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**Answers**.....

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    Jayden the 5,000 m Runner.....

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    Jacob the student.....

    Isaac the Cyclist.....

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# Teacher's Introduction

This resource contains 15 individual scenarios that detail individual characters' experiences of exercise and sport. Each scenario contains a set of questions and activities relevant to the specification. This resource provides great preparation for the AQA GCSE PE Paper 1 exam: The Human Body and Activity and Sport.

Questions and activities have been designed to engage students and allow them to apply their knowledge to real-life scenarios. Activities engage all types of learners, stimulating learning and making revision more enjoyable.

The activities and questions are completely self-contained, enabling the students to work independently. They also target the AO2 and AO3 marks of the specification, allowing the students to apply their knowledge to a sporting scenario as well as evaluating strategies and methods. This is ideal preparation for students for upcoming exams.

You will find relevant help boxes throughout the resource that support students' understanding of the specification. These boxes will make sure students are aware of the assessment objectives and what to expect in a real exam:

- AO1 marks – gained from demonstrating knowledge
- AO2 marks – gained from applying knowledge to relevant sporting examples
- AO3 marks – gained from analysing and evaluating key concepts

Tip boxes help focus students to think about the answers they provide to particular questions.

## Free Updates!

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\* resulting from minor specification changes, suggestions from teachers and peer reviews, or occasional errors reported by customers

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## Specification Reference

The following tables indicate the specification content covered under each scenario. This can be used to check the content you are covering.

Specification points	Marquise the Gymnast	Jayden the 5,000 m runner	Isabella the Swimmer	Ethan Training for the Army	Ava the Rock Climber	Emily the Table Tennis Player	Chris the Golfer	Eliza the Decathlete
<b>3.1.1 Applied Anatomy and Physiology</b>								
<b>3.1.1.1 Structure and Functions of the Musculoskeletal System</b>								
<b>Bones</b>	✓							
Structure of the skeleton								
Functions of the skeleton					✓			
Muscles of the body					✓			
Structure of the synovial joint						✓		
Types of freely moveable joints that allow different movements					✓			
Joints and movements						✓		✓
Muscles and movement						✓		✓
<b>3.1.1.2 Structure and Functions of the Cardiorespiratory System</b>								
The pathway of air		✓						
Gaseous exchange			✓					
Blood vessels			✓					
Structure of the heart								
Cardiac cycle and pathway of the blood			✓					
Cardiac output, stroke volume and heart rate			✓	✓				
Mechanics of breathing		✓		✓				
Interpretations of a spirometer trace			✓					

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Specification points	Marquise the Gymnast	Jayden the 5,000 m runner	Isabella the Swimmer	Ethan Training for the Army	Ava the Rock Climber	Emily the Table Tennis Player	Chris the Golfer	Eliza the Decathlete
<b>3.1.1.3 Anaerobic and Aerobic Exercise</b>								
Understanding the terms		✓						
Use of anaerobic and aerobic exercise in sport		✓						✓
EPOC and oxygen debt								
The recovery process	✓			✓				
<b>3.1.1.4 The Short-term Effects of Exercise</b>								
Immediate effects of exercise		✓						
Short-term effects of exercise		✓						
Long-term effects of exercise			✓					
<b>3.1.2 Movement Analysis</b>								
<b>3.1.2.1 Lever Systems</b>								
First-, second- and third-class lever systems	✓				✓			
Mechanical advantage					✓			
Analysis of basic movement skills						✓		✓
<b>3.1.2.2 Planes and Axes of Movement</b>								
Identification of relevant planes								✓
<b>3.1.3 Physical Training</b>								
<b>3.1.3.1 The Relationship between Health and Fitness</b>								
Health and fitness		✓				✓		
The relationship between health and fitness		✓				✓		

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Specification points	Marquise the Gymnast	Jayden the 5,000 m runner	Isabella the Swimmer	Ethan Training for the Army	Ava the Rock Climber	Emily the Table Tennis Player	Chris the Golfer	Eliza the Decathlete
<b>3.1.3.2 The Components of Fitness, Benefits for Sport and How Fit</b>								
The components of fitness	✓							
Linking sports and physical activities to components of fitness	✓							
Reasons for and limitations of fitness testing	✓			✓				
Measuring components of fitness	✓	✓		✓				✓
Demonstration of how data is collected for fitness testing	✓	✓						
<b>3.1.3.3 The Principles of Training and Their Application to Personal Exercise</b>								
The principles of training and overload		✓		✓			✓	✓
Application of the principles of training		✓						
Types of training						✓	✓	✓
Advantages and disadvantages of training types						✓		
<b>3.1.3.4 How to Optimise Training and Prevent Injury</b>								
Calculating intensities to optimise training effectiveness			✓					✓
Considerations to prevent injury	✓				✓	✓		
Specific training techniques		✓						
Seasonal aspects							✓	
<b>3.1.3.5 Effective Use of Warm-up and Cool-down</b>								
Warming up and cooling down								
<b>3.1.4 Use of Data</b>								
3.1.4.1 Data collection								
3.1.4.2 Data presentation							✓	✓
3.1.4.3 Data analysis and evaluation		✓					✓	✓

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# Scenarios

## Marquise the Gymnast

Marquise is a 14-year-old amateur gymnast who has ambitions of becoming a world champion. Two years ago, Marquise was tipped to be a regional gymnastics champion, but in her training leading up to the competition, she acquired a stress fracture of her ankle, leading to several months out. While she is back training, she feels she lacks the confidence she once had.

Her coach, Lucinda has put her on a strict training routine and diet and believes with hard work and dedication Marquise could be fit enough to compete at the regional competition in just over 12 weeks' time.

However, Marquise's parents split when she was younger. Her mum works full time at a primary school and often works late evenings, meaning Marquise often has to miss her gymnastics classes.

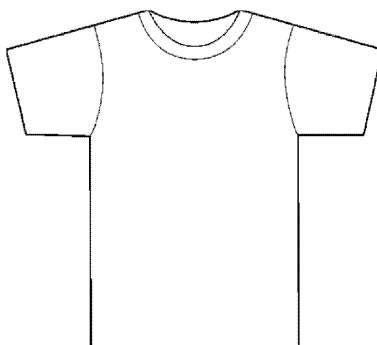
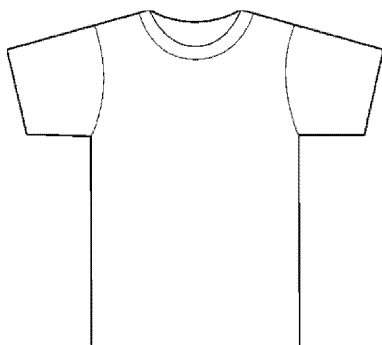
### Complete the following activities and questions on Marquise:

Marquise suffered a stress fracture of her ankle, while training for a regional

1. Label the bones that make up the ankle joint. (3.1.1.1)



2. i. Identify **three** reasons why Marquise could have suffered this type of injury.
  1. ....
  2. ....
  3. ....
- ii. Design three T-shirts that will help fellow gymnasts prevent getting injured. Each T-shirt should include hashtags, slogans or images to highlight factors that could prevent injuries occurring. (3.1.3.4)



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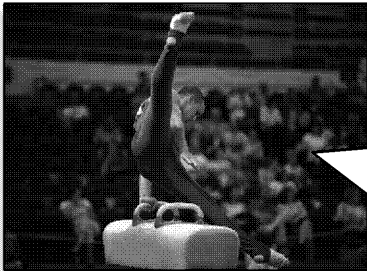
- iii. It was suggested by her coach that Marquise should change her diet and stretch often after training to help her recover. Give a brief explanation of each method and suggest how this could help Marquise. (3.1.1.3)

When explaining each method you should try to link it to Marquise! How would you help her in gymnastics?

