VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

**Victorian Certificate of Education**
**2013**

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

**STUDENT NUMBER**

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|---|---|---|---|---|---|---|---|---|---|
| Figures | | | | | | | | | Letter |
| Words | | | | | | | | | |

# PHYSICAL EDUCATION

## Written examination

**Thursday 7 November 2013**

**Reading time: 11.45 am to 12.00 noon (15 minutes)**
**Writing time: 12.00 noon to 2.00 pm (2 hours)**

## QUESTION AND ANSWER BOOK

**Structure of book**

| *Section* | *Number of questions* | *Number of questions to be answered* | *Number of marks* |
|---|---|---|---|
| A | 15 | 15 | 15 |
| B | 14 | 14 | 105 |
| | | | Total 120 |

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.
- No calculator is allowed in this examination.

**Materials supplied**
- Question and answer book of 24 pages.
- Answer sheet for multiple-choice questions.

**Instructions**
- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- All written responses must be in English.

**At the end of the examination**
- Place the answer sheet for multiple-choice questions inside the front cover of this book.

**Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.**

## SECTION A – Multiple-choice questions

### Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** or that **best answers** the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

**Question 1**
Stroke volume and heart rate both increase during exercise.
This results in
**A.** an increase in tidal volume.
**B.** a decrease in venous return.
**C.** an increase in cardiac output.
**D.** a decrease in blood flow to working muscles.

**Question 2**
In a workplace where most staff sit at computer workstations, a program sends a message every 15 minutes to each computer screen instructing the user to stand and walk around.
Which component of the social-ecological model is this physical activity initiative aimed at?
**A.** individual
**B.** population
**C.** social environment
**D.** physical environment

**Question 3**
Which one of the following fitness tests accurately assesses anaerobic capacity?
**A.** 20 m shuttle run test
**B.** phosphate recovery test
**C.** 1 repetition maximum (RM) test
**D.** Yo-Yo intermittent recovery test

**Question 4**
Carbohydrate loading for an elite female triathlete
**A.** increases muscle glycogen stores prior to the race.
**B.** requires no change to training load leading up to the event.
**C.** is intended to prolong the use of fats as the major fuel source.
**D.** involves a high-carbohydrate diet of approximately 4–5 grams per kilogram of body weight.

**Question 5**

As part of the World Anti-Doping Code, the World Anti-Doping Agency (WADA) monitors substances that are not on the list of prohibited substances. Nicotine was placed on the monitoring program in 2012.

In line with the WADA rationale, the purpose of placing nicotine on the monitoring program is to

**A.** discourage smoking and reduce rates of smoking.

**B.** measure the effects of nicotine on performance.

**C.** support government campaigns against drugs.

**D.** detect potential patterns of abuse and misuse.

**Question 6**

Which fuel produces the largest amount of energy per molecule?

**A.** triglycerides

**B.** blood glucose

**C.** muscle glycogen

**D.** stored ATP and PC

**Question 7**

For submaximal exercise, the linear relationship between heart rate and oxygen consumption can be used to estimate

**A.** arteriovenous oxygen difference (a-v$O_2$ diff.).

**B.** lactate inflection point (LIP).

**C.** $VO_2$ maximum.

**D.** cardiac output.

**Question 8**

There is sufficient evidence that caffeine can enhance performance in high-intensity exercise of a short duration (one to five minutes).

This is most likely due to

**A.** increased glycogen-storing capacity.

**B.** decreased permeability to calcium ions.

**C.** decreased adrenaline release and action.

**D.** decreased perception of fatigue or effort.

**Question 9**

A chronic adaptation to training that may lead to an increase in an endurance athlete's LIP would be increased

**A.** glycolytic capacity.

**B.** mitochondrial mass.

**C.** ATPase enzyme activity.

**D.** tolerance to metabolic by-products.

**Question 10**

An elite soccer player consumes a pre-match meal three hours before the game.

