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**Sports, exercise and health science**  
**Higher level**  
**Paper 1**

Tuesday 5 November 2019 (afternoon)

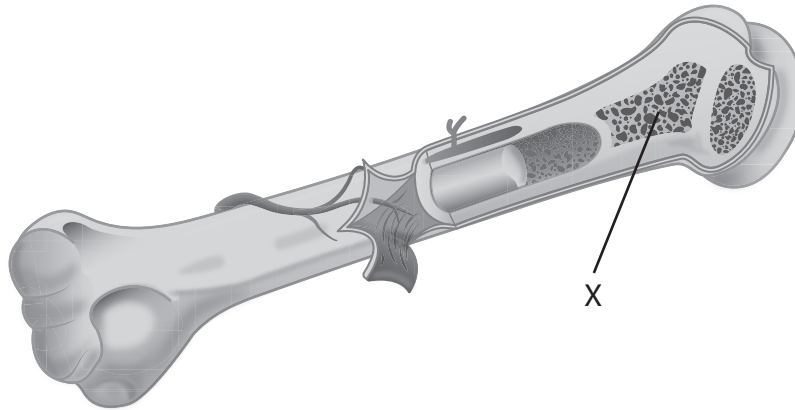
1 hour

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**Instructions to candidates**

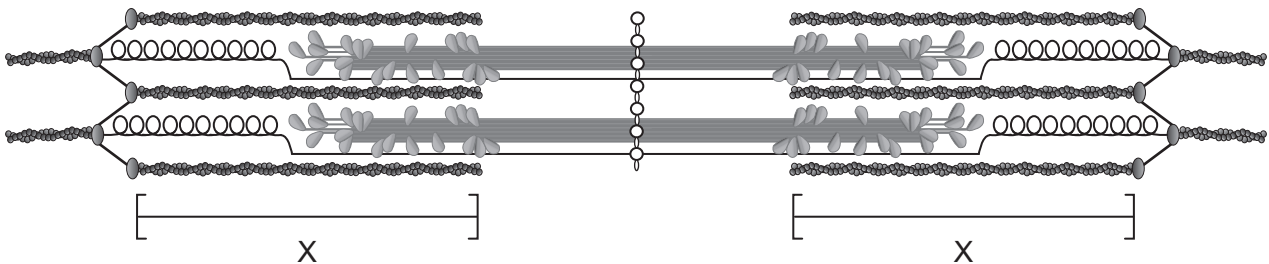
- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The maximum mark for this examination paper is **[40 marks]**.

1. The diagram below shows a long bone. What is the structure labelled X?



[Source: reprinted from *The Lancet, Diabetes & Endocrinology*, Vol. 2, no 5, M.G. Vervloet *et al.*, Bone: a new endocrine organ at the heart of chronic kidney disease and mineral and bone disorders, Pages 427–436, Copyright 2014, with permission from Elsevier. <https://www.thelancet.com/journals/landia/home> ]

- A. Compact bone
  - B. Spongy bone
  - C. Diaphysis
  - D. Cartilage
2. The diagram shows a sarcomere. What are the structures labelled X?



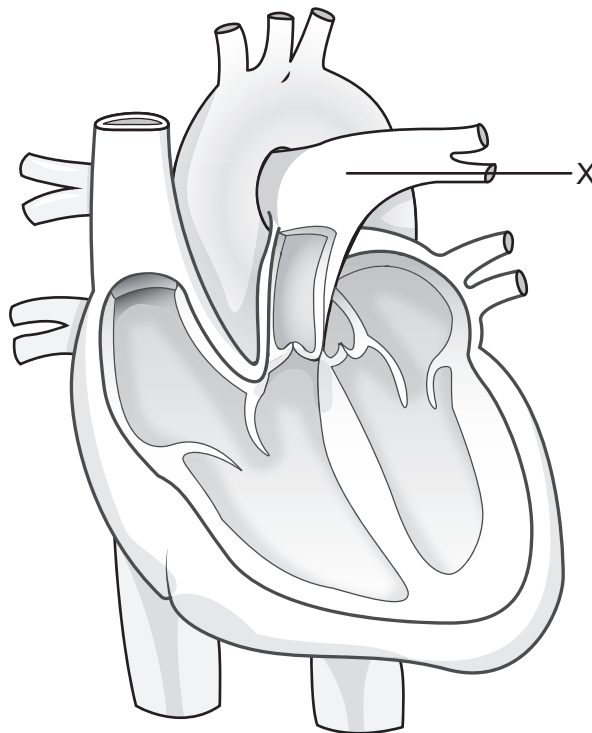
[Source: used with permission of Wiley & Sons – Books, adapted from *Principles of anatomy and physiology*, by Tortora, Gerard J., Grabowski, Sandra Reynolds, 2003, permission conveyed through Copyright Clearance Center, Inc.]