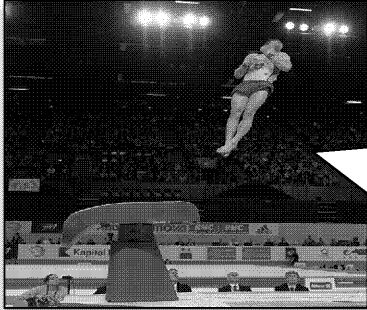
Recovery method suggested	Brief explanation of each suggested method
'Changing her diet'	
'Have ice baths'	
'Stretch often'	

3. Gymnastics requires multiple components of fitness for different disciplines. For each of the disciplines below, suggest the components of fitness each requires and how they are required in gymnastics.

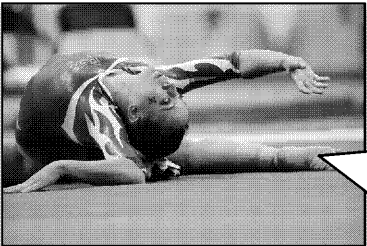
AO1 marks are for identifying relevant components of fitness, AO2 marks are for explaining how they are required in gymnastics by applying each to how they are required in gymnastics.

i. 

The pommel horse requires... ..  
 .....  
 .....

ii. 

The vault requires... ..  
 .....  
 .....

iii. 

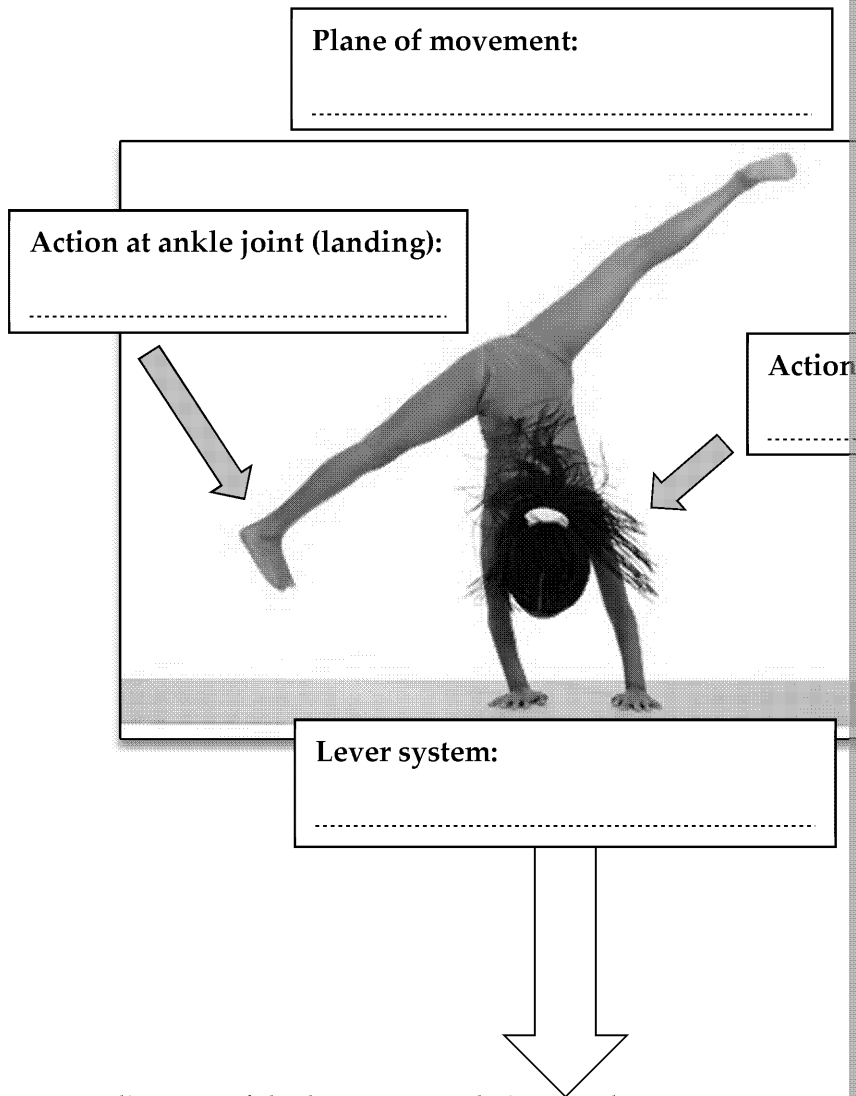
Floor gymnastics requires... ..  
 .....  
 .....

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4. i. Marquise has been asked to help some younger gymnasts successfully perform a handstand. Below is an image of one of these girls in the movement phase of a handstand to analyse the movement. (3.1.2.1)



- ii. Draw a diagram of the lever system being used:

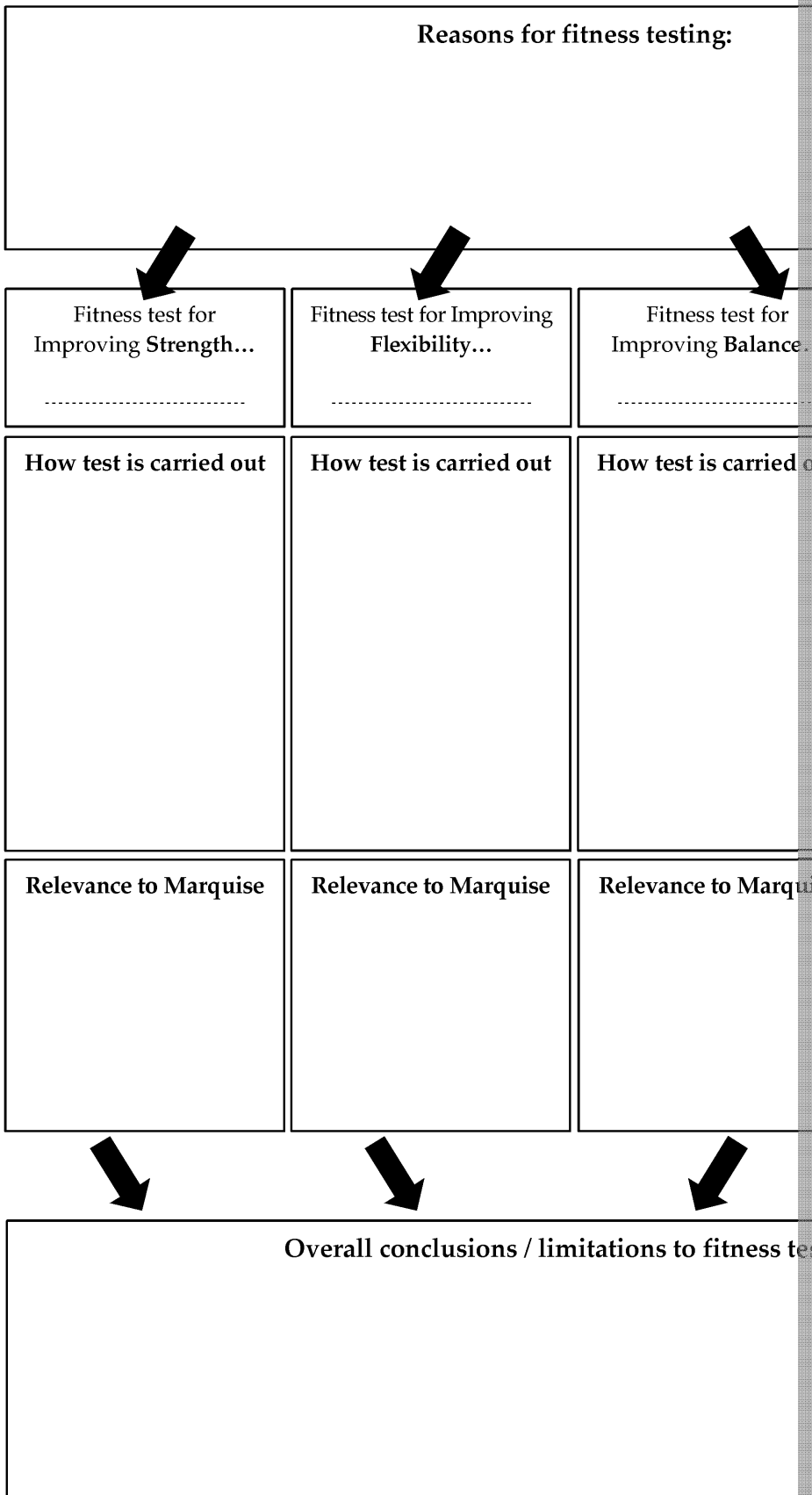
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5. Marquise's coach, Lucinda feels that in order for Marquise to get the best out of her training regime, she should do some fitness tests before, during and after her training regime.

