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Sports, exercise and health science
Higher level
Paper 2

Wednesday 28 October 2020 (afternoon)

Candidate session number

2 hours 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 two questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[90 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)



24EP02

(Question 1 continued)

(a) (i)

(i)

(b)

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(c)

(This question continues on the following page)



24EP03

Turn over

(Question 1 continued)

(d)

(e)

(f)

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24EP04

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 $N\ m^{-1}$ value means an increase in muscle stiffness.)

	Stiffness ($N\ m^{-1}$)							
	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 $N\ m^{-1}$, 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]

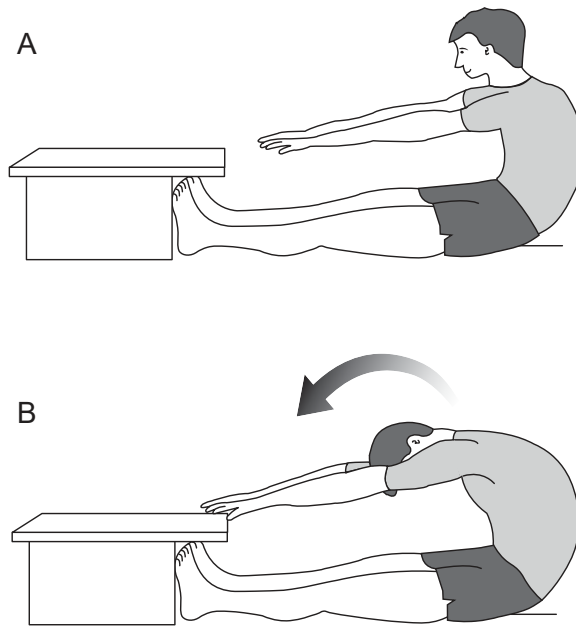
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24EP05

Turn over

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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(Question 3 continued)

(c) Using an example, define the anatomical term *posterior*. [1]

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(d) State the anatomical location of the iliopsoas. [1]

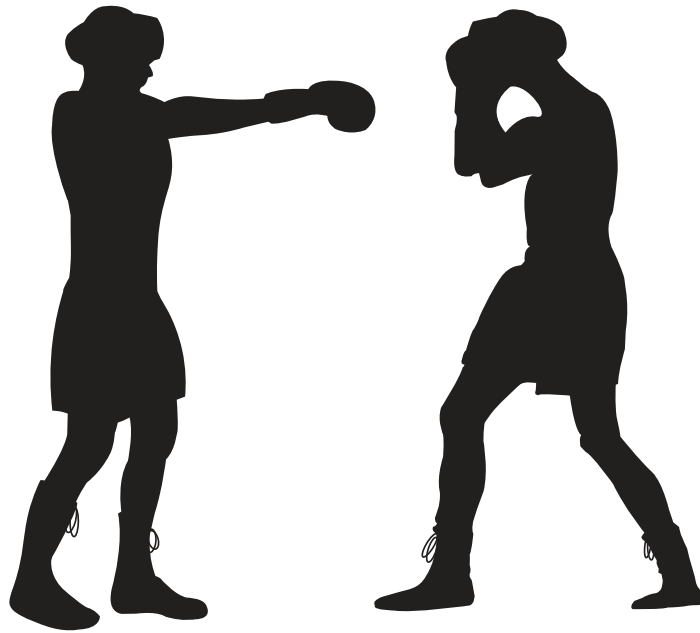
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(e) Explain the mechanics of inspiration for an athlete completing an aerobic fitness test. [4]

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4. The diagram shows two people boxing.



(a) Outline the functions of the cranium and vertebral column during a contact sport such as boxing. [2]

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(b) Identify **two** arteries that blood travels through from the aorta to the blood-brain barrier. [2]

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(Question 4 continued)

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

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

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24EP09

Turn over

5. (a) Analyse the factors that affect drag for a road cyclist. [5]

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(b) Using an example from sport, outline a closed skill. [1]

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(c) Compare and contrast the motor skill classifications of a boxer and a road cyclist. [4]

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(Question 5 continued)

(d) Analyse how a road cyclist plans a macrocycle using periodization.

[3]

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6. Discuss the limitations of genetic screening for sport, exercise and health.