Research would indicate that a

**A.** high-GI meal may lead to greater feelings of fullness than a low-GI meal.

**B.** high-GI meal may result in improved endurance capacity compared to a low-GI meal.

**C.** low-GI meal may result in a lower rate of fat oxidation during exercise than a high-GI meal.

**D.** low-GI meal may produce a more stable blood glucose concentration during exercise than a high-GI meal.

**Question 11**

The ATP-CP energy system produces energy at a

**A.** slow rate with a low yield.

**B.** slow rate with a high yield.

**C.** fast rate with a low yield.

**D.** fast rate with a high yield.

**Question 12**

A chronic adaptation to aerobic training is an

**A.** increase in the recruitment of fast-twitch fibres.

**B.** increase in fat oxidation at the same energy expenditure.

**C.** increase in carbohydrate metabolism at the same energy expenditure.

**D.** increased contribution from the anaerobic energy system at the same energy expenditure.

**Question 13**

An appropriate interval training program to increase the LIP of an elite endurance runner would be

| | Interval distance (m) | Repetitions | Work to rest ratio (W:R) | Intensity of $VO_2$ max. (%) |
|---|---|---|---|---|
| **A.** | 1000 | 6 | 1:1 | 75–90% |
| **B.** | 200 | 5 | 1:3 | 85–95% |
| **C.** | 100 | 4 | 1:5 | 90–95% |
| **D.** | 50 | 4 | 1:6 | 90–95% |

**Question 14**

Working at 110% of $VO_2$ max. requires

**A.** the body to use stored ATP for energy.

**B.** the anaerobic energy systems to provide the additional ATP.

**C.** the body to work in oxygen debt and replace the extra oxygen post-exercise.

**D.** the oxygen supply to be greater than demand so that the additional ATP is produced aerobically.

**Question 15**

A government initiative to promote adherence to the National Physical Activity Guidelines (NPAG) is the Premier's Active Families Challenge. It encourages families to be more active, more often, by doing 30 minutes of physical activity per day for 30 days.

Individuals in which age group would meet the NPAG by completing this initiative?

**A.** 0–5 years

**B.** 5–12 years

**C.** 12–18 years

**D.** 18–65 years

## SECTION B

**Instructions for Section B**

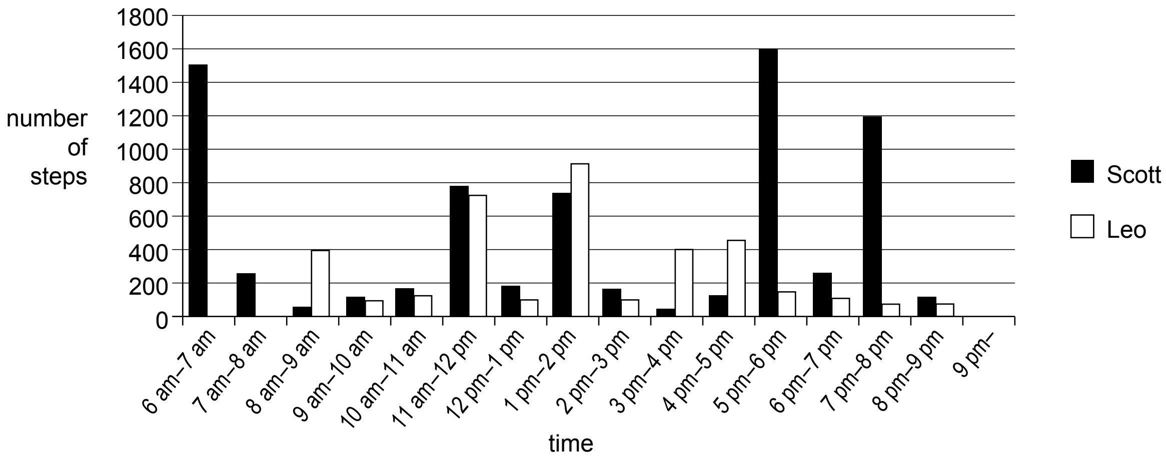
Answer **all** questions in the spaces provided.

**Question 1** (7 marks)

Scott is in Year 10 and lives on a farm 10 km outside of a town. He catches the school bus to and from school. His dad drives him into town for football and cricket training twice a week and on Saturdays to play during the season.