This is a  
and this  
question  
fitness t

Complete the flow diagram to help Lucinda assess the different fitness tests by Marquise to assess the given components of fitness. (3.1.3.2)



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## Jayden the 5,000 m Runner

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Jayden is a 17-year-old 5,000 m runner who is training to become a professional athlete, with the ultimate goal of representing his country at the next Olympic Games. Recently Jayden has felt that he has not shown any improvement in his performances, and has discussed this issue with his fitness coach. His fitness coach examined all of Jayden's performance data recorded within the last year, and highlighted that Jayden has been struggling with fatigue in the majority of the races. He specifies the point of fatigue as the final 500 m of each race.

Jayden and the fitness coach discuss a new training programme which could help Jayden with his future performances, and examine the effects that training has on Jayden.

### Complete the following activities and questions on Jayden:

1. i. What type of exercise (aerobic or anaerobic) is Jayden doing when he runs a 5,000 m race? Explain your answer below. (3.1.1.3)

Type of exercise: .....

Reason for answer:

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

- ii. Use the symbols and words provided to create an equation that summarises the process of cellular respiration that you have chosen.

Energy	→	Water	Glucose	+	+	O <sub>2</sub>
--------	---	-------	---------	---	---	----------------

Equation:

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

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2. i. Jayden told his coach that he usually feels tired and it is more difficult to run the last roughly 500 m of the race to go. Use the parts of the body provided to complete the pathway of the air that Jayden is breathing in. (3.1.1.2)

Trachea

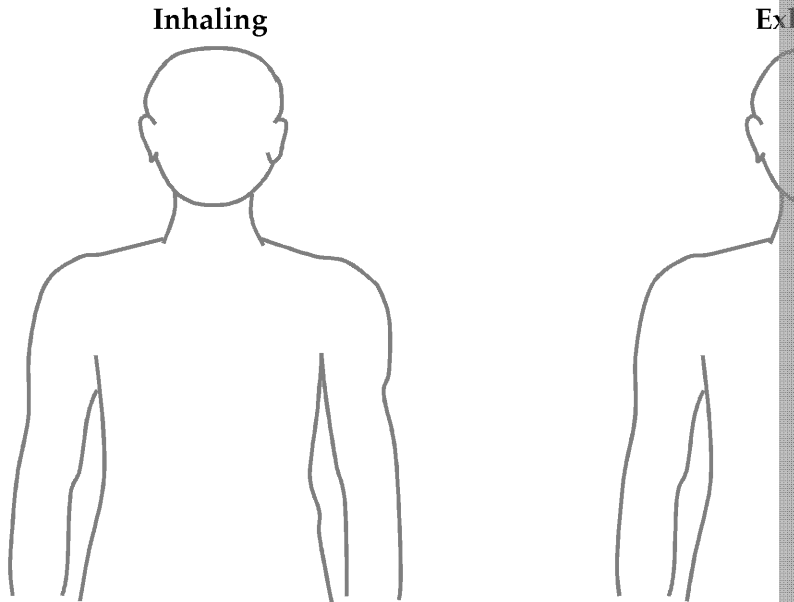
Bronchi

Mouth/nose

Air enters through the...

1..... → 2..... → 3..... → 4.....

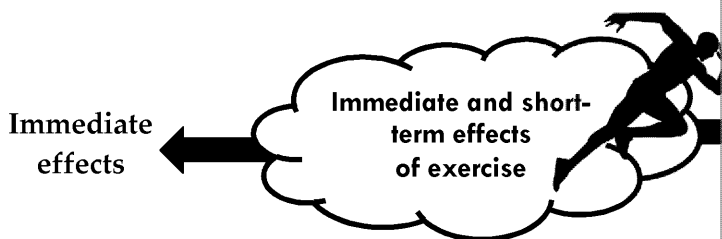
- ii. Below are two sketches of the outline of Jayden's upper body. Draw and label the structures: **intercostals**, **ribcage** and **diaphragm**. Label your drawings to show how these have during inhaling and exhaling at rest.



- iii. Identify the two muscles that have a role in inspiration during exercise.
1. ....
  2. ....

In the exam 'Identify'  
You do not need to e

3. On the spider diagram below, give the immediate and short-term effects of exercise.



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4. Three weeks into his new training schedule Jayden gets a cold that impacts his health and most noticeably his fitness levels. Define 'health' and 'fitness' and explain how Jayden's health has impacted on his fitness. (3.1.3.1)

**Definition of health:**

.....

.....

.....

.....

.....

.....

**Relationship between health and fitness:**

.....

.....

.....

.....

.....

.....

5. On the notepad below, write down the most relevant fitness test that Jayden uses in his training sessions. Give extra details about the procedures of this test in your own words.

Fitness test: .....

This will test Jayden's .....

Equipment and facilities needed: .....

.....

Procedures: .....

.....

.....

.....

Measurements: .....

What the measurements tell us: .....

.....

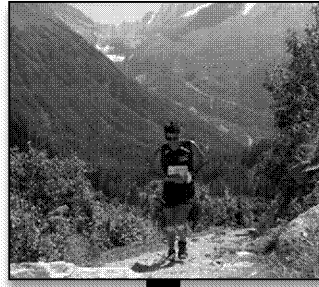
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8. Jayden's coach has suggested that he could benefit from high-altitude training. The diagram below suggests how high-altitude training is carried out, the benefits and the limitations to this training method. (3.1.3.4)



High-altitude training involves:

.....

.....

.....



Benefits:

+ .....

+ .....

+ .....

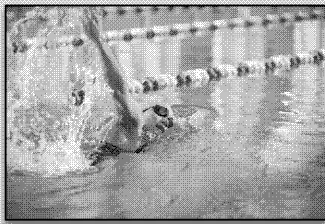
Limitations:

- .....

- .....

- .....

## Isabella the Swimmer



Isabella is a 20-year-old swimmer who represents Great Britain to beat her personal best time for the 200 m butterfly at the university she attends. She has a very demanding daily schedule, waking up at 5.30am every weekday to complete two training sessions, going to lectures which normally finish at 5pm, before getting home at 9pm. This means that Isabella's schedule is very busy.

