Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Higher level
Paper 3

7 November 2024

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

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.
- 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 **[50 marks]**.

Option	Questions
Option A — Optimizing physiological performance	1 – 4
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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 the following page)

(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 altitude training. [2]

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(d) Describe how to prevent high-altitude illness for athletes. [3]

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(Option A continues on the following page)

(Option A continued)

4. (a) Define the term *active recovery*. [1]

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(b) Evaluate cryotherapy. [3]

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End of Option A

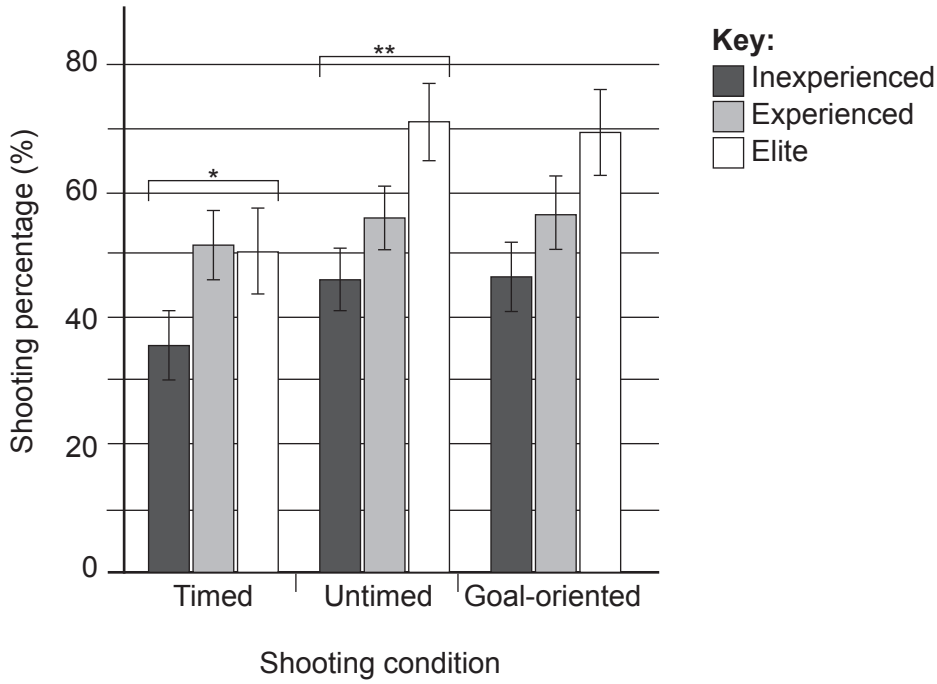
Option B — Psychology of sports

5. 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 5 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)

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

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(b) Outline the role of goal-setting in the process of self-regulated learning (SRL) for athletes. [3]

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(Option B continues on the following page)

(Option B continued)

7. (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 page 11)

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will not be marked.

(Option B continued)

8. (a) Outline the term *talent*. [1]

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(b) Discuss the potential opportunities, behaviours and obstacles during evolution of talent for athlete development. [6]

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End of Option B

Option C — Physical activity and health

9. 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.

Removed for copyright reasons

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

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(Option C continues on the following page)

(Option C, question 10 continued)

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

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(d) Outline the purpose of calculating population attributable risk (PAR). [1]

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(e) Explain **six** major societal changes that have led to an increase in hypokinetic disease. [6]

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(Option C continues on the following page)

(Option C continued)

11. In competitive sports, athletes often face a range of physical challenges and risks.

(a) Outline **four** common causes of running-related injuries in football (soccer). [4]

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(b) Identify **two** potential causes of sudden cardiac death in athletes. [2]

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End of Option C

Option D — Nutrition for sports, exercise and health

12. 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 (g min^{-1}) for both bar and drink groups during exercise.

Removed for copyright reasons

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

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(b) Calculate the difference in carbohydrate oxidation rates (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 12 continued)

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

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13. Following on from the study, the researchers considered introducing caffeine. Outline why they hypothesised that pre-exercise caffeine improves endurance cycling performance. [2]

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(Option D continues on the following page)

(Option D continued)

14. (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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(c) Dehydration is a negative acute side effect of alcohol consumption, outline **two** other negative effects of alcohol on the body. [2]

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15. Describe the function of enzymes in the context of macronutrient digestion. [2]

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(Option D continues on the following page)

(Option D continued)

16. Explain how training influences an athlete's ability to take in glucose at the cellular level. [3]

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17. (a) Describe free radical production during exercise. [2]

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(b) Discuss the use of antioxidant supplementation for combating the effects of free radicals. [3]

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End of Option D

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References:

5. 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.