Leo is in Year 6 and lives with his family in a high-rise apartment block in an inner-city suburb. He walks to and from school each day, which takes him about 15 minutes each way. He does not play any sport on the weekends.

Scott and Leo wore a pedometer on a school day and the data collected is presented in the graph below.




**a.** Other than recess or lunchtime, suggest **one** likely reason for the increase in Scott's physical activity levels between 11 am and 12 pm. 1 mark

______________________________________________________________________

**b.** Using the data provided above, give **one** explanation for the differences in Scott's and Leo's physical activity levels between **6 am and 9 am**. 2 marks

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

**c.** **i.** Other than age, list **one** individual factor and **one** factor relating to physical environment that could be perceived as barriers to physical activity for either Leo or Scott. 2 marks

| Individual | Physical environment |
|---|---|
| | |

**ii.** Select **one** of these factors and explain how it may **decrease** the likelihood of either Scott or Leo being physically active. 2 marks

**Question 2** (4 marks)

The World Anti-Doping Agency (WADA) has removed a number of sports from the list of sports that prohibit the use of beta-blockers. A number of sports, including archery, darts, golf and aerial skiing, remain on the list of sports in which beta-blockers cannot be used in competition.

Select **one** of the sports named above and explain why beta-blockers are still banned in that sport. In your response, refer to the **three** WADA criteria for banning a substance.

**Question 3** (10 marks)

Part of a 12-week training program for an untrained individual who is competing in a 10 km fun run is shown below.

| Week | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|---|---|---|---|---|---|---|---|
| 1 | rest | rest | 2 km run | rest | fartlek training 4 minutes hard/ 3 minutes easy × 3 | rest | 25-minute run |
| 4 | rest | rest | 3 km run | rest | fartlek training 5 minutes hard/ 3 minutes easy × 4 | rest | 30-minute run |
| 8 | rest | rest | 4 km run | rest | fartlek training 8 minutes hard/ 4 minutes easy × 4 | rest | 40-minute run |
| 10 | rest | fartlek training 5 minutes hard/ 5 minutes easy × 3 | 6 km run | rest | fartlek training 10 minutes hard/ 4 minutes easy × 4 | rest | 60-minute run |
| 12 | rest | rest | 30-minute easy run | rest | 20-minute easy run | rest | **10 km fun run** |

**a.** State the main fitness component targeted in this training program. 1 mark

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**b.** Suggest a suitable training intensity, as a percentage of heart rate maximum (HR max.), for the Wednesday training sessions. 1 mark

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**c.** Explain what occurs physiologically if the individual trains above the exercise intensity identified in **part b.** 4 marks

**d.** What is the purpose of fartlek training for the 10 km runner? 2 marks

**e.** The training program is overloaded during the 12-week period. However, in week 12 there is a significant decrease in training volume.

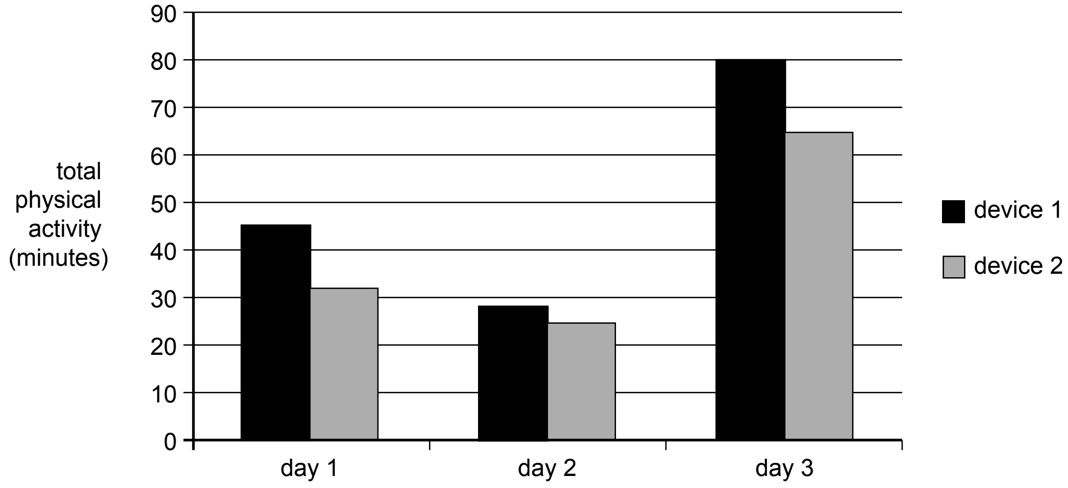
Name the training strategy applied in week 12 and explain the importance of implementing it. 2 marks