Her university coaches are also the national team coaches, and record every detail of her training sessions. For example, they examine the volume of oxygen that Isabella breathes during her training tests. Since joining the university and undergoing this demanding schedule, Isabella has gone through many changes.

### Complete the following activities and questions on Isabella:

1. Isabella's event requires high cardiovascular endurance. The statements below describe processes that assist Isabella's gaseous exchange at the alveoli in her lungs. However, some of these are incorrect. Identify whether each statement is true or false, and then write the correct statement underneath. (3.1.1.2)

i. The alveoli only have a small surface area. **TRUE / FALSE**

.....

ii. There are a large number of capillaries. **TRUE / FALSE**

.....

iii. The diffusion pathway is large, allowing enough time for gaseous exchange. **TRUE / FALSE**

.....

iv. There is a large blood supply. **TRUE / FALSE**

.....

v. Gas moves from a low concentration to a high concentration. **TRUE / FALSE**

.....

vi. The walls of the alveoli are only five cells thick. **TRUE / FALSE**

.....

vii. Haemoglobin can carry carbon dioxide. **TRUE / FALSE**

.....

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2. Isabella's coaches gather data on Isabella's cardiorespiratory system in order to inform future training plans and assess how she can improve. (3.1.1.2)

Understand and apply them to a situation

i. Define each of the following cardiac values and provide an equation that describes the relationship between them, including how they would change as Isabella starts

Definitions:
Heart Rate: .....
.....
Stroke Volume: .....
.....
Cardiac Output: .....
.....

Change
Heart Rate: .....
.....
Stroke Volume: .....
.....
Cardiac Output: .....
.....

 Relationship Equation:

--

ii. During the race day, Isabella's stroke volume was found to be 130 in this race was 175 bpm. Using this information, calculate Isabella Remember to show your working.

--

iii. To calculate Isabella's training intensities her coaches must use her Calculate Isabella's maximum heart rate. (3.1.3.4)

--

iv. Her coaches decide that they will vary Isabella's training to include sessions. Calculate Isabella's aerobic and anaerobic training zones.

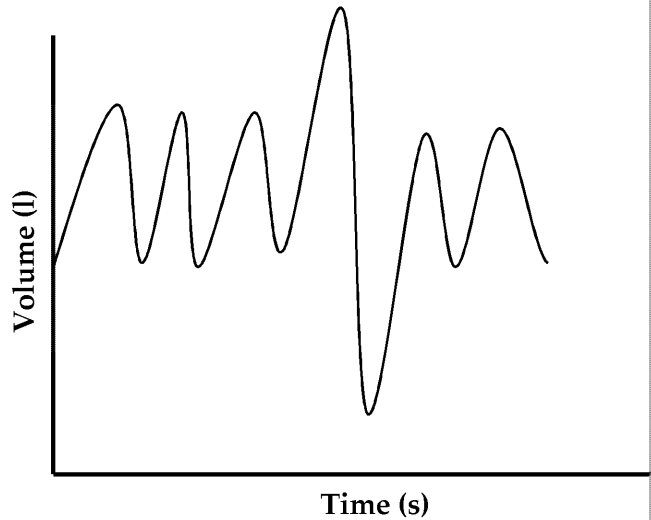
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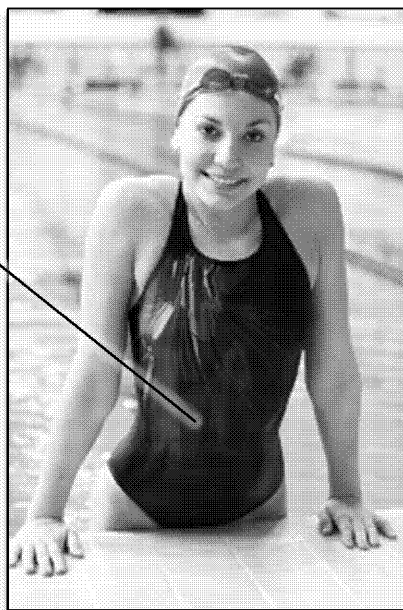


3. i. Below is a spirometer trace which was recorded when Isabella was on the trace: (3.1.1.2)
- Tidal volume
  - Inspiratory reserve volume
  - Expiratory reserve volume
  - Residual volume



- ii. Next to the labels that you have added to the graph above, note how the value to change when Isabella is swimming.
4. Isabella has a demanding training schedule. Using the image, annotate the exercise she will experience from months and years of training. Also, give Isabella's training schedule may result in these long-term effects. One of

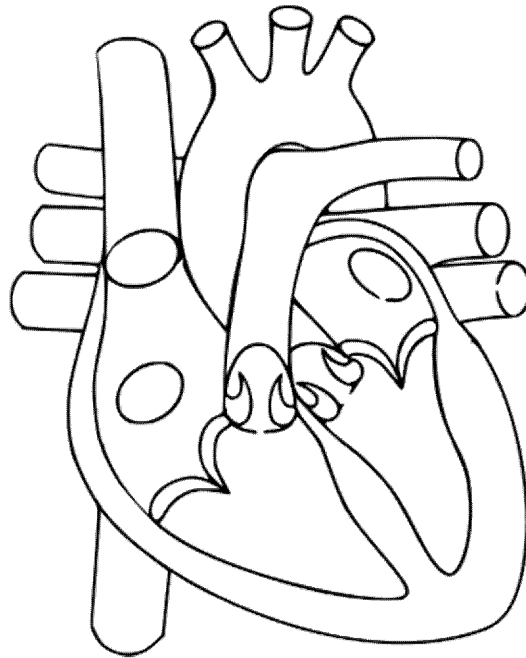
**Body shape**  
Swimming can reduce fat levels and improve the body's composition.



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- 5. i. On the diagram of the heart below, add and clearly label the arteries that carry blood to, and from, the heart. (3.1.1.2)



- ii. On your labels above, add whether the type of blood that each blood vessel carries is oxygenated or deoxygenated.
- iii. Explain the pathway of blood via the cardiac cycle, using the numbers for each separate point. Try to put a different

When explaining blood you should be clear about what is in helping Isabella

- 1. ....
- 2. ....
- 3. ....
- 4. ....
- 5. ....
- 6. ....
- 7. ....
- 8. ....
- 9. ....
- 10. ....
- 11. ....

