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Mark Scheme (Results)

January 2021

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

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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) (i)	Award **one** mark for identification. • Increased protein synthesis (1) • Increased muscle growth (1) • Increased muscle mass (1) Accept other appropriate responses.	(1)

Qu Num	Answer	Mark
1 (a) (ii)	Award **one** mark for identification and **one** additional mark for related explanation. Credit to a maximum of **two** marks. • Muscles will produce greater force (1) therefore will accelerate more quickly (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
1 (b) (i)	Award **one** mark for identification and **one** additional mark for related expansion. Credit to a maximum of **two** marks. • Very quick breakdown of ATP (1) therefore the sprinter can work at a high intensity immediately (to run fast) (1) • Large muscle fibres (1) so can accelerate at the start/ get an early lead (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
1 (b) (ii)	Award **one** mark for identification. • Type 1/Slow twitch • Type IIa Accept other appropriate responses.	(1)

Qu Num	Answer	Mark
1 (c) Expert	Award **one** mark for identification and **one** additional mark for related expansion. Credit to a maximum of **two** marks. • Muscles will <u>increase</u> in temperature (1) as heat is a by-product of energy production (1) • <u>Muscles</u> will get warmer (1) due to muscle <u>contraction</u> (1) • Increased energy demand during race/muscles <u>contracting</u> more (1) increases heat produced during energy production (1) Accept other appropriate responses.	(2)

Qu Num	Indicative content EVALUATE
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. **Isolated elements of knowledge about energy systems** • Three systems – aerobic; ATP-PC and lactate system • Aerobic system provides energy for low intensity/long duration activities • ATP-PC provides energy for high intensity activity/provides energy for short duration/no fatiguing by-products • Lactate system provides energy anaerobically/energy for short duration, high intensity activities/produces lactic acid **Applied knowledge to question context** • ATP-PC provides energy for the explosive start of the sprint/about 10 seconds of the sprint • Lactate system will become the more prominent system after 10 seconds into the race • Aerobic system has limited importance during the 200m **Evaluation** • The aerobic system provides energy for low intensity activities, as the 200 m sprint is high intensity this energy system would have limited importance during the activity/would be useful during recovery after the 200 m sprint • ATP-PC system is useful as provides energy for high intensity but as it only lasts around 10 seconds it cannot be the only energy system used/this system on its own could not produce the energy for all of the race • The lactate system becomes predominant once the ATP-PC system is depleted so allows the sprinter to continue to run fast for the remainder of the 200 m • There is an interplay between the energy systems, each providing energy at different points due to the intensity and duration of th 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
2 (a) (i)	Award **one** mark for **each** identification up to **two** marks and up to **two** additional marks for each related expansion. Credit to a maximum of **four** marks. **NB** Must state the changes in the trace (not just 'theory' for 4 marks) • Deeper/longer lines (1) as depth of breathing will increase in response to exercise/TV will increase (1) • Lines on trace are closer together/more frequent (1) due to an increase in breathing rate in response to exercise (1) **NB** Can accept relevant diagram to show changes in trace. Accept other appropriate responses.	(4)

Qu Num	Answer	Mark
2 (a) (ii)	Award **one** mark for identification and **one** additional mark for related expansion. Credit to a maximum of **two** marks. • Increased **oxygen** intake (1) to use in **energy** production for the race/so she can work aerobically/so she can maintain the required pace for longer/**delay fatigue** (1) • Increased removal of carbon dioxide (1) as more will be being produced during exercise/delay fatigue (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
2 (b)	Award **one** mark for identification and **one** additional mark for a linked descriptive point. Credit to a maximum of **two** marks. • Vasodilation (1) increasing lumen/internal diameter of blood vessel (leading to working muscles) (1) • Increased stroke volume/cardiac output (1) so more blood expelled per beat/per minute (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
2 (c)	Award **one** mark for identification and **one** additional mark for related expansion. Credit to a maximum of **two** marks. • **Increased** rate of diffusion/more gas exchange (1) as increased number of capillaries/surface area for diffusion to take place (1) Accept other appropriate responses.	(2)

Qu Num	Indicative content ANALYSE
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. **Isolated elements of knowledge about skeletal system** • Osteoblasts build new bone • Osteoclasts clear old bone • Osteocytes form from osteoblasts • Mineral content – calcium/phosphorus for bone strength • Collagen content increased in tendons/ligaments **Applied knowledge to question context** • Running stimulates remodelling • Increased stress on joints/skeletal system due to impact when running causes adaptations to cope with the impact • Increase in collagen increases thickness of cartilage at ends of bones **Linkages/interrelationships** • Osteoblast, osteoclast and osteocyte activity/bone remodelling increases the strength of the bones so less likely to suffer skeletal injury due to training • The increased strength of the bones due to increased uptake of calcium/phosphorus means the bones will be able to withstand the constant impact from all of the running training • Although bones will remodel due to weight-bearing exercise, without increased uptake of calcium at the same time the remodelled bones will lack the required strength to cope with the impact during exercise • The increased collagen impacts on joints, tendons and ligaments, which means the runner is less prone to injury and will be able to continue to train Accept other appropriate responses.

