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**Sports, exercise and health science**  
**Standard level**  
**Paper 2**

Wednesday 28 October 2020 (afternoon)

Candidate session number

1 hour 15 minutes

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**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.

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(This question continues on the following page)



**(Question 1 continued)**

(a) (i)

(ii)

(b)

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(c)

**(This question continues on the following page)**



16EP03

**Turn over**

(Question 1 continued)

(d)

(e)

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2. A separate study focused on the physiology of muscle fibres. It investigated the effect of post-exercise massage on muscle stiffness over a five-day period after downhill running. Stiffness of four leg muscles (rectus femoris, biceps femoris, tibialis anterior and medial gastrocnemius) was assessed pre-run, immediately post-run, post-massage, and 24, 48, and 72 hours post-massage. For comparison, one leg was massaged and the other received a placebo treatment. (Note: an increase in  $\text{N m}^{-1}$  value means an increase in muscle stiffness.)

	Stiffness ( $\text{N m}^{-1}$ )							
	Rectus femoris		Biceps femoris		Tibialis anterior		Medial gastrocnemius	
	Massaged	Placebo	Massaged	Placebo	Massaged	Placebo	Massaged	Placebo
Pre-run	275	275	310	305	380	370	280	285
Post-run	270	268	312	312	385	390	287	288
Post-massage	275	278	310	312	388	415	282	285
24 h post-massage	285	280	315	320	420	422	300	302
48 h post-massage	282	279	313	312	417	415	298	305
72 h post-massage	280	279	317	320	417	415	300	302

- (a) Identify the massaged muscle with the greatest stiffness post-run. [1]

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- (b) Calculate the difference in stiffness, in  $\text{N m}^{-1}$ , between massaged muscle and placebo post-massage for the muscle identified in 2(a). [2]

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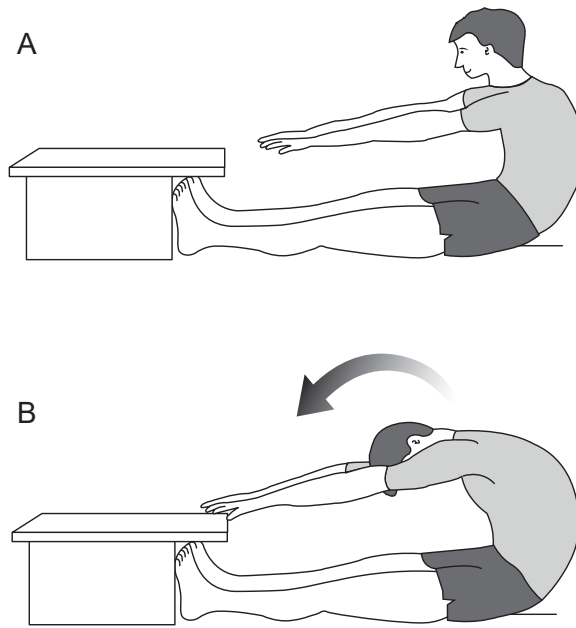
- (c) Deduce the effect of post-exercise massage on muscle stiffness at 72 hours post-massage. [1]

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3. The diagram shows a fitness test.



(a) State the fitness test shown in the diagram.

[1]

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(b) Identify the movement at the hip on moving from position A to position B.

[1]

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(This question continues on the following page)



**(Question 3 continued)**

- (c) Explain the mechanics of inspiration for an athlete completing an aerobic fitness test. [4]

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4. (a) State the function of platelets in response to a skin cut. [1]

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- (b) Describe the pathway of the electrical impulse during excitation of the heart muscle. [4]

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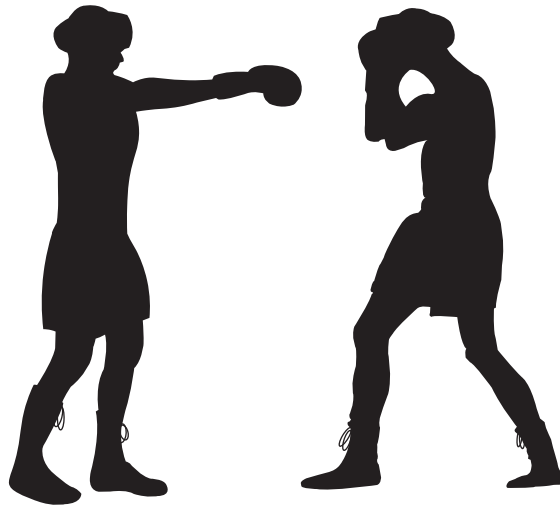
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5. The diagram shows two people boxing.



Compare and contrast the motor skill classifications of a boxer and a road cyclist.