- iv. Explain what happens to the blood in Isabella's body as she begins to exercise.  
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.....  
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.....  
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# Ethan Training for the Army

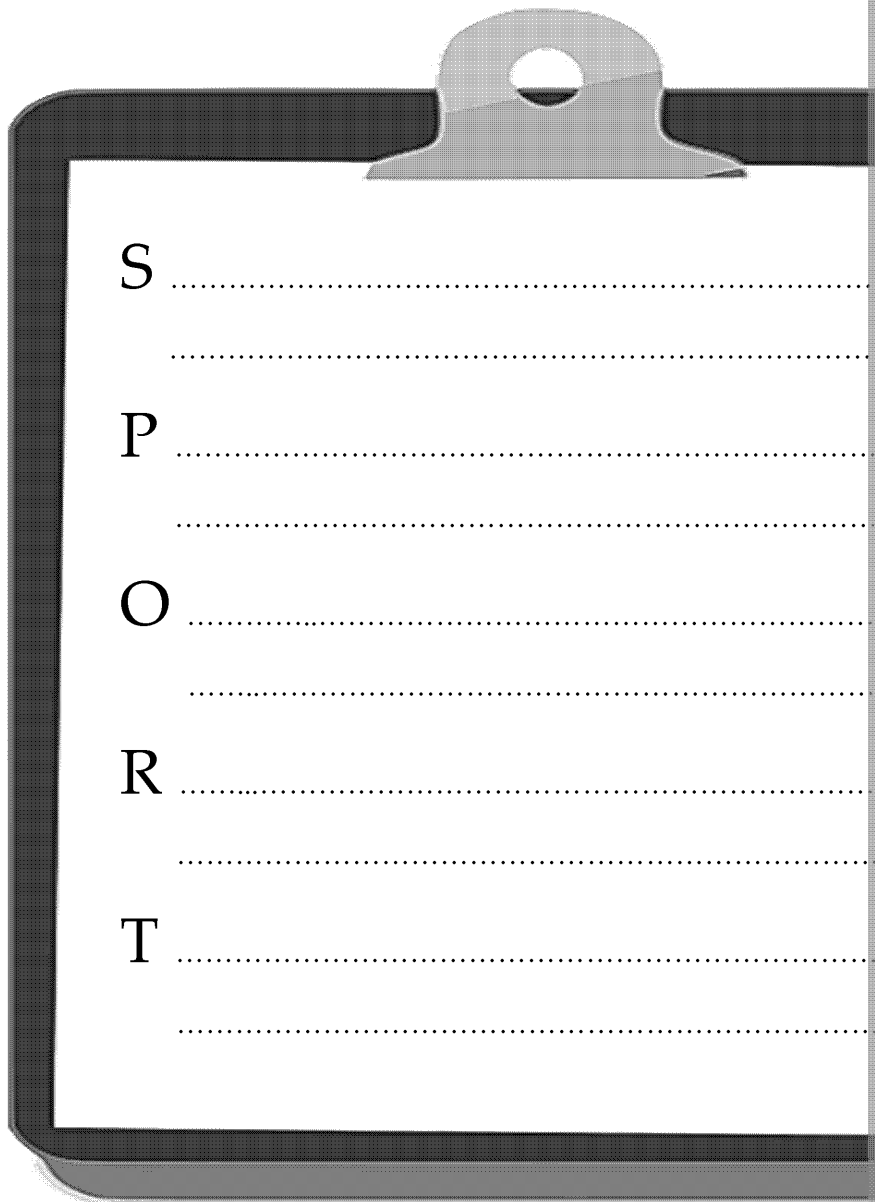
Ethan is a 16-year-old male who is just about to start his GCSE exams. Ethan has always known that he wants to join the army when he leaves school and follow in his father's footsteps.

Ethan currently does not enjoy exercising, and only does so in PE lessons at school, so does not have a great level of fitness. His father has warned him that he should begin training to improve his fitness if he is to be selected in the army.

Ethan looks up to his dad as a role model and has decided to plan ahead to improve his overall fitness levels, so he can achieve his ambition of being selected for the army.

## Complete the following activities and questions on Ethan:

- Using the key principles of training (SPORT) outline how Ethan could improve his fitness. (3.1.3.3)



S .....

P .....

O .....

R .....

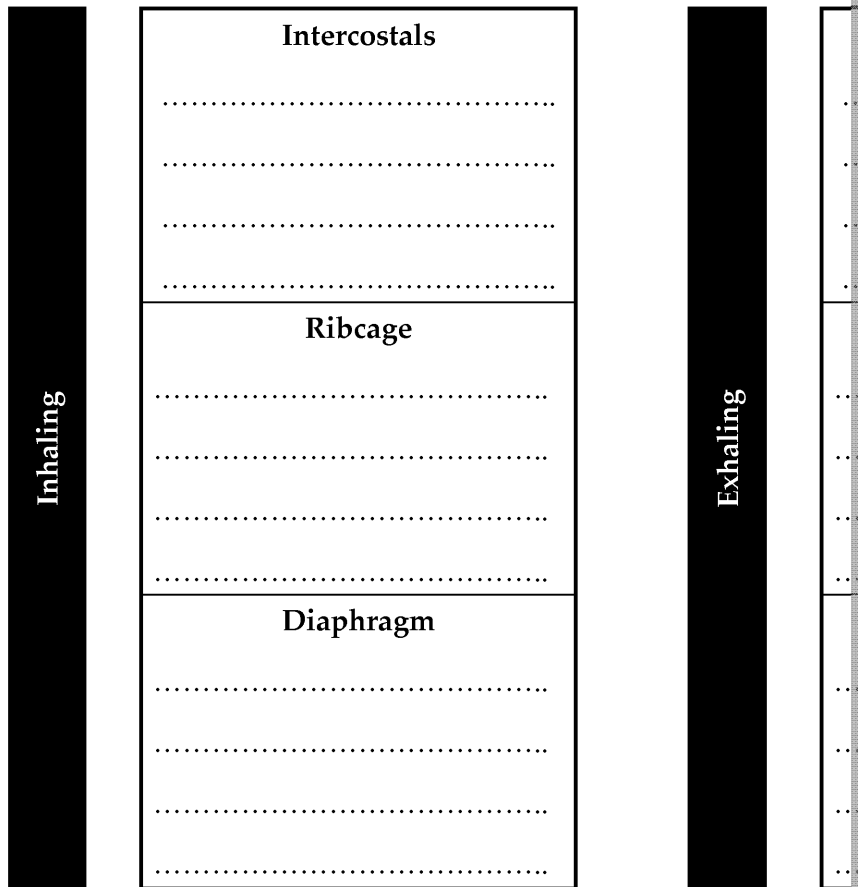
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2. i. Ethan is keen to learn about the mechanics of breathing. Explain to him how the components interact to allow him to breathe when resting. (3.1.1.2)



- ii. Explain how changes in air pressure will lead to Ethan exhaling at rest.

.....

.....

.....

.....

- iii. Identify whether the following statements are true or false.

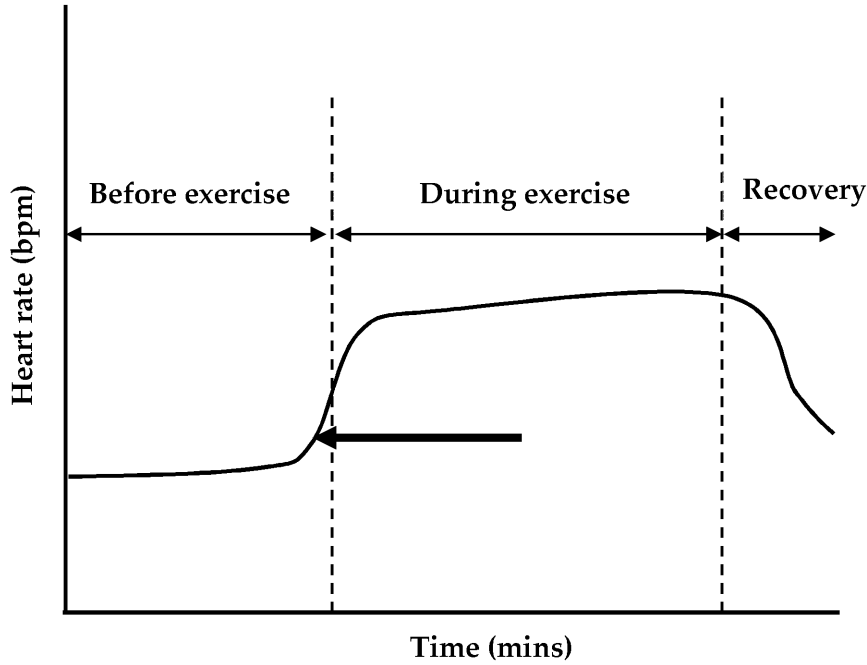
- (1) Lungs expand to the same volume whether at rest or during exercise.
- (2) The muscles that aid inspiration at rest are the pectorals and the intercostals.
- (3) When exercising the ribcage is lowered more quickly than at rest.
- (4) The abdominal muscles help to cause air to leave the lungs.

