Diploma Programme
Programme du diplôme
Programa del Diploma

© International Baccalaureate Organization 2025

All rights reserved. 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 the prior written permission from the IB. Additionally, the license tied with this product prohibits 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, whether fee-covered or not, is prohibited and is a criminal offense.

More information on how to request written permission in the form of a license can be obtained from https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/.

© Organisation du Baccalauréat International 2025

Tous droits réservés. 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 préalable de l’IB. De plus, la licence associée à ce produit interdit toute utilisation 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, moyennant paiement ou non, est interdite et constitue une infraction pénale.

Pour plus d’informations sur la procédure à suivre pour obtenir une autorisation écrite sous la forme d’une licence, rendez-vous à l’adresse https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/.

© Organización del Bachillerato Internacional, 2025

Todos los derechos reservados. 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 la previa autorización por escrito del IB. Además, la licencia vinculada a este producto prohíbe el uso 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—, ya sea incluido en tasas o no, está prohibido y constituye un delito.

En este enlace encontrará más información sobre cómo solicitar una autorización por escrito en forma de licencia: https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/.

Sports, exercise and health science
Higher level
Paper 2

6 November 2025

Zone A morning | **Zone B** morning | **Zone C** morning

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]**.

19 pages

Section A

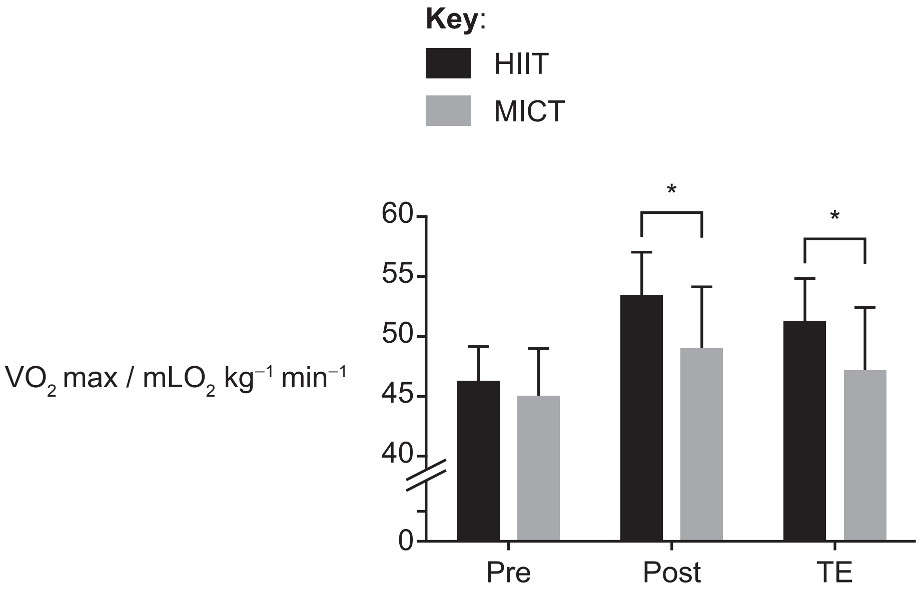
Answer **all** questions. Answers must be written within the answer boxes provided.

1. A study investigated the effect of high-intensity interval training and moderate-intensity continuous training on VO_2 max. Participants were randomly placed into two groups and completed an 8-week training protocol.

- HIIT: high-intensity interval training
- MICT: moderate-intensity continuous training

VO_2 max was measured prior to training (Pre), following the training protocol (Post), and four weeks after the training protocol had ended (TE). Data is presented in **Figure 1**.

Figure 1: Comparison of VO_2 max pre-training, post-training and four weeks after training has ended (TE)



* $p < 0.05$ between HIIT and MICT.
Error bars show the standard deviation.

(This question continues on the following page)

(Question 1 continued)

(a) Identify the group with the largest change in VO_2 max from pre-training to post-training. [1]

. . . .

. . . .

(b) Calculate the change in VO_2 max, in $mLO_2\ kg^{-1}\ min^{-1}$, for the MICT group pre- and post- training. [1]

. . . .

. . . .

(c) Using the data, deduce the effects of HIIT and MICT training on VO_2 max. [3]

. . . .

. . . .

. . . .

. . . .

. . . .

. . . .

(d) Explain how the standard deviation is useful for comparing the means between two data samples. [1]

. . . .

. . . .

(This question continues on page 5)

(Question 1 continued)

(e) Outline the different types of fatigue. [2]

. . . .

