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Sports, exercise and health science
Higher level
Paper 3

Thursday 29 October 2020 (morning)

Candidate session number

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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]**.

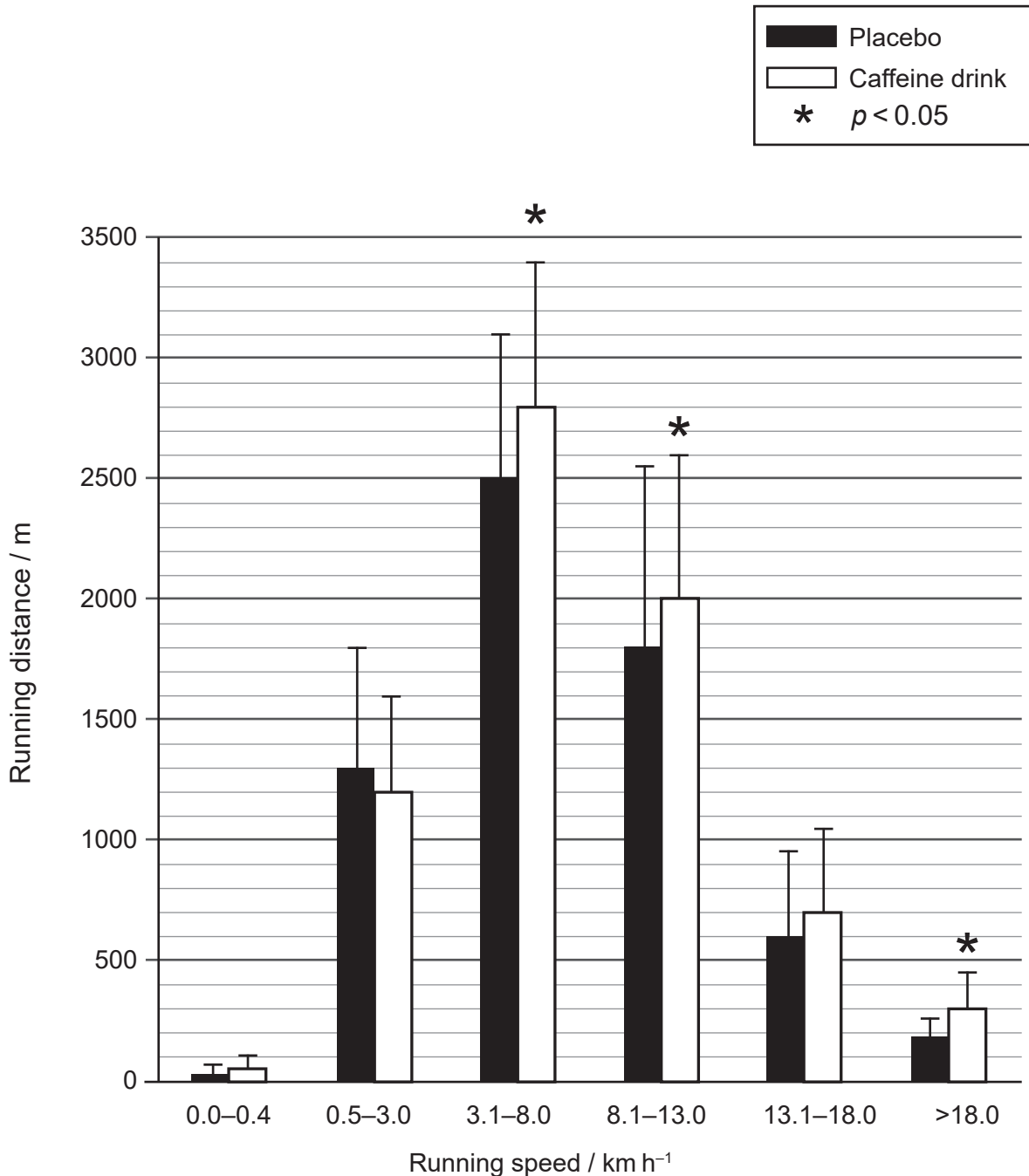
Option	Questions
Option A — Optimizing physiological performance	1 – 3
Option B — Psychology of sports	4 – 6
Option C — Physical activity and health	7 – 9
Option D — Nutrition for sports, exercise and health	10 – 12



