Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Higher level
Paper 2

30 April 2025

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

Candidate session number

2 hours 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 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]**.

2225 – 6820

19 pages

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Answers written on this page
will not be marked.

Section A

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

1. A study investigated the effect of an 8-week static stretching programme on maximum strength. Participants were placed into two groups.

- Intervention group (IG): Static stretching 15 minutes per day
- Control group (CG): No stretching routine

The following were tested:

- Isometric strength (ISO)
- Dynamic one-repetition maximum (1RM)
- Shoulder range of motion (ROM).

Measurements were recorded pre- and post-training and are presented in the table below.

Group	Test	Pre-training mean (±SD)	Post-training mean (±SD)
Intervention group (IG)	1RM (kg)	75.25 (33.62)	79.69 (34.0)
	ISO (N)	649.99 (337.07)	685.53 (325.11)
	ROM (cm)	54.61 (9.05)	49.28 (8.7)
Control group (CG)	1RM (kg)	68.65 (25.76)	69.19 (26.11)
	ISO (N)	600.50 (251.37)	643.61 (241.67)
	ROM (cm)	50.00 (5.34)	49.69 (5.7)

(a) Identify the group with the lower pre-training ISO mean. [1]

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(b) Determine the percentage change in the 1RM mean from pre-training to post-training for the intervention group. [2]

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(Question 1 continued)

The investigators allowed adequate time for muscles to recover between tests to prevent fatigue.

(c) Define *fatigue*. [1]

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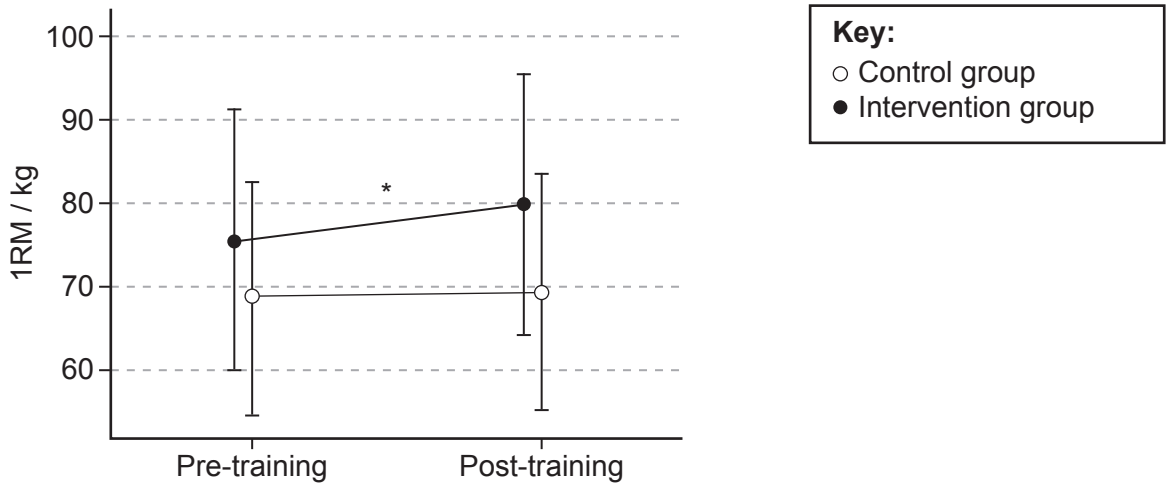
The data from the investigation was made into a series of graphs. The graphs for 1RM, ISO and ROM are presented in **Figure 1**.

Figure 1: (a) 1RM, (b) ISO, and (c) ROM



* $p < 0.05$ pre-training to post-training differences within group

Figure 1(a)