- A. Myofibril
- B. Endomysium
- C. Actin
- D. Myosin

3. What is the action of the diaphragm and the alveolar pressure relative to the atmospheric pressure that cause exhalation?

	Action of the diaphragm	Alveolar pressure relative to atmospheric pressure
A.	Contracts	Higher
B.	Relaxes	Higher
C.	Contracts	Lower
D.	Relaxes	Lower

4. The diagram shows an anterior view of the heart. Which blood vessel is labelled X?



[Source: adapted from Heart diagram with labels in, ZooFari, [https://en.wikipedia.org/wiki/Cardiology#/media/File:Heart\\_diagram\\_blood\\_flow\\_en.svg](https://en.wikipedia.org/wiki/Cardiology#/media/File:Heart_diagram_blood_flow_en.svg), licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license, <https://creativecommons.org/licenses/by-sa/3.0/legalcode>]

- A. Aorta
- B. Pulmonary artery
- C. Pulmonary vein
- D. Vena cava

5. What describes the effect of exercise on cardiac output?

	<b>Stroke volume</b>	<b>Heart rate</b>
A.	Increases	Increases
B.	Increases	Decreases
C.	Decreases	Increases
D.	Decreases	Decreases

6. How does blood pressure respond during a warm-up?

	<b>Systolic blood pressure</b>	<b>Diastolic blood pressure</b>
A.	Increases	Increases
B.	Remains constant	Remains constant
C.	Remains constant	Increases
D.	Increases	Remains constant

7. What cardiovascular adaptations can result from endurance training?

- A. Increased left ventricular volume and increased capillarization
- B. Decreased left ventricular volume and increased capillarization
- C. Decreased left ventricular volume and decreased arterio-venous oxygen difference
- D. Increased left ventricular volume and decreased arterio-venous oxygen difference

8. Which element distinguishes an amino acid from a fatty acid?

- A. Carbon
- B. Hydrogen
- C. Oxygen
- D. Nitrogen

9. The diagram shows the nutritional information from an energy gel packet. Which nutrient provides the **most** energy per serving?

Nutrition Facts	
Serving size 1 packet (30g)	
Servings per container 1	
Amount per serving	
Total fat	10g
Total carbohydrate	10g
Protein	10g

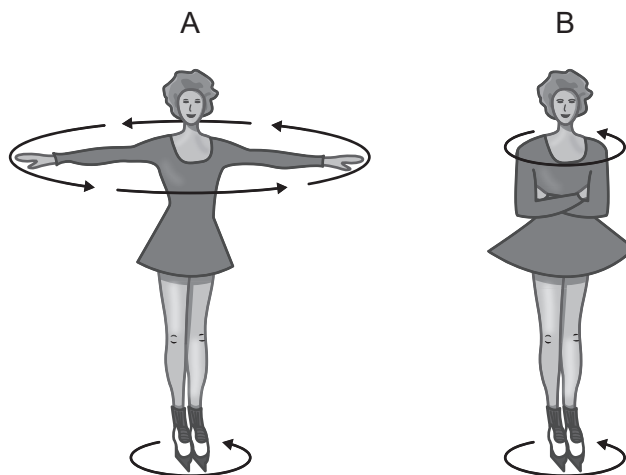
[Source: © International Baccalaureate Organization 2019]

- A. Total fat
- B. Total carbohydrate
- C. Protein
- D. The nutrients provide equal amounts of energy
10. Which outlines lipolysis?
- A. Two glucose molecules combine to form a disaccharide
- B. One glycerol and three fatty acids combine to form a triglyceride
- C. One disaccharide breaks down to form two glucose molecules
- D. One triglyceride breaks down to form glycerol and three fatty acids
11. Which type of athlete receives the majority of their energy during performance through aerobic respiration?
- A. Weightlifter
- B. Gymnast
- C. 100 m swimmer
- D. 1500 m runner

12. What describes the role of acetylcholine in skeletal muscle contraction?

- A. To open an axon's synaptic vesicle
- B. To close an axon's synaptic vesicle
- C. To open a motor-end plate channel
- D. To block a motor-end plate channel