Level	Mark	Descriptor (Analysis)
Level 0	0	No rewardable material.
Level 1	1–3	• 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	• 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	• 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
3 (a) (i)	Award **one** mark for identification. • Carbohydrate intake relative to activity levels (1) • How much carbohydrates he eats (1) Accept other appropriate responses.	(1)

Qu Num	Answer	Mark
3 (a) (ii)	Award **one** mark for identification. • Carbohydrate drinks (1) • Carbohydrate gels (1) • Isotonic /hypertonic drink (1) Accept other appropriate responses.	(1)

Qu Num	Answer	Mark
3 (b)	Award **one** mark for **each** identification. Credit to a maximum of **two** marks. • Exercise addiction (1) • Imbalanced training programme (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
3 (c)	Award **one** mark for identification and **one** additional mark for related explanation. Credit to a maximum of **two** marks • Performance will get worse (1) due to: **Any one of following:** • Increased resting heart rate (1) • Increased feelings of anxiety (1) • Disturbed sleep/poor sleep patterns (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
3 (d)	Award **one** mark for each identification and **one** mark for each related explanation. Credit to a maximum of **four** marks. • Overuse injury (1) due to lack of time for muscle repair/recovery (1) meaning that he will need to take time away from training/reduce training (1) leading to a drop in fitness (1) • Training results in micro tears in the muscles (1) these repair during rest periods (1) if they don't repair, they are likely to tear (1) resulting in time away from training (1) Accept other appropriate responses.	(4)

Qu Num	Indicative content EVALUATE
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. **Isolated elements of knowledge about methods of heat loss** • Named four methods of heat loss • Convection through air currents/movement of fluids • Conduction through direct contact • Radiation losing heat to surroundings • Evaporation of sweat **Applied knowledge to question context** • Convection causing heat loss due to the air inside being cooler than the performer and passing over the performer's skin • Conduction causing heat loss from the hands when in direct contact with cooler training equipment • Conduction causing heat loss when peripheral blood vessels vasodilate in response to exercise • Evaporation causing heat loss from the skin when the performer sweats **Evaluation** • The majority of heat loss during training will be through sweating therefore this is the most relevant method • In an indoor facility the space could become increasingly hot due to the heat from the performers/heaters making it difficult to lose heat by radiation/convection • If the indoor space is air-conditioned/cold more heat will be lost through convection as the air temperature passing over the skin will be cooler 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
4 (a) (i)	Award **one** mark for identification. • Insufficient oxygen available for the tissues/body (1) • Lower levels of oxygen than that required (1) Accept other appropriate responses.	(1)

Qu Num	Answer	Mark
4 (a) (ii)	Award **one** mark for identification and **one** additional mark for related explanation. Credit to a maximum of **two** marks. • To increase blood flow (1) to <u>speed</u> up oxygen delivery/deliver <u>more</u> oxygen (1) • To compensate for lack of oxygen/hypoxia (1) by sending the blood around <u>faster</u> (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
4 (a) (iii)	Award **one** mark for each identification. Credit to a maximum of **two** marks. • Headache (1) • Dizziness (1) • Exhaustion (1) • Nausea/vomiting (1) • Nosebleeds (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
4 (b)	Award **one** mark for identification and **one** additional mark for related explanation. Credit to a maximum of **two** marks. • Blood is shunted away from extremities/hands (1) to help maintain core temperature/so core temp remains at 37°C (1) • Poor circulation/lack of blood flow to the extremities (1) therefore tissue can freeze (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
4 (c) (i)	Award **one** mark for identification and **one** additional mark for related explanation. Credit to a maximum of **two** marks. • Rapid contraction of muscles (1) increases metabolic rate/generates heat (1) Accept other appropriate responses.	(2)

Qu Num	Answer	Mark
4 (c) (ii)	Award **one** mark for identification. • Non-shivering thermogenesis (1) • Vasoconstriction (1) Accept other appropriate responses.	(1)

Qu Num	Indicative content EVALUATE
4 (d) Expert	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. **Isolated elements of knowledge about training adaptations** • Increased/larger mitochondria found in the muscle/site of aerobic respiration • Increased RBC production due to EPO increase at high altitude/so increased oxygen carrying capacity • Increased oxidative enzymes for fat metabolism **Applied knowledge to question context** • Increased mitochondria found in the muscle/site of aerobic respiration, therefore during exercise more aerobic energy can be produced • Increased RBC production due to EPO increase at high altitude/so increased oxygen carrying capacity so can work aerobically for longer during exercise • Increased oxidative enzymes for fat metabolism, which means that a larger energy source will be available to the performer **Evaluation** • Increased mitochondria found in the muscle/site of aerobic respiration, therefore during exercise more aerobic energy can be produced, therefore the performer can work at a higher intensity for longer • Increased RBC production due to EPO increase at high altitude/so increased oxygen carrying capacity so can work aerobically for longer during exercise, but still reduced oxygen compared to lower altitudes so unlikely to produce best performance • Increased oxidative enzymes for fat metabolism, which means that a larger energy source will be available to the performer and reduces lactate produced by other energy systems so delays fatigue Accept other appropriate responses.

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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.