



PE.HW5 Health, Fitness and Wellbeing: Diet, Energy Balance and Performance

AQA 8582 · Calculator allowed · about 50 minutes

Total Marks

--

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

1 Which of the following best describes 'energy balance'?

- ☐ A) The comparison between a person's energy intake from food and drink, and their energy expenditure
- ☐ B) The total amount of carbohydrate stored as glycogen in the muscles
- ☐ C) The number of calories in a single meal
- ☐ D) A performer's measured level of cardiovascular fitness

(Total for Question 1 is 1 mark)

2 State what is meant by each of the following terms.

(a) Energy intake. (1)

(b) Energy expenditure. (1)

(c) Energy balance. (1)

(Total for Question 2 is 3 marks)

3 A performer's energy balance can be described using the formula $\text{energy balance} = \text{energy intake} - \text{energy expenditure}$.

(a) State what is meant by an 'energy surplus' and an 'energy deficit'. (2)

(b) Using the formula given, explain why a performer's energy needs typically increase on days with a heavy training session. (2)

(Total for Question 3 is 4 marks)

4 A rower's estimated energy expenditure for a training day is 3200 kcal. Using the formula $\text{energy balance} = \text{energy intake} - \text{energy expenditure}$, calculate their energy intake on a day when their energy balance is a surplus of 200 kcal.

(Total for Question 4 is 2 marks)

5 Which of the following situations describes an energy deficit?

- ☐ A) Energy intake of 2800 kcal, energy expenditure of 2500 kcal
- ☐ B) Energy intake of 2500 kcal, energy expenditure of 2800 kcal
- ☐ C) Energy intake of 2800 kcal, energy expenditure of 2800 kcal
- ☐ D) Energy intake and energy expenditure both increasing by the same amount

(Total for Question 5 is 1 mark)

6 State what is meant by 'carbohydrate loading'.

(Total for Question 6 is 2 marks)

- 7** Explain why carbohydrate loading is more likely to benefit a marathon runner than a 100 metre sprinter.

(Total for Question 7 is 3 marks)

- 8** Chen is a club cyclist preparing for a four-hour charity sportive.
Suggest and justify one change Chen could make to his carbohydrate intake in the days before the event, referring to glycogen storage.

(Total for Question 8 is 3 marks)

- 9** State two reasons why the timing of a performer's meal before competition matters.

(Total for Question 9 is 2 marks)

- 10** Explain why consuming carbohydrate, and some protein, soon after a hard training session is often recommended to support recovery.

(Total for Question 10 is 2 marks)

- 11** Which of the following best describes the main purpose of carbohydrate loading?

- ☐ A) To maximise glycogen stores before a long, continuous aerobic event
- ☐ B) To increase muscle mass as quickly as possible
- ☐ C) To reduce the amount of water a performer needs to drink
- ☐ D) To replace the need for a warm-up before exercise

(Total for Question 11 is 1 mark)

- 12** Discuss how Priya, a marathon runner, might adjust her diet in the days before, during and immediately after a marathon, referring to energy balance and the role of carbohydrate, and evaluate why matching dietary strategy to the specific demands of the event, rather than following a generic approach, matters for her performance.

(Total for Question 12 is 9 marks)

- 13** Which of the following would most directly increase a performer's energy expenditure on a given day?

- ☐ A) Eating a larger breakfast
- ☐ B) Completing an additional, longer training session
- ☐ C) Drinking more water throughout the day
- ☐ D) Taking a rest day with no planned training

(Total for Question 13 is 1 mark)

- 14** Explain one reason why a strength/power athlete's dietary priorities, for example around protein intake, might differ from an endurance athlete's.

(Total for Question 14 is 2 marks)

- 15** Explain why a performer's overall energy intake generally needs to increase during a period of intense training, such as pre-season, and suggest one risk of not adjusting intake to match this.

(Total for Question 15 is 3 marks)

- 16** State two examples of good carbohydrate sources a performer might use to increase their intake before a long event.

(Total for Question 16 is 2 marks)

- 17** Which of the following best describes why a performer's diet should generally reflect the total amount and type of training they are doing?
- ☐ A) Because energy needs are matched to the demands of training, rather than being fixed for every performer
 - ☐ B) Because every performer needs exactly the same amount of carbohydrate regardless of training
 - ☐ C) Because diet has no effect on training or recovery
 - ☐ D) Because energy expenditure does not change with training volume

(Total for Question 17 is 1 mark)

- 18** Explain why simply eating 'more food' is not, on its own, a complete description of a sensible strategy for meeting a performer's increased energy needs during heavy training.