Option A — Optimizing physiological performance

1. A study tested the effects of a caffeine drink on physical performance in soccer. Eighteen female players took part in two soccer games. They consumed a caffeine drink 60 minutes before Game 1 and a placebo 60 minutes before Game 2.

Each player wore a GPS device to record their distance travelled and speed. Mean running distance (m) for each game is shown.



[Source: Reprinted by permission from Springer-Verlag Wien: Springer Nature, Lara, B., Gonzalez-Millán, C., Salinero, J.J. *et al.* Caffeine-containing energy drink improves physical performance in female soccer players. *Amino Acids* 46, 1385-1392 (2014). © Copyright 2014. <https://doi.org/10.1007/s00726-014-1709-z>.]

(Option A continues on the following page)



(Option A, question 1 continued)

- (a) (i) Identify the running speed, in km h^{-1} , at which the difference in running distance between the two conditions is greatest. [1]

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- (ii) Calculate the difference in mean running distance, in metres, for the speed identified in 1(a)(i). [2]

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- (iii) Comment on the statistical significance of the effect of the caffeine drink in this study. [2]

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(Option A continues on the following page)



(Option A, question 1 continued)

(b) Outline **two** reasons for a placebo condition in the study. [2]

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(c) Explain the benefits of caffeine use for a soccer player. [3]

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(Option A continues on the following page)



(Option A continued)

2. (a) Define *active recovery*. [1]

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(b) Outline why active recovery should take place immediately after training. [2]

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(c) Describe the fitness-fatigue model of training. [3]

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(Option A continues on page 7)



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(Option A continued)

3. (a) Identify **two** physiological responses to hypoxia for a cyclist immediately after arriving at a training camp at 2000 m altitude. [2]

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- (b) The cyclist remains at the training camp for a month. Explain the physiological changes resulting from hypoxia that will improve their performance at sea level. [4]

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- (c) Mountain stages of an endurance cycle race take place between 2000 and 2500 m above sea level. Discuss the effects of altitude on the cyclist and their performance. [3]

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End of Option A



Option B — Psychology of sports

4.

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(a) (i)

(Option B continues on the following page)



(Option B, question 4 continued)

(ii)

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(iii)

(Option B continues on the following page)



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Turn over

(Option B, question 4 continued)

(b)

(c)

Question 4 removed for copyright reasons

(Option B continues on the following page)



(Option B continued)

5. (a) Identify **two** examples of intrinsic motivation. [2]

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(b) Describe why a self-determined athlete is likely to be more satisfied with training. [3]

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(c) Discuss the impact of self-determination on self-regulated learning. [3]

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(Option B continues on page 13)



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(Option B continued)

6. (a) Outline **three** psychological behaviours that support the evolution of talent. [3]

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(b) (i) State the **four** stages of development in the evolution of athlete talent. [1]

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(ii) Discuss the factors an athlete encounters during the stages of talent evolution. [3]

