **three** marks. • There is a lack of oxygen (1) due to the lower partial pressure of oxygen (at altitude) (1) so to compensate breathing rate increases so more air can be taken in (so 'normal' level of oxygen can be extracted from the increased volume of air in the lungs/alveoli) (1). Accept other appropriate responses.	(3)

Question Number	Answer	Mark
1 (c) EXP	Award **one** mark for identifying why they are given each type of drink and **one** additional mark for each related explanation. Credit to a maximum of **four** marks. **Carbohydrate** • To provide energy (1) as insufficient stores in the body for six-hour cycle ride (1) • Carbohydrate stores last (approximately) two hours (1) so will run out of energy unless taken during the six-hour ride (1) **Water** • To rehydrate/avoid dehydration (1) as (during the six-hour bike ride) they will lose water through sweat (from the exertion of cycling) (1). Accept other appropriate responses.	(4)

Question number	Indicative content
1 (d) EXP	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 my cover some/all of the indicative content but should be rewarded for other relevant answers. **Knowledge and understanding (responses and adaptations to excessive heat)** • Increased sweat production. • Reduced electrolyte concentration in sweat. • Increased plasma volume. • Earlier onset of sweating **Application to question context** • Increased sweat production during the cycle ride, especially on the more intense parts of the ride. • Selena won't lose as much sodium/chloride when she sweats during the cycle ride, reducing the loss of electrolytes from the body. • There will be an increase in the amount of water in blood plasma, which can be used to produce sweat during the bike ride. • As Selena exercises she will begin sweating <u>but</u> at a lower core temperature/before her body gets as hot. **Applied logical chains of reasoning/judgment** • Increased sweat production during the cycle ride, especially on the more intense parts of the ride, means that Selena can create a greater cooling effect on the body as the sweat evaporates from the skin to the air around her. • Selena won't lose as much sodium/chloride when she sweats during the cycle ride, reducing the loss of electrolytes from the body, which helps with water retention making her less prone to dehydration and its negative effects. • There will be an increase in the amount of water in plasma, which can be used to produce sweat during the bike ride so the body can cool down through evaporation. • As Selena exercises she will begin sweating <u>but</u> at a lower core temperature/before her body gets as hot so she will not feel the effects of the heat/less likely to suffer with hyperthermia. • All of the adaptations mean that Selena can produce more sweat in week three than she could in week one, which allows her to cool down more effectively through evaporation, hence she is less worried about the heat in week three. Accept other appropriate responses.

Level	Mark	Descriptor (Evaluate)
Level 0	0	No rewardable material.
Level 1	1–3	• 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	• 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	• 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 evaluation and logical evaluation which clearly considers different aspects leading to a conclusion which considers different competing points in detail.

Question Number	Answer	Mark
2 (a) GRAD	Award **one** mark for each correct identification of energy systems Credit to a maximum of **two** marks. Any order: • ATP-PC/ATP-CP/Alactic (1) • Aerobic (1) Accept other appropriate responses.	(2)

Question Number	Answer	Mark
2 (b) EXP	Award **one** mark for identifying why the lactate system is used and **one** mark for each related explanation up to **two** additional marks. Credit to a maximum of **three** marks. The lactate system can supply energy quickly for the station (1) because it doesn't require oxygen (1) and can provide energy to complete the 45 second station/can continue to provide a high yield of energy for 2 – 3 minutes (1). Accept other appropriate responses.	(3)

Question Number	Answer	Mark
2 (c) EXP	Award **one** mark for identifying why OBLA occurs and **one** mark for related explanation. Not able to use aerobic energy system/working anaerobically (1) therefore the lactate produced is not broken down/is not removed (1). Because lactate is produced (1) faster than it can be broken down (1) Accept other appropriate responses.	(2)

Question Number	Answer	Mark
2 (d) EXP	Award **one** mark for identifying the effect on lactate levels and **one** mark for each related explanation up to **two** additional marks. Credit to a maximum of **three** marks. (Blood lactate) levels will drop (1) as Lee will be taking in additional oxygen (1) to break down/reduce/remove the lactate (1). Accept other appropriate responses.	(3)

