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M19/4/SPEXS/HP2/ENG/TZ0/XX

Sports, exercise and health science
Higher level
Paper 2

Friday 17 May 2019 (afternoon)

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]**.

20 pages

2219 – 6602

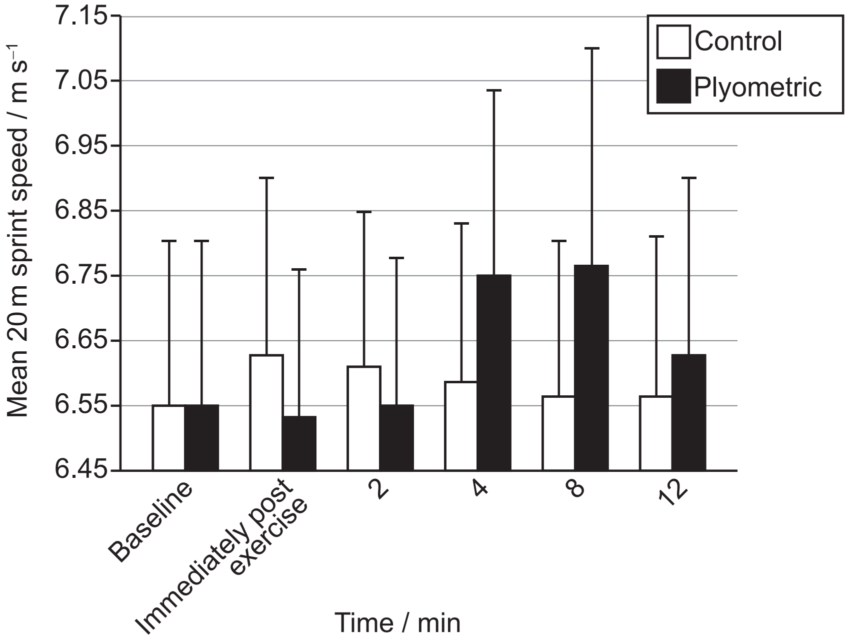
Section A

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

1. A study investigated the effect of plyometric exercise on sprint speed. (Plyometric exercise involves rapid and repeated stretching and contracting of the muscles.) The mean speed of each participant was measured during a 20 m sprint as a baseline and then in a further five 20 m sprints. During the first 75 seconds of the interval between sprints the participants carried out one of the following activities:

- Plyometric: three sets of alternate leg bounds (running-like movement, jumping from one leg to the other consecutively)
- Control: continuous walking.

The graph shows the mean sprint speed and positive standard deviation value for both conditions.



[Source: Anthony Turner *et al.*, Postactivation Potentiation of Sprint Acceleration Performance Using Plyometric Exercise, *Journal of Strength and Conditioning Research* **29** (2), pp. 343–50, https://journals.lww.com/nsca-jscr/fulltext/2015/02000/Postactivation_Potentiation_of_Sprint_Acceleration.9.aspx; National Strength and Conditioning Association]

A paired *t*-test was conducted to compare mean sprint speed at 4 minutes with mean sprint speed at baseline. The results were:

- Plyometric condition: $p < 0.05$
- Control condition: $p > 0.05$

(This question continues on the following page)

(Question 1 continued)

(a) Identify the time and condition with the highest mean sprint speed. [1]

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(b) Calculate the difference in mean sprint speed, in m s^{-1}, between baseline and at 4 minutes for the plyometric condition. [2]

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(c) Using the data, discuss the hypothesis that plyometric exercise can improve sprint performance. [2]

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(d) Explain the reason for using a control condition in this study design. [2]

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(e) Comment on the meaning of the results from the *t*-test. [2]

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2. (a) State **one** component transported by blood. [1]

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(b) Explain how cardiac output is maintained during prolonged exercise. [3]

