Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Higher level
Paper 2

26 April 2024

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]**.

2224 – 6808

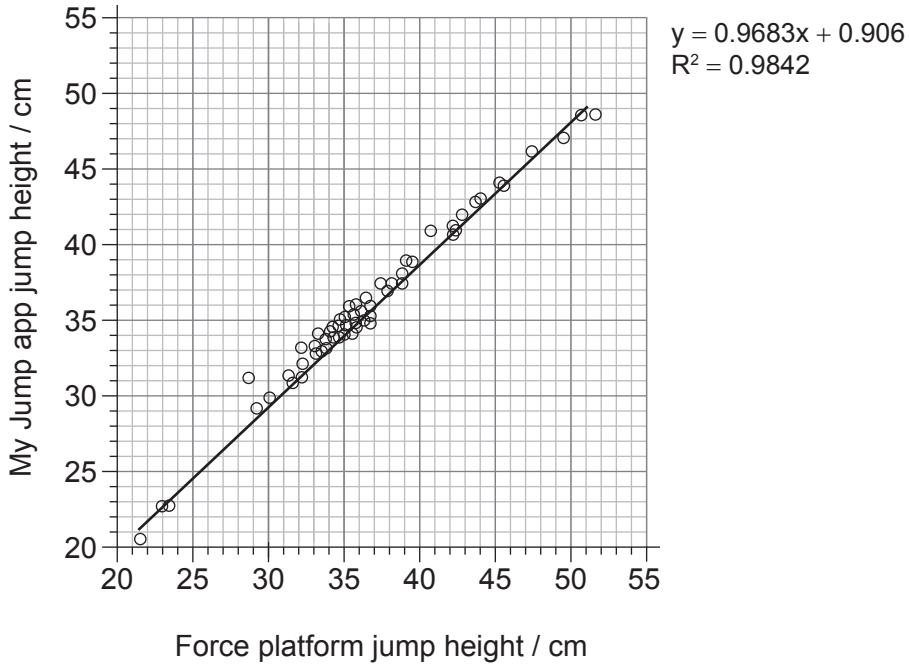
15 pages

Section A

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

1. A study examined reliability and validity of the My Jump iPhone application in measuring jump height. Each participant performed 5 vertical jumps on a force platform while simultaneously being assessed using the My Jump app. A force platform is a standard device for measuring jump height.

The graph shows the correlation between jump height recorded by the My Jump app and the force platform.



(a) (i) State the greatest jump height value as measured by the force platform. [1]

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(ii) Calculate, in cm, the difference between the greatest values recorded by the force platform and the My Jump app. [1]

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(This question continues on the following page)

(Question 1 continued)

(iii) Using the data, outline the validity and reliability of the My Jump app. [3]

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(iv) A two-tailed, paired *t*-test was conducted. The calculation yielded $P < 0.001$. Comment on the meaning of the results from the *t*-test. [1]

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(b) Discuss the potential benefits of using software applications such as the My Jump app in sports analysis. [3]

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(Question 1 continued)

(c) Muscles require adenosine triphosphate (ATP) during the vertical jump.

(i) Identify the dominant energy system in ATP production. [1]

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(ii) Analyse how this system contributes to ATP production. [3]

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Another study examined the effects of clinically safe levels of caffeine consumption on energy balance and exercise enjoyment. Data was collected during 3 trials on the same group of participants with healthy body mass indexes (BMIs):

- Control trial: no exercise, no placebo, no caffeine intake.
- Exercise with placebo trial: exercise and placebo intake.
- Exercise with caffeine trial: exercise and 3 mg/kg caffeine intake 90 minutes before as well as 30 minutes after exercise.

The table summarizes relative energy intake and enjoyability as measured by the Physical Activity Enjoyment Scale (0 = low enjoyability).

Trial	**Relative energy intake kJ (SD)**	**Enjoyability (SD)**
Control	2206 (1347)	Not measured
Exercise with placebo	–671 (1521)	87 (17)
Exercise with caffeine	–1638 (1309)	97 (18)

(This question continues on the following page)

(Question 1 continued)

(d) (i) Identify the trial with the highest enjoyability. [1]

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(ii) Comment how data supports the hypothesis that caffeine decreases relative energy intake (kJ) and improves exercise enjoyability. [1]

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(e) The participants in the study exercised at 65 % of the training heart rate range. Outline the use of the Karvonen method. [2]

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(f) Describe the physiological causes of peripheral fatigue during high-intensity activities. [2]

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2. (a) List the chemical elements in a protein molecule. [1]

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(b) Identify the main difference between an essential and a non-essential amino acid. [1]

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(c) A recreational dancer (with a healthy BMI) starts training for a competitive marathon.

Identify how their recommended macronutrient intake changes. [3]

Macronutrient	Change in recommended intake when marathon training
Carbohydrate	. . . . .
Protein	. . . . .
Fat	. . . . .

3. (a) Outline the reasons that the brain needs glucose. [3]

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(b) Analyse the functions of the **two** principal parts of the diencephalon. [2]

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(c) Predict **two** hormones that may be secreted by the pituitary gland when stimulated by the hypothalamus. [2]

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4. (a) Explain the reasons why adenosine gains and loses a phosphate molecule. [4]

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(b) Describe the role of calcium ions during the filament sliding of skeletal muscle contraction. [3]

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5. (a) Discuss the mechanism of oxygen exchange between the alveoli and the capillaries. [4]

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(b) Distinguish how cardiac output and resting heart rate would differ between trained and untrained individuals. [2]

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(c) Identify **two** cardiovascular adaptations that cause the differences in cardiac output between trained and untrained individuals. [2]

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(d) Discuss systolic and diastolic blood pressure at rest and during exercise for a trained athlete. [4]

