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**Sports, exercise and health science**  
**Standard level**  
**Paper 3**

7 November 2024

**Zone A** afternoon | **Zone B** afternoon | **Zone C** afternoon

Candidate session number

1 hour

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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.
- Answer all of the questions from two of the options.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[40 marks]**.

| Option   | Questions |
|--|-----------|
| Option A — Optimizing physiological performance      | 1 – 3     |
| Option B — Psychology of sports                      | 4 – 7     |
| Option C — Physical activity and health              | 8 – 9     |
| Option D — Nutrition for sports, exercise and health | 10 – 13   |



**Option A — Optimizing physiological performance**

1. A study investigated the effects of different intensities of resistance training over a 12-week period. Participants engaged in resistance training at various intensities: 20 %, 40 %, 60 %, and 80 % of their one-repetition maximum (1RM).

Percentage change in muscle cross-sectional area (CSA) and strength of biceps brachii were recorded and presented in the graph shown.

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- (a) Identify which intensity of resistance training showed the greatest increase in muscle strength over the 12-week training period.

[1]

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- (b) Calculate the difference in percentage change in muscle CSA between 20 % of 1RM and 80 % of 1RM training intensities.

[1]

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**(Option A continues on the following page)**



**(Option A, question 1 continued)**

- (c) Using the data, discuss the hypothesis that lifting weights greater than 80% 1RM is necessary to increase muscle CSA. [3]

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- 2. (a) Explain how the three phases of periodization could be organised to optimise muscle strength and avoid overtraining in strength training. [4]

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- (b) Outline the possible harmful effects of using anabolic steroids. [3]

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**(Option A continues on page 5)**



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**(Option A continued)**

3. Endurance athletes often use warm weather training at altitude to prepare for competitions in hot climates.

(a) State the normal physiological range for core body temperature in °C. [1]

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(b) Exercising in a hot climate can put athletes at risk of heat stress. Explain heat stroke. [3]

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(c) Outline how athletes could acclimatise to heat stress. [4]

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**End of Option A**



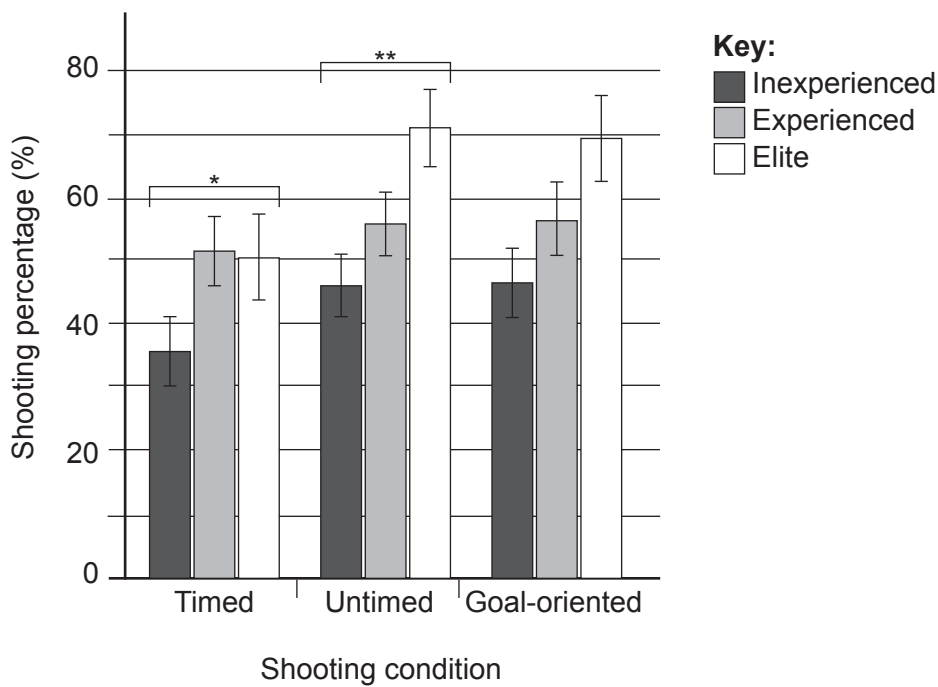
**Option B — Psychology of sports**

- 4. A study examined the effect of time constraints and goal-setting on the performance of basketball free-throw shooting. Participants were grouped into three categories based on their basketball skill level: elite, experienced and inexperienced.

Each group was assessed under three distinct shooting conditions:

- Timed condition: Successful free-throws recorded in a 30-second timeframe.
- Untimed condition: Attempt the same number of free-throws as in the Timed condition, without time pressure.
- Goal-oriented condition: Within a 30-second timeframe, players aimed to surpass their highest number of successful free-throws.

