Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Higher level
Paper 2

Thursday 10 May 2018 (afternoon)

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]**.

21 pages

2218 – 6602

International Baccalaureate
Baccalauréat International
Bachillerato Internacional

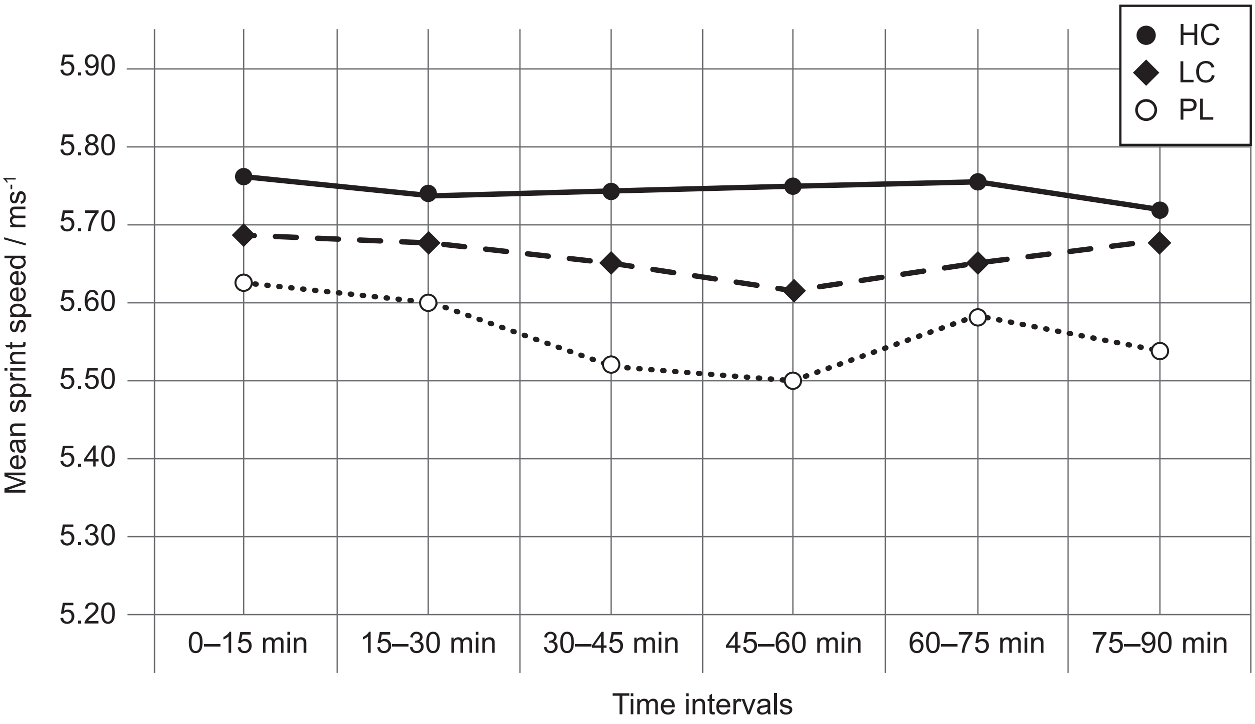
Section A

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

1. A study investigated the effect of three different pre-exercise drinks on sprint speed of football players during a match. Trials were completed in a randomized, double-blind fashion. Participants consumed the following drinks:

- Condition 1: High carbohydrate drink (HC)
- Condition 2: Low carbohydrate drink (LC)
- Condition 3: Placebo (PL).

The graph shows the mean sprint speed at six different time intervals.



[Source: Adapted from *Journal of Science and Medicine in Sport*, 17, M Kingsley *et al.*, Effects of carbohydrate-hydration strategies on glucose metabolism, sprint performance and hydration during a soccer match simulation in recreational players, copyright 2013, pp. 239–243, with permission from Elsevier.]

(a) (i) Identify the time interval which has the greatest difference in mean sprint speed between conditions 1 and 3. [1]

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(Question 1 continued)

(ii) Calculate the difference between mean sprint speeds for conditions 1 and 3 during the time interval identified in 1(a)(i). [2]

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(iii) Using the data, discuss the hypothesis that the consumption of a high carbohydrate drink improves sprinting performance. [2]

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(b) Explain how the double-blind experimental procedure was used in this study. [2]

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Turn over

(Question 1 continued)

(c) Compare and contrast the fuel sources used by the lactic acid and aerobic energy systems. [3]

The table shows the results from an investigation comparing the mean heart rate of 30-year-old individuals at rest and during a VO_2 max test on a treadmill. There were three groups:

- Group 1: Marathon runners
- Group 2: Recreational runners
- Group 3: Sedentary individuals.