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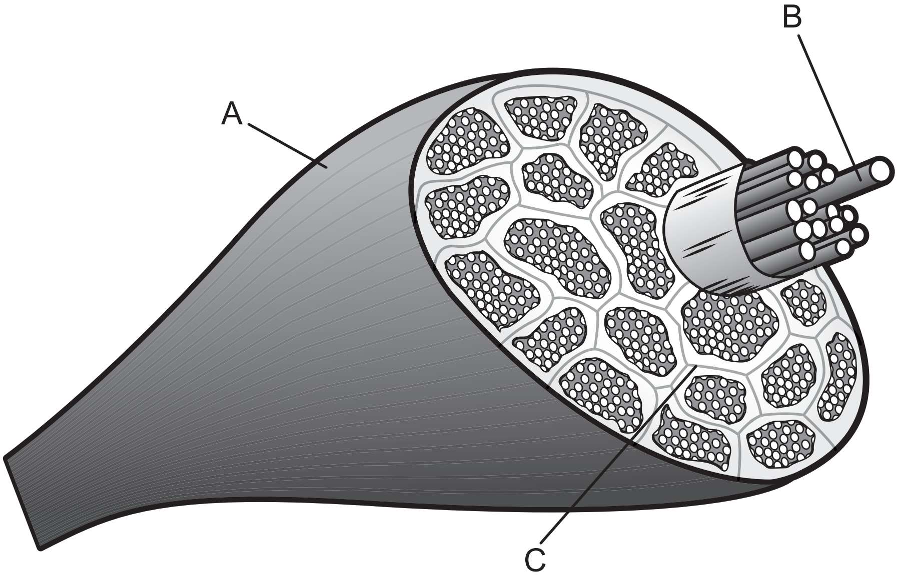
3. The diagram shows a skeletal muscle.



[Source: adapted from sportsinjuryclinic.net]

(a) Identify the structures A, B and C in the diagram. [3]

A: . . . .

B: . . . .

C: . . . .

(b) Define the term *origin* of a muscle. [1]

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(This question continues on the following page)

(Question 3 continued)

(c) Using an example of each, distinguish between isotonic and isometric muscle contractions. [3]

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(d) Using anatomical terminology, state the location of:

(i) The tibia relative to the femur. [1]

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(ii) The fibula relative to the tibia. [1]

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(iii) The patella relative to the tibia. [1]

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4. (a) Define *systolic blood pressure*. [1]

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(b) Predict the effect of a 100 m sprint on a runner's systolic and diastolic blood pressure. [2]

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(c) Explain the redistribution of blood during exercise. [3]

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5. (a) Identify **two** components of health-related fitness. [2]

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(b) Evaluate body mass index as a measure of healthy body composition. [3]

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(c) Discuss the potential benefits of genetic screening in sports, exercise and health. [3]

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6. (a) Define *drag force*. [1]

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(b) The diagram shows a hockey player dribbling.

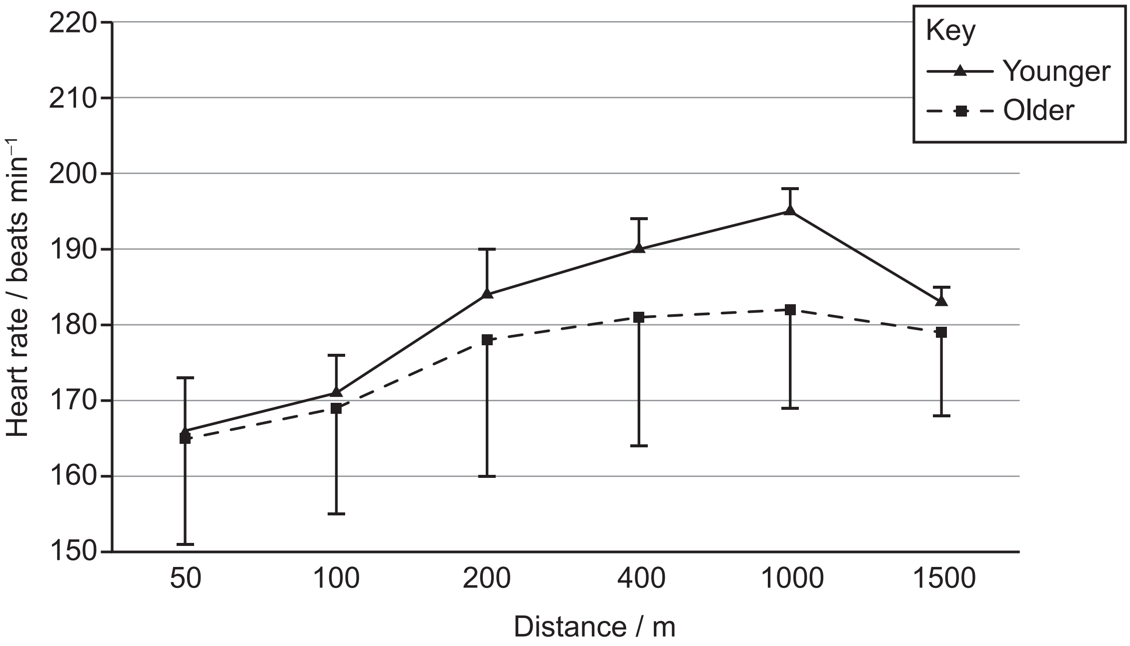
[Source: Oldok2 | Dreamstime.com]

