Mark Scheme Guidance

January 2020 (Final)

Pearson BTEC Level 3 Sport and Exercise Physiology

Unit 1: Sport and Exercise Physiology (31813)

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January 2020
Publications Code 31813H_2001_MS

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 judgement 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 2001

Qu Num	Answer	Mark
1 (a) (i)	Award **one** mark for identification and **one** additional mark for a linked descriptive point. Credit to a maximum of **two** marks. • Through evaporation of sweat (1) off the surface of the skin (releasing heat from the body) (1) • Water is evaporated (1) by heat released from the body/skin (cooling the body down) (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
1 (a) (ii)	Award **one** mark for identification and **one** additional mark for a linked descriptive point. Credit to a maximum of **two** marks. • Vasodilation (1) of blood vessels close to the skin (where it is cooler) (1) • Increased blood flow to the extremities/skin (1) taking warmer blood from the core (to be cooled down) (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
1 (b)	Award **one** mark for identification of each phase of the cardiac cycle. Credit to a maximum of **two** marks. **Any order:** • Systole • Diastole Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
1 (c)	Award **one** mark for each identification of how cardiac output can be increased. Credit to a maximum of **two** marks. • Increased stroke volume • Increased heart rate Accept other appropriate responses.	(2)

Qu Num	Indicative content ASSESS
1 (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. **Linking fibre type to phase of game** • Type I will be used in the low intensity parts of the game • Type IIx will be used in the high intensity parts of the game **Understanding/effect of stated feature** • Type I fibres have a high density capillary network, with more capillaries there will be greater blood flow, which means more oxygen is transported to the muscle fibres allowing them to work aerobically • Type I fibres have a high resistance to fatigue, which means they can contract continuously without needing a rest • Type IIx muscle fibres produce high levels of force so will be more powerful/stronger than Type 1 fibres • Type IIx have high stores of glycogen, which means they can produce energy/ATP quickly **Justification for use in the game** • Type I fibres have a high density capillary network, with more capillaries there will be greater blood flow, which means more oxygen is transported to the muscle fibres allowing them to work aerobically. However, if they are working aerobically they can only work at a lower intensity as the rate of ATP production will be slow, therefore this feature lends itself to the low intensity aspects of the game. • Type I fibres have a high resistance to fatigue, which means they can contract continuously without needing a rest, therefore they are good for the sustained low periods of intensity in the game or for recovery, essential as the match is 70 minutes long. • For high intensity periods of the game you need power/speed to accelerate for a loose ball, as Type IIx muscle fibres produce high levels of force they are more powerful/stronger than Type I fibres so they would be used during the intense parts of the game, e.g. to hit the ball harder. • In order to generate very high levels of force, the fibres need a good energy supply that they can access quickly, Type IIx fibres have high stores of glycogen, which means they can produce energy/ATP quickly, therefore will be ideal for a powerful shot at goal or sprinting for a loose ball. 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 some 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 mostly 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.

Qu Num	Answer	Mark
2 (a)	Award **one** mark for identification and **one** additional mark for a linked descriptive point. Credit to a maximum of **two** marks. • To maintain bone mass (1) by regulating the process of bone remodelling (1) • Maintains strength of bone (1) by inhibiting bone reabsorption/by limiting life span of osteoclasts (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
2 (b)	Award **one** mark for identification of how the activities are beneficial and up to **three** additional marks for each related explanation. Credit to a maximum of **four** marks. • It is weight-bearing exercise (1) so simulates <u>osteoblast</u> production (1) as which can increase bone density (1) due to increased calcium uptake (1) • Jogging increases the stress placed on the bones (1) this stimulates bone remodelling (1) increasing <u>osteoblast</u> activity (1) increasing the strength of the bones (1) Accept other appropriate responses.	(4)

Qu Num	Answer	Mark
2 (c)	Award **one** mark for correct identification of chemical control of breathing and **one** mark for correct identification of neural control of breathing and up to **two** additional marks for each linked descriptive point. Credit to a maximum of **four** marks. • Chemoreceptors (1) detect a 'change' in CO_2 levels/ blood pH /acidity of the blood (1) which signal the medulla oblongata/respiratory control centre in the brain (1) to increase breathing rate if high levels of CO2 (1) Accept other appropriate responses.	(4)

Qu Num	Indicative content - EVALUATE
2 (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. **Description/interpretation of graph** • ATP-PC system provides most of the energy at the start of the run • As the ATP-PC system contribution drops, the lactic acid system is relied on more • The aerobic system is the main energy provider after 60 seconds **Description of graph linked to relevant fact about the energy system** • ATP-PC system provides most of the energy at the start of the run as energy is released very quickly by this system • As the ATP-PC system tires, the lactic acid system is relied on more as it can still produce energy relatively quickly compared to the aerobic system • The aerobic system is the main energy provider after 60 seconds as it has access to large energy stores, which allow its continued use for a long period of time **Evaluation of use (why energy systems are used in this way in this context)** • ATP-PC system provides most of the energy at the start of the run (description) as energy is released very quickly by this system (linked fact), therefore allows the runner to increase intensity from being stationary to working hard to get up the hill (evaluation) • As the ATP-PC system tires, the lactic acid system is relied on more (description) as it can still produce energy relatively quickly compared to the aerobic system (linked fact). However a by-product of this energy system is lactate, which, if not broken down, can lead to muscle fatigue that would cause the runner to slow down/stop (evaluation) • The aerobic system is the main energy provider after 60 seconds (description) as it has access to large energy stores, which allow its continued use for a long period of time (linked fact) However, because energy production is relatively slow the pace of the runner will be slower than when they were using the other systems 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.