[4]

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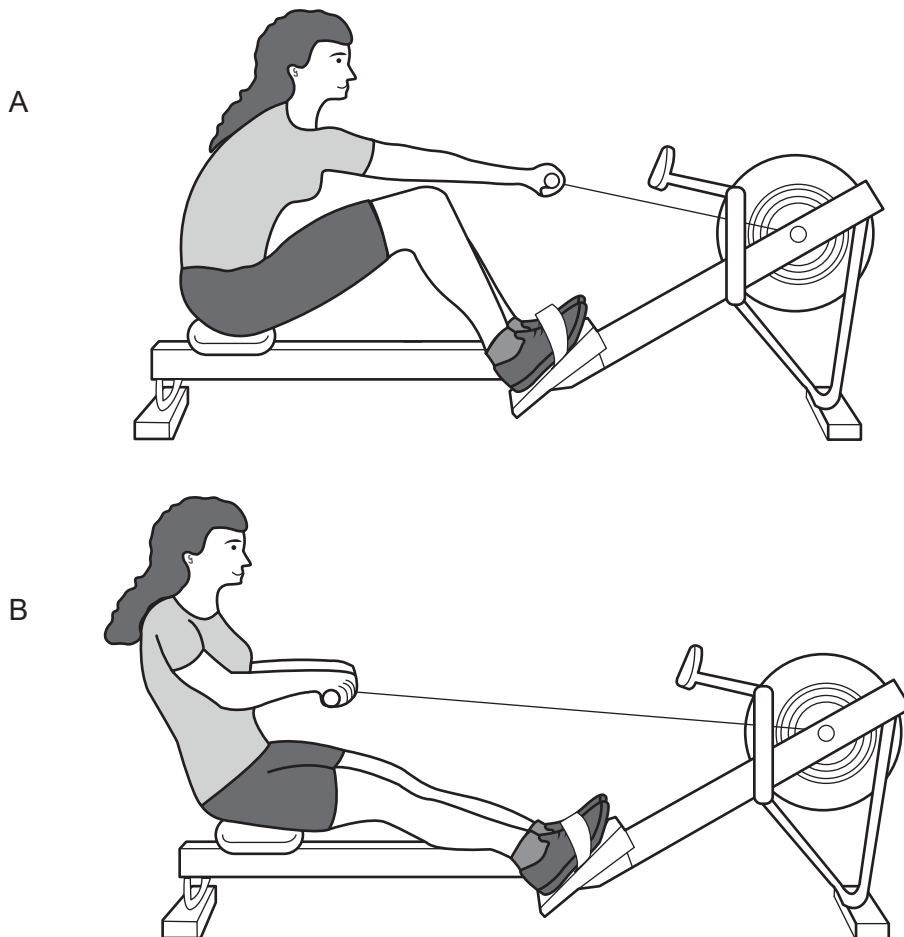
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### Section B

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

6. The diagram shows a rower using a rowing machine.



- (a) Analyse the movement at the knee and hip as the rower moves from position A to position B in the diagram. [6]
- (b) Outline **one** type of muscle tissue. [2]
- (c) Describe how the characteristics of slow-twitch muscle fibres are suited to a rower. [4]
- (d) Describe the production of ATP from fatty acids. [4]
- (e) Discuss the increased maximal oxygen consumption of athletes after a period of endurance training. [4]



- 7. (a) Define Newton's first law of motion. [1]
  - (b) Explain how Newton's laws of motion apply in a team sport. [4]
  - (c) Describe the function of adrenaline during exercise. [4]
  - (d) Discuss the distribution of blood at rest and redistribution of blood during strenuous exercise. [6]
  - (e) Using examples, outline the different methods of transfer. [5]
8. The diagram shows a basketball player shooting.



- (a) Distinguish between health-related and performance-related components of fitness. [1]
- (b) Apply **four** components of fitness to the movement of a basketball player. [4]
- (c) Using an example from a team sport, evaluate the concept of the psychological refractory period (PRP). [5]
- (d) Outline **five** features of a synovial joint. [5]
- (e) Explain what happens as an athlete breathes heavily after a basketball match. [5]



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16EP11

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A large rectangular area containing 25 horizontal dotted lines for writing.



16EP13

Turn over

A large rectangular area containing 30 horizontal dotted lines, intended for handwritten notes or answers.



A large rectangular area containing 25 horizontal dotted lines, intended for writing or drawing.



16EP15



## References:

2. [table: muscle stiffness] Adapted from Kong *et al.* "Effect of Post-Exercise Massage on Passive Muscle Stiffness Measured Using Myotonometry – A Double-Blind Study," *Journal of Sports Science and Medicine* 17(4), 599–606.
3. [diagram: fitness test] © International Baccalaureate Organization 2020.
5. [diagram: two people boxing] © International Baccalaureate Organization 2020.
6. [diagram: rowing machine] © International Baccalaureate Organization 2020.
8. [diagram: basketball player shooting] © International Baccalaureate Organization 2020.



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