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**Sports, exercise and health science**  
**Standard level**  
**Paper 2**

Wednesday 3 November 2021 (morning)

Candidate session number

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1 hour 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 one question.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[50 marks]**.



### Section A

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

1. A study investigated the effect of three different sports on force–time variables during a vertical jump performed by elite athletes. The variables measured were time during the eccentric phase (when the quadriceps lengthen to prepare for the jump), total jump time (eccentric and concentric phases), eccentric rate of force development, and jump height.

**Table 1: Mean and standard deviation (SD) for the force–time variable data**

	<b>Eccentric time (ms)</b>	<b>Total jump time (ms)</b>	<b>Eccentric rate of force development (kN s<sup>-1</sup>)</b>	<b>Jump height (cm)</b>
<b>Basketball</b>	260 (7)	494 (9)	3.37 (0.12)	46.8 (12.7)
<b>Football</b>	199 (5)	485 (10)	4.53 (0.16)	50.1 (15.9)
<b>Baseball</b>	241 (8)	495 (2)	5.41 (0.10)	45.7 (11.8)

- (a) Identify the sport with the greatest mean jump height. [1]

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- (b) Calculate the difference between mean eccentric rate of force development for baseball and basketball. [2]

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



**(Question 1 continued)**

(c) Using the data from Table 1, analyse the differences in force–time variables for basketball, football and baseball players.

[3]

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(d) Identify the sport with the smallest standard deviation for eccentric rate of force development.

[1]

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(e) Comment on the meaning of the standard deviation with reference to Table 1.

[3]

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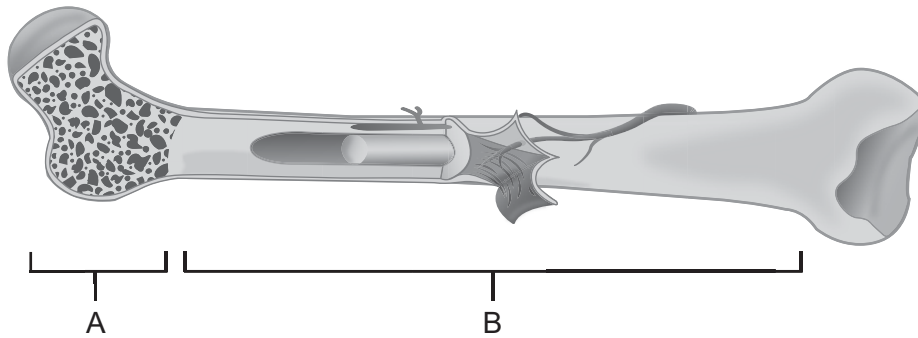
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2. The diagram shows a long bone.



(a) Label structures **A** and **B** in the diagram.

[2]

A: .....

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B: .....

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(b) (i) State the location of the femur in relation to the tibia using anatomical terminology.

[1]

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(ii) State the location of the sternum in relation to the vertebral column using anatomical terminology.

[1]

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**(Question 2 continued)**

(c) Outline **three** functions of cartilage.

[3]

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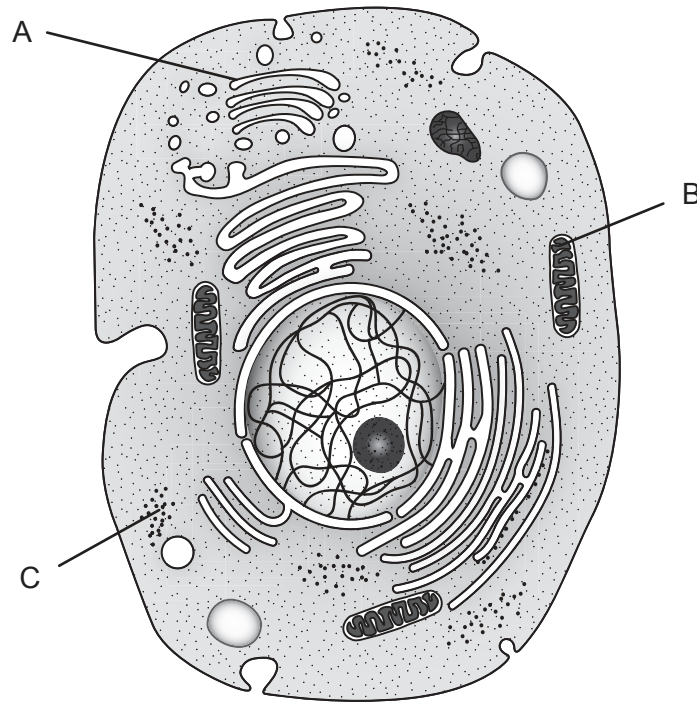
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16EP05