	Time of test	Group 1	Group 2	Group 3
Mean heart rate / beats min^{-1}	At rest	48	55	68
	At 6 minutes	119	132	153
	At 12 minutes	170	178	180

(d) Calculate the difference between the mean heart rate at rest of groups 1 and 3. [2]

(This question continues on the following page)

(Question 1 continued)

(e) Explain possible reasons for differences in the mean heart rate of the marathon runners with the other groups. [3]

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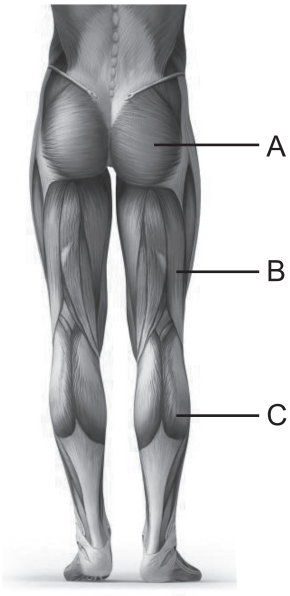
2. The diagram shows the lower body.



[Source: By Ciprian Stremtan / Shutterstock]

(a) Identify the muscles indicated by A, B and C. [3]

A. . . . .

B. . . . .

C. . . . .

(b) Distinguish between contractility, extensibility and elasticity. [3]

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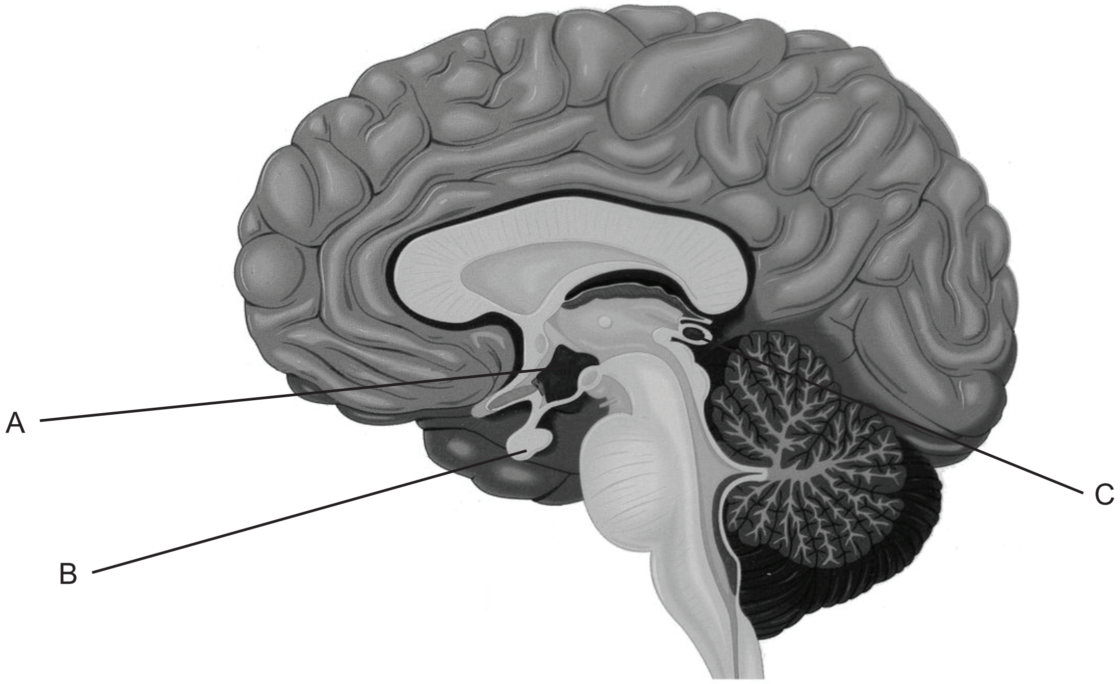
3. The diagram shows the brain.



[Source: Adapted from “Illustration of the human brain showing the Cerebral Cortex, the Suprachiasmatic Nucleus, the Optic Chiasm, the Hypothalamus and the Pineal Gland,” by Huáng yǔsǎn, https://commons.wikimedia.org/wiki/File:Suprachiasmatic_Nucleus.jpg, reproduced under Creative Commons Attribution-ShareAlike 3.0 Unported licence, https://creativecommons.org/licenses/by-sa/3.0/legalcode.]

