Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Standard level
Paper 3

Wednesday 6 November 2019 (morning)

1 hour

Candidate session number

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 – 4
Option B — Psychology of sports	5 – 8
Option C — Physical activity and health	9 – 12
Option D — Nutrition for sports, exercise and health	13 – 16

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Option A — Optimizing physiological performance

1. A study examined the effect of humidity on performance in a maximal test. Participants engaged in 60 minutes of steady-state submaximal exercise at varying levels of humidity. After the submaximal exercise in heat, time to exhaustion was measured. The mean results are shown in the bar chart.

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(a) State the humidity percentage that resulted in the lowest mean time to exhaustion. [1]

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(b) Calculate the difference in mean time to exhaustion, in minutes, after exercising at 23% and 71% humidity. [2]

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(Option A continues on the following page)

(Option A, question 1 continued)

(c) Deduce the relationship between humidity and time to exhaustion. [1]

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(d) Explain the challenge of thermoregulation while exercising in a high-humidity environment. [3]

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(e) Outline a plan for acclimatization in preparation for a competition in high humidity and heat. [2]

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(Option A continues on the following page)

(Option A continued)

2. (a) Define *cross-training*. [1]

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(b) Muscle soreness and fatigue are two indicators of overtraining. Discuss how a coach could monitor **two** other possible indicators to prevent overtraining. [2]

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3. (a) State the standard range for a healthy core body temperature. [1]

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(b) Identify an example of heat conduction in a sport. [1]

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(Option A continues on the following page)

(Option A continued)

4. (a) Stimulants are one class of non-nutritional ergogenic aids currently banned by the International Olympic Committee (IOC). List **two** other classes of non-nutritional ergogenic aids that are banned. [2]

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(b) Explain the use of erythropoietin (EPO) by a cross-country skier. [4]

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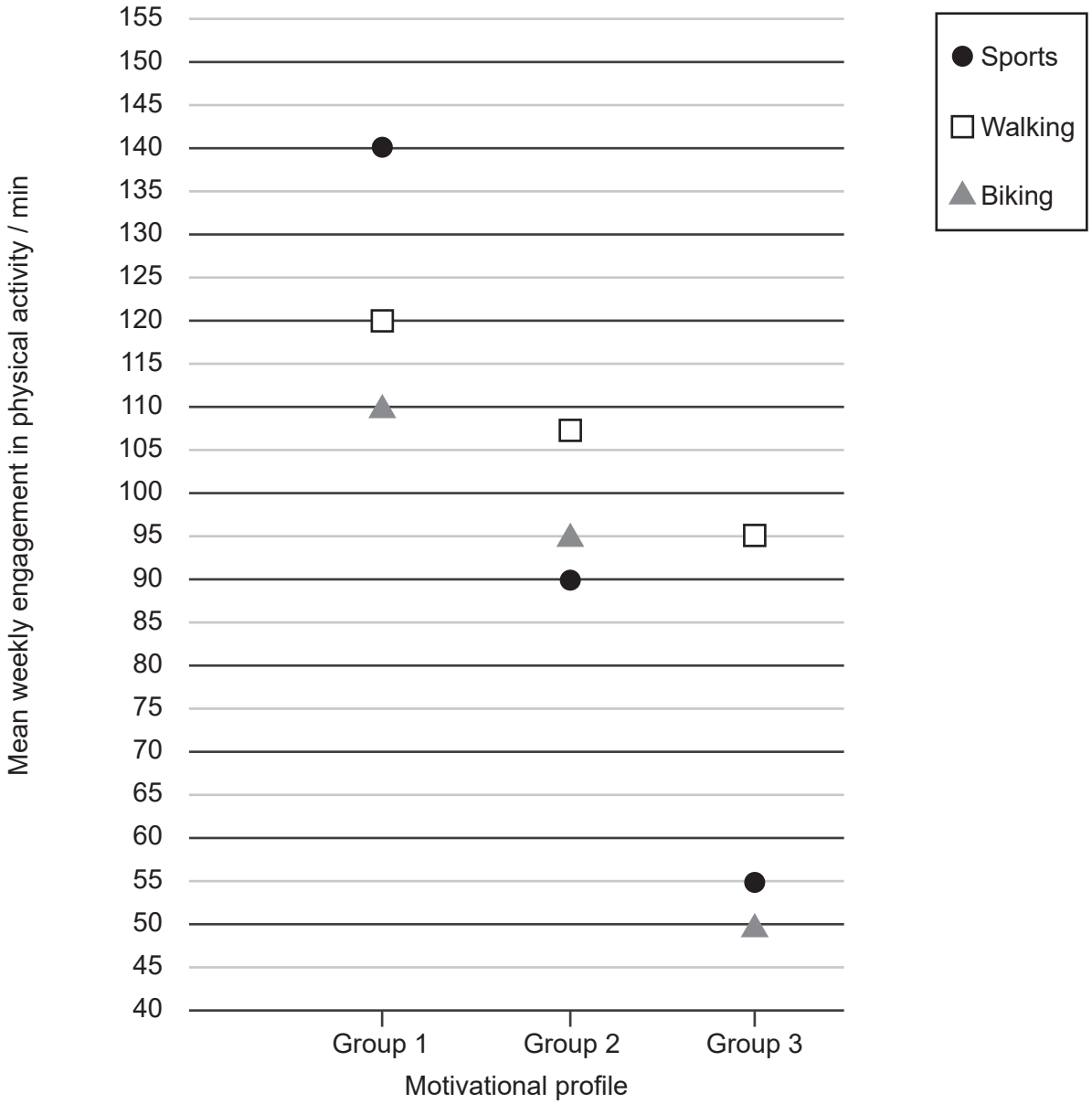
End of Option A

