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Sports, exercise and health science
Standard level
Paper 2

3 May 2023

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

17 pages

2223 – 6605

Section A

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

1. A study compared the physical characteristics of 55 experienced female rock climbers. They were divided into lower, advanced, and elite ability groups based on self-reported climbing experience. They completed a 10-minute warm-up prior to the testing sessions. The mean results (+/–SD) for some of the tests are shown.

Figure 1: (a) Forearm volume measurement, (b) counter movement jump, and (c) power slap test.

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(Question 1 continued)

(a) (i) State the mean forearm volume, in ml, for the lower ability group. [1]

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(a) (ii) Calculate the difference in distance achieved, in cm, for the mean power slap between the elite and the advanced ability groups. [1]

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(b) Explain the importance of performing a warm-up prior to conducting a maximal test with respect to study design. [3]

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(Question 1 continued)

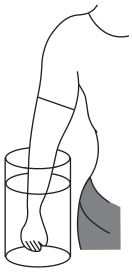

Fig 1 (a)

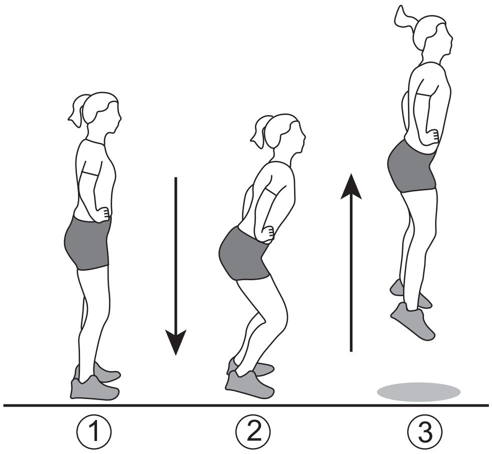

Fig 1 (b)

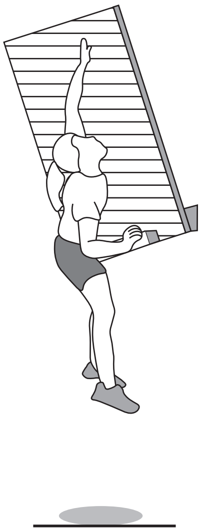

Fig 1 (c)

(c) (i) Identify the type of movement at the knees during the upward jumping phase (3) of the counter movement jump shown in **Figure 1(b)**. [1]

(c) (ii) Outline the muscle contractions required to produce the movement identified in Question 1c(i). [2]

(This question continues on the following page)

(Question 1 continued)

(d) **Figure 1(c)** shows a person performing the power slap test.

Describe the anatomical position of the carpals relative to the clavicle of the extended, left arm. [2]

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2. A study of 26 untrained 20–30 year old men investigated the potential health benefits of regular participation in team handball training. The participants were allocated randomly to either the handball group, which completed two training sessions each week for 12 weeks, or an inactive control group. VO_2max, fat percentage, blood pressure, resting heart rate and multistage fitness tests were carried out at the start and end of the study period and the mean results (+/– SD) are shown in the table.

	Handball group				**Inactive control group**			
	Week 0	**SD**	**Week 12**	**SD**	**Week 0**	**SD**	**Week 12**	**SD**
VO_2max / ml $min^{-1}kg^{-1}$	41.9	6.7	46.5*	6.1	41.6	5.8	41.6	5.8
Fat percentage / %	27.9	10.6	26.2*	10.7	28.6	7.8	28.6	7.8
Systolic blood pressure / mmHg	111	11	113	10	113	8	113	10
Diastolic blood pressure / mmHg	67	7	68	8	67	6	69	5
Resting heart rate / bpm	56	9	53	9	60	5	57	6
Multistage fitness distance / m	1880	80	2480*	1069	1750	750	1750	750

* $p < 0.05$ from week 0

(a) Identify the group whose results showed a significant improvement from week 0. [1]

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(b) Calculate the percentage difference in the VO_2max for the handball group from week 0 to week 12. [1]

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(This question continues on the following page)

(Question 2 continued)

(c) Discuss the hypothesis that regular participation in recreational active team sports training provides beneficial effects for the cardiovascular system. [3]

(d) Distinguish between saturated and unsaturated fatty acids. [3]

(e) Deception is used in team sports such as handball to gain an advantage over the opposition. Using a sporting example, explain how an athlete manipulates the psychological refractory period to gain an advantage over an opponent. [4]

3. The diagram shows a person kayaking.

The flatwater 200 m (one-person kayak) world records are:

Male	33.380 seconds
Female	37.898 seconds

(a) Describe the production of ATP by the predominant energy system used by an elite kayaker paddling during a flatwater 200 m race. [3]

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(Question 3 continued)

(b) Outline the variability in maximal oxygen consumption between arm ergometry and running. [2]

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(c) Using examples, describe **one** of Newton's laws of motion during a flatwater 200 m kayak race. [3]