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3. Below is a graph showing Ethan's changes in heart rate during an exercise session. What does the thicker arrow signify? Explain your answer. (3.1.1.2)



.....

.....

.....

.....

4. As a result of Ethan not doing regular exercise, he finds that his muscles are sore after exercising. Due to being inexperienced when it comes to exercising, Ethan is not aware of methods that could help him recover more quickly after exercising. Complete the fact sheet below to help you understand how the methods could aid his recovery process. (3.1.1.3)

**Cool-down**

.....

.....

.....

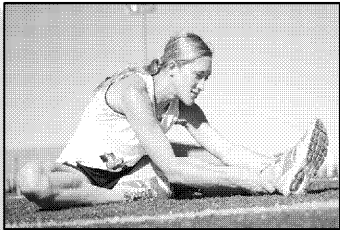
.....

.....

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.....

.....



**Manipulation of diet**

.....

.....

.....

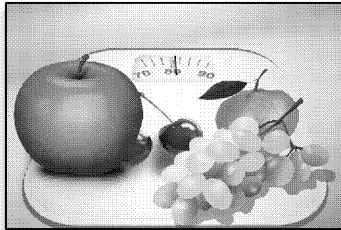
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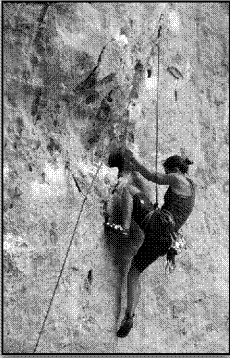


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## Ava the Rock Climber



Ava is a 17-year-old girl, who her friends describe as a risk taker. Recently Ava has become restless and bored going to school and then studying for her exams when at to give herself a break from studying, and try a new challenge climb at the local rock-climbing centre.

Although Ava wanted to start climbing up the wall as early as possible, she had to learn about the safety procedures before her instructor made sure that Ava took her safety very seriously. She had heard of serious injuries that she could suffer from if she did not follow the correct safety procedures.

### Complete the following activities and questions on Ava:

1. i. Here is a picture that Ava took of her instructor climbing outside. What lever system is being used at the instructor's elbow as he pulls himself upwards with his hands? (3.1.2.1)

Lever type: .....

- ii. In the space below, draw the lever type you have given as an answer above. Also, label the resistance and effort arm on your diagram.

You only need to draw a linear diagram for levers identifying the key components.



- iii. What equation would you use to determine the mechanical advantage?

.....

- iv. Explain the mechanical advantage of the lever that you have drawn.

.....

.....

.....

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2. Below are eight factors which Ava should consider to prevent injury. Imagine that you are Ava's instructor and explain how Ava could follow these factors in the space below. (3.1.3.4)

The me  
have b  
job is f  
them to

### How to avoid injury

1. Appropriate warm-up

.....  
.....

2. Correct clothing and footwear

.....  
.....

3. Make sure that you are hydrated

.....  
.....

4. Tape when required

.....  
.....

5. Use the correct technique

.....  
.....

6. Allow suitable recovery periods

.....  
.....

7. Do not overstretch or bounce when stretching

.....  
.....

8. Do not overtrain

.....  
.....

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- 3. i. Rock climbing requires many muscles to be utilised. On the diagram muscles that would be used by Ava and suggest how they would be used.



- ii. Explain the role that tendons have in allowing movement at Ava's

.....

.....

- 4. Ava has learned about the importance of her skeleton and how its role affects her rock climbing. For the seven functions of the skeleton below suggest how each can be applied to rock climbing.

The functions given below are for you to demonstrate (demonstration of knowledge and understanding) to apply them (AO2 mark)

- (1) Support – .....
- (2) Protection – .....
- (3) Movement – .....
- (4) Structural shape – .....
- (5) Muscle attachment – .....
- (6) Mineral storage – .....
- (7) Blood cell production – .....

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5. i. Consider the upper body joints that are used to help a rock climber. Complete the table below by providing detail about the upper body joints.

Upper body joint	Muscles at the joint

- ii. Justify the importance of the above joints and muscles to rock climbing.

When justifying you should provide a supporting case to why the joints are important to rock climbing.

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# Emily the Table Tennis Player

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Emily is a 17-year-old and was a promising young tennis player, and had represented her county from the age of 10 to 15. Unfortunately, when she was 15 she suffered a serious shoulder injury, tearing her deltoid when overextending to make a shot. This injury meant that she could no longer follow through on her groundstrokes as effectively as she could before and resulted in Emily's performance levels dropping. Subsequently she enjoyed playing tennis much less, giving up at the age of 16.

At the age of 17 she missed playing tennis and realised she could take up a similar sport which does not require such an extended follow through – table tennis. Due to her high hand-eye coordination that she learned from tennis, Emily found she was naturally good at table tennis. She now competes for her school team, and while healthy still occasionally suffers fitness-wise due to her previous injury.

### Complete the following activities and questions on Emily:

1. i. Provide a definition for the term 'health' and the term 'fitness'. (3.1.5)

Health:

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

Fitness:

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

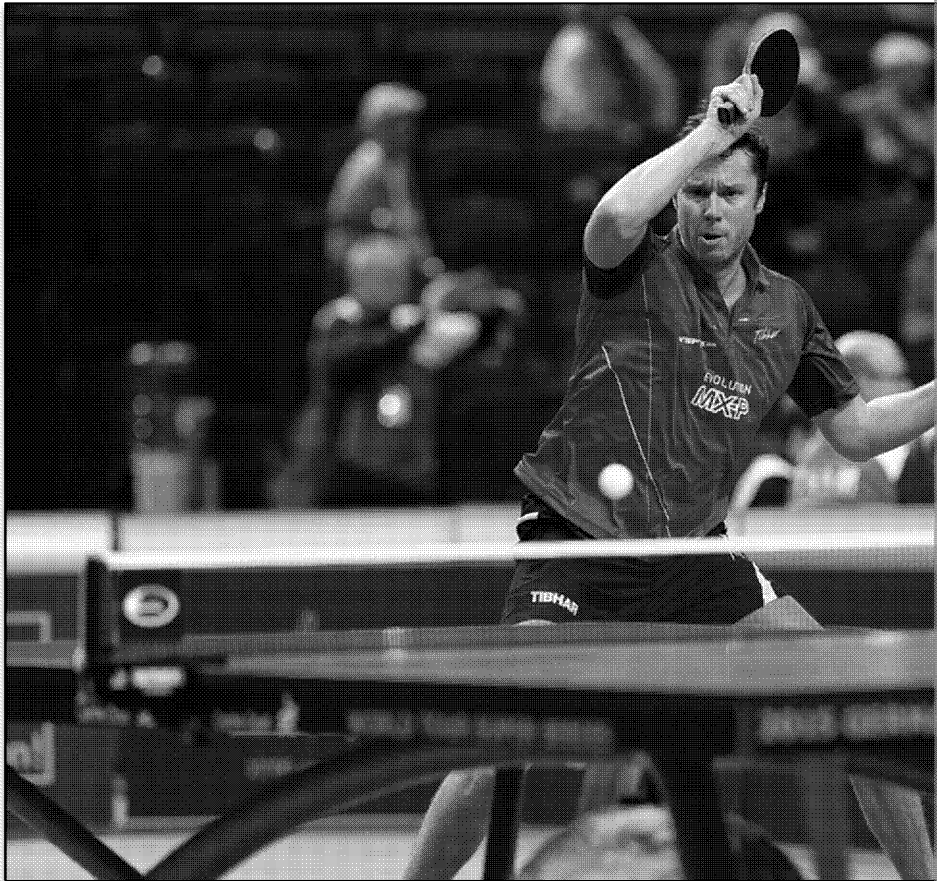
- ii. Using your above answers as a guide, explain how it is possible for people to suffer frequently from poor fitness levels.