Qu Num	Answer	Mark
3 (a)	Award **one** mark for identification of benefit and **one** mark for a related explanation. Credit to a maximum of **two** marks. • Faster impulse/rate coding (1) so the muscle contracts sooner (1) • Muscles can contract sooner (1) therefore increasing speed (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
3 (b)	Award **one** mark for identification of benefit and up to **two** additional marks for each related explanation. Credit to a maximum of **three** marks • More force can be produced (1) because more muscle fibres are activated to contract (1) therefore the sprinter will get a better start off the blocks/greater acceleration (1) Accept other appropriate responses.	(3)

Qu Num	Answer	Mark
3 (c)	Award **one** mark for identification of effect and **one** mark for a related explanation. Credit to a maximum of **two** marks. • Blood pressure will increase when lifting the weight (1) because the muscles constrict the blood vessels (of the working muscles) (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
3 (d)	Award **one** mark for identification of why they would not benefit and up to **two** additional marks for each related explanation. Credit to a maximum of **three** marks. • The adaptations from training at high altitude compensate for a lack of oxygen (1) for example an increase in red blood cell production (1) the sprinter would not benefit from this as they work anaerobically (1) Accept other appropriate responses.	(3)

Qu Num	Indicative content - DISCUSS
3 (e)	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. **General points in relation to high altitude** • High altitude is over 2400 m/6,500 feet • There is a reduced partial pressure at altitude • Hypoxic conditions **Advantages of training/sleeping at high altitude** • Causes adaptations, e.g. increased red blood cell production • Adaptations improve ability to utilise oxygen when competing at sea level/increase their VO_2 max once acclimatised • Performance improves once acclimatised; long distance runners should be able to run at a higher pace than before/recover more quickly before competition **Disadvantages of <u>training</u> at high altitude** • Causes poor sleep, which will cause the athlete to eventually fatigue and therefore not be able to train as well/lead to a loss in muscle mass • Lack of training intensity due to lack of oxygen at altitude meaning cannot work as hard in training until the body begins to adapt/detraining effects • Risk of altitude sickness, which will reduce the training possible as too ill to train • Can impact negatively on the immune system **Advantage of sleeping at high altitude/training at low altitude** • Reduced risk of suffering from altitude sickness therefore training programme should not be interrupted/no need to taper so can progress with normal training programme **Disadvantages of sleeping at high altitude/training at low altitude** • Time lost travelling from sleeping area to training • Not a practical 'life' solution and effects will be lost once living back at sea level **Additional points** • Training or sleeping at high altitude, the positive effects are reversible once back at sea level • Rather than sleep high it would be better to sleep in hypoxic chambers at sea level therefore not experiencing the disadvantages of sleeping high, training low Accept other appropriate responses.

Level	Mark	Descriptor (Discuss)
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 discussion which contains generic assertions.
Level 2	4–6	• 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	• 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.

Qu Num	Answer	Mark
4 (a)	Award **one** mark for each identification of a cause of muscle fatigue. Credit to a maximum of **two** marks. • Depletion of energy (1) • Accumulation of waste products (1) • Depletion of acetylcholine (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
4 (b)	For each energy system, award **one** mark for the identification of an appropriate energy system and up to **two** additional marks for each linked descriptive point. Credit to a maximum of **six** marks. **Any three points from:** • The **first stage** of recovery is to the **ATP-PC** system (1) • ATP is resynthesized (1) • CP/PC/phosphagen is resynthesised (1) • <u>using</u> the (additional) oxygen (1) **Any three points from:** • The **slow** component of EPOC aids recovery of the **lactate system** (1) • additional oxygen is <u>used to</u> (1) • break down lactic acid (1) • into CO_2 **and** water (1) Accept other appropriate responses.	(6)

Qu Num	Answer	Mark
4 (c)	Award **one** mark for each identification of measurement. Credit to a maximum of **two** marks. **Measurement of strength** • 1RM (one rep max) **Measurement of muscular endurance** • 15RM (15 rep max) Accept other appropriate responses.	(2)

Qu Num	Indicative content - ASSESS
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. **Muscular adaptations to aerobic training** • Increased number/size of mitochondria • Increased myoglobin stores • Increased ability to store glycogen and triglycerides • Capillarisation • Type IIa fibres can develop aerobic capacity **Respiratory adaptations to aerobic training** • Respiratory muscles will increase in strength • Increased vital capacity • Increased tidal volume • Increased minute volume • Capillarisation around the alveoli • Increased oxygen coming into the body (through increased lung volumes) increasing oxygen uptake **Applied to changes in fitness** • Breathing rate can reduce as tidal volume will have increased, therefore the same amount of air can be breathed in per minute taking fewer breaths • They can complete more sit-ups after training than before because they have increased their muscular endurance by increasing the myoglobin stores in the muscle that can be used to allow them to work aerobically for longer • They can skip for a longer period than before because increased capillarisation means the diffusion rate of gas exchange at the lungs and at the muscle increases/CO_2 is removed more quickly to delay fatigue so they can skip for longer than before Accept other appropriate responses.

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Level 3	7 – 8	• Demonstrates mostly 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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