



No part of this product may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without written permission from the IB.

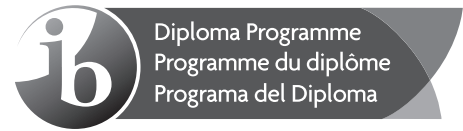
Additionally, the license tied with this product prohibits commercial use of any selected files or extracts from this product. Use by third parties, including but not limited to publishers, private teachers, tutoring or study services, preparatory schools, vendors operating curriculum mapping services or teacher resource digital platforms and app developers, is not permitted and is subject to the IB's prior written consent via a license. More information on how to request a license can be obtained from <http://www.ibo.org/contact-the-ib/media-inquiries/for-publishers/guidance-for-third-party-publishers-and-providers/how-to-apply-for-a-license>.

Aucune partie de ce produit ne peut être reproduite sous quelque forme ni par quelque moyen que ce soit, électronique ou mécanique, y compris des systèmes de stockage et de récupération d'informations, sans l'autorisation écrite de l'IB.

De plus, la licence associée à ce produit interdit toute utilisation commerciale de tout fichier ou extrait sélectionné dans ce produit. L'utilisation par des tiers, y compris, sans toutefois s'y limiter, des éditeurs, des professeurs particuliers, des services de tutorat ou d'aide aux études, des établissements de préparation à l'enseignement supérieur, des fournisseurs de services de planification des programmes d'études, des gestionnaires de plateformes pédagogiques en ligne, et des développeurs d'applications, n'est pas autorisée et est soumise au consentement écrit préalable de l'IB par l'intermédiaire d'une licence. Pour plus d'informations sur la procédure à suivre pour demander une licence, rendez-vous à l'adresse <http://www.ibo.org/fr/contact-the-ib/media-inquiries/for-publishers/guidance-for-third-party-publishers-and-providers/how-to-apply-for-a-license>.

No se podrá reproducir ninguna parte de este producto de ninguna forma ni por ningún medio electrónico o mecánico, incluidos los sistemas de almacenamiento y recuperación de información, sin que medie la autorización escrita del IB.

Además, la licencia vinculada a este producto prohíbe el uso con fines comerciales de todo archivo o fragmento seleccionado de este producto. El uso por parte de terceros —lo que incluye, a título enunciativo, editoriales, profesores particulares, servicios de apoyo académico o ayuda para el estudio, colegios preparatorios, desarrolladores de aplicaciones y entidades que presten servicios de planificación curricular u ofrezcan recursos para docentes mediante plataformas digitales— no está permitido y estará sujeto al otorgamiento previo de una licencia escrita por parte del IB. En este enlace encontrará más información sobre cómo solicitar una licencia: <http://www.ibo.org/es/contact-the-ib/media-inquiries/for-publishers/guidance-for-third-party-publishers-and-providers/how-to-apply-for-a-license>.



Sports, exercise and health science
Higher level
Paper 2

Friday 17 May 2019 (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]**.



