

Sports, exercise and health science
Higher level
Paper 2

Tuesday 30 October 2018 (afternoon)

Candidate session number

2 hours 15 minutes

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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]**.

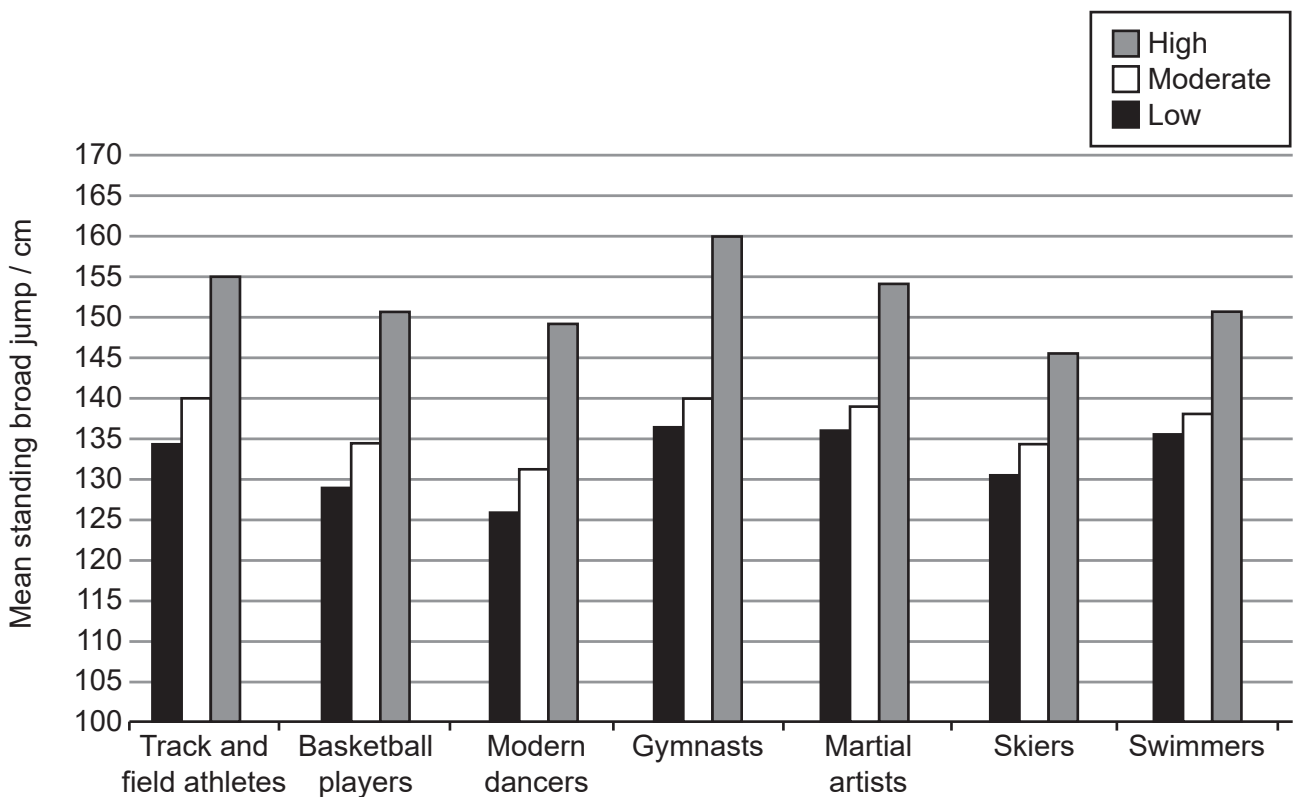


Section A

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

1. A study examined physical fitness levels of 10-year-old children who regularly participate in sports. The 900 participants were divided evenly between three groups according to their training level:
- Low: training less than 1 hour per week
 - Moderate: training between 1 and 5 hours per week
 - High: training more than 5 hours per week.

Each participant performed the standing broad jump fitness test. The mean results are shown in the graph.



[Source: © International Baccalaureate Organization 2018]

- (a) (i) Identify the training level and sport for the group that has the highest mean score on the standing broad jump fitness test.

[1]

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(Question 1 continued)

- (ii) Calculate the difference of mean standing broad jump fitness test score between moderate and high training levels for the group stated in 1(a)(i). [2]

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- (iii) Using the data, deduce the effect of high level of participation in sport on performance in the standing broad jump test. [2]

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- (iv) A two-tailed, unpaired *t*-test was conducted on the data. The calculations yielded the following results:

- comparing low and moderate training level yielded $p > 0.05$
- comparing moderate and high training level yielded $p < 0.05$
- comparing low and high training level yielded $p < 0.01$.

