PE.AP10 Recovery from Exercise: EPOC and Oxygen Debt

Total Marks

AQA 8582 · Calculators not allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer the questions. Write full sentences for any 3-mark or higher question. Allow approximately 30 minutes for this pack.

1 Define Excess Post-Exercise Oxygen Consumption (EPOC) as it applies after a sprint session in athletics.

(Total for Question 1 is 1 mark)

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2 State what is meant by 'oxygen debt' following a short, intense 400 m race.

(Total for Question 2 is 1 mark)

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3 Identify two physiological reasons oxygen debt occurs during very intense activity such as a maximal sprint.

(Total for Question 3 is 2 marks)

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4 Describe how EPOC helps remove lactic acid after a rugby player completes repeated high-intensity efforts.

(Total for Question 4 is 2 marks)

5 Name one practical recovery method that involves continuing to move at low intensity immediately after an anaerobic training set, as used by a track cyclist.

(Total for Question 5 is 1 mark)

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6 State two components an athlete should replace in the 30 minutes after an anaerobic rugby training session for effective recovery.

(Total for Question 6 is 2 marks)

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7 Explain how a cool-down of light jogging and stretching immediately after a short, intense 200 m swim helps speed recovery for the swimmer.

(Total for Question 7 is 3 marks)

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8 Describe briefly why active recovery (for example, easy cycling for 10 minutes after a sprint interval) is better than complete rest for removing lactic acid.

(Total for Question 8 is 2 marks)

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9 Explain how rehydration after an anaerobic circuit session helps the EPOC process and overall recovery.

(Total for Question 9 is 2 marks)

10 Name one food type an athlete should eat within two hours after an anaerobic weight training session to help replace glycogen, and state why it is appropriate.

(Total for Question 10 is 2 marks)

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11 Suggest one reason why consuming a small amount of protein after anaerobic exercise is useful for recovery.

(Total for Question 11 is 1 mark)

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12 State one practical recovery method that specifically helps prevent blood pooling in the legs immediately after repeated sprint work and say how it does so.

(Total for Question 12 is 1 mark)

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13 Identify one reason why passive recovery (sitting or lying still) might be less effective than active recovery after very hard anaerobic exercise.

(Total for Question 13 is 1 mark)

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14 Discuss which recovery methods are most effective after a brief bout of maximal anaerobic exercise, for example 4 x 60 m sprints with 90 seconds rest. You should consider active recovery, cool-down, rehydration and nutrition and make a judgement on the best approach for this specific session.

(Total for Question 14 is 6 marks)

Mark scheme · PE.AP10 Recovery from Exercise: EPOC and Oxygen Debt

Question 1

- **B1** a sustained elevation of oxygen uptake after exercise compared with resting levels, oe
- **Answer: A sustained elevation of oxygen uptake after exercise compared with resting levels.**

Question 2

- **B1** the amount of extra oxygen required after exercise to restore the body to its resting state following anaerobic energy use, oe
- **Answer: The amount of extra oxygen required after exercise to restore the body to its resting state following anaerobic energy use.**

Question 3

- **B1** oxygen supply to muscles is insufficient to meet immediate energy demand
- **B1** energy production relies on anaerobic metabolism leading to lactic acid build-up
- **Answer: Oxygen supply is insufficient to meet the immediate energy demand, and anaerobic metabolism produces energy leading to lactic acid build-up.**

Question 4

- **B1** increased oxygen uptake during EPOC allows conversion of lactic acid to pyruvate and then to carbon dioxide and water, oe
- **B1** enhanced blood flow during recovery helps transport lactic acid to the liver and muscles for removal and metabolism, oe
- **Answer: Increased oxygen uptake during EPOC allows lactic acid to be converted back to pyruvate and then into carbon dioxide and water, and enhanced blood flow helps transport lactic acid to the liver and muscles for removal and metabolism.**

Question 5

- **B1** active recovery
- **Answer: Active recovery**

Question 6

- **B1** carbohydrate
- **B1** fluid (rehydration) or water/electrolytes
- **Answer: Carbohydrate and fluid (rehydration, water or fluids with electrolytes).**