Option B — Psychology of sports

5. A study examined the relationship between motivation and engagement in regular physical activity. A survey determined motivational profiles based on participants' personal experiences with physical activity:

- Group 1: Intrinsically motivated.
- Group 2: Partially intrinsically motivated.
- Group 3: Extrinsically motivated.

Mean weekly engagement in physical activity is shown in the graph.



[Source: adapted from Friederichs, S.A., Bolman, C., Oenema, A. *et al.* Profiling physical activity motivation based on self-determination theory: a cluster analysis approach. *BMC Psychol* **3**, 1 (2015) doi:10.1186/s40359-015-0059-2. Reproduced under terms of the Creative Commons Attribution 4.0 International Public License (http://creativecommons.org/licenses/by/4.0)]

(Option B continues on the following page)

(Option B, question 5 continued)

(a) State the motivational profile that resulted in the highest mean weekly engagement in physical activity. [1]

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(b) Calculate the difference, in minutes, between the mean weekly engagement in sports for Group 1 and Group 3. [2]

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(c) Deduce the relationship between motivational profile and engagement in physical activity. [1]

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(d) Explain the impact of the different types of motivation on physical activity. [3]

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(Option B continues on the following page)

(Option B continued)

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

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(b) Discuss issues associated with studies on personality and sports performance. [2]

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7. (a) Define *social learning theory*. [1]

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(b) Outline the concept of SMARTER goals in goal setting. [1]

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(c) Identify **two** benefits of using mental imagery in psychological skills training. [2]

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(Option B continues on the following page)

(Option B continued)

8. (a) List **two** theoretical approaches to arousal. [2]

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(b) Discuss how trait anxiety and state anxiety are measured. [4]

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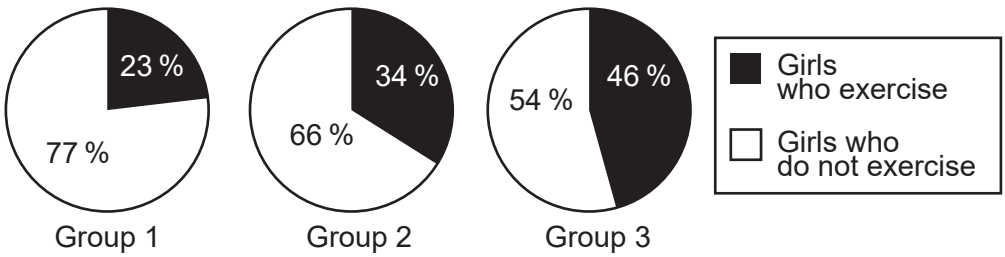
End of Option B

Option C — Physical activity and health

9. A study examined the effect of parental exercise on their daughters' participation in exercise. Parents were grouped according to their exercise habits:

- Group 1: Neither parent exercises (78%).
- Group 2: Only one parent exercises (18%).
- Group 3: Both parents exercise (4%).

The percentages of the girls' exercise habits are shown in the diagram.



