Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Standard level
Paper 2

Tuesday 4 May 2021 (morning)

Candidate session number

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]**.

2221 – 6605

15 pages

Section A

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

1. A study investigated the magnitude of the impact force, in Newtons (N), at the shoulder during tackling in 35 experienced rugby union players. The researchers looked at the effect of the following variables on the impact force at the shoulder:

- Condition 1: Shoulder pads (with and without)
- Condition 2: Shoulder (dominant versus non-dominant)
- Condition 3: Setting (in a laboratory versus on a rugby field)

Table 1 shows the mean maximum impact force in Newtons (and standard deviation) for Conditions 1 and 2.

		Condition 1	
		With shoulder pads	**Without shoulder pads**
Condition 2	**Dominant shoulder**	1697 (558) N	1719 (510) N
	Non-dominant shoulder	1573 (560) N	1648 (460) N

(a) (i) Identify which shoulder has the greatest mean impact force. [1]

. . . . . .

. . . . . .

(This question continues on the following page)

(Question 1 continued)

(ii) Calculate the difference, in Newtons, between mean maximum impact force for dominant and non-dominant shoulders for players wearing pads. [2]

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(iii) Using the data, discuss the hypothesis that wearing padding could reduce the incidence of injuries to the tackler in rugby union. [2]

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Table 2 shows the mean maximum impact force for trials conducted in the laboratory and on the field (Condition 3).

	Condition 3	
	Laboratory	**Field**
Force (N)	1717	1997

(b) Suggest reasons for the lower impact forces recorded in the laboratory setting. [2]

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(This question continues on the following page)

(Question 1 continued)

(c) Evaluate field and laboratory testing for human performance. [4]

. . . . . .

. . . . . .

. . . . . .

. . . . . .

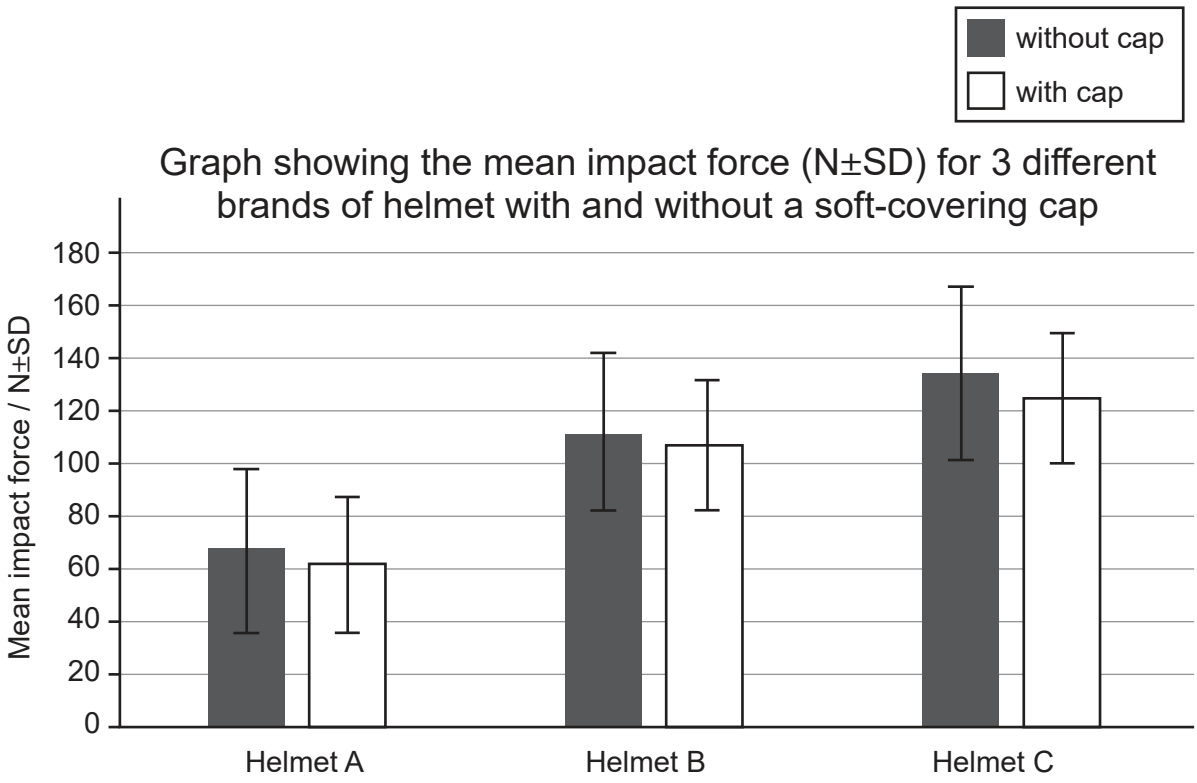
. . . . . .

. . . . . .

. . . . . .

. . . . . .

The possibility of brain injuries is a concern in certain sports. A recent study tested the effect on the impact force (N) of adding a soft-covering cap to a helmet when dropped from a set height. The graph shows the results for three different brands of helmet, A, B, and C.



Helmet A–B: $p > 0.05$

Helmet A–C: $p > 0.05$

Helmet B–C: $p > 0.05$

(This question continues on the following page)

(Question 1 continued)

(d) Identify the brand of helmet that demonstrated the lowest mean impact force. [1]

. . . . . .

. . . . . .