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2. Below is an image of Emily's coach completing a forehand drive. Complete the movements of the different joints given and the agonist/antagonist



**Pull-back phase**

<b>Agonist:</b> .....	←	<b>Movement at the shoulder:</b> .....	→	
<b>Agonist:</b> .....	←	<b>Movement at the elbow:</b> .....	→	

**Follow-through phase**

<b>Agonist:</b> .....	←	<b>Movement at the shoulder:</b> .....	→	
<b>Agonist:</b> .....	←	<b>Movement at the elbow:</b> .....	→	

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- 3. i. As part of her rehabilitation from injury, Emily performed light weight training to increase the strength of her shoulder and upper body. Imagine you are a gym instructor. Emily is coming back from a serious injury. Design a sign outlining the most important components of weight training, to promote a safe environment.



This develops your AO3 marks as you are evaluating the appropriateness of weight training for a specific sport/individual.

- ii. When completing her weight training she often gets concerned with the correct method to help her with her injury. On the two Post-it notes below outline the advantages and limitations of weight training for Emily's situation.

Pros

Limitations

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4. Emily is understandably cautious of suffering another long-term injury of six pictures, showing Emily considering six different methods of inj

4.	5.	6.
1.	2.	3.

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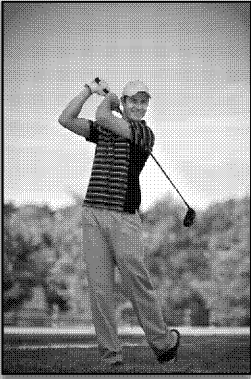
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## Chris the Golfer



Chris is 15 years old and has played golf for eight years. He has recently lost his love for the sport, and is trying to play golf as much as he used to. Part of the reason for not enjoying playing golf as much is due to the constant pressure from his parents to perform well during tournaments. They often pay a lot of money for his lessons and equipment so that he can stay away by performing it badly or by giving up.

Chris talked to his coach about his issues, and his coach suggested a coaching approach to make the lessons more interesting for Chris. This involved rewarding Chris for achieving fitness goals.

### Complete the following questions and activities on Chris:

1. To try to enjoy practising golf, Chris has decided to try a variety of training methods. He has decided to try the most enjoyable one.
  - i. To help Chris understand the distinctions between some of the different training methods available, outline what each involves in the boxes below. (3.1.3.3)

Outlining involves setting out main characteristics and features!



<p style="text-align: center;"><b>Circuit Training</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p style="text-align: center;"><b>Continuous</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
<p style="text-align: center;"><b>Weight Training</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p style="text-align: center;"><b>Fartlek</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

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ii. Chris's coach has decided to use a combination of circuit training and continuous training in Chris's training programme. For each of the following, suggest why his coach has decided to use it. (3.1.3.3)

Circuit training: .....

.....

Weight training: .....

.....

Continuous training: .....

.....

iii. How might a combination of training types chosen have a positive effect on Chris's performance?

.....

.....

.....

2. In the boxes below, suggest how each of the principles of training can help improve the enjoyment of golf. Also, suggest how each principle can help improve performance.

<p><b>Specificity</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p><b>Progression</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
<p><b>Reversibility</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

There are two parts to this question. Consider how each can increase Chris's enjoyment of golf, and how each can improve his fitness.

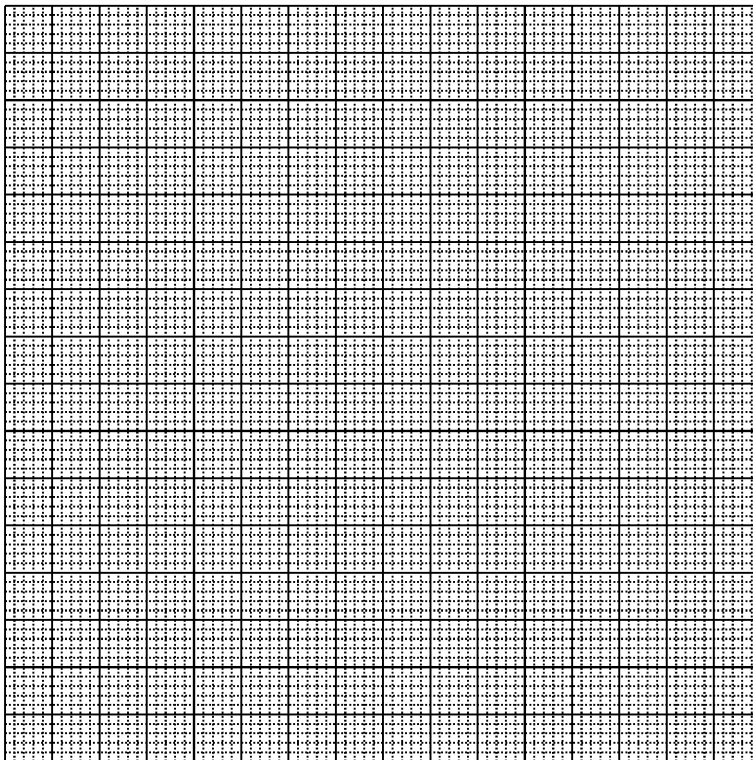
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3. Chris completed five days of different training types. He measured his training types so that he could keep informed of the intensity of each training type on how enjoyable it was on a scale from 1–10.

Day (training type)	Highest recorded heart rate (bpm)	Enjoyability (1–10)
Monday (continuous)	175	
Tuesday (weight)	105	
Wednesday (weight)	100	
Thursday (continuous)	168	
Friday (circuit)	177	

- i. Draw a line graph of this data in the space below, showing how his heart rate varied throughout the week. (3.1.4.2)



This question doesn't ask you to describe the data, but it asks you to explain the whole in regards to Chris's training!

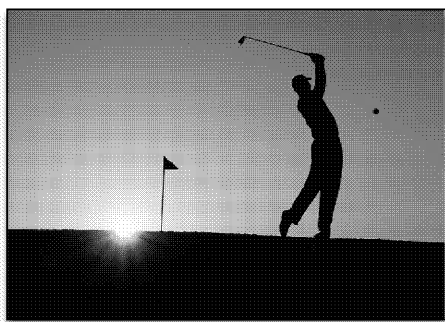
- ii. What does this data (from your graph and the table) suggest? (3.1.4.3)

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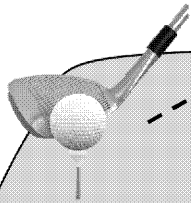
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4. Although Chris has found that the time he spent trying to regain his lost fitness took up much of his pre-season, not allowing him to complete much of his competition phase.

Describe each of the three training seasons and justify their characteristics.

