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Sports, exercise and health science
Standard level
Paper 2

Friday 4 November 2022 (morning)

Candidate session number

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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]**.

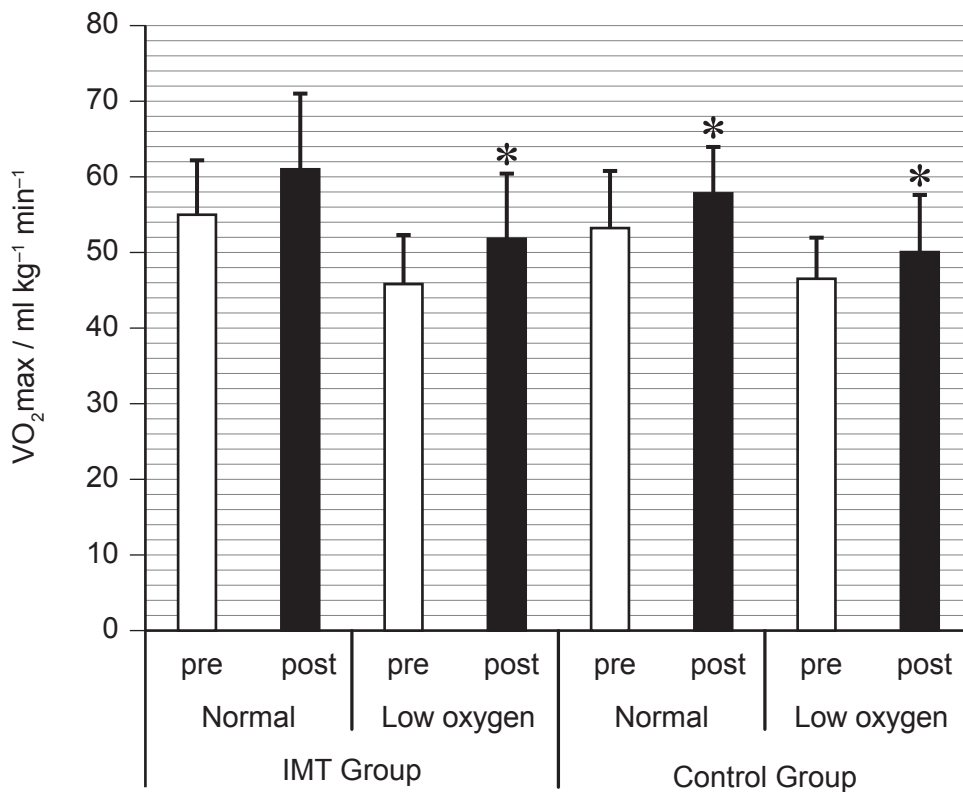


Section A

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

1. A study investigated the effect of a 4-week period of inspiratory muscle training (IMT) on VO_{2max} performance. Participants completed a cycling programme and were randomly allocated to either a control group or the IMT group. Each week, both groups completed 3x20 minutes cycling (60 rpm) at 60% VO_{2max} .

VO_{2max} was measured before (pre) and at the end (post) of the cycling programme under normal oxygen and low oxygen conditions. The results (mean and standard deviation) are presented in the graph.



* $p < 0.05$ versus pre-cycling VO_{2max}

- (a) (i) State the VO_{2max} , $ml\ kg^{-1}\ min^{-1}$, for the IMT group post-cycling in the low oxygen condition.

[1]

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(This question continues on the following page)



(Question 1 continued)

- (a) (ii) Calculate the difference in $VO_2\text{max}$, $\text{ml kg}^{-1} \text{min}^{-1}$, for the IMT group from pre-cycling to post-cycling during normal oxygen conditions. [1]

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- (b) Outline the use of error bars in the graph. [1]

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- (c) Using the data, deduce the effects of training on $VO_2\text{max}$. [4]

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(This question continues on the following page)



(Question 1 continued)

- (d) Trained endurance cyclists use fat stores efficiently. Outline the breakdown of fatty acids by a cyclist during a long-distance race.

[2]

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- (e) Discuss the variability of maximal oxygen consumption between cycling and arm ergometry.

[3]

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2. Usain Bolt set a world record time of 9.58 seconds for the men's 100 m sprint.