(Total for Question 18 is 3 marks)

- 19** A swimmer has two training sessions in one day, one in the morning and one in the evening. Suggest one dietary consideration between the two sessions relevant to her energy balance, and explain why it matters.

(Total for Question 19 is 2 marks)

- 20** State two factors that can affect how much energy a performer needs to consume each day.

(Total for Question 20 is 2 marks)

21 Which of the following statements about energy balance is correct?

- ☐ A) Energy balance compares a performer's energy intake with their energy expenditure over a period of time
- ☐ B) Energy balance only applies to performers in endurance sports
- ☐ C) Energy balance is fixed and does not change with training volume
- ☐ D) Energy balance measures a performer's muscular strength

(Total for Question 21 is 1 mark)

Mark scheme · PE.HW5 Health, Fitness and Wellbeing: Diet, Energy Balance and Performance

Question 1

- **B1 A**
- **Answer: A**

Question 2

- (a) **B1** the total energy consumed through food and drink, oe
- (a) **Answer: The total energy consumed through food and drink.**
- (b) **B1** the total energy used by the body, through daily bodily functions (basal metabolism) plus physical activity, oe
- (b) **Answer: The total energy used by the body, through daily bodily functions plus physical activity.**
- (c) **B1** the relationship/comparison between a person's energy intake and their energy expenditure over a period of time, oe
- (c) **Answer: The relationship between a person's energy intake and their energy expenditure over a period of time.**

Question 3

- (a) **B1** energy surplus: when energy intake is greater than energy expenditure over a period, oe
- (a) **B1** energy deficit: when energy intake is less than energy expenditure over a period, oe
- (a) **Answer: An energy surplus is when energy intake is greater than energy expenditure over a period; an energy deficit is when energy intake is less than energy expenditure over a period.**
- (b) **B1** a heavy training session increases the energy expenditure side of the equation, through the activity itself and the demands of recovery, oe
- (b) **B1** so more energy intake is generally needed on that day to keep the same energy balance, compared with a lighter training day, oe
- (b) **Answer: A heavy training session increases the energy expenditure side of the equation, through the activity itself and the demands of recovery, so more energy intake is generally needed on that day to keep the same energy balance compared with a lighter training day.**

Question 4

- **M1** rearranges to energy intake = energy balance + energy expenditure, or $200 + 3200$ seen, oe
- **A1** 3400 kcal cao
- **Answer: 3400 kcal.**

Question 5

- **B1 B**
- **Answer: B**

Question 6

- **B1** a strategy, typically used before a long, continuous endurance event, of increasing carbohydrate intake, often alongside reduced training, in the days beforehand, oe
- **B1** aimed at maximising the amount of glycogen stored in the muscles and liver before the event, oe
- **Answer: Carbohydrate loading is a strategy, typically used before a long, continuous endurance event, of increasing carbohydrate intake in the days beforehand, aimed at maximising the amount of glycogen stored in the muscles and liver.**

Question 7

- **B1** a marathon is a long, continuous aerobic event where glycogen stores can become significantly depleted before the finish, oe
- **B1** carbohydrate loading increases the amount of stored glycogen available, delaying the point at which stores run low and fatigue sets in, oe
- **B1** a 100m sprint lasts only a few seconds and does not meaningfully deplete glycogen stores, so there is little or no store-depletion problem for loading to solve, oe
- **Answer: A marathon is a long, continuous aerobic event where glycogen stores can become significantly depleted before the finish, and carbohydrate loading increases stored glycogen, delaying the point at which stores run low and fatigue sets in. A 100m sprint lasts only a few seconds and does not meaningfully deplete glycogen stores, so there is little or no store-depletion problem for loading to solve.**

Question 8

- **B1** increasing carbohydrate intake in the 2-3 days before the event (carbohydrate loading), oe
- **B1** this increases stored muscle and liver glycogen, providing a larger fuel reserve for the long duration of the event, oe
- **B1** which can help delay fatigue caused by glycogen depletion later in the ride, oe
- **Answer: Chen could increase his carbohydrate intake in the 2-3 days before the event (carbohydrate loading). This increases stored muscle and liver glycogen, providing a larger fuel reserve for the long duration of the event, which can help delay fatigue caused by glycogen depletion later in the ride.**

Question 9

- **B1** eating too close to the start can cause discomfort, as digestion is still in progress, oe
- **B1** eating too long before, without a top-up snack, may leave energy stores lower by the start, oe
- **Answer: Eating too close to the start can cause discomfort as digestion is still in progress, and eating too long before, without a top-up snack, may leave energy stores lower by the start.**