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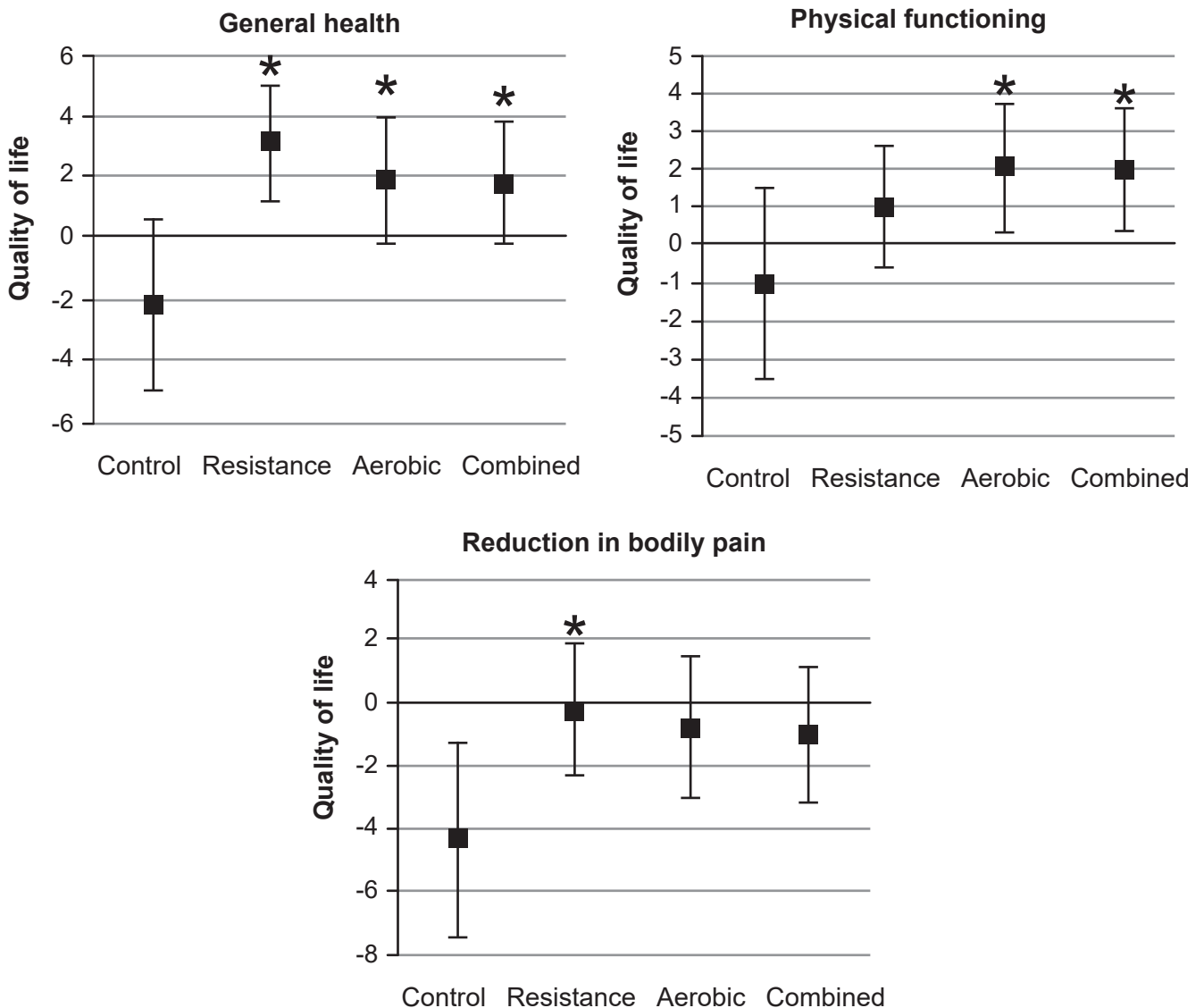
End of Option B



Option C — Physical activity and health

7. A nine-month trial investigated the effectiveness of exercise on *Quality of Life* for individuals with type II diabetes. 173 participants were randomly assigned to one of four training groups:
- aerobic training only
 - resistance training only
 - combined aerobic and resistance training
 - control: stretching only (no additional exercise).

A *Quality of Life* questionnaire was used to measure physical functioning, bodily pain and general health. The mean change in questionnaire score between the start and the end of the trial is shown for each group.