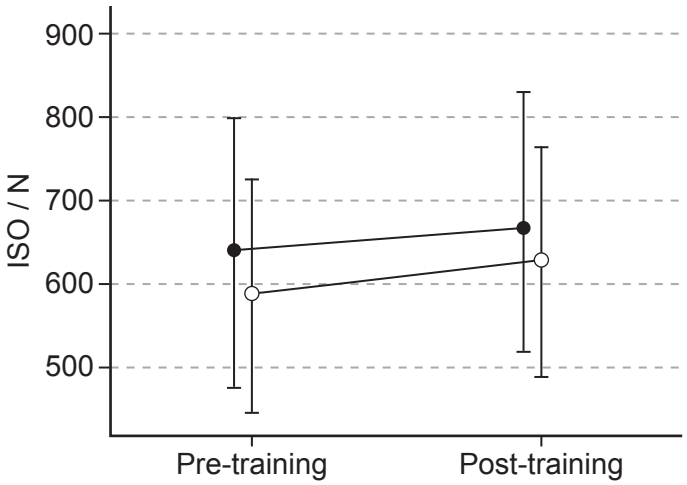
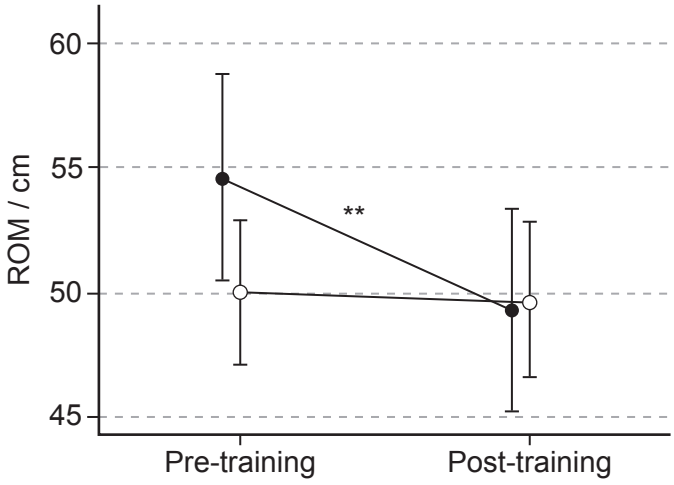


Figure 1(b)



** $p < 0.001$ pre-training to post-training differences within group

Figure 1(c)

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(Question 1 continued)

(d) The coefficient of variation is the ratio of the standard deviation to the mean expressed as a percentage. Compare and contrast the coefficients of variation of the data represented in **Figure 1(a)** and **Figure 1(b)**. [2]

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(e) With reference to **Figure 1(c)**, compare and contrast the reliability of the results for ROM for the control and intervention groups. [2]

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(f) Using **Figure 1**, comment on the impact of an 8-week static stretching programme on strength and flexibility. [3]

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2. Protein is an important macronutrient required to support strength training.

(a) List the chemical composition of protein. [1]

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(b) Outline the importance of essential amino acids to an individual's health. [1]

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(c) Protein is essential for the production of blood cells. Outline the functions of the **three** types of cells that form blood. [3]

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(d) Identify the recommended relative percentage intake of protein for a balanced diet. [1]

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(e) Outline how a performer is assessed during a standing broad jump. [2]

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3. A coach is coaching a performer to play tennis.

(a) State the coaching pedagogy in which learning is collaborative, creative and process-orientated. [1]

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(b) Define the concept of *transfer*. [1]

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(c) Outline abilities to skills as a type of transfer when learning to return the ball in tennis. [1]

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(d) Using examples, suggest **three** task constraints that could be introduced for a tennis player to increase their motivation and success. [3]

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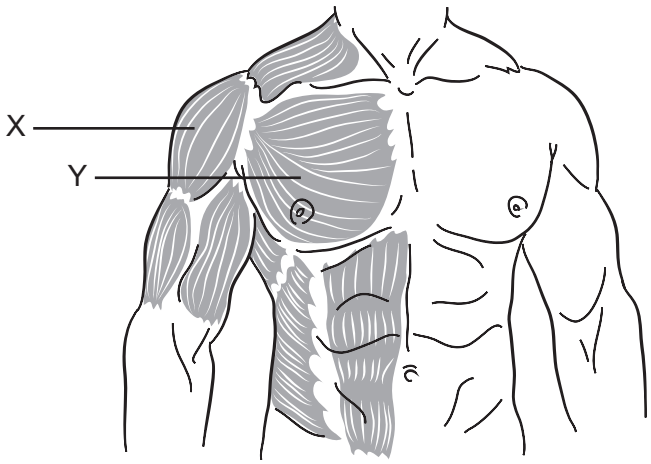
(Question 3 continued)

