

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**

Tuesday 5 November 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 practice on the improvement of four field hockey skills. Participants engaged in pre-test and post-test competitions before and after a six-week training programme. During the training programme, participants were randomly allocated to one of three practice groups:

- fixed
- variable
- game-based.

Results for the successful performance of each skill during the competitions are shown in the table.

Field hockey skill	Practice group	Pre-test		Post-test	
		Mean (%)	± SD	Mean (%)	± SD
Trapping	Fixed	67.02	13.59	74.68	12.97
	Variable	63.66	7.70	79.14*	3.96
	Game-based	65.23	9.82	82.73*	7.11
Passing	Fixed	67.95	15.98	69.47	8.25
	Variable	64.58	10.91	67.20	9.84
	Game-based	65.73	15.25	72.27*	5.89
Shooting	Fixed	65.00	31.83	69.45	18.76
	Variable	50.00	36.06	46.02	21.00
	Game-based	79.17	33.23	52.20	31.42
Dribbling	Fixed	92.23	10.02	88.98	7.44
	Variable	98.00	4.47	93.22	4.19
	Game-based	86.48	14.37	91.80	4.42

\* $p < 0.05$

(a) (i) State the mean percentage for successful passing by the fixed practice group in the pre-test competition. [1]

.....

.....

(ii) Identify the practice group and skill with the highest mean percentage of successful post-test performances. [1]

.....

.....

(This question continues on the following page)



**(Question 1 continued)**

- (iii) Calculate the difference in mean percentage between successful pre-test and post-test game-based trapping. [2]

.....

.....

.....

.....

- (b) Using the data, deduce the effect of each practice group on each skill. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Using the statistical data, comment on the performance of trapping by the variable practice and game-based practice groups. [1]

.....

.....

**(This question continues on the following page)**



**(Question 1 continued)**

(d) Outline fixed practice.

[2]

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

(e) Describe the type of transfer used by the game-based practice group during post-test competition.

[2]

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

(f) Explain how physical maturation and motivation can affect the rate of learning.

[3]

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



2. (a) (i) Outline **two** reasons for using notational analysis in sport. [2]

.....

.....

.....

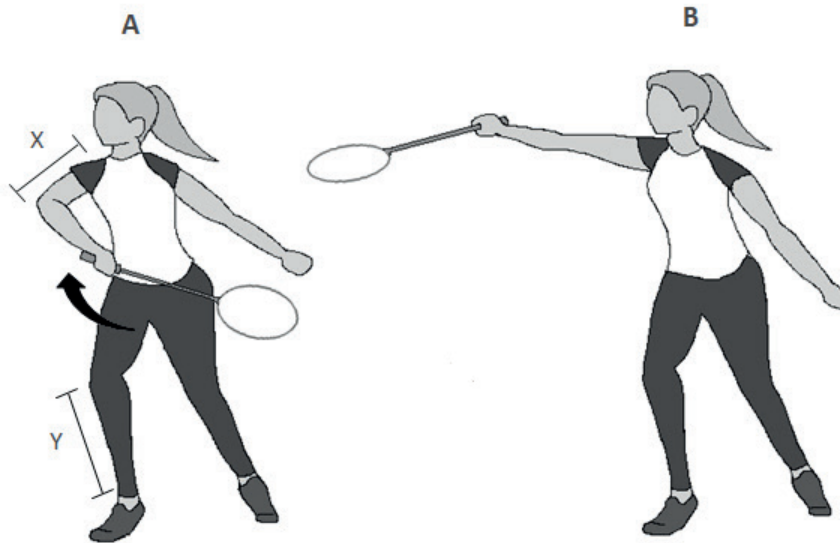
.....

(ii) A team is in possession of the ball during an invasion game. Sketch a flow chart that can be used for notational analysis. [3]

.....



3. The diagram shows performance of a backhand lob in badminton.



(a) (i) State the names of the muscles at X and Y. [2]

X: .....

Y: .....

(ii) Identify the movement at the elbow joint during the upward phase from position A to position B in the diagram. [1]

.....

.....

(iii) Outline the type of muscle contraction of the agonist at the elbow joint during the upward phase from position A to position B in the diagram. [1]

.....

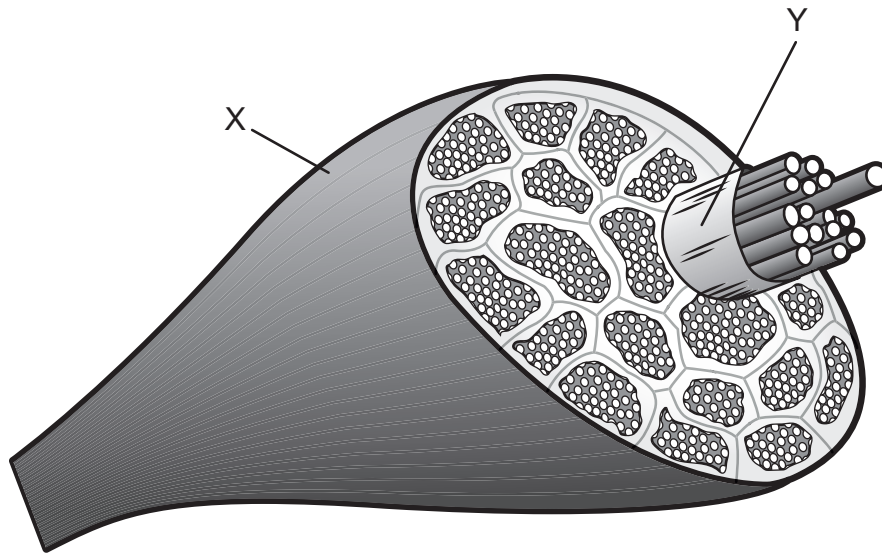
.....