Identify the forces A and B in the diagram. [2]

A: . . . .

B: . . . .

7. The heart rate data is from a study of younger swimmers (aged 14–16 years) and older swimmers (aged 35–40 years) during a 1500 m swim.



[Source: © International Baccalaureate Organization 2019]

Explain the lower increase of heart rate in older swimmers. [3]

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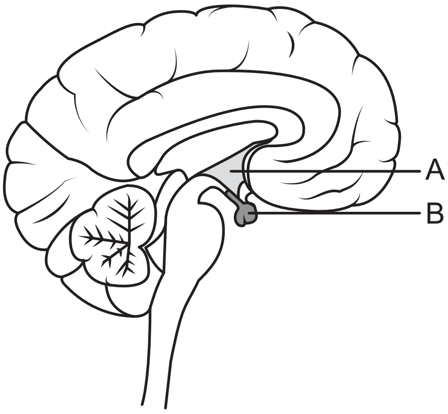
8. The diagram shows a cross section through a human brain.



[Source: from the MSD Manual Consumer Version (Known as the Merck Manual in the US and Canada and the MSD Manual in the rest of the world), edited by Robert Porter. Copyright 2019 by Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Kenilworth, NJ. Available at http://www.msdmanuals.com/home. Accessed 5 July 2019.]

(a) Identify the structures A and B in the diagram. [2]

A: . . . .

B: . . . .

(b) List **two** functions of the frontal lobe of the brain. [2]

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(c) Outline **three** different types of exteroceptor sensory inputs for a football player during a game. [3]

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Section B

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

9. (a) Discuss the role of hormones on glucose uptake during exercise. [4]

(b) Using an example, discuss the effect of experience and memory on selective attention. [6]

(c) Using an example, describe the phases of learning a skill. [6]

(d) Apply a phase analysis model to a sporting technique. [4]

10. (a) Explain how anaerobic energy systems could contribute to ATP production during a 3-minute round of boxing. [6]

(b) Describe long-term vascular adaptations to endurance training. [4]

(c) Describe the process of energy production and supply to brain cells. [4]

(d) Using examples, suggest ways a coach could manipulate task constraints in training. [6]

11. (a) Describe the influence of genes in forming human characteristics. [5]

(b) Discuss the relationship between exercise and susceptibility to infection. [5]

(c) Explain the process of gaseous exchange at the alveoli. [4]

(d) Explain the regulation of adrenaline and insulin levels in the body. [6]

12. (a) Apply Newton’s second law of motion to the distance travelled by a golf ball after being struck. [4]

(b) Outline how the Bernoulli principle affects a golf ball in flight. [5]

(c) Outline different types of drag and ways they can be reduced in swimming. [6]

(d) Discuss reasons for recovery following a soccer game. [5]