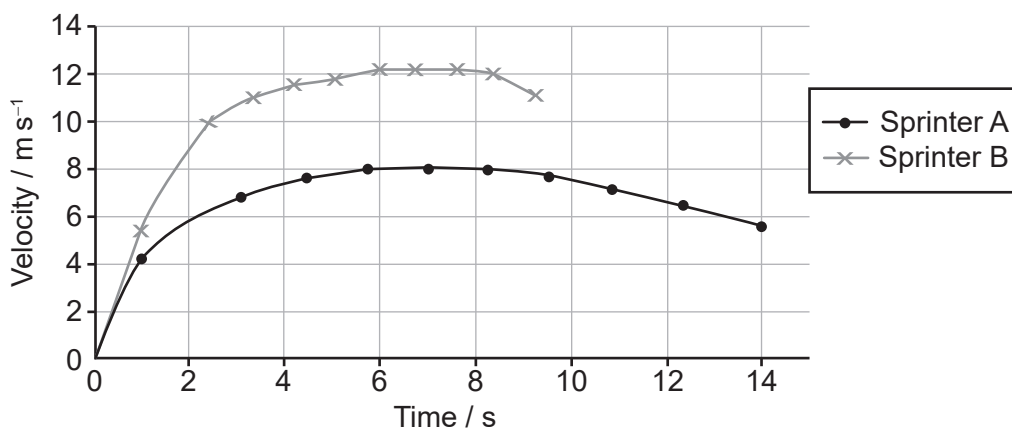
13. The diagram below shows an arm movement. Which type of movement occurs from A to B?



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

- A. Adduction
  - B. Abduction
  - C. Elevation
  - D. Circumduction
14. The mass of a body being balanced in all directions defines which term?
- A. Centre of mass
  - B. Momentum
  - C. Fulcrum
  - D. Moment of inertia

15. The velocity–time graph below shows the performance of two sprinters. Which statement describes the sprinters **at 1 second**?

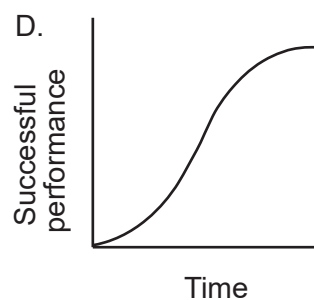
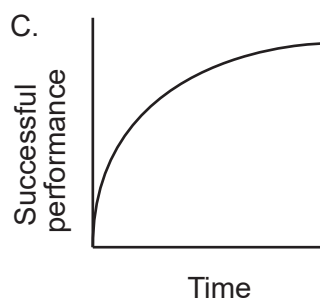
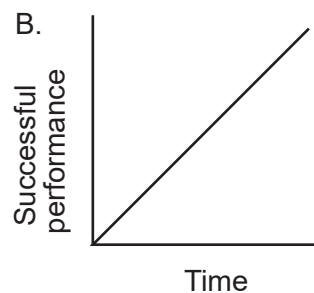
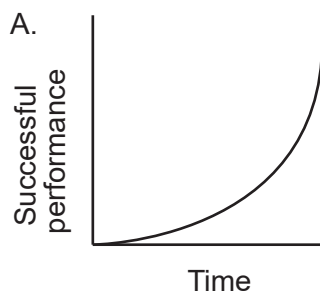


[Source: adapted from [www.liacoseducationalmedia.com](http://www.liacoseducationalmedia.com)]

- A. Sprinter A is moving faster than Sprinter B at 1 second.
- B. Sprinter B is moving faster than Sprinter A at 1 second.
- C. Sprinter A and Sprinter B are moving at the same velocity at 1 second.
- D. Sprinter A and Sprinter B are not moving at 1 second.
16. Which levers have the effort and the load on the same side of the fulcrum?
- I. First class lever
- II. Second class lever
- III. Third class lever
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III



17. An athlete sees a ball and reacts to catch it. Which type of skill is used?
- Cognitive skill
  - Perceptual skill
  - Motor skill
  - Perceptual motor skill
18. Which term is defined as a capacity of the individual that is related to the performance potential of a variety of tasks?
- Skill
  - Ability
  - Technique
  - Learning
19. Which statement characterizes Hick's Law?
- As the number of stimuli increases, the reaction time increases.
  - The response time increases as stimuli are presented in close succession.
  - Reaction time decreases as the number of stimuli presented increases.
  - The time it takes to respond includes the reaction to stimulus and the movement.
20. Which graph shows a negatively accelerated learning curve?



21. Which type of presentation involves the repetitive practice of a single part of a skill?
- A. Whole
  - B. Whole–part–whole
  - C. Progressive part
  - D. Part
22. What describes the difference between the two sets of group data in the table?