(This question continues on the following page)



**(Question 3 continued)**

(b) The diagram shows a skeletal muscle.



[Source: adapted from sportsinjuryclinic.net]

(i) Identify the structures X and Y in the diagram. [2]

X:	.....
Y:	.....

(ii) Compare and contrast the structure of fast-twitch (type IIa and IIb) muscle fibres. [4]

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

(This question continues on the following page)





**(Question 3 continued)**

(c) (i) Distinguish between genotype and phenotype. [1]

.....  
.....

(ii) Suggest how genetic and environmental factors may affect muscle fibre type expression. [2]

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

(d) Explain the physiological causes of peripheral fatigue in endurance activities. [3]

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

(e) Describe delayed onset muscle soreness. [2]

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



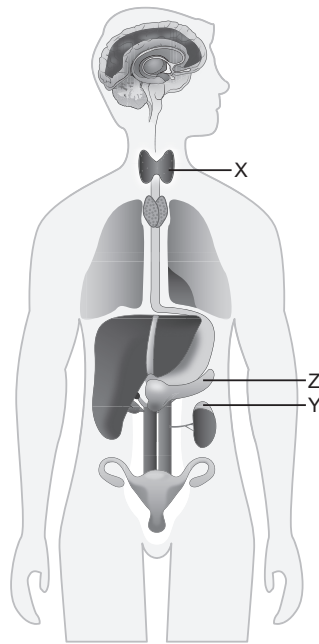
4. (a) (i) State the function of the immune system. [1]

.....  
.....

(ii) Using an example, outline the function of platelets in sport. [2]

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

(b) (i) Identify glands X, Y and Z in the diagram. [3]



[Source: by ttsz/iStock Photos]

X: .....

Y: .....

Z: .....

(This question continues on the following page)



**(Question 4 continued)**

(ii) Explain adrenaline regulation immediately prior to a sprint race.

[3]

.....

.....

.....

.....

.....

.....

(c) Outline the function of adrenaline during fasting.

[2]

.....

.....

.....

.....



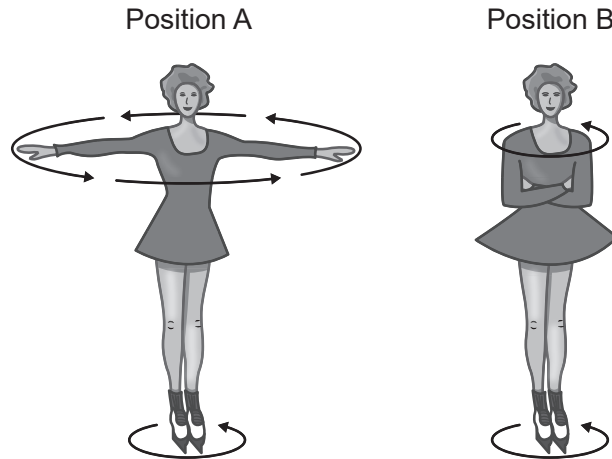
## Section B

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

5. (a) (i) Distinguish between health-related and performance-related fitness. [1]  
(ii) Apply **two** health-related components of fitness to a marathon runner. [2]
- (b) Describe the exchange of carbon dioxide from the bloodstream during exercise. [4]
- (c) Explain the reason for elevated breathing in the first minutes after a swimming sprint. [5]
- (d) (i) Outline **two** types of drag that can occur in swimming. [4]  
(ii) Suggest how a triathlete (swimming, cycling, running) can overcome drag. [4]
6. (a) (i) Identify **one** effect on the immune system of training for a marathon. [1]  
(ii) Outline strategies a marathon runner could use to reduce the risk of infection. [3]
- (b) (i) Describe the extrinsic regulation of the sinoatrial (SA) node as an athlete begins a warm-up. [3]  
(ii) Describe **two** functions of the skin. [4]
- (c) Suggest how an aerobic 1500 m endurance athlete uses the principles of overload. [4]
- (d) Evaluate the multistage fitness test as a method of assessing aerobic capacity in a long-distance runner. [5]



- 7. (a) (i) Using anatomical terminology, state the location of the cerebellum in relation to the cerebrum. [1]
- (ii) Describe the role of the cerebellum during the performance of a dance routine. [3]
- (b) The diagram shows a figure skater spinning on ice.



[Source: © David Darling, [http://www.daviddarling.info/encyclopedia/A/angular\\_momentum.htm](http://www.daviddarling.info/encyclopedia/A/angular_momentum.htm)]

- Explain the concept of angular momentum when a figure skater spins on ice. [6]
- (c) Outline the components associated with sensory input that can be used by the figure skater when performing a routine. [4]
  - (d) (i) Identify **two** characteristics of a novice figure skater. [2]
  - (ii) Using examples, explain how a coach can use task and environment constraints to increase motivation in novice performers. [4]
- 8. (a) (i) Outline catabolism. [1]
  - (ii) Describe the aerobic production of ATP before electrons are passed into the electron transport chain. [6]
  - (b) Describe the replacement of glycogen stores during recovery from fatigue after a long-distance swim. [4]
  - (c) Analyse the long-term effect of training on maximal oxygen consumption. [5]
  - (d) Evaluate the implications of genetic screening in sport. [4]



A large rectangular area containing horizontal dotted lines for writing.



20EP13

Turn over

[A large rectangular area containing 25 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, typical of a lined paper or a form intended for handwritten notes or data entry.



20EP16

A large rectangular area containing multiple horizontal dotted lines, serving as a template for handwritten text.



20EP17

Turn over

A large rectangular area with a dotted grid pattern, intended for handwritten notes or calculations.



Large empty rectangular area with horizontal dotted lines for writing.



20EP19

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

Answers written on this page  
will not be marked.



20EP20