Question number	Indicative content
2 (e) EXP	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. **Knowledge and understanding (energy systems, adaptations)** • Description/features of each system • Example adaptations: - increased ATP-PC in muscle; • Increased enzyme activity; • Increased number/size of mitochondria; • Increased number of aerobic enzymes; • Increase in lactate threshold/delayed OBLA/lactate buffering. **Application to question context (linked to football performance)** • ATP-PC in muscle so Lee will be able to complete more explosive movements, e.g. jumping to catch the ball before needing to replenish this system. • The delay in the onset of blood lactate accumulation means Lee can use his lactate system for longer/can maintain intense/explosive movements for longer. • Increased size of mitochondria will mean that more aerobic energy can be produced so Lee will be able to sustain performance throughout the 90-minute match. • Lee needs to use his aerobic system to recover from intense parts of the match. **Applied logical chains of reasoning/judgment** (how adaptation improves performance) • As a goalkeeper Lee is mainly making short-lived quick movements so he should focus on his anaerobic energy systems as these are the ones he will rely on most during the game. • Due to an increase in ATP-PC in his muscle Lee will have the energy required to keep jumping to intercept a ball/cross, or dive to make a save even in a period of constant pressure from the opponents. • If Lee increases his tolerance to lactic acid through training his lactate system, his muscles will not be fatigued as quickly in the game so the standard of his play can be maintained for longer. • A game of football requires use of all three energy systems, therefore to focus on one rather than all would mean an aspect of performance would suffer, for example quick runs into space would be limited without an efficient aerobic system to replenish the energy needed for these runs into space. Accept other appropriate responses.

Level	Mark	Descriptor (Evaluate)
Level 0	0	No rewardable material.
Level 1	1–3	• 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	• 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	• 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 evaluation and logical evaluation which clearly considers different aspects leading to a conclusion which considers different competing points in detail.

Question Number	Answer	Mark
3 (a) EXP	Award **one** mark for identification of the role and **one** mark for each related explanation up to **two** additional marks. Their role is to prevent injury/act as a proprioceptor (1) signalling the central nervous system (CNS) (1) if the muscle is being stretched too far/overstretching (1) They provide information to the central nervous system (CNS) (1) about the position of the muscle (1) if the muscle is being overstretched a stretch reflex is activated (1) Accept other appropriate responses.	(3)

Question Number	Answer	Mark
3 (b) EXP	Award **one** mark for identification of use of fibre type in race and **one** additional mark for related characteristic of fibre type. Credit to a maximum of **two** marks. **type I** Are resistant to fatigue (1) therefore will be used to run the 3,000m (1) Have a dense capillary network (1) allowing the athlete to run the 3,000m without fatigue (1) **type IIx** This muscle fibre type produces a high force of contraction (1) so the athlete can jump to clear the barrier/sprint finish (1) Accept other appropriate responses.	(4)

Question Number	Answer	Mark
3 (c)	Award **one** mark for identifying how blood flow is redistributed and up to **two** additional marks for each linked descriptive point. Credit to a maximum of **three** marks. Blood flow is redistributed by vascular shunting (1). This increases blood flow to the skeletal muscle (1) and decreases blood flow to the digestive system (1). Blood vessels/arteries/arterioles to active areas vasodilate (1) to increase blood flow to active area/working muscles (1) but vasoconstrict to inactive areas (reducing blood flow) (1) Accept other appropriate responses.	(3)