(a) It is important for a sprinter to have a good start. Define *response time*. [1]

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(b) Identify physiological factors that affect a sprinter's response time. [2]

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(c) Explain how a sprinter uses selective attention to optimize their start time and improve their performance in a race. [3]

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3. (a) In basketball, teams have to shoot within 24 seconds of gaining possession of the ball. Describe the two systems used to produce ATP during a short, intense period of possession. [3]

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- (b) Identify the reaction that takes place when two glucose molecules combine and water is released to form a disaccharide. [1]

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4. (a) Characteristics of muscle tissue include being controlled by nerve stimuli and fed by capillaries. Outline **two** other general characteristics common to muscle tissue. [2]

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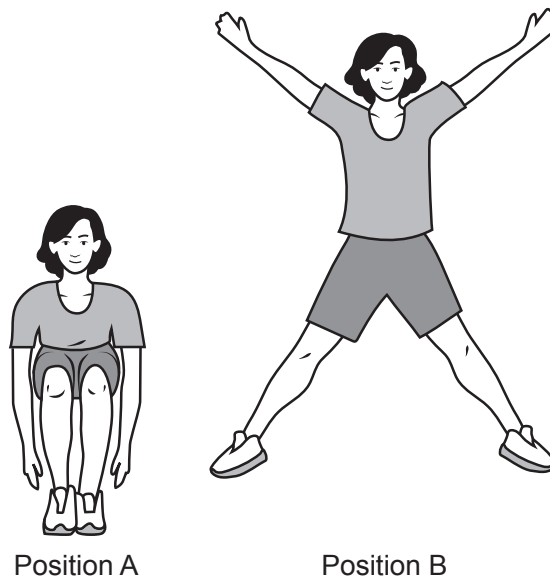
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- (b) The diagram shows someone performing a star jump.



Analyse the action of the knees when moving from Position A to Position B in the diagram. [2]

Joint	Joint action	Muscle contraction
Knees



5. (a) Define *learning*. [1]

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(b) Using an example from sport, explain whole-part-whole skill presentation. [3]

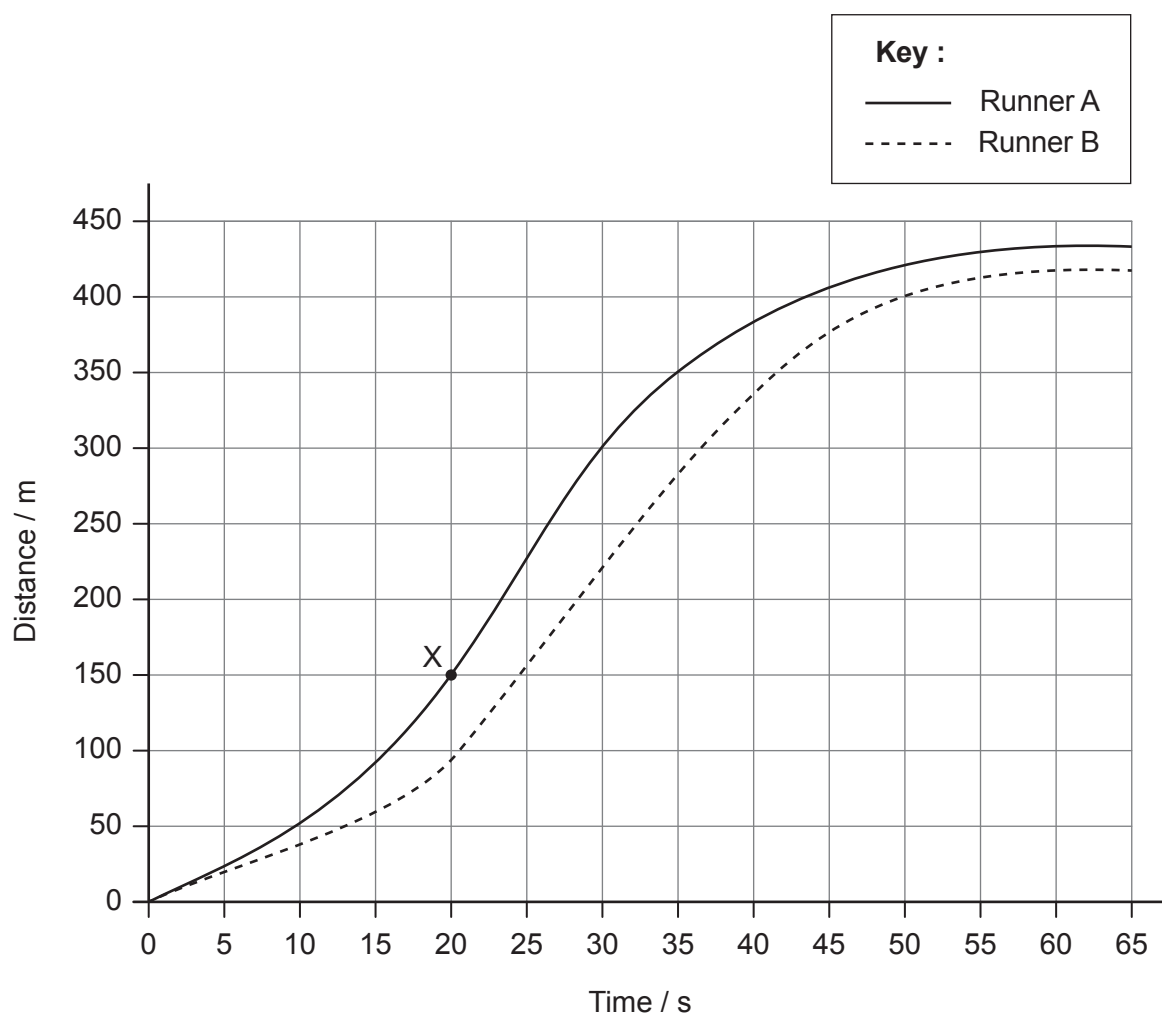
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Section B