Question 7

- **B1** light jogging maintains elevated heart rate and breathing, keeping blood flow high to remove metabolic waste, oe
- **B1** stretching helps reduce muscle tightness and may aid removal of lactic acid by improving circulation to the muscles, oe
- **B1** a gradual reduction in intensity prevents blood pooling and helps maintain venous return, supporting faster removal of waste and delivery of oxygen, oe
- **Answer: Light jogging keeps heart rate and breathing slightly elevated so blood flow remains high to remove metabolic waste; stretching helps reduce muscle tightness and may improve circulation aiding lactic acid removal; together the gradual reduction in intensity prevents blood pooling and maintains venous return, supporting faster recovery.**

Question 8

- **B1** active recovery maintains blood flow which transports lactic acid away from muscles to be metabolised, oe
- **B1** it keeps oxygen uptake elevated to allow aerobic metabolism to convert lactic acid more quickly than if the athlete rested completely, oe
- **Answer: Active recovery maintains blood flow which transports lactic acid away from muscles to be metabolised, and it keeps oxygen uptake elevated so aerobic metabolism can convert lactic acid more quickly than during complete rest.**

Question 9

- **B1** rehydration restores plasma volume, which helps maintain stroke volume and blood flow for transport of oxygen and removal of waste, oe
- **B1** replacing fluids and electrolytes supports cellular processes involved in metabolism and muscle repair, aiding the return to homeostasis, oe
- **Answer: Rehydration restores plasma volume which helps maintain stroke volume and blood flow for transport of oxygen and removal of waste, and replacing fluids and electrolytes supports cellular processes for metabolism and muscle repair, aiding the return to homeostasis.**

Question 10

- **B1** high glycaemic index carbohydrate (e.g. white rice, pasta, or a sports recovery drink)
- **B1** it is appropriate because it is rapidly digested and helps restore muscle glycogen quickly, oe
- **Answer: High glycaemic index carbohydrate such as white rice or a sports recovery drink; it is appropriate because it is rapidly digested and helps restore muscle glycogen quickly.**

Question 11

- **B1** protein provides amino acids to support muscle repair and recovery, oe
- **Answer: Protein provides amino acids to support muscle repair and recovery.**

Question 12

- **B1** active cool-down such as light jogging or walking, it maintains muscle pump action to keep venous return and prevent pooling
- **Answer: An active cool-down such as light jogging or walking, it maintains muscle pump action to keep venous return and prevent pooling.**

Question 13

- **B1** passive recovery allows circulation to slow, reducing lactic acid removal and slowing oxygen delivery for repayment of oxygen debt, oe
- **Answer: Passive recovery allows circulation to slow, reducing lactic acid removal and slowing oxygen delivery for repayment of oxygen debt.**

Question 14

- **Level 2** (4-6): A clear discussion that evaluates how at least two recovery methods (active recovery, cool-down, rehydration, nutrition) help repay oxygen debt and remove lactic acid in the context of repeated 60 m sprints, links evidence to effectiveness, and reaches a justified conclusion about the best approach for this session.
- **Level 1** (1-3): Limited discussion that describes one or two recovery methods with some links to oxygen debt or lactic acid removal, but with little development or no clear conclusion applied to the sprint example.
- **Indicative content:**
  - Active recovery maintains elevated blood flow and oxygen delivery between and after sprints, speeding lactic acid removal and repayment of oxygen debt, which is highly relevant to short repeated maximal efforts.
  - A cool-down that combines light aerobic work and stretching helps prevent blood pooling, maintains circulation and aids gradual reduction of metabolic stress, valuable immediately after the sprint set.
  - Rehydration is essential to maintain plasma volume and effective transport of oxygen and metabolites; without fluids the benefit of active recovery is reduced because circulation is impaired.
  - Rapid intake of carbohydrates after the session begins glycogen resynthesis, which matters if further training or competition follows the same day, while some protein supports muscle repair.
  - Compare practicality: active recovery is immediately effective and low cost, rehydration is essential but does not clear lactic acid by itself, and nutrition is important for longer term recovery rather than immediate lactic acid clearance.
  - A justified conclusion could argue that a combination of active recovery plus rehydration, followed by carbohydrate and protein within two hours, provides the most effective overall recovery for 4 x 60 m sprints.