[Source: adapted from *Journal of Sports Science and Medicine*, Vol **13** no 3, S. Sukys *et al.*, Do Parents' Exercise Habits Predict 13–18-Year-Old Adolescents' Involvement in Sport?, Pages 522–528, with permission from the JOURNAL OF SPORTS SCIENCE AND MEDICINE]

(a) State the parent group with the largest percentage of girls who exercise. [1]

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(b) Calculate the difference between the percentage of girls who exercise in Groups 1 and 3. [2]

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(c) Deduce the effect of parental exercise habits on the participation of girls in exercise. [1]

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(Option C continues on the following page)

(Option C, question 9 continued)

(d) Analyse personal and environmental barriers that may affect girls' adherence to exercise. [3]

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10. (a) State **one** habit that increases susceptibility to cardiovascular disease. [1]

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(b) Suggest **two** ways humans can overcome major societal changes that increase susceptibility to hypokinetic disease. [2]

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(Option C continues on the following page)

(Option C continued)

11. (a) Define *atherosclerosis*. [1]

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(b) Outline how a lifestyle of physical inactivity increases the risk of cardiovascular disease. [1]

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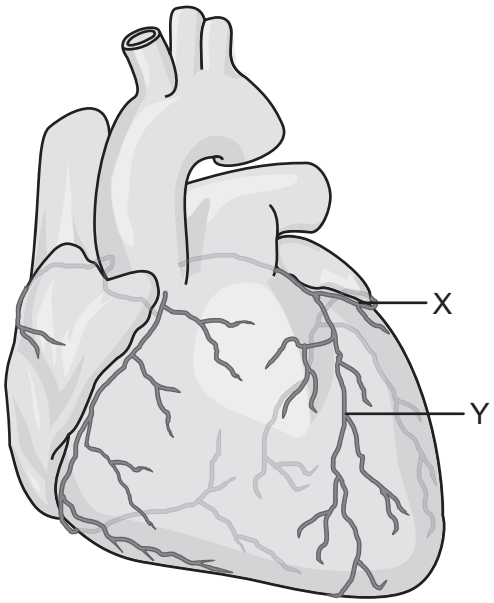
(c) The diagram shows an anterior view of the heart.



[Source: adapted from Coronary arterial circulation, author: Addicted04, https://commons.m.wikimedia.org/wiki/File:Coronary_arterial_circulation_-_es.svg. Licensed under the Creative Commons Attribution 3.0 Unported license (https://creativecommons.org/licenses/by/3.0/deed.en).]

Annotate parts X and Y of the coronary circulation. [2]

X: . . . . . .

Y: . . . . . .

(Option C continues on the following page)

(Option C continued)

12. (a) List **two** methods used to assess obesity. [2]

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(b) Explain factors that increase susceptibility to type 2 diabetes. [4]

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End of Option C

Option D — Nutrition for sports, exercise and health

13. An eight-week study examined the effects of time-restricted diet on body composition and strength. Participants were randomly assigned to two groups:

- Experimental group: Consumed only 3 meals within an 8-hour period each day, and did not eat for the other 16 hours.
- Control group: Consumed 3 meals within a 12-hour period each day, and did not eat for the other 12 hours.

All participants were assessed before (pre-test) and after (post-test) the eight-week study period. The mean results for body composition and strength are shown in the table.

	Experimental group mean			**Control group mean**		
	Pre-test	Post-test	*p* value	Pre-test	Post-test	*p* value
Fat-free mass (kg)	73.08	73.72	0.230	73.93	74.41	0.312
Fat mass (kg)	10.90	9.28	0.005	11.36	11.05	0.531
Bench press 1 repetition max (kg)	107.08	113.36	0.004	109.82	110.57	0.211
Leg press 1 repetition max (kg)	282.80	302.00	0.002	298.56	309.00	0.423

[Source: adapted from Moro, T., Tinsley, G., Bianco, A. *et al.* Effects of eight weeks of time-restricted feeding (16/8) on basal metabolism, maximal strength, body composition, inflammation, and cardiovascular risk factors in resistance-trained males. *J Transl Med* **14**, 290 (2016) doi:10.1186/s12967-016-1044-0. Reproduced under terms of the Creative Commons Attribution 4.0 International Public License (http://creativecommons.org/licenses/by/4.0).]

(a) State the group with the lowest post-test fat mass. [1]

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(b) Calculate the difference, in kilograms, between pre-test and post-test performance on the leg press 1 repetition max for the experimental group. [2]

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(c) Deduce the effect of the time-restricted diet on fat mass and strength. [1]

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(Option D continues on the following page)

(Option D, question 13 continued)

(d) Analyse the association between body composition and strength. [3]

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14. (a) Define *glycemic index* (GI). [1]

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(b) With reference to glycemic index (GI), discuss the type of food recommended for consumption before and after an endurance race. [2]

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(Option D continues on the following page)

(Option D continued)

15. (a) List **one** enzyme responsible for the digestion of proteins. [1]

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(b) Outline the absorption of amino acids from the intestinal lumen into the capillary network. [3]

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16. (a) List **two** ways of monitoring the hydration status of an athlete. [2]

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(Option D continues on the following page)

(Option D, question 16 continued)

(b) Sketch the loop of Henlé, medulla, collecting duct and ADH during the process of water regulation when body fluid levels are low. [4]

End of Option D

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