Comment on the meaning of the results from the *t*-test. [3]

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(Question 1 continued)

- (b) (i) State an alternative test (other than standing broad jump) for measuring leg power. [1]

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- (ii) Outline the procedure for measuring leg power in the test stated in 1(b)(i). [3]

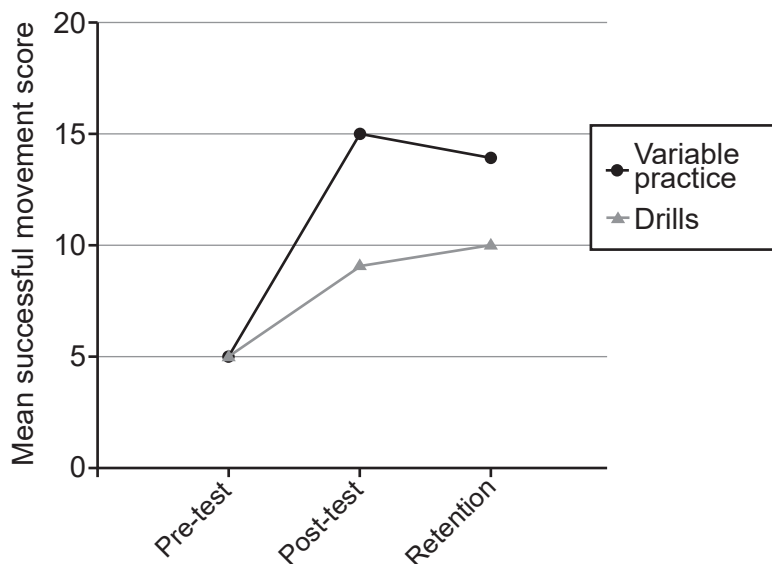
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2. A study investigated teaching that supports individual differences in skill learning. Two groups of 10-year-old participants were taught for four weeks using the following techniques:

- Variable practice (non-linear pedagogy)
- Drills (traditional pedagogy).

Participant movement was recorded by digital video and scored against criteria. The graph shows the mean score of successful movements during the pre-test performance (day 1), post-test performance (4 weeks), and retention testing (10 weeks).



[Source: Lee MCY, Chow JY, Komar J, Tan CWK, Button C (2014) Nonlinear Pedagogy: An Effective Approach to Cater for Individual Differences in Learning a Sports Skill. *PLoS ONE* 9(8): e104744. <https://doi.org/10.1371/journal.pone.0104744>. Licenced under a Creative Commons International 4.0 licence, <https://creativecommons.org/licenses/by/4.0.>]

(a) Identify the highest mean movement score for retention testing. [1]

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(b) Calculate the change between the pre-test and post-test mean movement scores for the variable practice participants. [2]

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(Question 2 continued)

(c) Suggest reasons for the trends shown in the graph.

[3]

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3. (a) State the general characteristic common to muscle tissue that allows the muscle to stretch and return to its original resting length.

[1]

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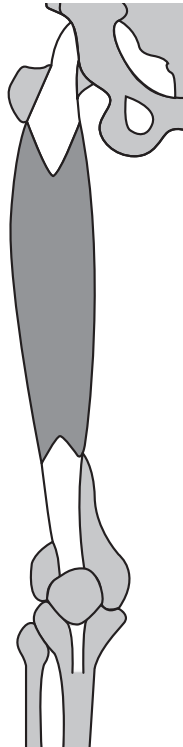
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(Question 3 continued)

(b) (i) Identify the origin and insertion for the rectus femoris.

[2]



[Source: Copyright 2003-2004 University of Washington, Seattle, Washington, U.S.A. All rights reserved including all photographs and images. No re-use, re-distribution or commercial use without prior written permission of the authors and the University of Washington. Musculoskeletal images are from the University of Washington 'Musculoskeletal Atlas: A Musculoskeletal Atlas of the Human Body' by Carol Teitz, M.D. and Dan Graney, Ph.D.]

Origin:

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Insertion:

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(ii) Describe the functions of ligaments and tendons in a joint such as the knee joint.

[2]

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(Question 3 continued)

(c) Distinguish between maximal oxygen consumption during cycling and arm ergometry. [1]

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(d) Describe the process of oxygen exchange between the lungs and pulmonary capillaries at rest. [4]

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(e) (i) Outline the characteristics of hormones. [2]

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(ii) Describe how circulating hormone levels are regulated. [2]

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4. (a) Explain how acetylcholine (ACh) initiates skeletal muscle contraction. [2]

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(b) Analyse how capillary and mitochondrial densities affect slow twitch (type I) muscle fibres. [2]

