You do not need any other materials.
Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☑️ If you change your mind about an answer, put a line through the box ☒️ and then mark your new answer with a cross ☑️.

1. (a) Which one of the following bone classifications is most suitable for weight bearing activities?

☐ A  Long bone  
☐ B  Flat bone  
☐ C  Short bone  
☐ D  Irregular bone

(b) Which one of the following is the correct classification of the knee joint?

☐ A  Pivot  
☐ B  Ball and socket  
☐ C  Condyloid  
☐ D  Hinge

(c) Which one of the following correctly states the role of ligaments?

☐ A  Join bone to bone  
☐ B  Join muscle to bone  
☐ C  Join tendons to muscles  
☐ D  Join muscle to muscle

(d) Which one of the following blood vessels takes oxygenated blood away from the heart to the body?

☐ A  Pulmonary vein  
☐ B  Pulmonary artery  
☐ C  Aorta  
☐ D  Vena cava
(e) Identify where gas exchange takes place.

- A Bronchi
- B Alveoli
- C Bronchioles
- D Diaphragm

(f) Which one of the following movements uses a second class lever system?

- A Bending the arm at the elbow to lift a weight in a biceps curl
- B Heading the ball downwards in football
- C Lifting the body weight onto the toes from standing during calf raises
- D Straightening the leg at the knee to kick a ball in rugby

(g) Which one of the following athletes is most likely to use carbohydrate loading?

- A Marathon runner
- B Sprint runner
- C Long jumper
- D Discus thrower

(Total for Question 1 = 7 marks)
2. *Figure 1* shows the muscular system while running.

![Muscular System](https://via.placeholder.com/150)

(Source: © Sebastian Kaulitzki/Shutterstock)

**Figure 1**

Complete **Table 1** by:

(a) Identifying the muscles labelled A, B and C in *Figure 1*.

(b) Stating the role of each muscle.

<table>
<thead>
<tr>
<th></th>
<th>(a) Muscle</th>
<th>(b) Role of the muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>(1)</td>
</tr>
</tbody>
</table>

*Table 1*

(Total for Question 2 = 6 marks)
3. **Figure 2** shows a long jumper.

![Long jumper](Source: Photo by Tobias Heyer/Bongarts/Getty Images)

**Figure 2**

Examine the antagonistic muscle action taking place at the elbow and the hip in **Figure 2** that allows the long jumper to achieve this position.

**Elbow**

(Fill in the description)

**Hip**

(Fill in the description)

*(Total for Question 3 = 6 marks)*
4 **Figure 3** shows steeplechase athletes running a race.

The race involves running 3000m and jumping hurdles.

![Running 3000m](Source: © FABRICE COFFRINI/Getty Images)

![Jumping hurdles](Source: © PEDRO UGARTE/Getty Images)

**Figure 3**

Examine how two different muscle fibre types are used by the athletes in **Figure 3** during the different parts of the race.

(6)
5 Figure 4 shows a boxer who has a cut to the face.

(Source: Photo by Christian Fischer/Getty Images)

Figure 4

(a) Explain why platelets are important to athletes in contact sports such as boxing.

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(b) State two functions of plasma.

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2 ..........................................................................................................................
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(c) To ensure blood flow to the working muscles, vasoconstriction occurs in some of the boxer's blood vessels.

State the meaning of the term vasoconstriction. (1)

(d) Explain why the boxer includes protein in her diet. (2)

(e) Explain why the boxer drinks water during the breaks in a boxing match. (2)

(Total for Question 5 = 9 marks)
Figures 5 and 6 show the percentages of oxygen, carbon dioxide and nitrogen in the air inhaled and exhaled by a long distance runner while training.

**INHALED AIR**

- Oxygen: 21%
- Carbon dioxide: 0.04%
- Nitrogen: 78%

**EXHALED AIR**

- Oxygen: 16%
- Carbon dioxide: 4%
- Nitrogen: 78%

(a) Analyse, using the data in Figures 5 and 6, the difference between the runner’s inhaled and exhaled air.
(b) Explain why there is a difference in the amount of oxygen and carbon dioxide in inhaled and exhaled air whilst the long distance runner is training.

(4)
The graphs in Figures 7 and 8 show the runner's depth and rate of breathing at rest and during exercise.

Figure 7 – At rest

Figure 8 – During exercise
(c) (i) Identify, using the data in Figure 7, the name of the lung volume labelled A.

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(1)

(ii) Explain two reasons why Figure 8 represents the runner’s breathing during exercise.

Reason 1

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Reason 2

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(Total for Question 6 = 11 marks)
Statements A and B in Table 2 show how energy is released aerobically and anaerobically.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Energy release</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Glucose + oxygen</td>
</tr>
<tr>
<td></td>
<td>carbon dioxide +</td>
</tr>
<tr>
<td></td>
<td>water + energy</td>
</tr>
<tr>
<td>B</td>
<td>Glucose</td>
</tr>
<tr>
<td></td>
<td>lactic acid + energy</td>
</tr>
</tbody>
</table>

Table 2
(a) Justify why Statement A in Table 2 shows aerobic energy release.

(2)
(b) Explain **two** functions of the cardiovascular system that enable a long distance cyclist to perform well in their event.

Function 1

(Total for Question 7 = 8 marks)
8  Lever systems are made up of four parts. One of these parts is the lever.

(a) State the other three parts of a lever system.

1  ..........................................................................................................................

2  ..........................................................................................................................

3  ..........................................................................................................................

(b) Explain the term mechanical disadvantage.

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(Total for Question 8 = 5 marks)
9 Movement patterns occur in planes and around axes.

Complete Table 3 by:

(a) Stating the plane and axis for the tucked somersault.
(b) Stating the plane and axis for the full twist.

$$\begin{array}{|c|c|c|}
  \hline
  \text{Movement pattern} & \text{Plane} & \text{Axis} \\
  \hline
  \text{(a)} & \text{Tucked somersault} & (1) \\
  \hline
  \text{(b)} & \text{Full twist} & (1) \\
  \hline
\end{array}$$

(Source: Photos by David Ramos/Getty Images, and Julian Finney/Getty Images)

Table 3

(Total for Question 9 = 4 marks)
10 Explain, using examples from sport, how height and muscle girth affect optimum weight.

**Height**

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**Muscle girth**

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(Total for Question 10 = 6 marks)
11 Explain **one** reason, other than poor health and well-being, why smoking is a negative lifestyle choice for endurance athletes.

(Total for Question 11 = 3 marks)
Jacob is 18 years old.

Table 4 shows some of Jacob’s lifestyle choices.

<table>
<thead>
<tr>
<th>Diet</th>
<th>Activity level</th>
<th>Work/rest/sleep balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greatest proportion of diet is fat</td>
<td>Sedentary</td>
<td>15 hours spent working</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 hours spent resting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 hours spent sleeping</td>
</tr>
</tbody>
</table>

Table 4

Evaluate, using the data in Table 4, the impact of Jacob’s lifestyle choices on his health and well-being.