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Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Standard level
Paper 2

30 April 2025

Zone A morning | **Zone B** morning | **Zone C** morning

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]**.

15 pages

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Section A

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

1. A study investigated the relationship between psychological readiness for return to sport and predicted motor unit force (MUF) after anterior cruciate ligament (ACL) injury. Psychological readiness for return to sport was measured using a return to sport after injury (RSI) questionnaire.

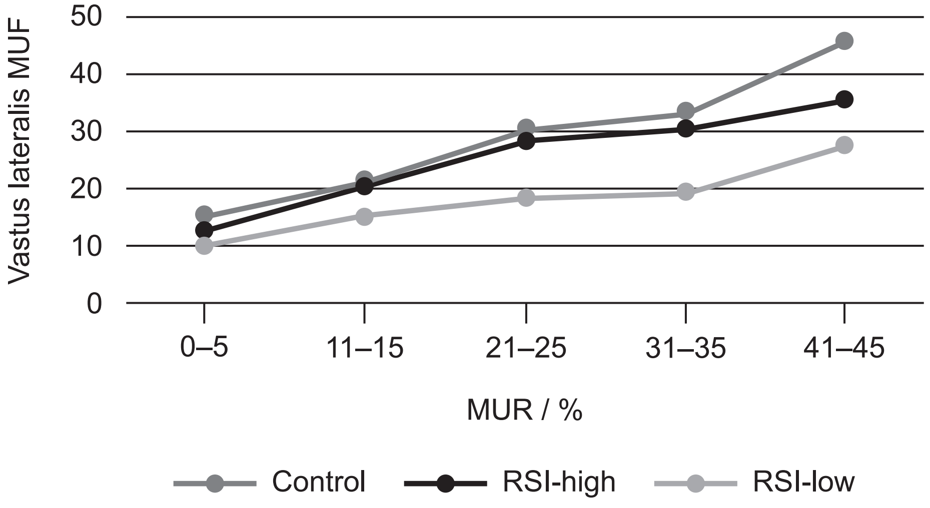
Participants were placed into three groups:

- RSI-low – low psychological readiness for return to sport
- RSI-high – high psychological readiness for return to sport
- Control – individuals without ACL injuries.

MUF was calculated using data from isometric muscle contractions of the vastus lateralis muscles. **Figure 1** shows the MUF generated at five different motor unit recruitment (MUR) percentages.

MUF = average firing rate (pulses per second) × motor unit action potential (peak-to-peak amplitude per mass).

Figure 1



* Control MUF > RSI-high MUF $p < 0.001$
** Control MUF > RSI-low $p < 0.001$
*** RSI-low MUF < RSI-high $p < 0.001$

(a) Identify the group that showed the lowest vastus lateralis MUF. [1]

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(This question continues on the following page)

(Question 1 continued)

(b) Calculate the difference in MUF of the vastus lateralis between the RSI-high and RSI-low groups at 21–25 % MUR. [1]

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(c) Based on the data presented in **Figure 1**, discuss the hypothesis that psychological readiness for return to sport is related to MUF. [3]

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(d) Explain why it was important to include a control group in this study. [2]

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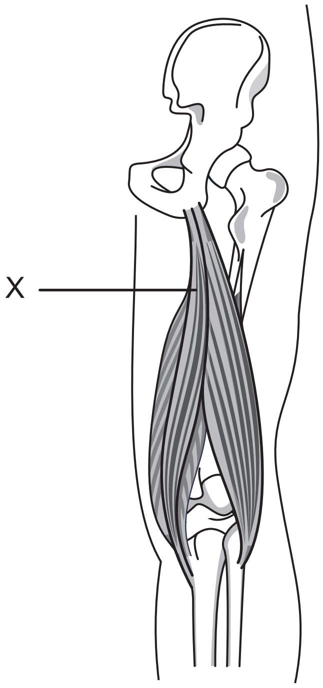
(Question 1 continued)

The diagram shows the muscles of the hamstring group.