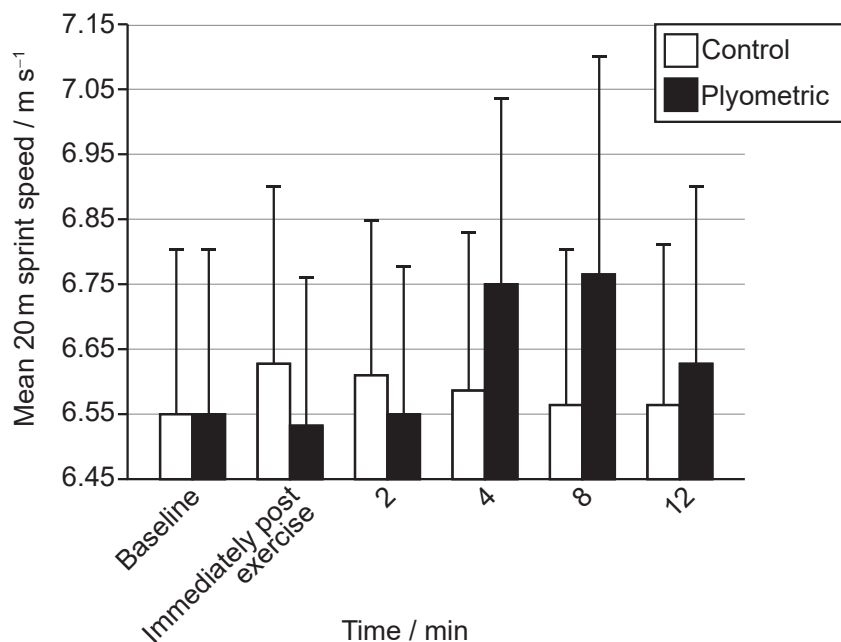
Section A

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

1. A study investigated the effect of plyometric exercise on sprint speed. (Plyometric exercise involves rapid and repeated stretching and contracting of the muscles.) The mean speed of each participant was measured during a 20 m sprint as a baseline and then in a further five 20 m sprints. During the first 75 seconds of the interval between sprints the participants carried out one of the following activities:

- Plyometric: three sets of alternate leg bounds (running-like movement, jumping from one leg to the other consecutively)
- Control: continuous walking.

The graph shows the mean sprint speed and positive standard deviation value for both conditions.



[Source: Anthony Turner *et al.*, Postactivation Potentiation of Sprint Acceleration Performance Using Plyometric Exercise, *Journal of Strength and Conditioning Research* **29** (2), pp. 343–50, https://journals.lww.com/nsca-jscr/fulltext/2015/02000/Postactivation_Potentiation_of_Sprint_Acceleration.9.aspx; National Strength and Conditioning Association]

A paired *t*-test was conducted to compare mean sprint speed at 4 minutes with mean sprint speed at baseline. The results were:

- Plyometric condition: $p < 0.05$
- Control condition: $p > 0.05$

(This question continues on the following page)



(Question 1 continued)

- (a) Identify the time and condition with the highest mean sprint speed. [1]

.....
.....

- (b) Calculate the difference in mean sprint speed, in m s^{-1} , between baseline and at 4 minutes for the plyometric condition. [2]

.....
.....
.....
.....

- (c) Using the data, discuss the hypothesis that plyometric exercise can improve sprint performance. [2]

.....
.....
.....
.....

- (d) Explain the reason for using a control condition in this study design. [2]

.....
.....
.....
.....

- (e) Comment on the meaning of the results from the t -test. [2]

.....
.....
.....
.....



2. (a) State **one** component transported by blood. [1]

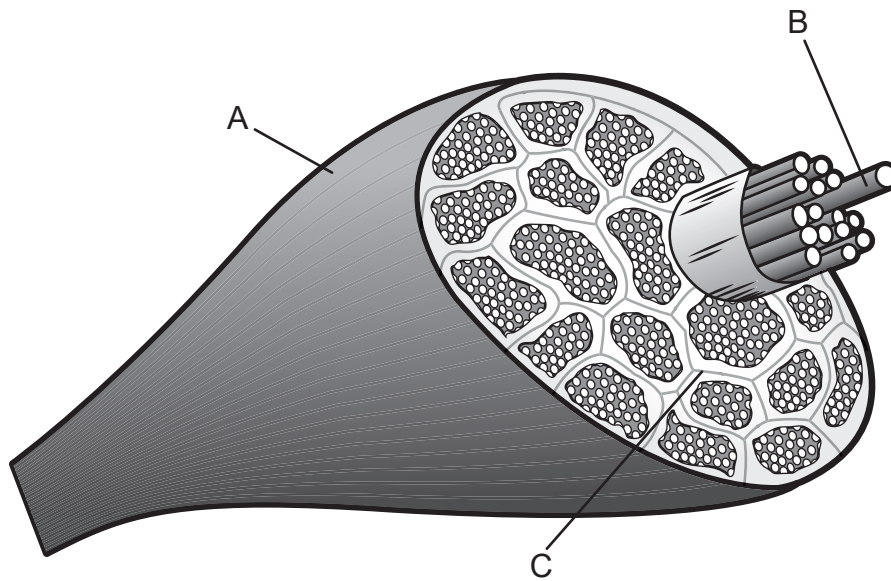
.....
.....