. . . .

. . . .

. . . .

(f) Discuss the causes of fatigue in the MICT group. [4]

. . . .

. . . .

. . . .

. . . .

. . . .

. . . .

. . . .

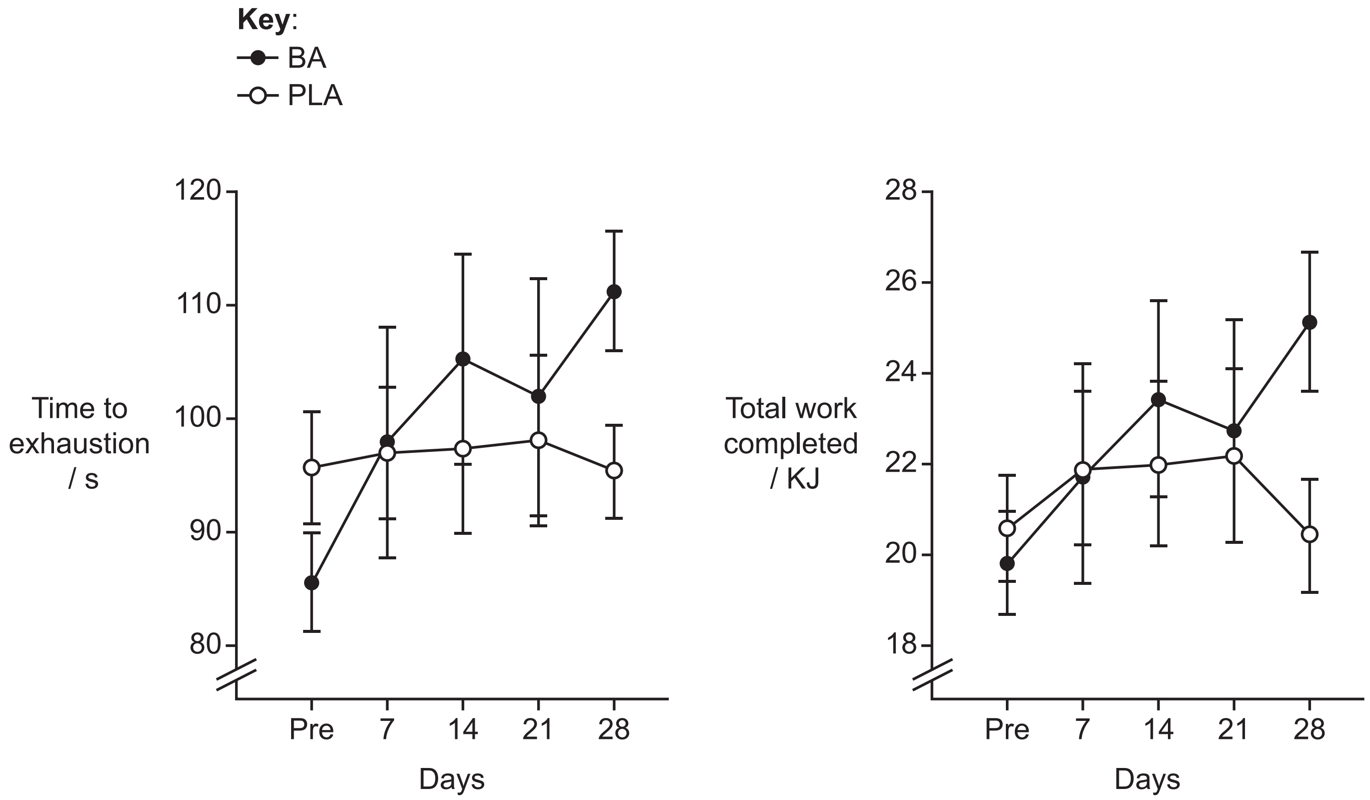
. . . .

2. A study investigated the effects of beta-alanine (a non-essential amino acid) supplementation for 28 days on high-intensity cycling. The athletes were placed into two groups.

- BA: beta-alanine amino acid supplements group
- PLA: placebo group

Cyclists were measured for time to exhaustion and total work completed. Data was collected prior to the training protocol (Pre) and every 7 days for 28 days. Data is presented in **Figure 2**.

Figure 2



(a) State the time to exhaustion (in seconds) for the BA group after 28 days. [1]

. . . .

. . . .

(b) Calculate the difference in total work completed (in KJ) for the BA group between the pre-test values and day 28 of the study. [1]

. . . .

. . . .

