



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 1

Friday 17 May 2019 (afternoon)

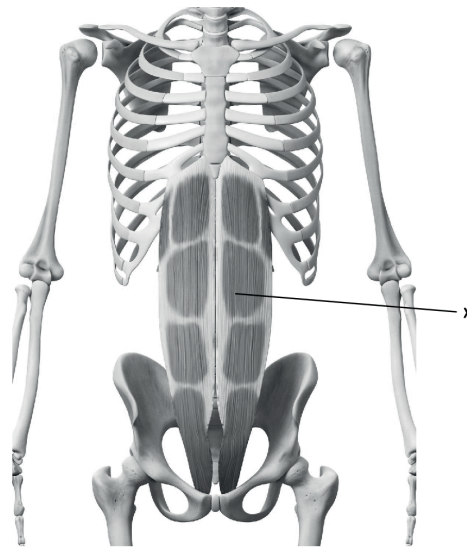
1 hour

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The maximum mark for this examination paper is **[40 marks]**.

1. An athlete's broken leg is immobilized in a cast. Which muscle characteristic causes difficulty in walking after the prolonged inactivity?
 - A. Extensibility
 - B. Elasticity
 - C. Atrophy
 - D. Hypertrophy

2. What is the muscle labelled X in the diagram?



[Source: ID 45575799 © Sebastian Kaulitzki | Dreamstime.com]

- A. Abdominus rectus
 - B. External obliques
 - C. Erector spinae
 - D. Iliopsoas

3. What is vital capacity?
 - A. Inspiratory reserve volume plus total lung capacity
 - B. Total lung capacity minus residual volume
 - C. Tidal volume plus inspiratory reserve volume
 - D. Residual volume minus expiratory reserve volume

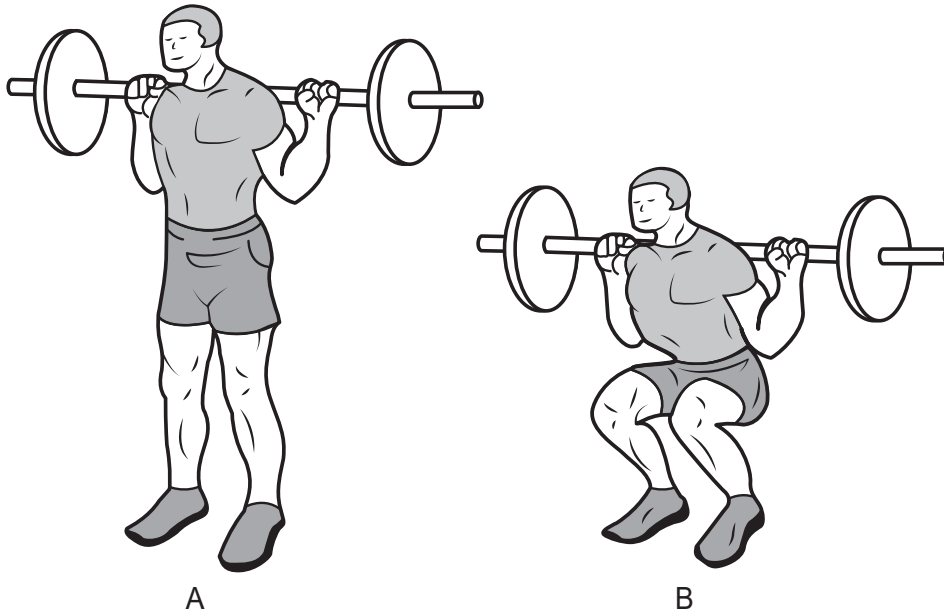
4. Which component of blood is greatest by volume?
- Electrolytes
 - Plasma
 - Erythrocytes
 - Leucocytes
5. How does an increased erythrocyte level benefit an athlete?
- By increasing the oxygen carrying capacity of the blood
 - By decreasing the capacity of the blood to clot in case of an injury
 - By increasing the ability of the body to fight infection
 - By decreasing viscosity of the blood
6. What type of blood is pumped by each of the blood vessels listed?

	Vena cava	Pulmonary artery	Pulmonary vein	Aorta
A.	oxygenated	deoxygenated	deoxygenated	oxygenated
B.	deoxygenated	oxygenated	deoxygenated	deoxygenated
C.	deoxygenated	deoxygenated	oxygenated	oxygenated
D.	oxygenated	deoxygenated	oxygenated	deoxygenated

7. What is the chemical composition of a protein molecule?
- Glycerol and three fatty acids
 - Only carbon, hydrogen and oxygen
 - Only carbon and oxygen
 - Carbon, hydrogen, oxygen and nitrogen