* $p < 0.05$ change compared to control group

(Option C continues on the following page)



(Option C, question 7 continued)

(a) (i) State the group with the greatest change in general health. [1]

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(ii) Calculate the mean change in physical functioning for the three exercise groups. [2]

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(iii) Comment on the statistically significant results from this study. [2]

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(b) List **two** health risks of diabetes. [2]

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(Option C continues on the following page)



(Option C, question 7 continued)

- (c) The family history of a person makes them susceptible to type II diabetes. Discuss lifestyle factors that they should consider to reduce their risk of developing the condition. [3]

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- 8. (a) Define *population attributable risk*. [1]

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- (b) An athlete has been diagnosed with hypertrophic cardiomyopathy. Identify **two** other risk factors that may lead to sudden cardiac death. [2]

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(Option C continues on the following page)



(Option C, question 8 continued)

- (c) Walking is associated with a lower risk of mortality. Discuss the benefits of regular walks on health.

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9. (a) Outline common soft-tissue injuries that occur in soccer.

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- (b) Using examples, explain sport-specific injury prevention strategies.

[4]

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End of Option C



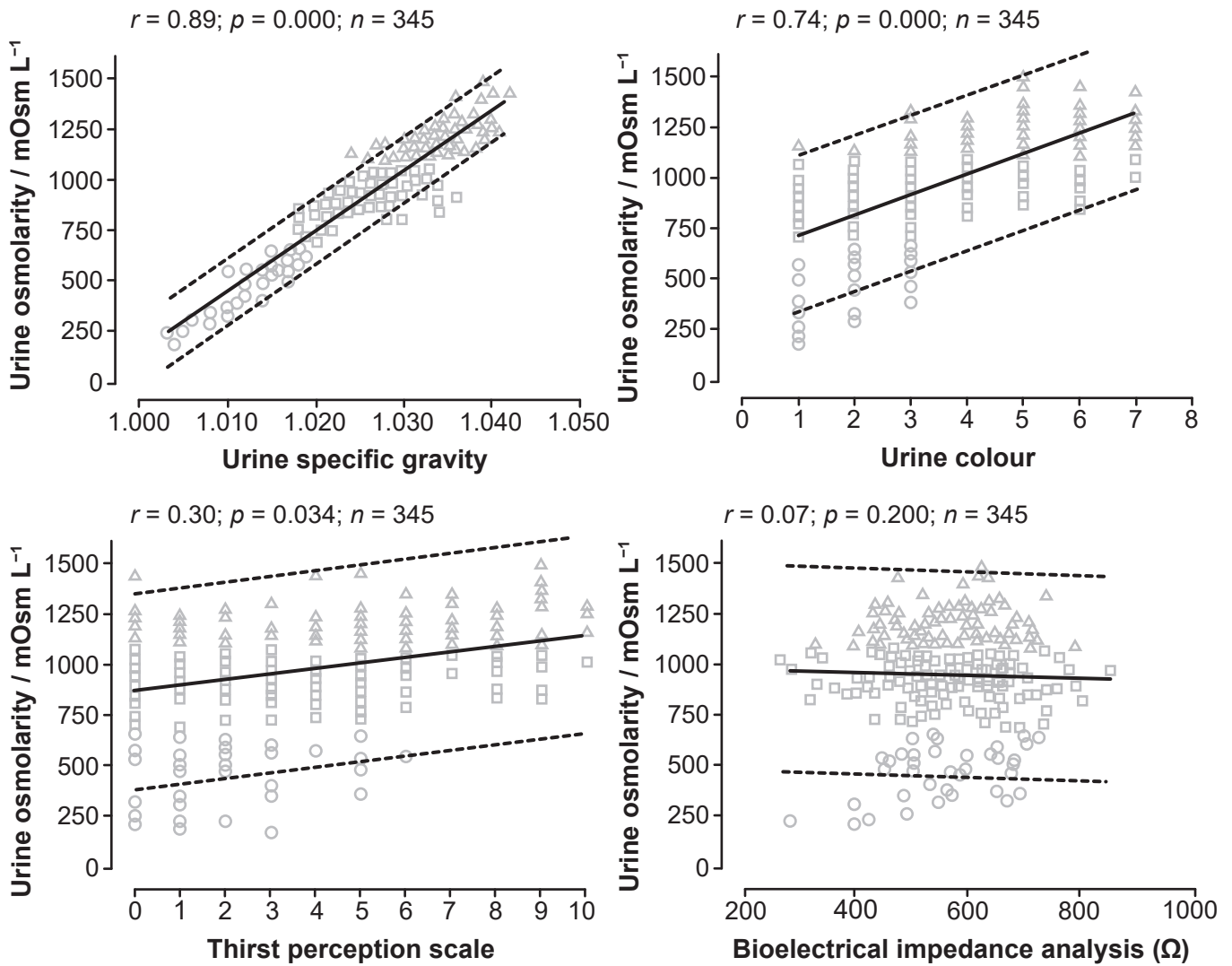
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Option D — Nutrition for sports, exercise and health

