Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Standard level
Paper 2

26 October 2023

Zone A afternoon | **Zone B** afternoon | **Zone C** 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]**.

8823 – 6605

15 pages

Section A

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

1. A study investigated the performance of cyclists in VO_2max and peak power tests after performing high-intensity interval training (HIIT) for four weeks. One group completed the training while wearing an elevation mask (EM). A different control group completed the same training without the use of a mask. EMs are designed to simulate oxygen levels that would be experienced at higher altitudes. Results (mean and standard deviation) pre- and post-training for the tests are shown in **Figure 1**.

Figure 1: (a) VO_2max, (b) peak power, and (c) average power for individual tests

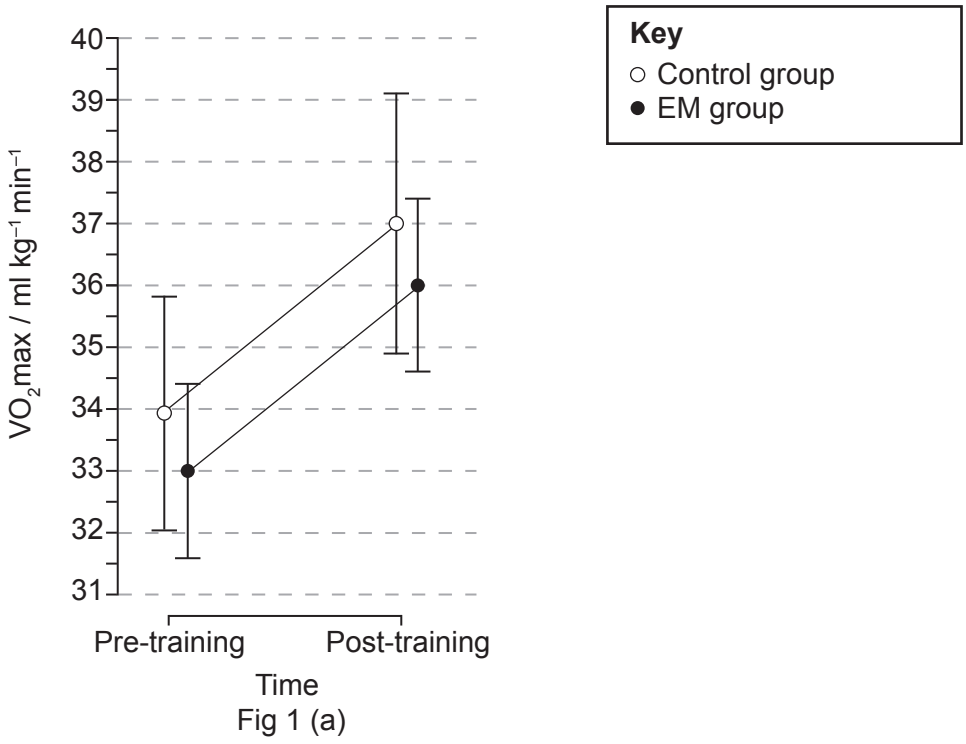

Fig 1 (a)

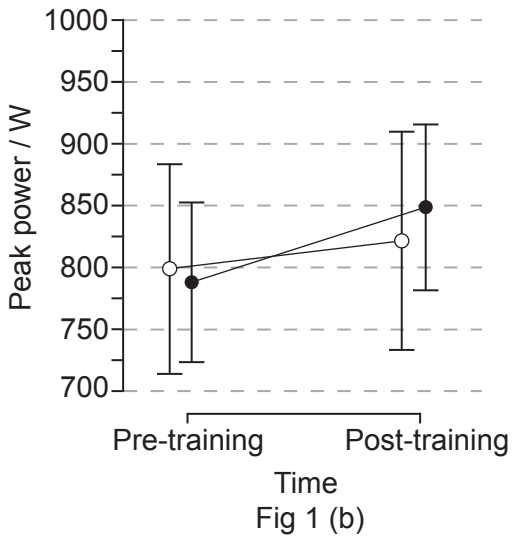

Fig 1 (b)