(b) Explain how cardiac output is maintained during prolonged exercise. [3]

.....
.....
.....
.....
.....
.....



3. The diagram shows a skeletal muscle.



[Source: adapted from sportsinjuryclinic.net]

(a) Identify the structures A, B and C in the diagram. [3]

A:
B:
C:

(b) Define the term *origin* of a muscle. [1]

.....
.....

(This question continues on the following page)



(Question 3 continued)

(c) Using an example of each, distinguish between isotonic and isometric muscle contractions.

[3]

.....

.....

.....

.....

.....

.....

(d) Using anatomical terminology, state the location of:

(i) The tibia relative to the femur.

[1]

.....

.....

(ii) The fibula relative to the tibia.

[1]

.....

.....

(iii) The patella relative to the tibia.

[1]

.....

.....



4. (a) Define *systolic blood pressure*. [1]

.....
.....

(b) Predict the effect of a 100m sprint on a runner's systolic and diastolic blood pressure. [2]

.....
.....
.....
.....

(c) Explain the redistribution of blood during exercise. [3]

.....
.....
.....
.....
.....
.....



5. (a) Identify **two** components of health-related fitness. [2]

.....
.....
.....
.....

(b) Evaluate body mass index as a measure of healthy body composition. [3]

.....
.....
.....
.....
.....
.....

(c) Discuss the potential benefits of genetic screening in sports, exercise and health. [3]

.....
.....
.....
.....
.....
.....



6. (a) Define *drag force*.

[1]

.....
.....

(b) The diagram shows a hockey player dribbling.



[Source: Oldok2 | Dreamstime.com]

Identify the forces A and B in the diagram.

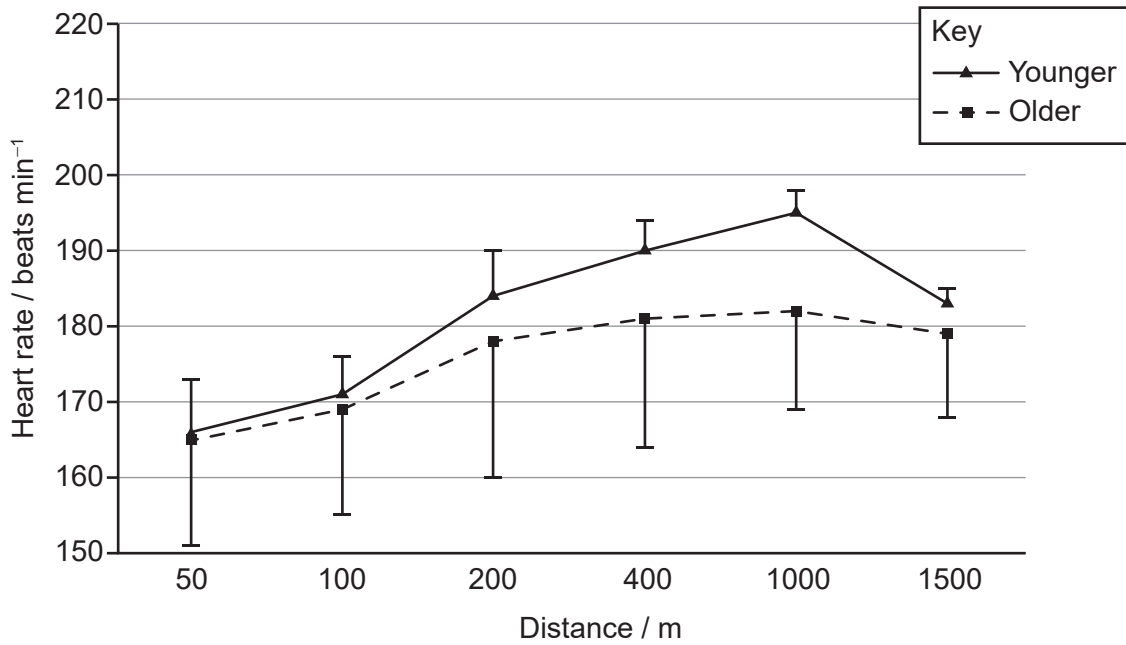
[2]