strategy

explanation

**Question 4** (5 marks)

The information in the following graph shows total moderate-to-vigorous physical activity as measured by two different devices for a 17-year-old individual across three days in a week.




**a.** Based on the data from the graph, on which day(s) has the individual met the National Physical Activity Guidelines (NPAG)? 1 mark

**b.** **i.** Is the data collected by device 2 more likely to have been collected using an objective or subjective method? 1 mark

**ii.** With reference to the data, justify your answer to **part b.i.** 3 marks

**Question 5** (6 marks)

Athletes use many different strategies to enhance their recovery after exercise.

**a.** Explain, physiologically, why cold-water immersion (or the use of ice baths) can be very effective in improving an athlete's recovery. 3 marks

Michelle Austin, a psychologist at the ACT Academy of Sport, says, 'Sleep is something we often take for granted … However, quality sleep is vital to our health, our well-being, and our performance … It is essential that athletes normalise their sleeping patterns to maximise the recovery process'.

Source: M Austin, 'Strategies for quality sleep', in *Sports Coach*, vol. 29(1), Australian Sports Commission, 2006

**b.** Other than increased fatigue, outline **three** different physiological or psychological factors that may be affected by poor quality or duration of sleep. 3 marks

**Question 6** (13 marks)

Due to copyright restriction,
this excerpt is not supplied.

Source: EL Fox, RW Bowers and ML Foss, *The Physiological Basis for Exercise and Sport*, 5th edn, Brown and Benchmark, USA, 1993, p. 383

**a.** Using the graph above, identify **one** factor that can affect the strength of a muscle. 1 mark

______________________________________________________________________

**b.** 'The force exerted by equal-sized muscles is the same for both males and females.'
Is this statement accurate? Use the information in the graph to justify your answer. 3 marks

______________________________________________________________________

______________________________________________________________________

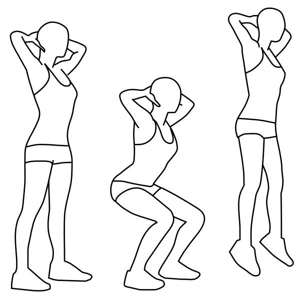
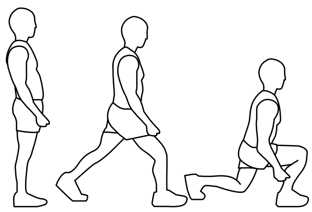
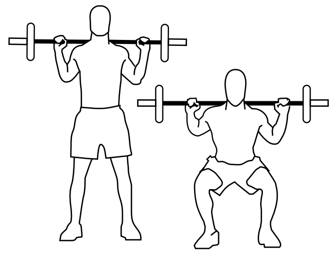
______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

**c.** The exercises in the table below all target the lower body.

Complete the table (1.–4.) by identifying a **different** fitness component being targeted in each exercise and a **different** method of overload for each exercise. Two of the answers have been provided for you. 4 marks

| **Exercise** | jump squat  | lunge walk  | barbell squat  |
|---|---|---|---|
| **Fitness component** | 1. | 2. | *muscular strength* |
| **Method of overload** | 3. | *carry a weight while lunging* | 4. |

**d.** A chronic muscular adaptation to weight training is muscular hypertrophy.

Identify **two** changes that occur in the muscle that contribute to muscular hypertrophy. 2 marks

**e.** Explain why a combined protein–carbohydrate snack or meal following a heavy weight-training workout may be a more effective recovery strategy than consuming protein alone. 3 marks

**Question 7** (4 marks)

Creatine in supplemental form can be used in international competitions as WADA considers creatine a legal substance. The effects of 12 weeks of creatine supplementation plus heavy resistance training on body composition (graph 1) and muscular strength (graph 2) are shown below.