[3]

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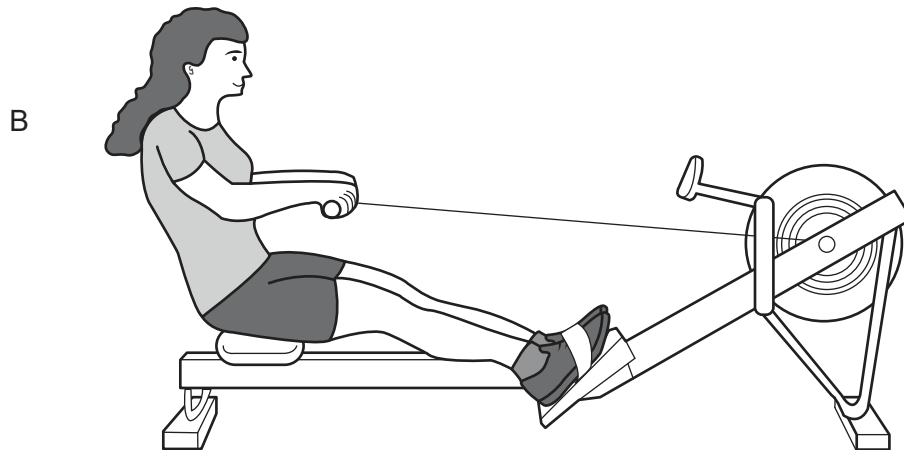
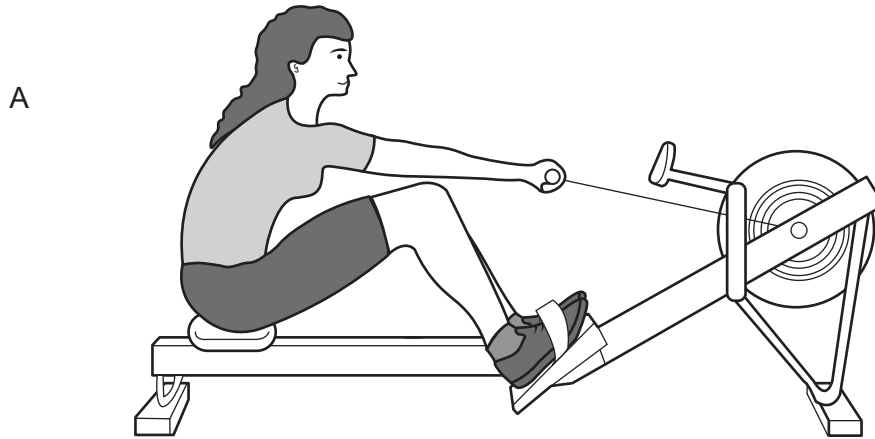
24EP11

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Section B

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

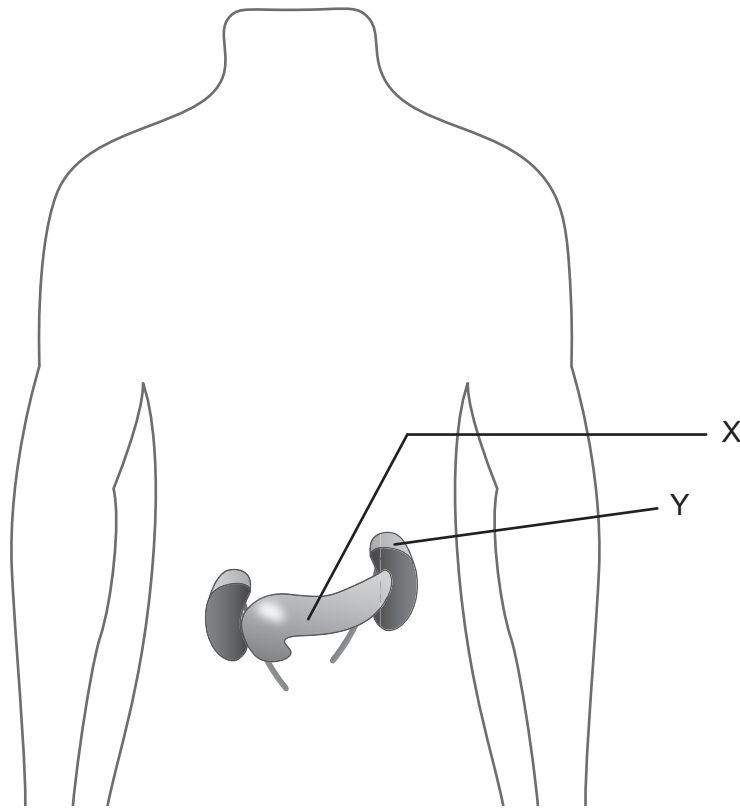
7. The diagram shows a rower using a rowing machine.