8. What is the correct order (greatest to least) for the amount of energy contained in 100 g of each body fuel?
- A. Carbohydrate, protein, lipid
 - B. Lipid, carbohydrate, protein
 - C. Protein, carbohydrate, lipid
 - D. Lipid, protein, carbohydrate
9. What type of process is lipolysis?
- A. Aerobic anabolism
 - B. Anaerobic anabolism
 - C. Aerobic catabolism
 - D. Anaerobic catabolism
10. Which energy system is the most rapid to resynthesize ATP?
- A. Anaerobic glycolysis
 - B. Aerobic glycolysis
 - C. Lactic acid
 - D. Creatine phosphate

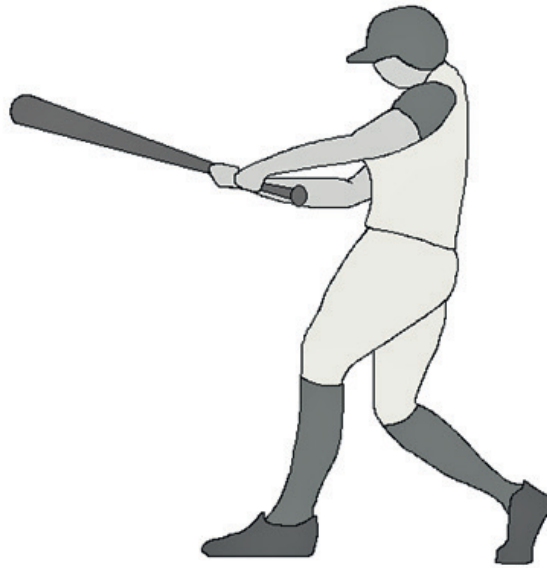
11. Which type of contraction occurs in the rectus femoris while performing a squat (moving from position A to B)?



[Source: adapted from "parallel squat" by Everkinetic, <https://commons.wikimedia.org/wiki/File:Squats.svg>. Licensed under a Creative Commons Attribution-ShareAlike 3.0 Unported license. <https://creativecommons.org/licenses/by-sa/3.0/>.]

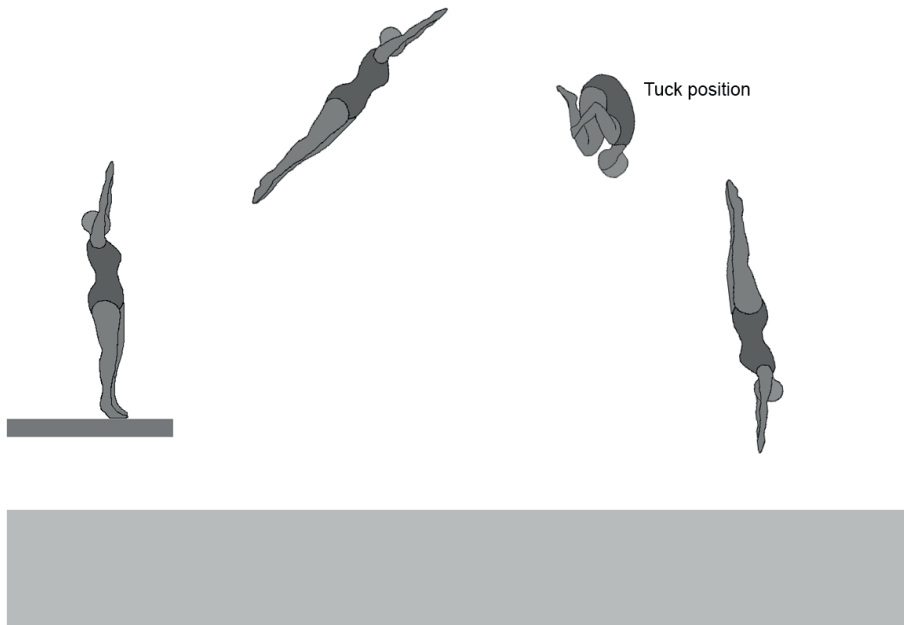
- A. Isometric
 - B. Isotonic eccentric
 - C. Isotonic concentric
 - D. Isokinetic eccentric
12. Which is an example of a second-class lever?
- A. The ankle joint during plantar flexion
 - B. The elbow during flexion
 - C. The knee during extension
 - D. The hip during abduction

13. Which of Newton's laws predicts the increase in acceleration of the swing when a child uses a lighter baseball bat?



- A. First
- B. Second
- C. Third
- D. First and second

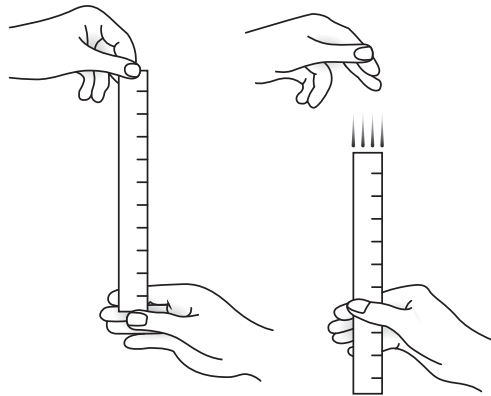
14. Why does a diver use the tuck position?