Question number	Indicative content
3 (d)	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. **Knowledge and understanding (effects of exercise addiction)** • (Exercise addiction can lead to) overtraining • Not enough time to recover/rest/adaptations • (Therefore increased risk of) injury • Muscles/micro tears cannot repair from previous session • Can lead to imbalances in the endocrine system • Excess adrenaline production • Excess cortisol production • Sleep deprivation **Application to question context** • May impact on muscular/skeletal system, for example inadequate amounts of rest due to lack of rest or recovery between training sessions can lead to increased risk of muscle injury. • Exercise addiction can lead to imbalances in the endocrine system, for example an increase in adrenaline/cortisol, as more is released due to the increase in exercise sessions. • May suppress the immune system so that the performer is more likely to catch colds/become ill. **Applied logical chains of reasoning/judgement** • Leads to overtraining as not enough time for rest/recovery which will increase the risk of muscle injury preventing training, causing reversibility/loss of adaptations • Exercise addiction can lead to imbalances in the endocrine system/increase in cortisol, as more is released due to the increase in exercise sessions. If not used it can lead to a drop in function of other body systems, for example the digestive system, leading to weight gain (impacting on performance). • Exercise addiction can lead to an increase in adrenaline, as more is released due to the increase in exercise sessions. If not used it can lead to an increase in stress/anxiety/drop in function of immune system, leading to an increase in health issues for the athlete reducing their ability to train and therefore decreasing their performance. • May impact on skeletal system, for example the increase in the number of exercise sessions can increase the risk of stress fractures, lengthening the time needed for full recovery impacting on ability to train, losing previous adaptations Accept other appropriate responses.

Level	Mark	Descriptor (To what extent)
Level 0	0	No rewardable material.
Level 1	1–3	• 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	• 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	• 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.

Question Number	Answer	Mark
4 (a) GRAD	Award **one** mark for each correct identification of a response of the skeletal system. Credit to a total of **two** marks. • Increase in amount of synovial fluid (1) • Reduction in viscosity of synovial fluid (1) • (Increase in) osteoclast activity (1) Accept other appropriate responses.	(2)

Question Number	Answer	Mark
4 (b)	Award **one** mark for identification why bone strength increases and **one** mark for each related explanation up to **two** additional marks. Credit to a maximum of **three** marks. • Regular exercise stimulates bone remodelling (1). So osteoclasts destroy old bone (1) and activate osteoblasts to lay down collagen/minerals (1). • Regular exercise leads to an increased uptake of minerals (1) in particular calcium/phosphorus (1) and are used in remodelling of the bone (1) Accept other appropriate responses.	(3)

Qu No.	Answer	Mark
4 (c)	Award **one** mark for identification of effect on the dissociation curve and **one** mark for each related explanation up to **two** additional marks. Credit to a maximum of **three** marks. • The curve shifts to the right (1) as blood pH decreases/blood acidity increase (1) due to increased CO_2 production (due to the rugby game) (1) • The curve shifts to the right (1) as body temperature increases (1) due to the heat generated by the body (during exercise) (1) Accept other appropriate responses.	(3)

Question number	Indicative content
4 (d)	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. **Knowledge and understanding (effect of testosterone on strength)** • Released in response to exercise/exercise increases levels • An increase in testosterone increases aggression/increased competiveness • Increased protein synthesis due to increase in testosterone • Faster recovery rate (in context of muscle) • increases muscle size/hypertrophy. • Increased muscle strength • may be due to hyperplasia/increase in muscle fibres. **Application to question context** • Increased levels of testosterone will increase strength that can be used in the game, for example to lift a player in the line out. • An increase in testosterone increases aggression/increased competiveness so more forceful in challenges/when tackling • The player may experience increased protein synthesis due to the increase in testosterone which means he will build muscle faster. • Increased muscle size/hypertrophy means more force can be exerted against an opponent in rugby to hand off a player/avoid tackle. **Applied logical chains of reasoning/judgment** • Increased muscle size/hypertrophy means more force can be exerted against an opponent in rugby to hand off player/avoid tackle so that he is less likely to lose possession of the ball. • Increased strength may be due to hyperplasia/increase in muscle fibres rather than hypertrophy. If there are more muscle fibres they can work collectively to generate more force, or contract, whilst others are resting, allowing some recovery within the game so that Melvin can produce strength performances when he needs to in the game. • Testosterone boosts protein synthesis therefore the muscle adapts to exercise more quickly/recovers from exercise more quickly so the player can play or train again sooner, allowing them to train more to gain even more fitness gains to help performance. Accept other appropriate responses.

Level	Mark	Descriptor (Assess)
Level 0	0	No rewardable material.
Level 1	1–3	• 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	• 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	• 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.

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