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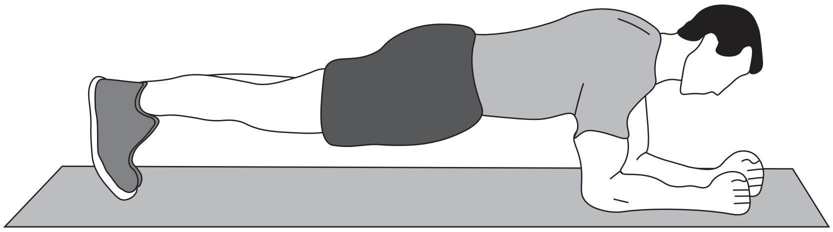
Section B

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

4. The diagram shows someone performing the 'plank' exercise.



(a) Discuss the systolic and diastolic blood pressure response when holding the 'plank' exercise for one minute. [3]

(b) Describe **four** types of feedback that could be used when teaching a skill to a cognitive (early phase) learner. [4]

(c) Compare and contrast the relative contributions of energy systems during a 400 m sprint and 10 000 m run. [4]

(d) A marathon runner is training for the Olympics. Describe the resultant cardiovascular adaptations that will improve their performance. [5]

(e) During a tennis tournament, an elite tennis player had a first serve percentage of 73 % and was able to serve accurately to a chosen area of the service box. A novice tennis player may struggle to serve without error on a regular basis. Discuss **four** other differences in skill execution that exist between a novice tennis player and an elite tennis player. [4]

5. (a) Compare and contrast the excess post-exercise oxygen consumption for a trained athlete and an untrained individual. [3]

(b) Describe the process of increased gaseous exchange at the alveoli during exercise. [4]

(c) A cyclist completes a 50 km bike ride in hot weather, maintaining a steady pace on flat terrain throughout. Describe the cyclist's cardiovascular drift response during the ride. [3]

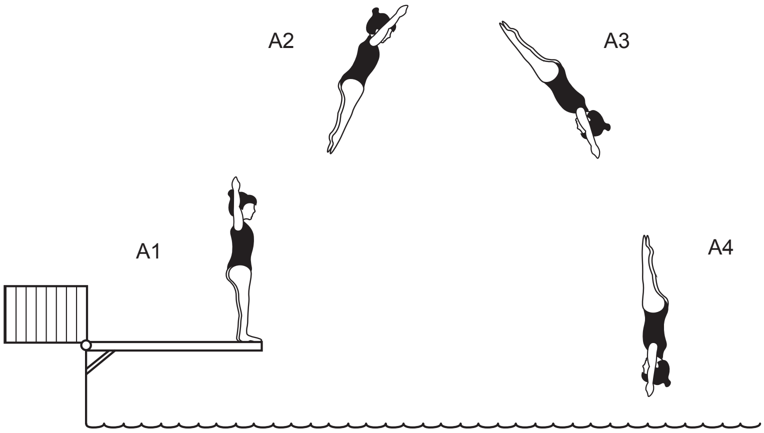
(d) Using the sliding filament theory, explain the changes that occur at the sarcomere during a concentric isotonic contraction. [6]

(e) Discuss how memory and selective attention interact in the cognitive phase of learning a skill. [4]

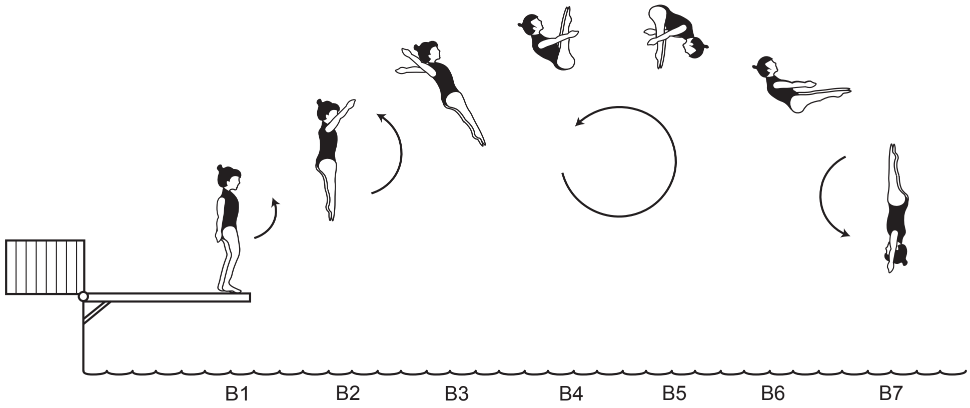
6. (a) Outline the chemical control of ventilation from rest to exercise. [3]

(b) Explain the role of insulin and muscle contraction on glucose uptake during exercise. [4]

Dive A



Dive B



(c) Compare and contrast how a diver uses the concept of angular momentum to perform dives A and B. [5]

(d) Discuss **one** type of presentation you would use to maximize the acquisition of a skill of your choice. [3]

(e) Outline **five** characteristics common to muscle tissue. [5]

References:

2. Material from: Hornstrup, H., et al., Cardiovascular, muscular, and skeletal adaptations to recreational team handball training: a randomized controlled trial with young adult untrained men. *Eur J Appl Physiol* published 2019. Springer Link reproduced with permission of SNCSC.