[Source: used with permission]

- A. To reduce spin by decreasing moment of inertia
 - B. To reduce spin by increasing moment of inertia
 - C. To increase spin by decreasing moment of inertia
 - D. To increase spin by increasing moment of inertia
15. Which motor skill classifications apply when an athlete runs a 100 m race?
- A. Gross, interactive, externally paced
 - B. Fine, individual, internally paced
 - C. Gross, coactive, externally paced
 - D. Fine, coactive, internally paced

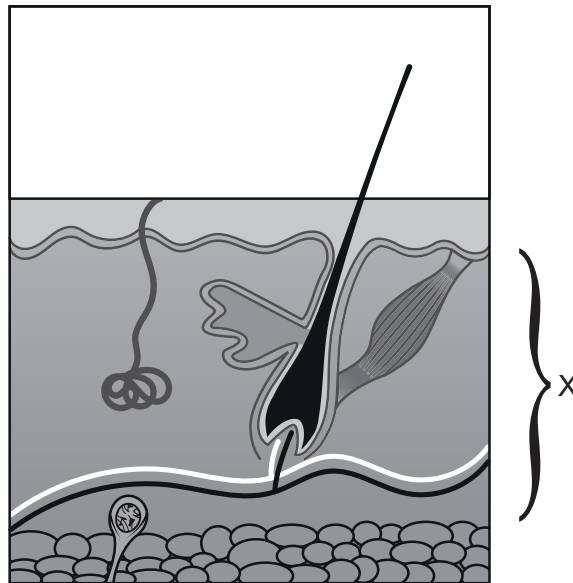
16. What is measured by the drop test?



[Source: © Thapos, thapos.com.]

- A. Reaction time
 - B. Response time
 - C. Movement time
 - D. Coordination
17. As a golfer hits the ball they feel a sharp pain in the right bicep; this is an example of which types of feedback?
- A. Knowledge of result, negative, terminal
 - B. Knowledge of result, positive, concurrent
 - C. Knowledge of performance, negative, concurrent
 - D. Knowledge of performance, positive, terminal
18. What is coefficient of variation?
- A. The ratio of the standard deviation to the mean expressed as a percentage
 - B. The sum of the standard deviation and the mean
 - C. The ratio of the mean to the standard deviation expressed as a percentage
 - D. The sum of the standard deviation subtracted from the mean

19. Which terms apply to the use of the multistage fitness test to evaluate the muscular power of a 100 m swimmer?
- A. Reliable and valid
 - B. Not reliable and not valid
 - C. Not reliable but valid
 - D. Reliable and not valid
20. Why would an athlete work at different heart rate training zones rather than a maximum heart rate zone?
- A. To avoid overreaching
 - B. To increase the number of fast-twitch fibres
 - C. To target specific training adaptations
 - D. To reduce excess post-exercise oxygen consumption (EPOC)
21. On the diagram of the skin, what structure is labelled X?



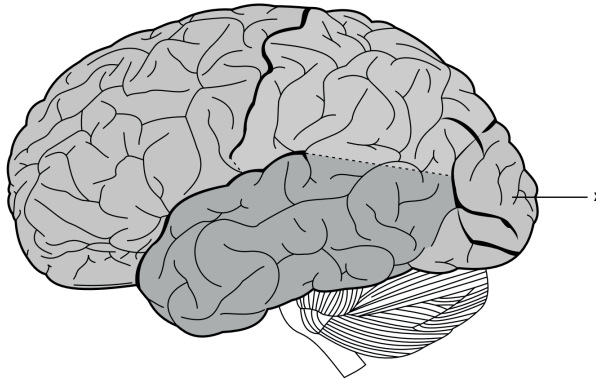
[Source: udaix / Bigstock.com]

- A. Fat
- B. Glands
- C. Epidermis
- D. Dermis

22. Which are the functions of the skin?

- I. Temperature regulation
 - II. Excretion
 - III. Synthesis of vitamin D
- A. I only
- B. I and II only
- C. II and III only
- D. I, II and III

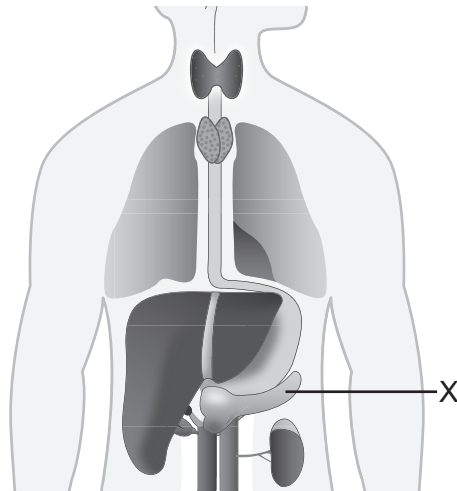
23. On the diagram of the brain, which lobe is labelled X?