- (a) Outline **one** type of muscle tissue. [2]
- (b) Describe how the characteristics of slow-twitch muscle fibres are suited to a rower. [4]
- (c) Outline the genetic mechanism for the inheritance of potential athletic ability. [5]
- (d) Discuss the increased maximal oxygen consumption of athletes after a period of endurance training. [4]
- (e) Evaluate the use of information technologies to assess rowing performance. [5]



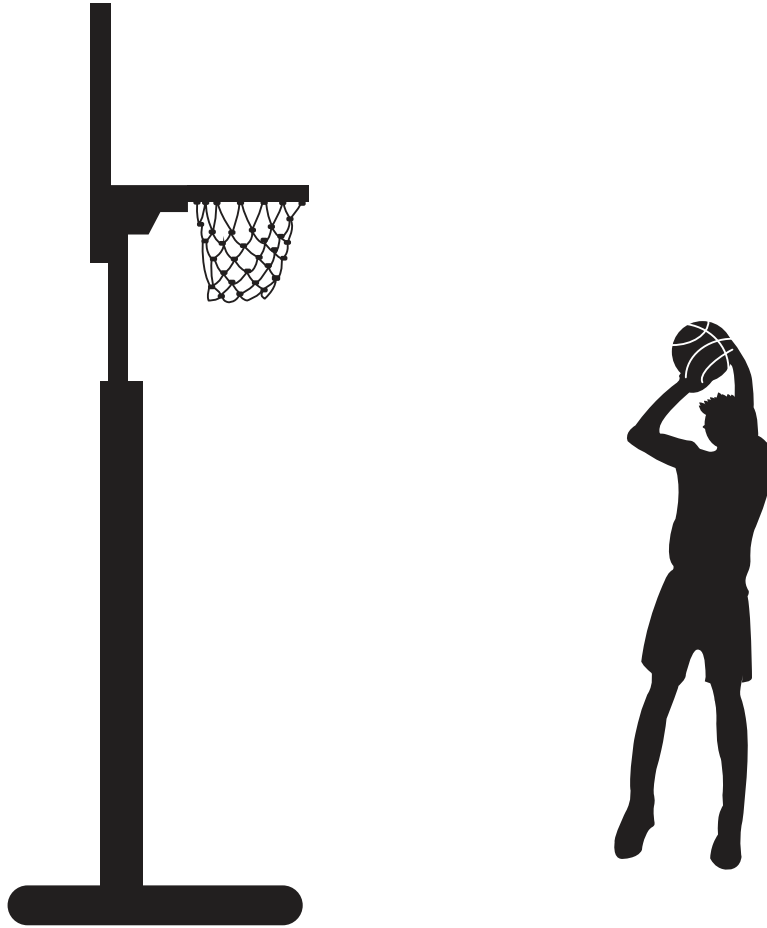
8. The diagram shows selected glands in a human torso.



- (a) State the glands labelled X and Y in the diagram. [2]
- (b) Describe the function of adrenaline during exercise. [4]
- (c) Describe how hormone levels are regulated. [4]
- (d) Discuss the factors which may cause peripheral fatigue in a sprinter. [5]
- (e) Explain what happens as an athlete breathes heavily after a 200 m sprint. [5]



9. (a) Define Newton’s first law of motion. [1]
(b) Explain how Newton’s laws of motion apply in a team sport. [4]
(c) The diagram shows a basketball player shooting.



- Describe types of feedback when shooting in a basketball game. [5]
(d) Apply methods of minimizing and maximizing friction in a sport. [5]
(e) Using examples, suggest simple notation systems for a soccer game. [5]



10. The diagram shows a gymnast on a beam.



[Source: Zaricm/DigitalVision Vectors via Getty Images.]

- (a) Outline flexibility training for a gymnast. [1]
- (b) Describe how heart rate can be used to monitor exercise intensity. [4]
- (c) Outline mechanisms the gymnast's body uses in response to damage from a fall off the beam. [5]
- (d) Explain the functions of the cerebellum and the parietal lobe for a gymnastic routine. [5]
- (e) The gymnast is performing a routine on the beam. Explain the influence of the position of the centre of mass on stability. [5]



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24EP16

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24EP20

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24EP21

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.
4. [diagram: two people boxing] © International Baccalaureate Organization 2020.
7. [diagram: rowing machine] © International Baccalaureate Organization 2020.
8. [diagram: glands in a human torso] © International Baccalaureate Organization 2020.
9. [diagram: basketball player shooting] © International Baccalaureate Organization 2020.
10. [diagram: gymnast on a beam] Zaricm/DigitalVision Vectors via Getty Images.



24EP22

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24EP23

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