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Section B

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

6. (a) Describe Newton's laws and how they apply in football (soccer). [5]

(b) Outline the ethical and health implications of genetic screening. [4]

(c) Discuss how heat contributes to cardiovascular drift during a football (soccer) game. [6]

(d) Explain how exercise and training can affect an athlete's susceptibility to infection. [5]

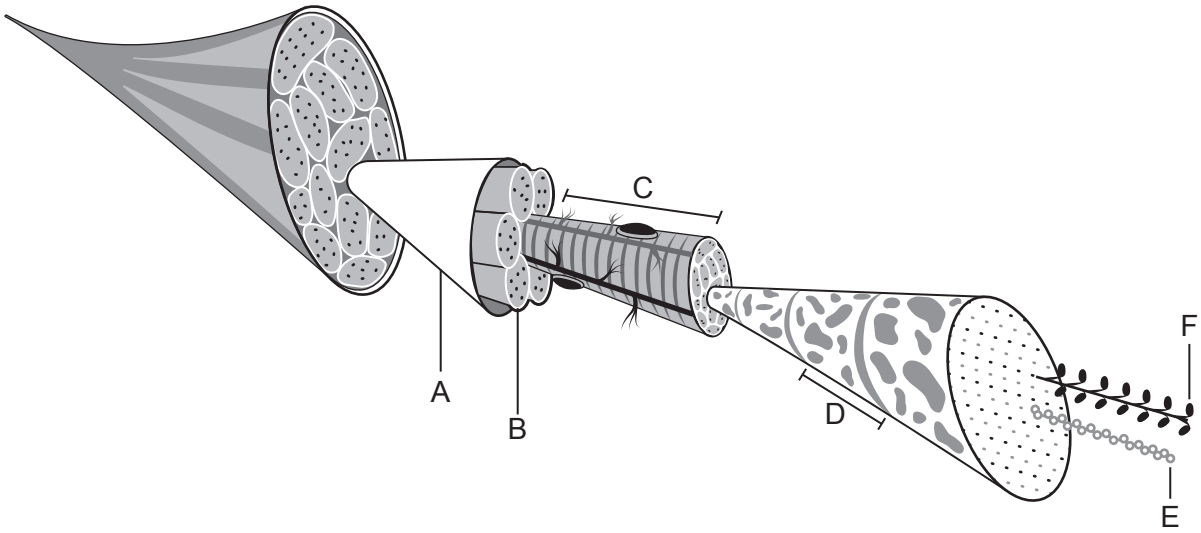
7. (a) Outline how a coach uses key principles of training to maximize athletic development. [6]

(b) Describe the role of hormones and the basic mechanism of their release. [4]

(c) Using an example from a team sport, evaluate the application of psychological refractory period (PRP). [5]

(d) Discuss methods that minimize and maximize friction. [5]

8. (a) Annotate the structure of skeletal muscle. Write your answers in the answer pages following, not on the diagram. [6]

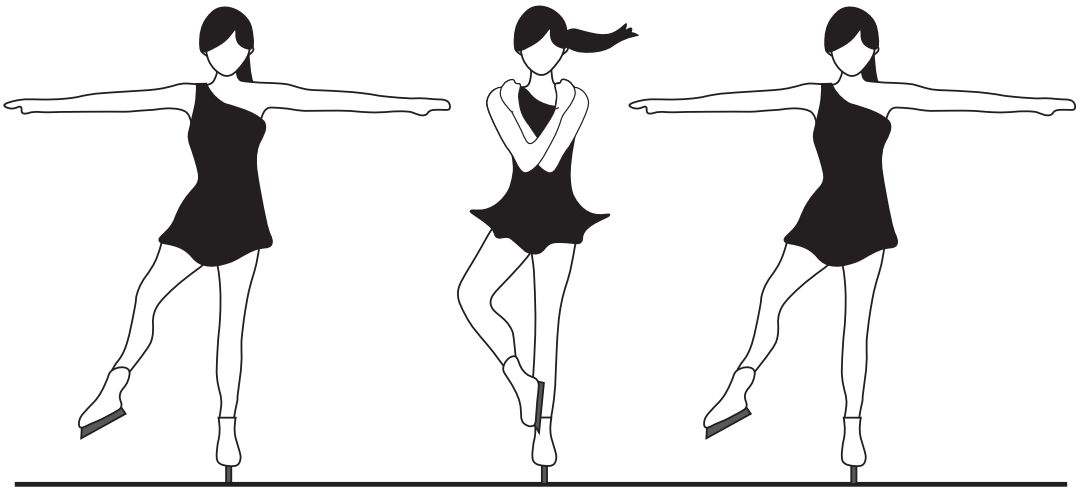


(b) Outline the relationship between genes and human characteristics. [4]

(c) Analyse how different methods can improve memory. [5]

(d) Explain recovery from fatigue after exercise. [5]

9. (a) Outline how a figure skater uses the law of conservation of angular momentum to perform a pirouette. [6]



(b) Using examples, outline how **two** types of drag can be reduced during performance. [4]

(c) Discuss the relationship between selective attention and memory. [5]

(d) Explain how a flow chart system can be used for match analysis in a team invasion game. [5]

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References:

1. Balsalobre-Fernández, C., et al, 2015. The validity and reliability of an iPhone app for measuring vertical jump performance. *Journal of Sports Sciences*, 33(15), pp. 1574–9. Source adapted.

Schubert, M., et al., 2014. Caffeine consumption around an exercise bout: effects on energy expenditure, energy intake, and exercise enjoyment. *Journal of Applied Physiology*, 117(7), pp. 745–754. Source adapted.

8. (a) https://nl.dreamstime.com/stock-illustratie-structuur-van-skeletachtige-spier-image71569200.