10. A study considered the hydration status of 345 athletes. To assess validity, the best urine measure of hydration (urine osmolarity) was compared with four other measures (urine specific gravity; urine colour; thirst perception scale; and bioelectrical impedance analysis).

Correlation to urine osmolarity is shown in the scattergrams.



(a) (i) State the measure with a non-significant correlation to urine osmolarity. [1]

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(Option D continues on the following page)



(Option D, question 10 continued)

- (ii) Calculate the difference in the strength of the correlation (r) with urine osmolarity between urine colour and thirst perception scale. [2]

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- (iii) Urine osmolarity is considered the most accurate measure of hydration that does not require blood. Comment on the relative validity of each of the other methods in this study. [2]

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- (b) State **two** reasons why water is vital to sustain human life. [2]

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- (c) Discuss regulation of electrolyte balance in endurance exercise. [3]

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(Option D continues on the following page)



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Turn over

(Option D continued)

11. (a) State the role of antioxidants. [1]

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(b) Explain the harmful effects of free radicals. [3]

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(c) Outline the impact of training and exhaustive exercise on oxidative stress. [2]

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(Option D continues on the following page)



(Option D continued)

12. (a) Describe the physiological effects of excess alcohol on the body. **[4]**

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(b) Biathlon is a winter sport that combines cross-country skiing and rifle shooting. Discuss the possible effects of alcohol on a biathlete's performance. **[5]**

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End of Option D



References:

1. **[graph: effects of a caffeine drink]** Reprinted by permission from Springer-Verlag Wien: Springer Nature, Lara, B., Gonzalez-Millán, C., Salinero, J.J. *et al.* Caffeine-containing energy drink improves physical performance in female soccer players. *Amino Acids* 46, 1385–1392 (2014). © Copyright 2014. <https://doi.org/10.1007/s00726-014-1709-z>.
7. **[graphs: effectiveness of exercise]** Reprinted with permission from Valerie H. Myers, Megan A. McVay, Meghan M. Brashear, Neil M. Johannsen, Damon L. Swift, Kimberly Kramer, Melissa Nauta Harris, William D. Johnson, Conrad P. Earnest, and Timothy S. Church: Exercise Training and Quality of Life in Individuals With Type 2 Diabetes. *Diabetes Care* 2013 Jul; 36(7): 1884–1890: <https://doi.org/10.2337/dc12-1153>. Copyright 2013 by the American Diabetes Association.
10. **[scattergrams: urine osmolarity]** Fernández-Elías VE, Martínez-Abellán A, López-Gullón JM, Morán-Navarro R, Pallarés JG, De la Cruz-Sánchez E, *et al.* (2014) Validity of Hydration Non-Invasive Indices during the Weightcutting and Official Weigh-In for Olympic Combat Sports. *PLoS ONE* 9(4): e95336. <https://doi.org/10.1371/journal.pone.0095336>. © 2014 Fernández-Elías *et al.* Published under the terms of Creative Commons CC by 4.0 licence: <https://creativecommons.org/licenses/by/4.0>.



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