Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Standard level
Paper 2

Tuesday 31 October 2017 (afternoon)

Candidate session number

1 hour 15 minutes

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer one question.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[50 marks]**.

8817 – 6602

Section A

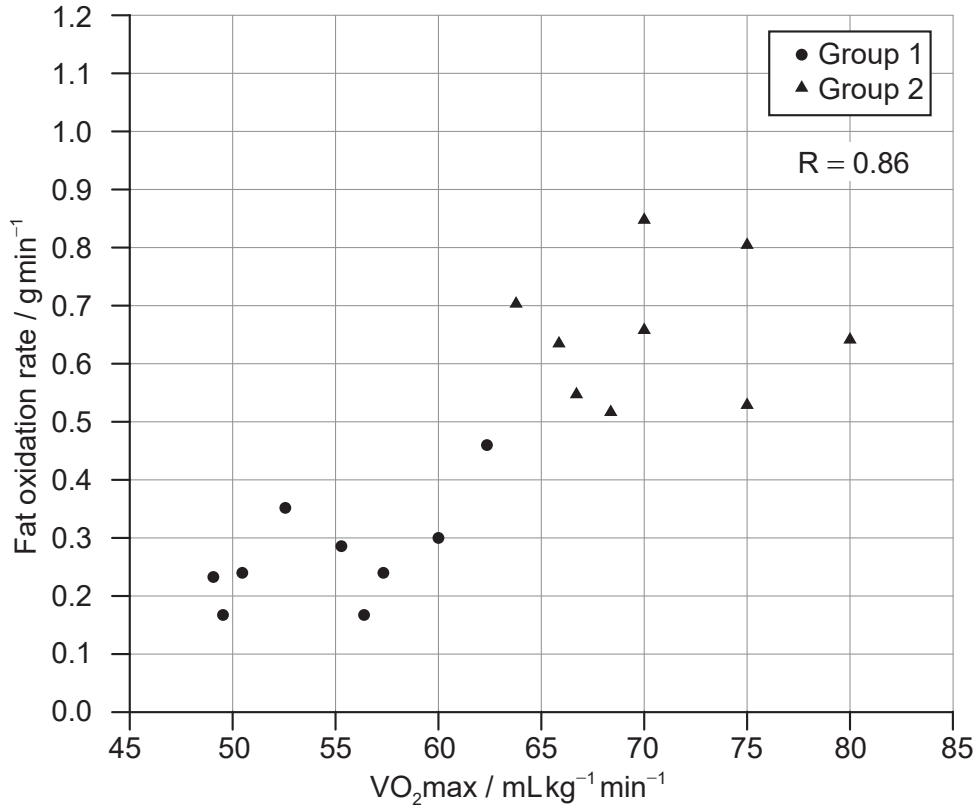
Answer **all** questions. Answers must be written within the answer boxes provided.

1. A study assessed fat oxidation rate during high intensity interval training (HIIT) in two groups of Norwegian men.

- Group 1: Recreational participants
- Group 2: Trained participants

The recreational participants were active in a variety of sports and the trained participants were regional-level distance runners and national-level orienteers.

The scattergram below shows the relationship between maximal oxygen uptake (VO_2max) and fat oxidation rate during the HIIT for each participant.



[Source: Ken J. Hetlelid, Daniel J. Plews, Eva Herold, Paul B. Laursen and Stephen Seiler (2015) 'Rethinking the role of fat oxidation: substrate utilisation during high-intensity interval training in well-trained and recreationally trained runners.' *BMJ Open Sport & Exercise Medicine*, 1, 0:e000047. doi:10.1136/bmjsem-2015-000047]

(a) Identify the group with the higher VO_2max values. [1]

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(Question 1 continued)

(b) State the fat oxidation rate for the runner with a VO_2max of 60 mL kg^{-1} min^{-1}. [1]

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(c) Discuss the relationship between VO_2max and fat oxidation rate. [3]

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(d) Outline the importance of using a Physical Activity Readiness Questionnaire (PAR-Q) in study design. [2]

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(Question 1 continued)

Another study compared the effects of two different high intensity interval training (HIIT) methods and one steady-state endurance training method in non-active people following 8 weeks of cycling. Participants were put into three training groups:

- Group 1: steady-state endurance training at 70 % VO_2max
- Group 2: HIIT at 70 % VO_2max
- Group 3: HIIT at 100 % VO_2max

The table below shows mean VO_2max ($mL\,kg^{-1}\,min^{-1}$) and mean peak power output ($W\,kg^{-1}$) before and after 8 weeks of training.

	Method of training	Before training	After training
VO_2max / $mL\,kg^{-1}\,min^{-1}$	Group 1	33.6	40.1
	Group 2	34.0	40.1
	Group 3	34.3	40.6
Peak power output / $W\,kg^{-1}$	Group 1	11.5	12.4
	Group 2	11.7	12.7
	Group 3	11.8	12.4

[Source: adapted from Carl Foster *et al.*, 'The Effects of High Intensity Interval Training vs Steady State Training on Aerobic and Anaerobic Capacity'. (2015) *Journal of Sports Science and Medicine*, 14, pp. 747–755.]

(e) State the change in peak power output for Group 3. [1]

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(f) Deduce the effect of the methods of training on,

(i) peak power output. [1]

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(ii) VO_2max. [1]

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(Question 1 continued)

(g) Outline **two** cardiovascular adaptations following steady-state endurance training. [2]

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(h) Explain the variability of maximal oxygen consumption in cycling versus arm ergometry. [2]

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2. (a) Long bones are one type of bone found in the body. List **two** other types of bone. [2]

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(b) Outline the function of a ligament in a shoulder joint. [1]

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(Question 2 continued)

(c) The diagram shows an athlete performing a lateral raise.