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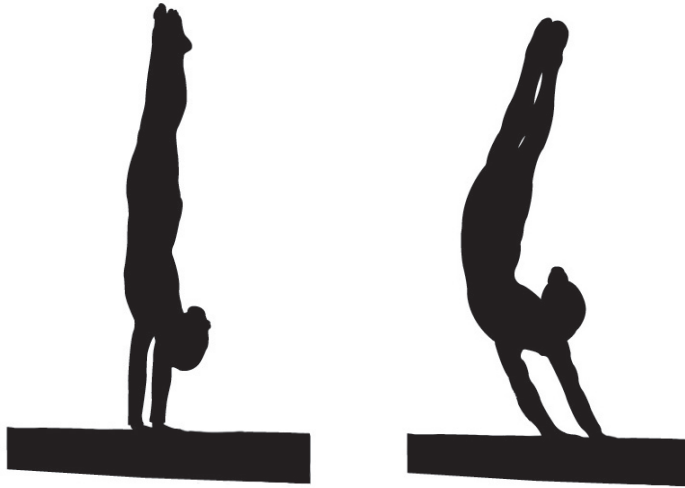
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(Question 4 continued)

- (c) Diagram A, shows a gymnast balanced on a beam. In Diagram B, she is about to fall. Explain how a fall can be avoided by moving the body and therefore the centre of mass. [3]



[Source: © Ranko Bojanovic/123RF.COM]

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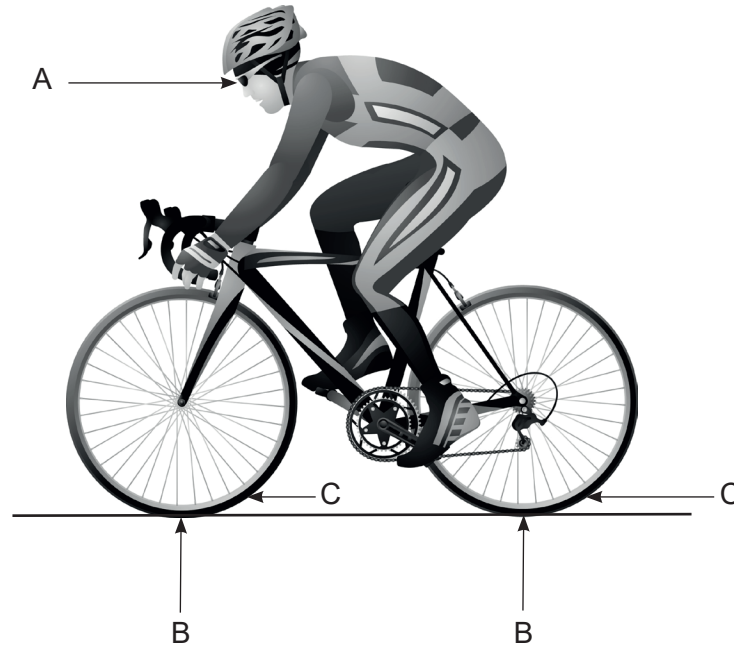
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(Question 4 continued)

(d) The diagram shows a cyclist.



[Source: elmm/Vector Images/Shutterstock]

Label the **three** forces: A, B, and C.

[2]

A:
B:
C:

(e) Outline how wave drag can be reduced for a swimmer.

[2]

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5. (a) List the functions of the cerebrum. [2]

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(b) Evaluate the implications of genetic screening for sports, exercise and health. [5]

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Section B

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

6. (a) Describe the need for glucose and oxygen by the brain. [3]
- (b) Using an example, describe how selective attention prevents information overload. [3]
- (c) (i) Define *motor programme*. [1]
- (ii) Apply the concept of motor programme to improving performance of a gymnastics routine. [2]
- (d) Explain how genetic and environmental factors contribute to improved performance in long distance runners. [5]
- (e) Discuss how the **three** energy systems contribute to ATP production during an 800-metre run. [6]
7. (a) Describe how cardiovascular drift takes place. [3]
- (b) Identify the location and function of the pituitary gland. [3]
- (c) Outline the chemical control of ventilation during exercise. [3]
- (d) Explain physiological causes of peripheral fatigue in long distance running. [5]
- (e) Explain excess post-exercise oxygen consumption (EPOC) during recovery. [6]
8. (a) Outline characteristics of performance outcome model of qualitative biomechanical analysis for an individual sports technique. [3]
- (b) Distinguish between the movement permitted in different types of joints. [3]
- (c) (i) Define *delayed onset muscle soreness* (DOMS). [1]
- (ii) Outline components of a resistance training session in order to reduce DOMS. [2]
- (d) Analyse factors that decrease drag for a road cyclist. [5]
- (e) Explain sliding filament theory after acetylcholine (ACh) increases muscle membrane permeability. [6]



9. (a) Describe the path taken by blood from the right ventricle to the left ventricle. [3]
- (b) Distinguish how cardiac output, stroke volume and resting heart rate would differ between trained and untrained women during exercise. [3]
- (c) Draw a flowchart with features that can be used for match analysis in a team invasion game of choice. [3]
- (d) Discuss how exercise affects susceptibility to infectious disease in a highly-trained athlete. [5]
- (e) Using examples from team sports, evaluate the concept of the psychological refractory period (PRP). [6]



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