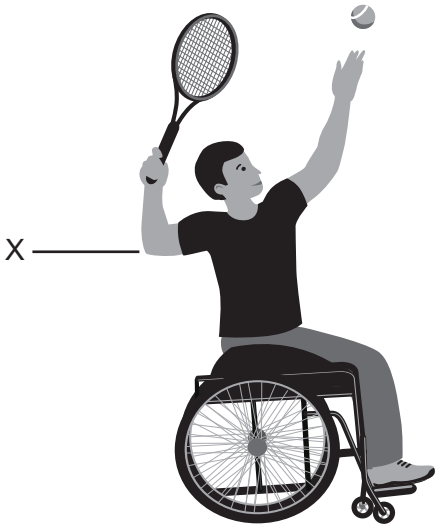
(e) Identify the muscles labelled X and Y. [2]



X: . . . . . .

Y: . . . . . .

Figure 2: A tennis player serving the ball during a match



(f) Analyse the movement occurring at the elbow labelled X in **Figure 2** as the tennis player stretches to serve. [4]

Joint	Joint action	Agonist	Contraction type of agonist	Antagonist
Elbow	. . . . .	. . . . .	. . . . .	. . . . .

4. Many individuals take up running as a form of endurance exercise. This is because it is often cheap, accessible and has cardiovascular benefits.

(a) An increase in stroke volume is an adaptation of the heart to regular endurance exercise. Outline **one** other adaptation of the heart. [1]

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(b) Predict the change in stroke volume at rest as a child grows into an adult athlete. [1]

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(c) Describe cardiovascular drift and **one** method for reducing it. [4]

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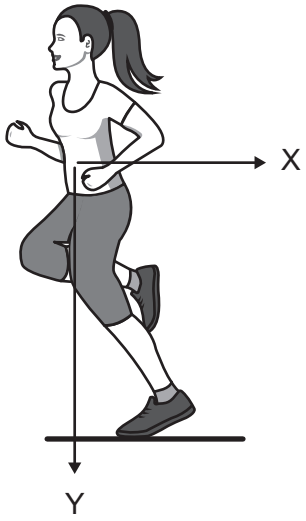
(Question 4 continued)

(d) Identify the forces labelled X and Y. [2]



X: . . . . . .

Y: . . . . . .

5. A gymnast is competing in the floor exercise which is composed of gymnastic and acrobatic skills demonstrating strength, balance and flexibility. The routine duration is limited to 70 seconds for male gymnasts and 90 seconds for female gymnasts.

(a) Gymnastics is considered a high-intensity activity. Define the term *high-intensity*. [1]

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(b) Analyse the relative contributions of the anaerobic energy systems during the floor exercise. [4]

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(c) On completion of the floor exercise, the gymnast breathes heavily during the recovery period (EPOC). Explain oxygen deficit and its impact on excess post-exercise oxygen consumption. [3]

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(Question 5 continued)

The diagram shows a gymnast holding a balance position on the parallel bars for one minute in training.

(d) Determine which type of exercise is shown and its effects on systolic and diastolic blood pressure. [3]

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Section B

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

6. (a) Outline **four** features of a synovial joint. [4]

(b) Explain the mechanism of expiration (exhalation) when exercising. [5]

(c) State the location of the pituitary and thyroid glands. [2]

(d) Explain the role of the pituitary gland in maintaining homeostasis. [5]

(e) Outline the genetic mechanism for the inheritance of potential athletic ability. [4]

7. (a) Identify **two** arteries that carry blood from the brachiocephalic trunk to the brain. [2]

(b) Explain how the sarcomere of the skeletal muscle shortens after calcium ions are released from the sarcoplasmic reticulum. [5]

(c) Describe **four** roles of the skin for an athlete training outside. [4]

(d) Analyse the physiological factors that lead to reduced muscle cell force in a triathlete as a result of endurance training. [5]

(e) Using examples, apply the classification of motor skills to an athlete competing in a marathon race. [4]