(e) Deduce the effect of having a soft-covering cap on the impact force of the different helmets. [2]

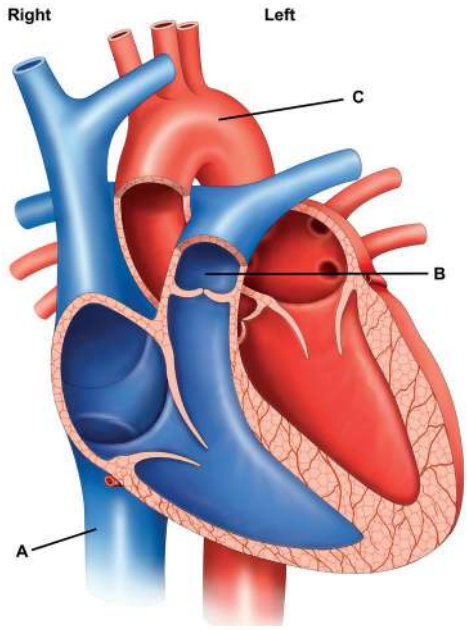
. . . . . .

. . . . . .

. . . . . .

. . . . . .

2. The diagram shows the heart.



(a) State the blood vessels A, B and C in the diagram. [3]

A: . . . . . .

B: . . . . . .

C: . . . . . .

(b) Distinguish between the pulmonary and systemic circulatory systems. [2]

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(c) Explain the changes in blood distribution that occur during an endurance training run. [3]

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

3. (a) Outline the functions of protein. [2]

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(b) (i) Describe essential amino acids. [1]

. . . . . .
. . . . . .

(ii) Identify a source of essential amino acids. [1]

. . . . . .
. . . . . .

4. (a) Using a sporting example, outline a closed skill. [2]

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(b) Discuss a sporting example of an externally-paced skill. [2]

. . . . . .
. . . . . .
. . . . . .
. . . . . .

Section B

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

5. (a) A company has developed a drink to improve the performance of athletes during endurance events, such as the *Tour de France* cycling race.
Describe **four** study design features which could be used in an experiment to test if the sports drink is beneficial to endurance performance. [4]

(b) Discuss how you would use the key principles of training to help you prepare for a long-distance cycle race. [6]

(c) Outline **six** cardiovascular changes that would be expected as a result of an endurance cycling training programme. [6]

(d) Explain the physiological changes which contribute to a person experiencing cardiovascular drift during an endurance event such as the *Tour de France*. [4]

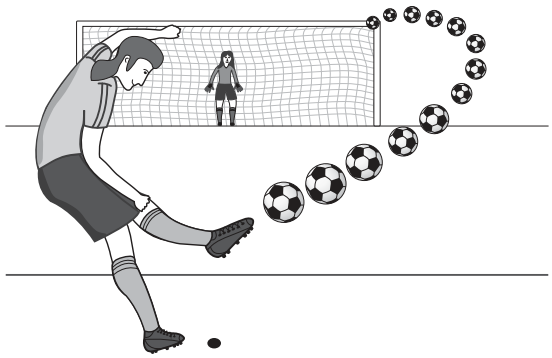
6. (a) Explain the phenomena of oxygen deficit and oxygen debt for an individual hiking 20 km in mountains. [6]

(b) During the 20 km hike, the hiker stops briefly to have a sandwich for lunch.
Discuss the effects of insulin and exercise on glucose uptake in the hiker's leg muscles [4]

(c) Describe the structural features of the hiker's femurs. [6]

(d) During the weeks of training prior to the journey, the hiker's leg muscles increased in size.
Outline **four** other general characteristics which are common to muscle tissue. [4]

7. (a) The soccer player David Beckham could bend the path of a ball through the air in order to deceive a goalkeeper and score a goal.
Discuss the Bernoulli principle with respect to the ball's flight during a free kick. [4]



(b) Using examples, outline Newton's three laws of motion during a soccer match. [6]

(c) Using examples, describe **two** different types of practice that a coach can use to improve skill performance. [4]

(d) A football coach is trying to maximize the performance of the individuals in the team.
Discuss factors that will contribute to the players' different rates of learning. [6]

References:

1. [*Rugby player training*] Steve Haag/Gallo Images/Getty Images.

1.(a) [*Table 1*] Reprinted from *Journal of Science and Medicine in Sport*, [e-journal] 14, Usman, J., Mcintosh, A. S., Fréchède, B., 2011. An investigation of shoulder forces in active shoulder tackles in rugby union football. pp.547-552. with permission from Elsevier. Available at: https://www.jsams. org/article/S1440-2440(11)00106-X/pdf [accessed 05 September 2019].

1.(b) [*Table 2*] Reprinted from *Journal of Science and Medicine in Sport*, [e-journal] 14, Usman, J., Mcintosh, A. S., Fréchède, B., 2011. An investigation of shoulder forces in active shoulder tackles in rugby union football. pp.547-552. with permission from Elsevier. Available at: https://www.jsams. org/article/S1440-2440(11)00106-X/pdf [accessed 05 September 2019].

1.(c) Breedlove KM, *et al*. The Ability of an Aftermarket Helmet Add-On Device to Reduce Impact-Force Acceleration During Drop Tests. *J Athl Train*. 2017;52(9):802-808.

2. [*Unlabeled heart diagram*] ilusmedical/shutterstock.com.