Due to copyright restriction, this excerpt is not supplied.

Source: JS Volek, ND Duncan, SA Mazzetti, RS Staron, M Putukian, AL Gómez, DR Pearson, WJ Fink and WJ Kraemer, 'Performance and muscle fiber adaptations to creatine supplementation and heavy resistance training', in *Medicine & Science in Sports & Exercise*, vol. 31(8), Lippincott Williams & Wilkins, Inc., August 1999, pp. 1150 and 1151

The graphs show the results of two groups in the study, one group using creatine and the other not using creatine.

**a.** Based on the information in the graphs, identify which group used creatine supplements. 1 mark

**b.** Using the data provided, identify **two** benefits of creatine supplementation. 2 marks

**c.** Outline **one** potential harm associated with creatine supplementation. 1 mark

**Question 8** (6 marks)

Brett, a 37-year-old male, completed a marathon. His split times are shown below.

| | Distance | Time (hours : minutes : seconds) |
|---|---|---|
| | 10 km | 0:48:20 |
| | 20 km | 0:48:21 |
| | 30 km | 0:48:40 |
| | 40 km | 1:00:19 |
| **Total** | 42.195 km | 3:37:51 |

**a.** Provide a physiological explanation as to why the final 10 km split was slower than the previous three split times. 3 marks

**b.** Explain why it is important for Brett to be adequately hydrated prior to running a marathon. 3 marks

**Question 9** (6 marks)


Source: ACT Government Transport for Canberra;
http://www.transport.act.gov.au/cycle_or_walk/bike_and_ride

**a.** Placing bicycle racks on buses is an example of a strategy to encourage people to cycle to work and/or school.

Identify the **two** components of the social-ecological model that relate to this strategy. 2 marks

**b.** Describe how a workplace or school could implement a change in one of the components identified in **part a.**, which could lead to an increase in people cycling to work and/or school. 2 marks

**c.** Identify **one** individual factor and outline how it may **decrease** the likelihood of an individual using the bicycle racks on buses. 2 marks

**Question 10** (7 marks)

An activity analysis conducted on a basketball game found that the predominant fitness components required for the sport were muscular power (lower body) and agility.

**a.** Name **one** recognised fitness test to assess each of these fitness components. 2 marks

muscular power ______________________________

agility ______________________________

**b.** What is the purpose of conducting fitness tests prior to writing a training program? 2 marks

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______________________________

______________________________

______________________________

**c.** Accuracy and reliability are important when carrying out fitness testing, both in the laboratory and in the field.

Outline **three** procedures that will ensure the accuracy and reliability of fitness testing both in the laboratory and in the field. 3 marks

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______________________________

**Question 11** (6 marks)

A local primary school wanted to increase students' physical activity levels by encouraging them to ride their bicycles to school. After a highly successful 'Ride-to-school Day', the school council and parents' group decided to offer a parent-supervised bicycle riding group. The group rides to school on a designated route, picking up students along the way. Parent volunteers ride with the group. The school installed extra bicycle racks in a secure area for students to store their bicycles during the day.

While the initiative was initially successful at promoting physical activity at the school level, ultimately it was unsustainable and, as a result, is no longer used by the school.

Apply the social-ecological model to critique the bicycle riding initiative and to explain why it was not successful in the long term.

**Question 12** (8 marks)

$VO_2$ max. can be measured in absolute or relative terms.

**a.** Explain how two individuals who have the same absolute $VO_2$ max. measured in litres per minute (L/min) may have different relative $VO_2$ max. results. 2 marks

**b.** **i.** Identify one respiratory, one vascular and one muscular chronic adaptation to the type of training used to improve $VO_2$ max. 3 marks

respiratory

vascular

muscular

**ii.** Explain how each of the adaptations identified in **part b.i.** may lead to an increase in the arteriovenous oxygen difference (a-$vO_2$ diff.) under maximal exercise conditions. 3 marks

**Question 13** (8 marks)

At the age of 15 years and nine months, Michael Phelps became the youngest man ever to set a swimming World Record (WR). He did this in the 200 m butterfly in 2001. He currently holds the WR with a time of 1 minute 51.51 seconds.

