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

Wednesday 6 November 2019 (morning)

Candidate session number

1 hour 15 minutes

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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 **[50 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 – 17



**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) There has been an increase in the use of cryotherapy after exercise. Explain reasons for using cryotherapy. [4]

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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) Outline macrocycle. [1]

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3. (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 reasons for banning pharmacological substances. [2]

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



**(Option A continued)**

4. (a) Define *hypoxia*. [1]

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(b) During a competition at altitude, a runner did not alter their normal, low-altitude hydration habits. Using the concept of fluid balance, identify reasons for the reduction in their performance at altitude. [3]

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(c) Outline altitude training. [2]

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(d) Using examples, predict the adaptations after endurance athletes have lived and trained at altitude for a month. [2]

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**End of Option A**

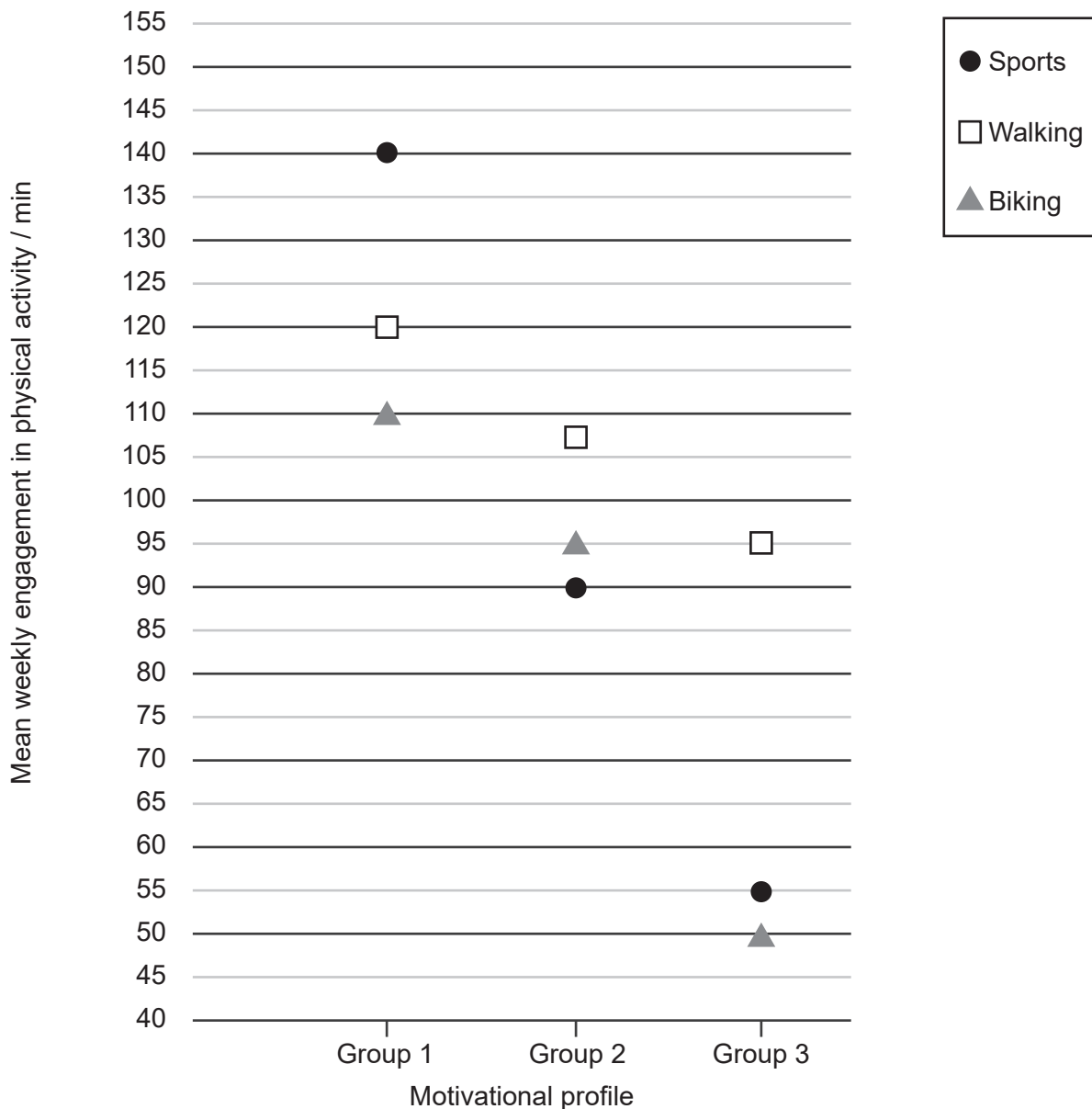


### Option B — Psychology of sports

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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- (e) Explain the benefits of the reflection phase of self-regulated learning on motivation. [2]

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





(Option B continued)

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

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(b) Using an example, predict the effect of positive and negative emotions on performance. [2]

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

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(b) Analyse **two** phases of the psychological skills training (PST) programme. [2]

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8. (a) Define *talent*. [1]

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(Option B continues on the following page)



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

(b) Outline traditional talent identification (TI) processes. [2]

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(c) Identify reasons for an elite athlete to transfer to a second sport. [2]

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(d) An athlete is in the mastery stage of their talent development. Discuss factors that affect their performance. [4]

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**End of Option B**

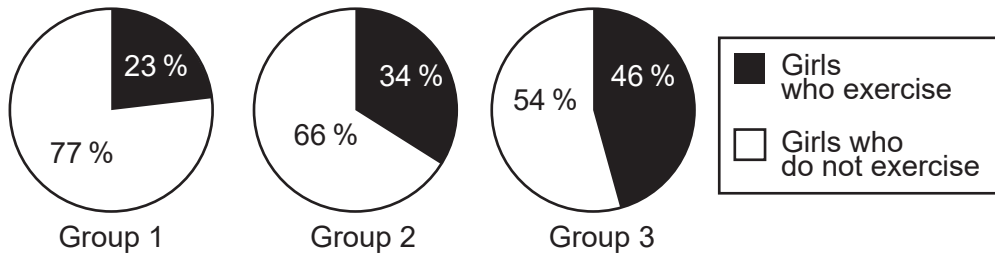


**Option C — Physical activity and health**

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** reasons why regular walking decreases the risk of cardiovascular disease.

[2]

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- (c) Discuss ways that exercise affects trait and state anxiety.

[2]

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



**(Option C continued)**

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

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(b) Analyse treatment for type 2 diabetes. [2]

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**12.** (a) Define *musculoskeletal injuries*. [1]

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(b) Using an example, outline acute and chronic injuries. [2]

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(c) Using sporting examples, identify **two** different types of injuries. [2]

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



**(Option C, question 12 continued)**

(d) Explain ways to decrease risks and hazards during exercise.

[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	<i>p</i> value	Pre-test	Post-test	<i>p</i> 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) Explain glycogen use in type I and type II muscle fibres during exercise at low and high intensities. [2]

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(c) Discuss the location and role of GLUT4 transporters in glucose uptake into a cell. [2]

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





**(Option D continued)**

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

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**(b)** Analyse reasons for greater water intake requirement by endurance athletes. [2]

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**16. (a)** State **one** acute effect of excessive alcohol use. [1]

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**(b)** Identify possible effects of chronic and excessive alcohol use on the brain and liver. [2]

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**17. (a)** Outline the production of free radicals during exercise. [2]

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



**(Option D, question 17 continued)**

(b) Analyse the negative effects on cells by free radicals.

[4]

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**End of Option D**

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