(e) Identify the hamstring muscle X. [1]

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(f) Muscle tissue can contract under neural control. Outline **one** other characteristic that is common to muscle tissue. [1]

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(g) Define *strength* as a major component of fitness. [1]

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(This question continues on the following page)

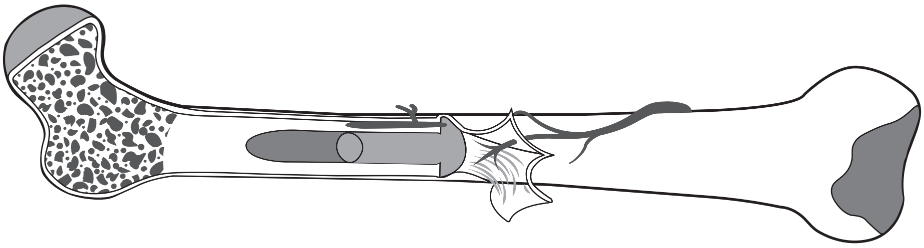
(Question 1 continued)

(h) Evaluate the use of a hand grip dynamometer to measure strength. [3]

2. (a) A study reported that 88 % of the injuries sustained by gymnasts required them to modify their training. Suggest how **two** key principles of training programme design could be modified to reduce the recurrence of injuries. [4]

(b) Discuss **three** differences in skill execution between a skilled and a novice gymnast. [3]

3. The diagram shows a long bone.



(a) Outline the structure of **both** the periosteum and spongy bone. [2]

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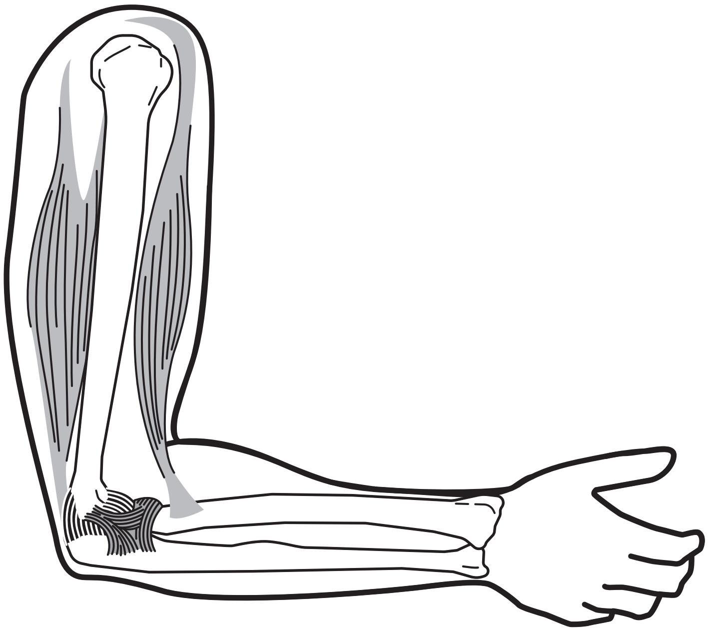
The diagram shows the elbow joint.



(b) State the location of the humerus in relation to the radius using anatomical terminology. [1]

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(This question continues on the following page)

(Question 3 continued)

(c) Distinguish between first class levers and third class levers. [2]

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(d) Outline **two** types of feedback an umpire provides players during a game. [2]

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(e) Explain why the recommended intake of carbohydrates and proteins between an elite distance runner and a healthy sedentary person are different. [3]