Position A **Position B**

[Source: © nickp37 www.fotosearch.com]

(i) Identify **one** way of monitoring exercise intensity during three minutes of lateral raises. [1]

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(ii) Analyse the movement of the shoulder joint during the upward phase from Position A to Position B. [3]

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3. (a) State **one** major storage site of triacylglycerol. [1]

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(b) Outline how a marathon runner produces ATP from fatty acids. [2]

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4. (a) (i) Define the concept of *transfer*. [1]

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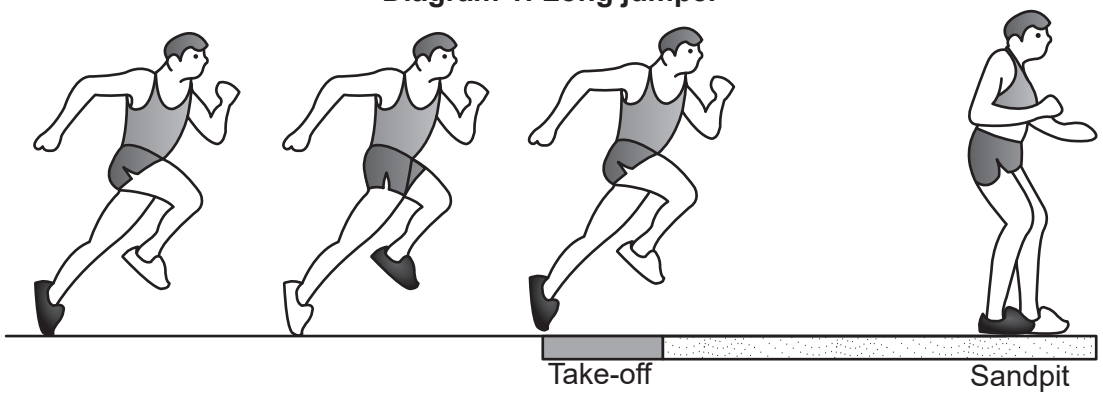
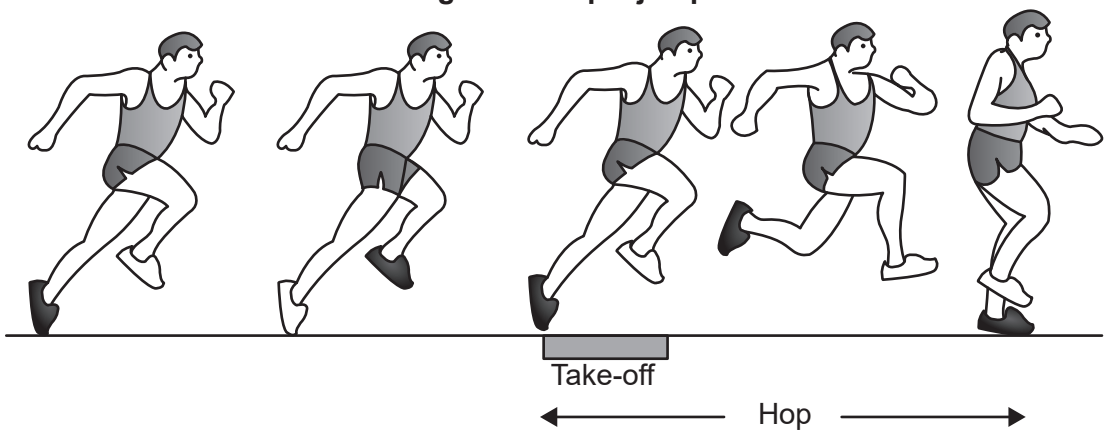
(ii) The diagrams show a long jumper at take-off and a triple jumper during the hop phase.

Diagram 1: Long jumper



[Source: © International Baccalaureate Organization 2017]

Diagram 2: Triple jumper



[Source: © International Baccalaureate Organization 2017]

Outline the type of transfer that occurs between a long jumper moving to triple jump as a new event. [2]

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(Question 4 continued)

(b) Evaluate the use of submaximal tests in sport and exercise science. [3]

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Section B

Answer **one** question. Answers must be written within the answer boxes provided.

5. (a) Using examples, outline the function of the axial and appendicular skeleton during physical activity. [4]

(b) Describe the mechanics of inspiration in the final stages of a cycling race. [5]

(c) Explain the relative contributions of the three energy systems during a hockey or soccer match. [6]

(d) Explain how characteristics of type IIb muscle fibres could enhance the performance of a sprinter. [5]

6. (a) Describe how cardiovascular drift occurs during a marathon. [5]

(b) Outline the process of the sliding filament theory after calcium has been released and until it is pumped back into the sarcoplasmic recticulum. [4]

(c) Analyse how rehearsal and organization improve memory in a sporting routine. [5]

(d) Evaluate **two** fitness tests used to assess body composition. [6]

7. (a) Describe how a glucose molecule forms a polysaccharide molecule. [4]

(b) Distinguish between the skill profile of a javelin throw and a forehand shot in table tennis. [5]

(c) Explain the application of Newton's three laws of motion to a swimmer as they start a race from the blocks. [5]

(d) Analyse the distribution of blood during maximal exercise. [6]

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Answers written on this page
will not be marked.