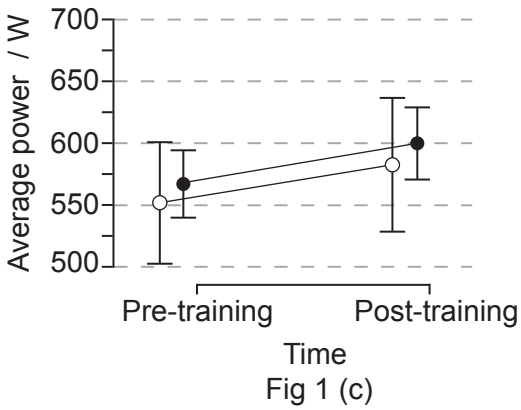

Fig 1 (c)

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(Question 1 continued)

(a) State the peak power, in W, for the EM group post-training. [1]

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(b) Calculate the mean change in VO_2max, in $ml\,kg^{-1}\,min^{-1}$, for the EM group from pre-training to post-training. [1]

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(c) With reference to **Figure 1(b)** and **Figure 1(c)**, compare and contrast the reliability of the results for the peak power and average power data. [2]

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(d) Deduce the effect of wearing an EM on the cyclists' performance in the tests. [3]

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(e) State why randomization was used to assign participants to the EM and control groups. [1]

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will not be marked.

2. (a) Outline the role of the diaphragm and external intercostal muscles as a yoga practitioner breathes in, causing air to rush into the lungs. [2]

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(b) A sedentary individual undertakes a 12-week aerobic training programme. Identify the changes observed at the end of 12 weeks in:

(i) Heart rate [1]

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(ii) Stroke volume [1]

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(iii) Cardiac output [1]

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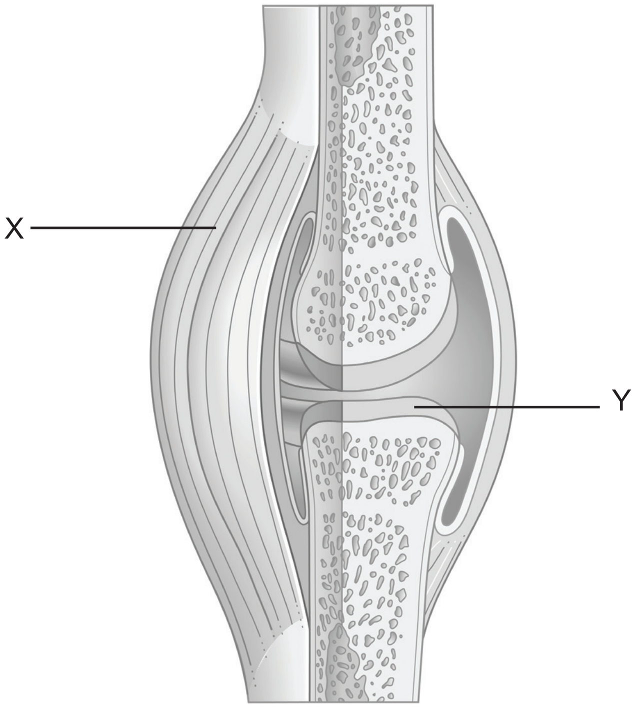
3. The diagram shows a synovial joint.



(a) Annotate the structures X and Y in the synovial joint. [4]

	Structure	Annotation
X	. . . .	. . . .
Y	. . . .	. . . .