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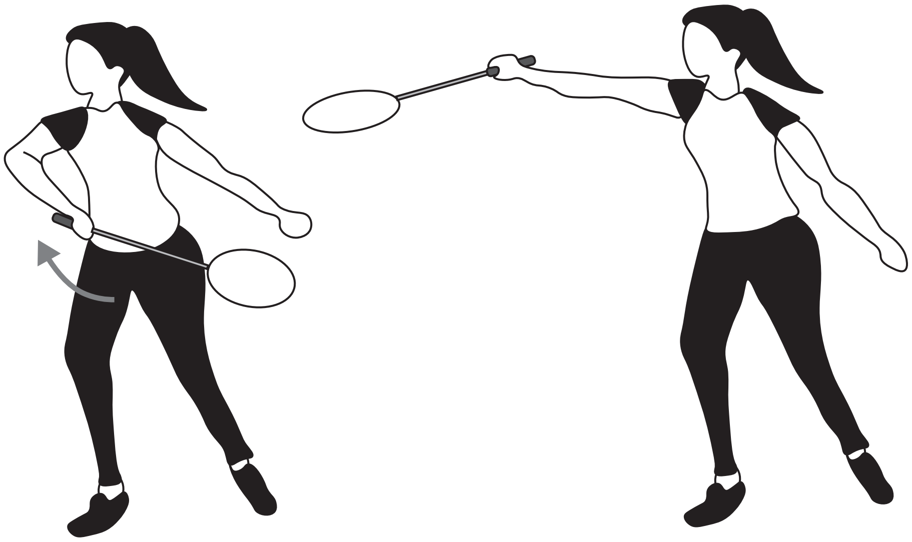
Section B

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

4. (a) Compare and contrast the process of gaseous exchange of oxygen and carbon dioxide at the alveoli during exercise. [4]

(b) Identify the fuel sources and net ATP produced per molecule of fuel by the ATP–CP and the lactic acid systems. [4]

(c) Analyse how the muscles work in pairs to extend the elbow during a backhand in badminton. [4]



(d) Using sporting examples, outline a discrete, a serial and a continuous skill. [3]

(e) Discuss how adenosine can gain and lose a phosphate molecule. [3]

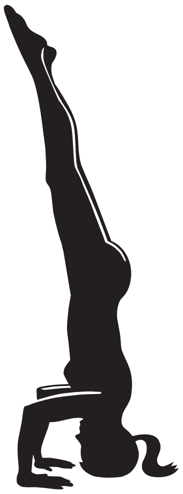
(f) Using examples, outline positive and negative transfer. [2]

5. (a) Insulin is inhibited by muscle contraction. Explain the role of insulin on glucose uptake at rest. [3]

(b) Predict how changing the speed and height of release affects the motion of a projectile released at a 45° angle. [2]

(c) Chunking, association and practice are three methods of improving memory. Describe how an athlete uses these three methods in sporting contexts. [3]

(d) The images show a person holding a yoga headstand and a person riding a stationary bicycle.



Explain how diastolic blood pressure responds to these exercises. [6]

(e) Outline **two** features of synovial joints. [2]

(f) Flexion and extension are types of movement that occur at synovial joints. Outline **four** other types of movement. [4]

6. (a) Analyse how acetylcholine causes calcium ions to be released into a muscle cell to stimulate contraction. [3]

(b) Discuss how the difficulty of a task affects the rate of learning. [3]

(c) Describe how vasodilation impacts blood redistribution during a 400 m freestyle swimming race. [4]

(d) Using named examples of molecules, analyse how polysaccharides are formed. [6]

(e) Maximal oxygen consumption (VO_2max) is a measure of aerobic capacity. Describe what this represents for a runner during a marathon. [2]

(f) Apply Newton’s third law of motion to a swimmer using a starting block. [2]

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1.(e) VectorMine, 2022. *Hamstring posterior muscle anatomy with bones and ligaments outline diagram - stock illustration*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/hamstring-posterior-muscle-anatomy-with-royalty-free-illustration/1367951924?phrase=hamstring&adppopup=true [Accessed 5 July 2024]. Source adapted.

3.(b) VectorMine, 2018. *Elbow joint vector illustrated diagram, medical scheme. - stock illustration*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/elbow-joint-vector-illustrated-diagram-royalty-free-illustration/912872238?phrase=elbow+joint&adppopup=true [Accessed 5 July 2024]. Source adapted.

5.(d) CSA-Archive, 2018. *Yoga Pose – stock illustration*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/yoga-pose-royalty-free-illustration/1003207210?phrase=yoga+headstand&adppopup=true [Accessed 5 July 2024]. Source adapted.

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