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

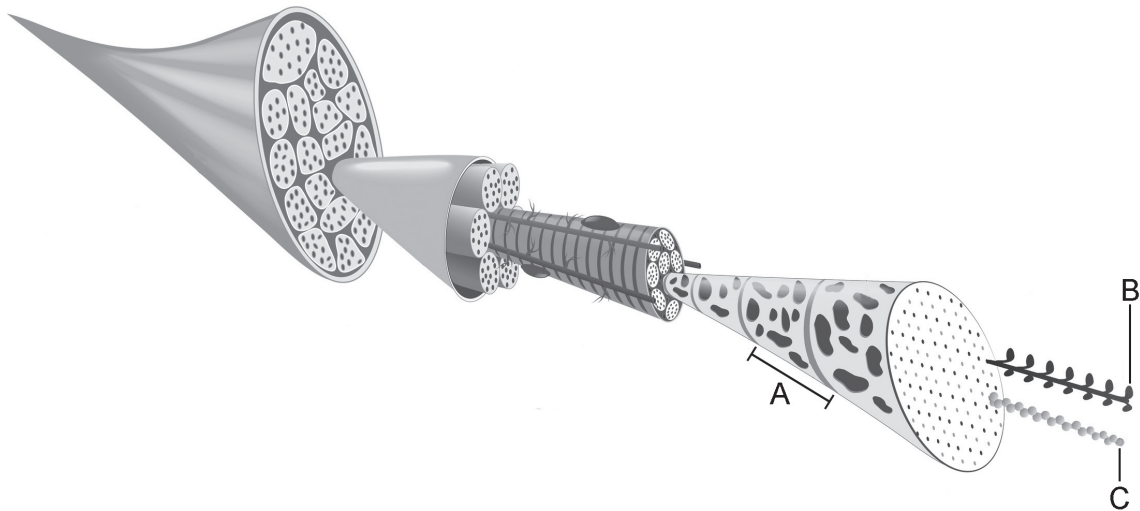
- 6. (a) Describe the structural characteristics of a muscle fibre that benefits a marathon runner. [4]
- (b) Evaluate the use of a 40 m sprint, drop test and standing broad jump test to assess and monitor a basketball player's performance. [6]
- (c) Outline the pathway of blood as it leaves the capillaries of skeletal muscle and arrives at the lungs. [5]
- (d) The distance-time graph shows data for two 400 m runners.



- (i) Calculate the speed at point X. [1]
- (ii) Compare and contrast the distance-time curves for runners A and B. [4]



- 7. (a) An individual medley race requires a swimmer to swim the four main competitive strokes (butterfly, backstroke, breaststroke, freestyle). Using examples, outline **five** types of movements of synovial joints during an individual medley race. [5]
 - (b) On completion of the 200 m individual medley race, a swimmer breathes heavily during their recovery period. Explain the factors that influence the swimmer's elevated breathing after the race. [5]
 - (c) Using examples, describe the skill profile for a swimmer competing indoors in a 200 m individual medley race. [5]
 - (d) Explain the mechanism of blood redistribution during a long-distance cycle ride. [5]
8. (a) The diagram shows a skeletal muscle fibre. Annotate the **three** structures A to C, giving their name, structure and function. (Write your answer in the answer pages following, not on the diagram.) [6]



- (b) Discuss the recommended macronutrients required to provide sufficient energy for an endurance runner. [5]
- (c) Explain the effect of a soccer player faking to shoot. [4]
- (d) Describe the cardiovascular adaptations from marathon training and their effect on race performance. [5]



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16EP11

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16EP13

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16EP14

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References:

1. Ogawa, T., Nagao, M., Fujii, N., et al., 2020. Effect of inspiratory muscle-loaded exercise training on peak oxygen uptake and ventilatory response during incremental exercise under normoxia and hypoxia. *BMC Sports Sci Med Rehabil*, [e-journal] 12(25). <https://doi.org/10.1186/s13102-020-00172-1>.
- 8.a Structure of skeletal muscle stock illustration, n.d. [image online] Available at: <https://www.istockphoto.com/vector/structure-of-skeletal-muscle-gm537402778-95275293?phrase=sarcomere>. Credit:ttsz [Accessed 9 December 2022].

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