**a.** Explain why anaerobic training was an important training method used by Phelps and how the chronic adaptations to this type of training contributed to his WR results. 3 marks

Due to copyright restriction, this excerpt is not supplied.

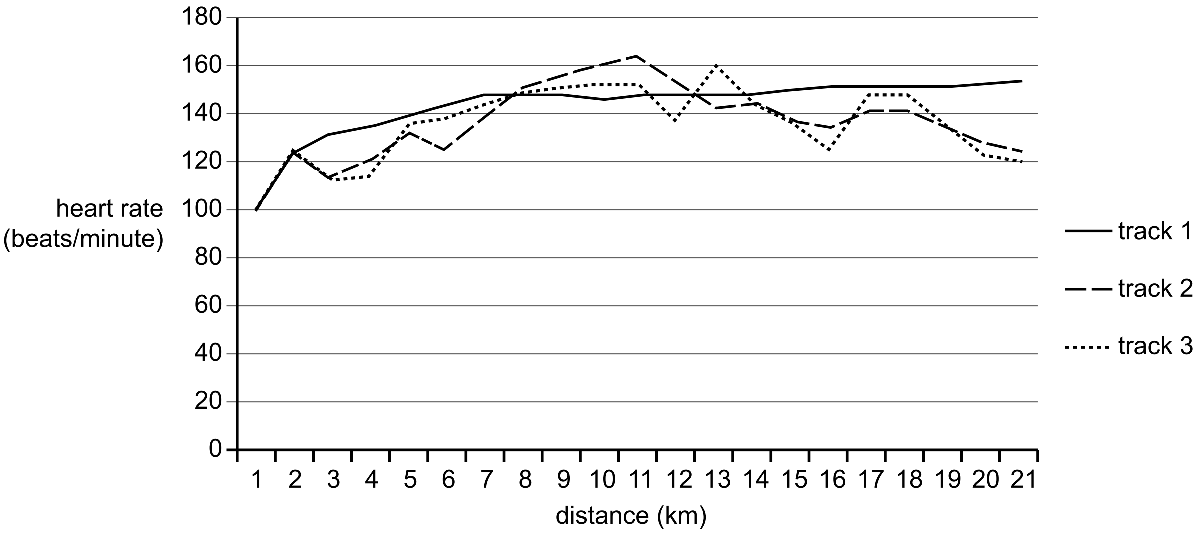
Source: based on S Dodd, SK Powers, T Callender and E Brooks, 'Blood lactate disappearance at various intensities of recovery exercise', in *Journal of Applied Physiology*, no. 57, American Physiological Society, Bethesda, 1984, p. 1464

**b.** The data shows the rate of blood lactate removal for various intensities of recovery exercise: passive, 35%, 65–35% and 65% of HR max.

Using the data provided, justify why Phelps would use an active rather than a passive recovery following his 200 m butterfly event. 5 marks

**Question 14** (15 marks)

Alice is a 40-year-old female who enjoys recreational mountain biking. To adjust her training, she varies her choice of riding terrain. The graph below shows her heart rate responses for three different rides that she completed.




**a.** Estimate Alice's predicted maximum heart rate. Show your working. 1 mark

**b. i.** Which training principle is Alice able to apply by wearing a heart rate monitor while riding? 1 mark

**ii.** Explain how Alice may use the heart rate data to structure her training sessions. 2 marks

**c.** Discuss how the three energy systems combine to provide energy for each of the different rides that Alice completed. Refer to the data provided in the graph on page 22 to support your answer. 6 marks

**d.** **i.** Which food fuel would be used predominantly throughout each ride? 1 mark

**ii.** Support your answer to **part d.i.** using the data provided in the graph on page 22. 2 marks

**e.** How would the fuel usage of an elite mountain bike rider be different from that of Alice? 2 marks

**END OF QUESTION AND ANSWER BOOK**