Turn over

3. The diagram represents the ultrastructure of a generalized animal cell.



(a) Annotate structures **A**, **B** and **C** in the diagram.

[3]

	Name	Annotation
<b>A</b>	..... ..... .....	..... ..... .....
<b>B</b>	..... ..... .....	..... ..... .....
<b>C</b>	..... ..... .....	..... ..... .....

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**(Question 3 continued)**

(b) Explain cardiovascular drift and the relevance of hydration during a 50km walk.

[4]

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16EP07

Turn over



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Answers written on this page  
will not be marked.



16EP08

4. (a) Discuss the variability of maximal oxygen consumption relative to age for trained and untrained individuals.

[4]

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- (b) Outline how maximal oxygen consumption differs between running and arm ergometry.

[2]

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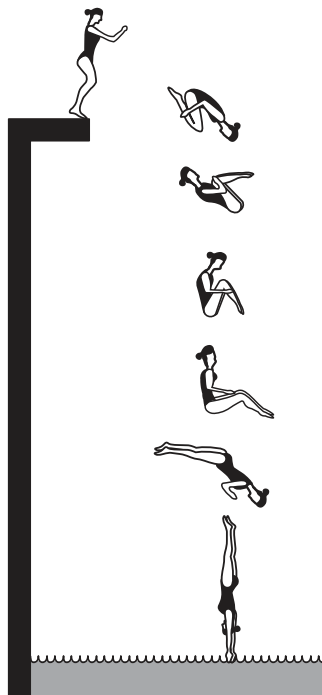
16EP09

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### Section B

Answer **one** question. Answers must be written within the answer boxes provided.

- 5. (a) Using examples, describe **two** different types of practice. [4]
  - (b) Periodization can be used to optimize an athlete's performance. Explain how a coach uses the **other** key principles of training to maximize athletic development. [5]
  - (c) Analyse the process of gaseous exchange at the alveoli during exercise. [5]
  - (d) Using examples, outline the features of a skilled performer. [6]
- 
- 6. (a) Describe the regulation of heart rate. [4]
  - (b) Analyse oxygen deficit. [5]
  - (c) Explain the differences in dietary recommendations for a runner during marathon training and a sedentary individual both with healthy body mass index (BMI). [5]
  - (d) The diagram shows a person performing a somersault dive from a 10 m platform.



Outline how they use the law of conservation of angular momentum to perform a somersault dive.

[6]



16EP10

7. (a) Carbohydrates are important for muscular contraction during hill walking. Describe the role of insulin on glucose uptake when walking. [4]
- (b) Discuss the structural differences between slow twitch and fast twitch muscle fibre types. [6]
- (c) Analyse how research design and statistical analysis aid the validity of studies conducted by sports scientists. [4]
- (d) Motor skills are classified into various continua. Using examples, outline the motor skills along the interaction continuum. [6]



16EP11

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16EP12

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16EP13

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16EP14

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16EP15



#### References:

1. Laffaye, G., et al., 2014. Countermovement jump height: gender and sport-specific differences in the force-time variables. *Journal of Strength and Conditioning Research*, 28(4), pp. 1096–1105. Source adapted.
2. OpenStax College – Anatomy & Physiology, Connexions Web site. <http://cnx.org/content/col11496/1.6/>, Jun 19, 2013. Attribution 3.0 Unported (CC BY 3.0) <https://creativecommons.org/licenses/by/3.0/>.

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16EP16