(This question continues on the following page)

(Question 2 continued)

(c) Using the data, deduce the effect of the 28-day beta-alanine supplementation on cycling performance. [3]

. . . .

. . . .

. . . .

. . . .

. . . .

. . . .

(d) Outline the difference between an essential and non-essential amino acid. [2]

. . . .

. . . .

. . . .

. . . .

. . . .

(e) The study applied the principles of study design. Analyse **three** aspects of effective study design to demonstrate causality. [3]

. . . .

. . . .

. . . .

. . . .

. . . .

. . . .

3. (a) Using an example related to appendicular skeleton bones, describe the anatomical term *distal*. [2]

. . . .

. . . .

. . . .

. . . .

(b) Explain the role of cholinesterase in skeletal muscle contraction. [2]

. . . .

. . . .

. . . .

. . . .

(c) Describe how a javelin thrower can maximize throwing distance at release. [3]

. . . .

. . . .

. . . .

. . . .

. . . .

. . . .

(This question continues on the following page)

(Question 3 continued)

(d) Using examples, explain clarity and chunking as methods of memory improvement. [4]

(e) Outline a fitness test to measure muscular endurance. [3]

4. (a) Identify the arteries that transport blood from the aortic branch to the internal and external carotid arteries. [2]

. . . .

. . . .

. . . .

. . . .

(b) Using an example, outline how circulating hormones are regulated. [3]

. . . .

. . . .

. . . .

. . . .

. . . .

(c) Define *friction*. [1]

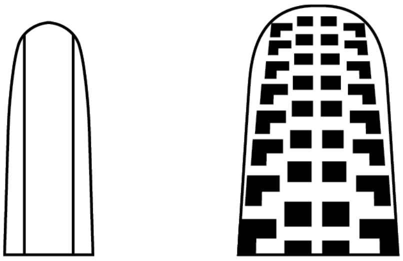
. . . .

. . . .

(This question continues on the following page)

(Question 4 continued)

(d) The image shows tyres for road and mountain bicycles at the same pressure.



Explain how the designs optimize frictional influence in cycling. [3]

(e) Outline **two** task constraints that can enhance a person's learning of a new skill. [2]

(f) Discuss the potential benefits of genetic screening in sport. [3]

Section B

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

5. (a) Outline contractility, extensibility and elasticity of muscle tissue. [3]

(b) Analyse the process of gaseous exchange at the alveoli during exercise. [5]

(c) Discuss how motivation, fitness and coach contribute to different rates of learning. [5]

(d) Describe the relationship between the hypothalamus and the pituitary gland in the regulation of growth hormone. [4]

(e) Suggest why an athlete who trains intensely for prolonged periods may be more susceptible to decreased immune response. [3]

6. (a) Discuss the regulation and function of glucagon during endurance exercise. [4]

(b) Explain how Newton's three laws of motion affect a speed skater during a 1500 m race. [5]

(c) A road cyclist is planning progressive training sessions to improve their performance. Suggest **four** other principles they can use to manipulate aspects of training programme design. [4]

(d) Outline how surface and form drag act on a downhill skier and ways in which they can be reduced. [4]

(e) Outline **three** mechanisms the body uses for the defence against damage or infection. [3]

7. (a) Outline **three** features of a synovial joint. [3]

(b) Explain cardiovascular drift with reference to cardiac output. [6]

(c) Using a sporting example, distinguish between Fleishman's physical proficiency abilities and perceptual motor abilities. [3]

(d) Describe **five** functions of the skin. [5]

(e) Analyse how a scattergram may be developed for a team game. [3]

8. (a) Analyse the fuel sources and duration of the three energy systems and their relative contributions to exercise. [6]

(b) Explain the causes and prevention of delayed onset muscle soreness (DOMS). [4]

(c) Describe the components associated with sensory input. [3]

(d) Outline the reasons for using notational analysis in training for sport. [3]

(e) Outline how genes can influence athletic characteristics. [4]

References:

Figure 1 Used with permission of Springer Nature BV, from HIIT is superior than MICT on cardiometabolic health during training and detraining, Gripp et al., Volume 121, issue 1, 2020; permission conveyed through Copyright Clearance Center, Inc.

Figure 2 Used with permission of Springer Nature BV, from Incremental effects of 28 days of beta-alanine supplementation on high-intensity cycling performance and blood lactate in masters female cyclists., Kavouras et al., volume 47, 2015; permission conveyed through Copyright Clearance Center, Inc.