8. (a) Describe **two** types of drag and how each affects a cyclist. [4]

(b) Identify **two** ways a cyclist can minimize drag. [2]

(c) Suggest the possible strengths of using information technology in sports analysis. [5]

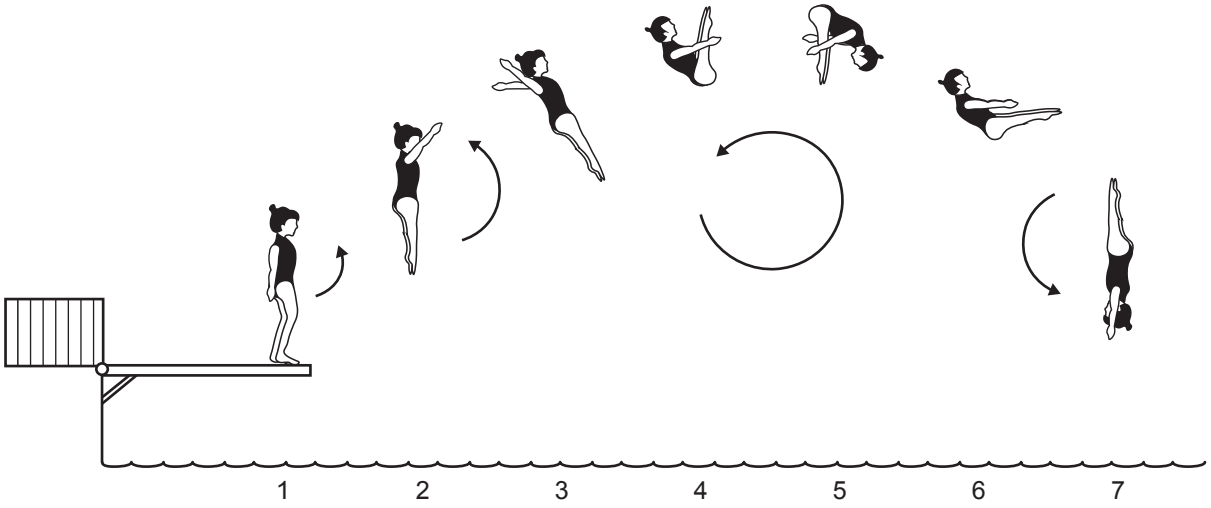
(d) Using examples, outline **four** features of a skilled performer. [4]

(e) Periodization can be used to optimize an athlete's development. Analyse how a coach uses the **other** key principles of training to enhance performance. [5]

9. (a) Identify **two** physiological reasons why athletes who overtrain may be more susceptible to infection. [2]

(b) Describe **four** strategies that athletes may use to reduce the risk of infection in preparation for a competition. [4]

(c) Analyse how the diver uses the concept of angular momentum to perform their dive. [5]



(d) Analyse the environmental factors that contribute to improved performance in long-distance runners. [5]

(e) Feedback can be received extrinsically or felt intrinsically during sport. Describe **four** other types of feedback that could be used when learning a skill. [4]

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References:

1. Warneke, et al., 2023. Effects of a Home-Based Stretching Program on Bench Press Maximum Strength and Shoulder Flexibility. *Journal of Sports Science and Medicine*, 22, pp. 597–604. Source adapted.

3.(e) Kabanova, V., 2021. *Mens body arms shoulders chest and abs. – stock illustration*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/men-s-body-arms-shoulders-chest-and-abs-royalty-free-illustration/1359361226?adppopup=true [Accessed 5 July 2024]. Source adapted.

3.(f) AnnaSqBerg, 2016. *Disabled Athlete On Wheelchair Play Tennis Sport Competition Vector - stock illustration*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/disabled-athlete-on-wheelchair-play-tennis-royalty-free-illustration/583809218?adppopup=true [Accessed 5 July 2024]. Source adapted.

5.(d) chipstudio, 2011. *Silhouettes of a male gymnast on the parallel bars – stock illustration*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/silhouettes-of-a-male-gymnast-on-the-royalty-free-illustration/165759825 [Accessed 5 July 2024]. Source adapted.