A:

B:



7. The heart rate data is from a study of younger swimmers (aged 14–16 years) and older swimmers (aged 35–40 years) during a 1500 m swim.



[Source: © International Baccalaureate Organization 2019]

Explain the lower increase of heart rate in older swimmers.

[3]

.....

.....

.....

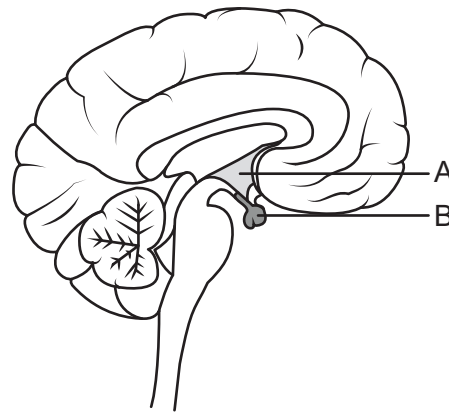
.....

.....

.....



8. The diagram shows a cross section through a human brain.



[Source: from the MSD Manual Consumer Version (Known as the Merck Manual in the US and Canada and the MSD Manual in the rest of the world), edited by Robert Porter. Copyright 2019 by Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Kenilworth, NJ. Available at <http://www.msdmanuals.com/home>. Accessed 5 July 2019.]

(a) Identify the structures A and B in the diagram. [2]

A:
B:

(b) List **two** functions of the frontal lobe of the brain. [2]

.....
.....
.....
.....

(c) Outline **three** different types of exteroceptor sensory inputs for a football player during a game. [3]

.....
.....
.....
.....
.....
.....



Section B

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

9. (a) Discuss the role of hormones on glucose uptake during exercise. [4]
- (b) Using an example, discuss the effect of experience and memory on selective attention. [6]
- (c) Using an example, describe the phases of learning a skill. [6]
- (d) Apply a phase analysis model to a sporting technique. [4]
10. (a) Explain how anaerobic energy systems could contribute to ATP production during a 3-minute round of boxing. [6]
- (b) Describe long-term vascular adaptations to endurance training. [4]
- (c) Describe the process of energy production and supply to brain cells. [4]
- (d) Using examples, suggest ways a coach could manipulate task constraints in training. [6]
11. (a) Describe the influence of genes in forming human characteristics. [5]
- (b) Discuss the relationship between exercise and susceptibility to infection. [5]
- (c) Explain the process of gaseous exchange at the alveoli. [4]
- (d) Explain the regulation of adrenaline and insulin levels in the body. [6]
12. (a) Apply Newton's second law of motion to the distance travelled by a golf ball after being struck. [4]
- (b) Outline how the Bernoulli principle affects a golf ball in flight. [5]
- (c) Outline different types of drag and ways they can be reduced in swimming. [6]
- (d) Discuss reasons for recovery following a soccer game. [5]



A large rectangular area containing horizontal dotted lines for writing.



20EP13

Turn over

A large rectangular area containing horizontal dotted lines for writing.



A large rectangular area containing horizontal dotted lines for writing.



20EP15

Turn over

A large rectangular area containing horizontal dotted lines for writing.



Large rectangular area with horizontal dotted lines for writing.



20EP17

Turn over

Large rectangular area with horizontal dotted lines for writing.



20EP19

Turn over