(a) Label the endocrine structures A, B and C. [3]

A. . . . .

B. . . . .

C. . . . .

(This question continues on the following page)

(Question 3 continued)

(b) Explain the regulation of insulin levels in the body. [3]

(c) Discuss the processes of redistribution of blood during a Cooper's 12-minute run. [3]

4. (a) State **two** functions of the trachea. [2]

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(b) Outline nervous control of ventilation during exercise. [3]

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5. (a) Identify **two** adaptive mechanisms of the immune system. [2]

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(b) Outline the effects of intense and long-term training on the immune system. [3]

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(c) (i) Compare and contrast the susceptibility to disease for individuals who are sedentary, moderately active or elite athletes. [2]

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(ii) Explain why some individuals are more susceptible to infections than others, referring to the relationship identified in 5(c)(i). [2]

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6. (a) Define the following terms:

(i) *phenotype* [1]

(ii) *genotype* [1]

(b) Analyse the benefits of genetic screening in sport. [2]

(c) Discuss the influence of genetic factors on sporting performance. [2]

Section B

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

7. (a) Distinguish specific fitness tests that would be valid for a long-distance runner and a basketball player. [6]

(b) Compare and contrast the effectiveness of field and laboratory tests. [6]

(c) Outline **two** examples of the use of digital technology in sports analysis. [4]

(d) Evaluate the use of technology for officials making decisions in sport. [4]

8. (a) Describe the cardiovascular adaptations resulting from endurance training. [6]

(b) Explain how adenosine can gain or lose a phosphate molecule in a runner during the first three minutes of a training run. [6]

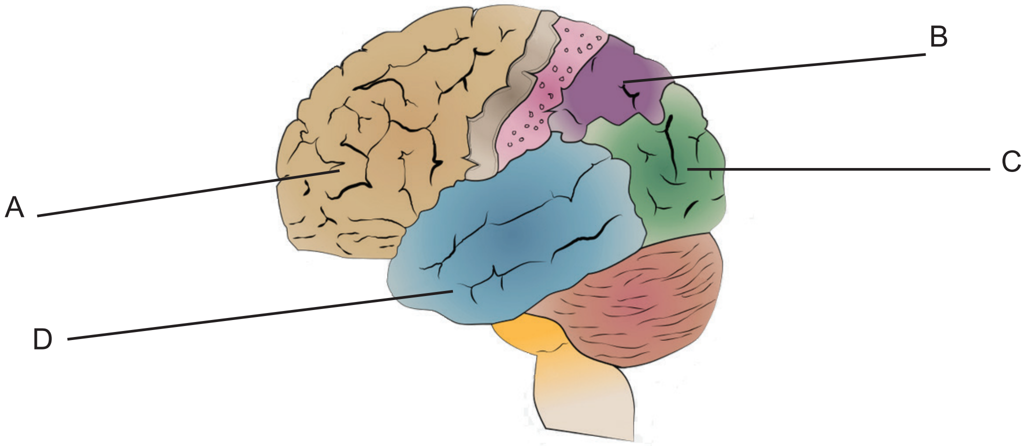
(c) Discuss the causes of peripheral fatigue which occur during endurance running. [4]

(d) Outline recovery techniques from fatigue following completion of a half marathon. [4]

9. (a) For a sport of your choice, distinguish between the sensory input from exteroceptors, proprioceptors and interoceptors. [6]

(b) Discuss **three** factors that contribute to different rates of learning. [6]

(c) The diagram shows the brain.



[Source: Adapted from annotated lobes of the cerebrum, https://commons.wikimedia.org/wiki/File:Cerebrum_lobes.svg by Jkwchui (image traced and labels removed), licenced under Creative Commons Attribution-Share Alike 3.0 Unported license, https://creativecommons.org/licenses/by-sa/3.0/legalcode.]

Identify the lobes indicated by A, B, C and D. [4]

(d) Analyse the function of the four lobes of the cerebrum identified in 9(c). [4]

10. (a) A golfer bends over to retrieve their ball from the hole.

Describe the movements that can occur at the elbow in terms of joint action and muscle contraction. [6]

(b) Using one sport of your choice, analyse how an athlete can influence the projectile motion of a ball. [6]

(c) Outline how drag can be changed to maximize performance. [4]

(d) Discuss factors that can affect friction in sport. [4]

Please **do not** write on this page.

Answers written on this page
will not be marked.