	Group 1 data	Group 2 data
<b>Mean</b>	385	402
<b>SD</b>	34.33	25.70
<b><i>p</i></b>	0.32	

[Source: copyright International Baccalaureate Organization, 2019]

	Percent probability that the difference is due to chance	Difference is statistically significant
A.	0.32%	Yes
B.	0.32%	No
C.	32%	Yes
D.	32%	No

23. What makes a fitness test reliable?
- A. It is repeatable.
  - B. It is relevant to a given sport.
  - C. It is inconsistent.
  - D. It measures the factors that it is designed to measure.
24. Which fitness test provides an assessment of muscle endurance?
- A. Hand grip dynamometer
  - B. Maximum push-ups
  - C. Harvard step test
  - D. Standing broad jump

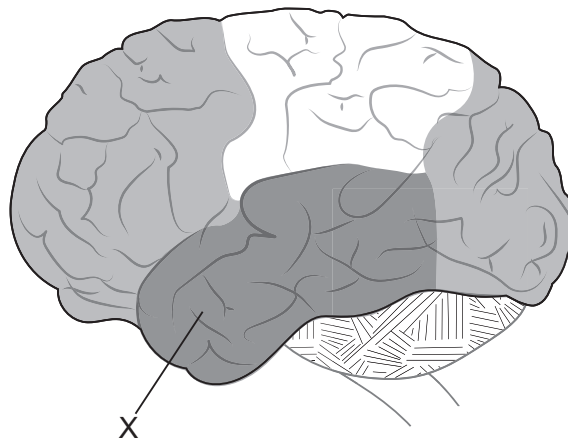
**25.** What monitors exercise intensity?

- A. BodyByte
- B. Body mass index
- C. Karvonen method
- D. Vertical jump test

**26.** Which are functions of the skin?

- I. Thermoregulation
  - II. Protection against infectious disease
  - III. Synthesis of vitamin D
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III

**27.** The diagram shows a left lateral view of the brain. Which lobe is labelled X?



[Source: <https://pixabay.com>]

- A. Frontal
- B. Parietal
- C. Occipital
- D. Temporal

- 28.** Which describes the role of a local hormone?
- A. It travels around the body in the blood to regulate a bodily function.
  - B. It signals a change in target cells from a distant control centre.
  - C. It acts on nearby cells without entering the blood to regulate a bodily function.
  - D. It leaves the body in sweat to stimulate a change in body temperature.
- 29.** Which part of the brain controls the pituitary gland?
- A. Cerebellum
  - B. Hypothalamus
  - C. Brainstem
  - D. Pineal gland
- 30.** Which activity involves high-intensity exercise?
- A. Swimming intervals at 4 x 1 minute
  - B. Running intervals at 4 x 1500 m
  - C. Cycling a 5 km race
  - D. Rowing a 2 km race
- 31.** During training, which athlete could experience central fatigue?
- A. Weightlifter
  - B. Marathon runner
  - C. High jumper
  - D. Diver
- 32.** Which two interfacing surfaces have the lowest coefficient of friction?
- A. Sprinter's cleat (spike) and track
  - B. Basketball player's shoe and court
  - C. Speed skater's blade and ice
  - D. Gymnast's foot and mat

33. Which force is represented by the arrow in the free-body diagram?



[Source: © International Baccalaureate Organization 2019]

- A. Body weight
  - B. Ground reaction
  - C. Air resistance
  - D. Friction
34. What is an example of an **athlete** constraint during motor learning?
- A. A swimmer practises strokes without kicking.
  - B. A soccer player trains indoors.
  - C. A dancer chooses the music for their routine.
  - D. A tennis player uses a short-handled racket.
35. What are the applications of notation in sporting contexts?
- I. Tactical and technical evaluation
  - II. Movement analysis
  - III. Model development
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III

36. What are strengths of using information technologies to analyse performance?

- I. Athletes can visualize and compare data in detail.
- II. Information technologies are easily accessed in all regions.
- III. Accurate data can be collected for a wide range of timescales.

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

37. Which human characteristic is influenced by the environment?

- A. Eye colour
- B. Blood type
- C. Gender
- D.  $\text{VO}_2\text{max}$

38. Which is an example of a genetic factor on performance in sports?

- A. An athlete's training programme
- B. An athlete's diet
- C. An athlete's anaerobic threshold
- D. An athlete's heart rate monitor

39. Which is an example of an **adaptive** immune response?

- A. Lowered pH of bodily fluids
- B. Increased mucosal secretions
- C. Presence of skin
- D. Increased inflammation

- 40.** Which training intensity most likely reduces the risk of infection in highly trained athletes?
- A. Low intensity
  - B. Moderate intensity
  - C. High intensity
  - D. There is no relationship between training intensity and risk of infection
-