The graph shows the shooting percentages of the players for the three shooting conditions.



\*  $p < 0.05$  compared to goal-oriented condition  
\*\*  $p > 0.05$  compared to goal-oriented condition

- (a) Identify the group that showed the smallest percentage change from the timed to the untimed condition.

[1]

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(Option B continues on the following page)



**(Option B, question 4 continued)**

- (b) Calculate the difference in shooting percentage for the elite players between the timed and goal-oriented conditions.

[1]

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- (c) Using the data, discuss the effect of a goal-oriented condition on shooting performance under time constraints.

[3]

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**(Option B continues on the following page)**





**(Option B continued)**

5. Describe **five** principles of effective goal-setting in sports performance. [5]

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6. (a) Define the term *personality*. [1]

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(b) Discuss the Interactionist Theory and how it relates to the reactions of players in competitive sports. [4]

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**(Option B continues on the following page)**



**(Option B continued)**

7. (a) Define the term *motivation*. [1]

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(b) Discuss the influence of extrinsic motivators on intrinsic motivation in sport. [4]

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**End of Option B**



**Option C — Physical activity and health**

8. A study investigated the effect of three 16-week treatments on people with mild to moderate depression. Participants were divided into three treatment groups:
- Medication Only: Patients were given a type of antidepressant medication.
  - Exercise and Medication: Patients did regular exercise and also took antidepressant medication.
  - Exercise Only: Patients only did regular exercise.

At the end of the 16-week treatment, participants were monitored for a six-month period.

The graph shows the percentage of patients who experienced depression during the six-month period post-treatment.

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- (a) State the percentage of patients who experienced depression within six months post-treatment for the Exercise and Medication group. [1]

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- (b) Calculate the difference in the percentage of patients who experienced depression within the six-month period post-treatment between the Medication Only group and the Exercise Only group. [1]

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**(Option C continues on the following page)**



**(Option C, question 8 continued)**

- (c) Using the data, discuss the hypothesis that exercise lowers the percentage of patients experiencing depression six months post-treatment. [3]

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**9.** Hypokinetic diseases are a growing concern in modern society. Understanding effective strategies for their prevention and management is essential for promoting overall health.

- (a) Define the term *hypokinetic disease*. [1]

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- (b) State **two** hypokinetic diseases. [2]

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- (c) Discuss the concept of energy balance as it relates to hypokinetic disease. [3]

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**(Option C continues on page 13)**



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**(Option C, question 9 continued)**

(d) Outline **three** aims of exercise for individuals with a hypokinetic disease. [3]

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(e) Outline potential barriers to physical activity. [3]

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(f) Explain **three** major societal changes that have led to an increase in hypokinetic disease. [3]

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**End of Option C**



**Option D — Nutrition for sports, exercise and health**

10. Researchers investigated how elite cyclists' bodies utilize carbohydrates during exercise by comparing carbohydrate oxidation rates from an energy bar, against an energy drink.

Cyclists were divided into two groups:

- Group 1: Energy bar
- Group 2: Energy drink

The graph shows the carbohydrate oxidation rate ( $\text{g min}^{-1}$ ) for both bar and drink groups during exercise.

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- (a) State the group with the highest carbohydrate oxidation rate ( $\text{g min}^{-1}$ ) at 15 minutes of exercise.

[1]

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- (b) Calculate the difference in carbohydrate oxidation rates ( $\text{g min}^{-1}$ ) between the energy bar group and energy drink group at 120 minutes.

[1]

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(Option D continues on the following page)



**(Option D, question 10 continued)**

- (c) Using the data, discuss the hypothesis that consuming an energy drink leads to a greater carbohydrate oxidation rate ( $\text{g min}^{-1}$ ) than an energy bar. [3]

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- 11.** (a) State **two** reasons why humans cannot live without water for a prolonged period of time. [2]

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- (b) Explain how a negative feedback mechanism maintains water balance when a person is dehydrated. [4]

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**(Option D continues on page 17)**





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**(Option D continued)**

**12.** (a) Describe the function of enzymes in the context of macronutrient digestion. [2]

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(b) Outline the functions of pancreatic amylase and pancreatic lipase. [2]

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(c) State the typical pH range found in the small intestine. [1]

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**13.** Discuss dietary practices sometimes employed by athletes to increase muscle mass or lose body fat. [4]

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**End of Option D**



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**References:**

4. Kostrna, J., June 28, 2022. Effects of Time Constraints and Goal Setting on Basketball Shooting. *Frontiers in Psychology*, vol. 13. Available at: <https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2022.923061/full> [Accessed 1 December 2024]. Source adapted.

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20EP18

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20EP19

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20EP20