Question 10

- **B1** carbohydrate helps to replenish glycogen stores that were used up during the session, oe
- **B1** protein supports the repair of muscle tissue that has been broken down or stressed during training, oe
- **Answer: Carbohydrate helps to replenish glycogen stores that were used up during the session, and protein supports the repair of muscle tissue that has been broken down or stressed during training.**

Question 11

- **B1 A**
- **Answer: A**

Question 12

- **Level 3** (7-9): A detailed and coherent response that accurately explains dietary adjustments before, during and after the marathon, referring correctly to energy balance and carbohydrate's role, applies them specifically to Priya's event, and reaches a well-justified evaluative judgement about why event-specific matching matters. Sustained, accurate use of nutrition terminology throughout.
- **Level 2** (4-6): Some accurate coverage of dietary adjustments across at least two of the three phases (before/during/after), with some application to Priya's event, though coverage may be incomplete or the evaluative judgement underdeveloped. Generally correct use of terminology.
- **Level 1** (1-3): Basic or generic statements about diet and marathon running with little or no reference to specific phases or energy balance, and little evaluation of event-specific matching.
- **Level 0** (0): No relevant content.
- **Indicative content:**
 - Before: carbohydrate loading in the preceding days to maximise glycogen stores in the muscles and liver.
 - During: possible carbohydrate intake (e.g. gels or sports drinks) during the race itself, to delay glycogen depletion over the several hours of continuous running.
 - After: carbohydrate and protein intake soon after finishing, to support glycogen replenishment and muscle repair during recovery.
 - Energy balance point: overall daily energy intake needs to reflect the very high energy expenditure of marathon training and racing, to avoid an unplanned, large energy deficit.
 - Evaluative point: a generic dietary approach not matched to the marathon's specific duration and intensity (for example, a strategy designed around a short sprint event) would not adequately fuel a multi-hour continuous aerobic effort.
 - Evaluative point: strategies therefore need to be matched to the specific demands (duration, intensity, continuous versus intermittent effort) of the event in question, rather than following a single approach for every performer or every event.
 - Balanced conclusion: the three phases work together as a single fuelling plan across the whole event, rather than as separate, unrelated decisions.

Question 13

- **B1 B**
- **Answer: B**

Question 14

- **B1** strength/power training causes more muscle tissue breakdown that needs repairing and rebuilding, oe
- **B1** so protein needs relative to training volume are generally higher, to support this muscle repair and adaptation, oe
- **Answer: Strength/power training causes more muscle tissue breakdown that needs repairing and rebuilding, so protein needs relative to training volume are generally higher, to support this muscle repair and adaptation.**

Question 15

- **B1** energy expenditure rises substantially during intense training, due to the training itself and the demands of recovery/adaptation, oe
- **B1** if intake does not increase to reflect this, an energy deficit can occur, oe
- **B1** risk: this can leave insufficient energy for training quality and recovery, potentially reducing performance and slowing adaptation, oe
- **Answer: Energy expenditure rises substantially during intense training, so if intake does not increase to reflect this, an energy deficit can occur. This can leave insufficient energy for training quality and recovery, potentially reducing performance and slowing adaptation.**

Question 16

- **B1** pasta, rice or potatoes, oe
- **B1** wholegrain bread, oats or bananas, oe
- **Answer: Pasta, rice or potatoes, and wholegrain bread, oats or bananas, are all good carbohydrate sources a performer might use before a long event.**

Question 17

- **B1 A**

Question 18

- **B1** the type of energy matters, not just the total amount, e.g. carbohydrate is particularly important for fuelling and refuelling muscle glycogen, oe
- **B1** timing also matters, e.g. eating around training sessions supports fuelling and recovery more effectively than the same food eaten at a different time, oe
- **B1** so an effective strategy considers the balance, type and timing of intake relative to training demands, not simply a larger total amount of food, oe
- **Answer: The type of energy matters, not just the total amount, since carbohydrate is particularly important for fuelling and refuelling muscle glycogen. Timing also matters, as eating around training sessions supports fuelling and recovery more effectively than the same food eaten at a different time. An effective strategy therefore considers the balance, type and timing of intake, not simply a larger total amount of food.**

Question 19

- **B1** eating a carbohydrate-containing meal or snack between the two sessions, oe
- **B1** to help replenish some glycogen used in the morning session ahead of the evening session, so training quality is not compromised by low fuel, oe
- **Answer: Eating a carbohydrate-containing meal or snack between the two sessions would help replenish some glycogen used in the morning session ahead of the evening session, so training quality is not compromised by low fuel.**

Question 20

- **B1** the volume and intensity of their training, oe
- **B1** their overall body size, oe
- **Answer: The volume and intensity of a performer's training, and their overall body size, can both affect how much energy they need to consume each day.**

Question 21

- **B1 A**
- **Answer: A**