[Source: adapted from Henry Gray, Anatomy of the Human Body, 20th edition (Philadelphia and New York: Lea and Febiger), 1918.]

- A. Frontal
- B. Occipital
- C. Temporal
- D. Limbic
24. What is the principal source of energy for the brain?
- A. Aerobic glycolysis
- B. Anaerobic glycolysis
- C. Aerobic lipolysis
- D. Creatine phosphate

25. What is the endocrine organ labelled X in the diagram?



[Source: By ttsz/iStock Photos]

- A. Pineal gland
 - B. Hypothalamus
 - C. Pancreas
 - D. Thyroid gland
26. How do local hormones differ from circulating hormones?
- A. They are secreted by endocrine glands
 - B. They regulate a range of bodily functions
 - C. They do not enter the blood stream
 - D. They bind to specific receptors
27. A soccer player misjudges a pass and has an impaired reaction time. What type of fatigue is this?
- A. Central
 - B. Chronic
 - C. Peripheral
 - D. Local

28. How is high intensity activity characterized?

	Duration	Peak force	Fuel
A.	Short	Low	Carbohydrate
B.	Long	High	Glucose
C.	Long	Low	Fats
D.	Short	High	Creatine phosphate

29. What is friction?

- I. A force that acts parallel to two surfaces in contact
- II. A force that opposes relative motion
- III. A force that acts through the centre of mass

- A. I only
- B. I and II only
- C. II and III only
- D. I, II and III

30. In canoeing, why is it easier to maintain a constant speed than begin movement from a stationary position?

- A. Water density changes with movement
- B. Coefficient of static friction is greater than dynamic friction
- C. Coefficient of dynamic friction is greater than static friction
- D. Friction is increased between the water and the canoe as it moves

31. What is the relevant force acting on the athlete identified as X in the diagram?



[Source: © International Baccalaureate Organization 2019]

- A. Ground reaction force
- B. Air resistance
- C. Friction
- D. Body weight
32. An athlete and coach work together to solve a problem with a given set of constraints. Which type of pedagogy is this?
- A. Linear
- B. Traditional
- C. Non-linear
- D. Non-traditional
33. What are some of the advantages of using the “Dartfish” program?
- A. It provides a rating of perceived exertion.
- B. It provides immediate on-field feedback directly to athlete.
- C. It quantifies performance in a consistent and reliable manner.
- D. It is used to determine the mental state of the athlete.

34. The following notational analysis data was collected from the French Tennis Open where Serena Williams played Maria Sharapova. How can it be used to improve performance?

	Williams	Sharapova
Aces	10	2
1st serve percentage	69	55
Fastest serve / kmph	200	183
Clear winning shots	29	10
Unforced errors	21	17
Match duration	1 hour, 45 minutes	

- A. Tactical evaluation, technical evaluation, mental relaxation prior to game
- B. Analysis of movement, mental relaxation prior to game, tactical evaluation
- C. Analysis of movement, development of databases, treatment of injuries
- D. Tactical evaluation, technical evaluation, analysis of movement
35. Which principles form a phase analysis model?
- A. Preparation, retraction, force, specific performance
- B. Preparation, retraction, action, follow through
- C. Speed, action, follow through, coordination
- D. Speed, force, coordination, performance
36. What percentage of a girl's DNA would be inherited from her grandfather?
- A. 0%
- B. 25%
- C. 50%
- D. 100%

- 37.** Identical twins, Carlos and Juan, have been undertaking the same aerobic training programme for four months. Carlos lives at sea level, Juan lives at an elevation of 1600 m. A blood test showed that Carlos had significantly lower levels of hemoglobin than Juan. What caused this difference?
- A. Juan was more motivated than Carlos due to extrinsic feedback
 - B. Developmentally Carlos has inferior genetic makeup to Juan
 - C. Juan genetically has more fast-twitch fibres than Carlos
 - D. Environmental conditions have triggered greater gene expression in Juan than Carlos
- 38.** What is the function of the immune system?
- A. Carries oxygenated blood
 - B. Regulates growth of the body
 - C. Protects the body from disease
 - D. Body thermoregulation
- 39.** Which adaptive mechanism is used in response to pathogens in the body?
- A. Increased antibody production
 - B. Decreased resting heart rate
 - C. Decreased body temperature
 - D. Increased blood pH
- 40.** How can athletes minimize their risk of infection?
- A. Maintain hydration levels, maintain high levels of cortisol
 - B. Reduce recovery time between training sessions, maintain oral hygiene
 - C. Ensure sufficient sleep, maintain high levels of adrenaline
 - D. Maintain varied diet, avoid contact with people with infections
-