(b) Apply the following components of fitness to a sport of your choice:

(i) Flexibility [1]

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(ii) Muscular endurance [1]

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(Question 3 continued)

(c) Distinguish between skeletal and smooth muscle found within the body. [2]

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(d) Identify the nutrient required to help repair and build muscle tissue after training. [1]

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(e) Explain how ATP enables muscle contraction. [3]

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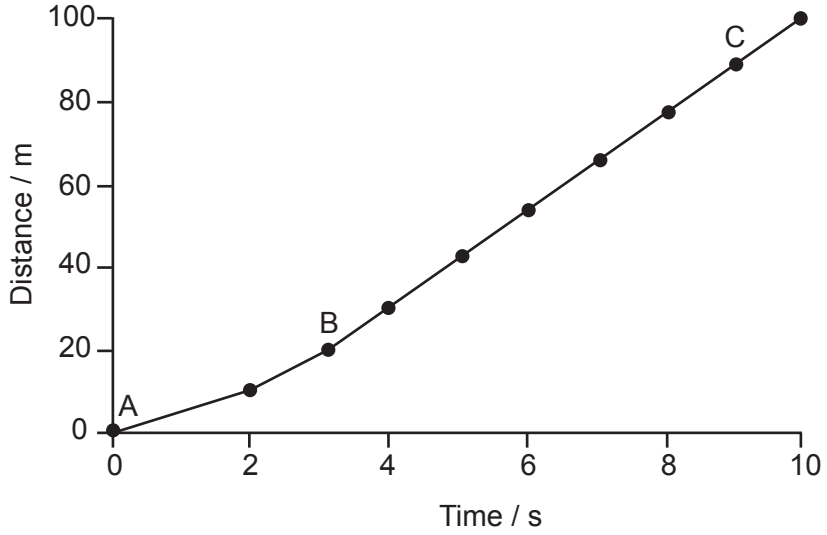
4. The diagram shows a distance–time graph for a 100 m sprinter.



(a) Analyse the graph between

(i) A–B. [1]

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(ii) B–C. [1]

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(b) Explain why oxygen deficit occurs. [3]

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Section B

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

5. (a) The image shows a sprinter at the start of a race.

Apply Newton's three laws of motion to a sprinter using starting blocks. [5]

(b) Describe the process of releasing glucose from the liver. [6]

(c) A field hockey coach is working to maximize their team's performance. Discuss **three** factors that will influence the players' different rates of learning. [5]

(d) Describe how inhalation is controlled when performing an aerobic warm-up. [4]

6. (a) A sports scientist assesses the aerobic capacity and muscular endurance of a group of runners. Outline the procedures for completing Cooper's 12-minute run and maximum push-up test. [6]

(b) Explain sliding filament theory from the moment sodium ions enter the muscle until acetylcholine is broken down by cholinesterase. [6]

(c) A trained athlete monitors their heart rate while running an ultramarathon in hot conditions. Their heart rate continues to increase even when they are running at a steady state.

Explain why there is a gradual increase in heart rate while running an ultramarathon in hot conditions. [4]

(d) A swimmer completes a 100 m breaststroke race in 75 seconds. Describe how ATP is re-synthesized during the final 25 m of the 100 m breaststroke race. [4]

7. (a) Distinguish the function of the predominant muscle fibres in the quadriceps of an elite marathon runner and a 100 m sprinter. [5]

(b) Analyse the difference in maximal oxygen consumption between trained and untrained individuals. [4]

(c) Using an example from a team sport, evaluate the concept of the psychological refractory period. [6]

(d) The image shows a biathlete rifle shooting at a stationary target during a biathlon. A biathlon involves shooting at targets at multiple locations along a cross-country skiing course.

Apply the skill classification continuum to one rifle shot performed by a biathlete. [5]

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References:

3. Kindersley, D., n.d. *Cross section biomedical illustration of synovial joint - stock illustration*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/cross-section-biomedical-illustration-of-royalty-free-illustration/150955126?adppopup=true [Accessed 21 April 2023].

7. Technotr, n.d. *Young women shooting during biathlon competition - stock photo*. [image online] Available at: https://www.gettyimages.co.uk/detail/photo/young-women-shooting-during-biathlon-competition-royalty-free-image/185090207?phrase=young+woman+shooting+during+biathlon&adppopup=true [Accessed 21 April 2023].