Once you reach the green, explain how a poor pre-season may have affected the other training seasons. (3.1.3.4)



**Pre-season**

.....

.....

.....

.....

**Competition**

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**Post-season**

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**How could a poor pre-season affect the other training seasons?**

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## Eliza the Decathlete

Eliza is a 16-year-old who has always had an interest in athletics and has been on her school's athletics team in recent years. Eliza also competes at her local athletics club as a member. She competes in 10 events over two days on weekends throughout the summer.

### Day 1

- 100 m
- Long Jump
- Shot-put
- High Jump
- 400 m

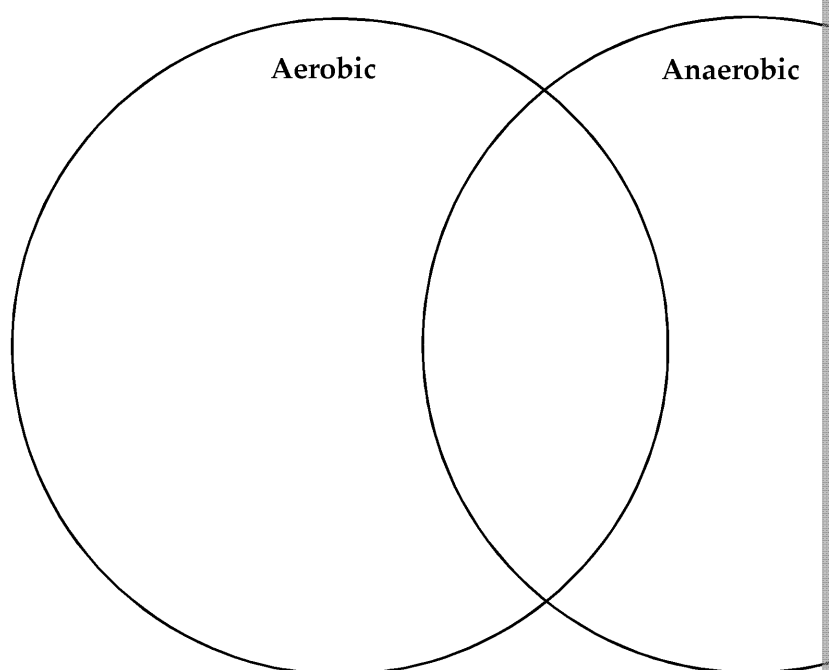
### Day 2

- 100 m Hurdles
- Discus Throw
- Pole Vault
- Javelin Throw
- 1,500 m

Her athletics coach has informed Eliza that her performance across several events needs to be improved if she is to be in contention for the medal places. As a result, her coach has suggested starting the season with several fitness tests to determine her strengths and weaknesses. The coach also wants to provide her with a method to monitor Eliza's progress.

### Complete the following questions and activities on Eliza:

1. i. For each of the events that Eliza competes in during a decathlon, complete the areas of the Venn diagram to show if they are anaerobic or aerobic.



So you have identified those sports as aerobic and anaerobic or both! Now you need to support your case. Justifications can earn you the AO3 marks in the exam.

- ii. Justify why you have classified the sports above into the relevant categories.

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2. i. The long jump is Eliza’s favourite event in the decathlon. When she she often teaches younger athletes about the technique. Complete the movement analysis of the take-off stage of a long jump. (3.1.1.1)



Joint	Action	Agonist	Antagonist
Ankle			
Knee			
Hip			

- ii. What plane and axis does the long jump take place in? (3.1.2.2)

Plane: .....

Axis: .....

- iii. How does this differ to Eliza’s plane of movement when she comp

.....  
 .....

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3. Here is Eliza's coach's working when calculating if Eliza was exercising while training for her 1500 m run. However, something does not look right. Identify the mistakes and correct them for her? Show your calculations in the box below.

*Eliza's heart rate during the 1,500 m averaged at 158 bpm*

*Eliza's max heart rate =  $200 - 16 = 184$*

*Aerobic training zone = 50% - 65% of 184*

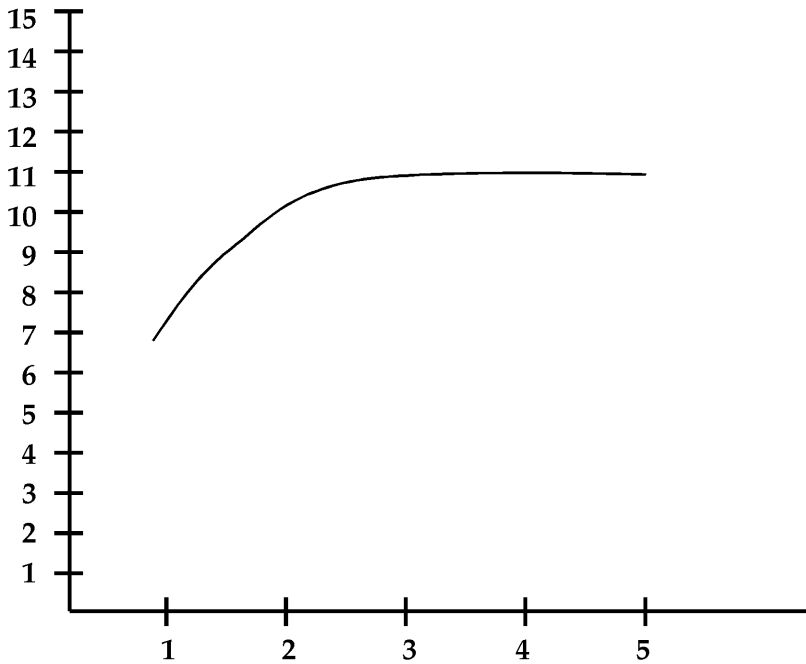
*Aerobic training zone = between 92 and 132.6, so Eliza was not in the aerobic training zone*

4. Eliza has a great level of experience in all types of training due to the variety of training she has done. Select the odd one out from the following answers to the statements provided.
- For circuit training it is important to think about:
    - the available equipment
    - the available space
    - the terrain
    - the number of recovery periods
  - Fartlek training involves:
    - changing speed
    - changing recovery periods
    - changing the terrain
    - changing the target component of fitness
  - The procedures of static stretching include:
    - holding the stretch for 30 seconds
    - holding the stretch concentrically
    - using the correct technique
    - not overstretching
  - All training methods should be:
    - the same
    - trainable
    - the same
    - varying
  - plyometric training involves:
    - coordination
    - power
    - jumping
    - explosive

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5. As a major part of Eliza’s training schedule she has to complete many of the following tests. Below is a graph showing Eliza’s scores on the multistage fitness tests over a period of 5 weeks.



- i. Label the x- and y-axis of the graph above.
- ii. What does the graph suggest about Eliza’s fitness levels? (3.1.4.3)

.....

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.....

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- iii. Eliza has seen some changes to her fitness levels, such as in the multistage fitness test. Her coach has concluded by her coach that she is below where she needs to be in order to be in contention. Send four motivational tweets to Eliza to suggest how these changes could be used to improve her fitness. (3.1.3.3)

**Frequency:**

**Intensity:**

**Time:**

**Type:**

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- iv. Eliza has never scored particularly well in the muscular endurance test. However, she argues that this is not relevant to her sport so it does not need to be included. She also argues that she performs poorly in it. Argue for and against this being a relevant test and suggest what other tests should be included. It should be relevant to the majority of Eliza's events.

Provide a balanced argument for why this identified fitness test is not relevant to Eliza's sport. Link your answers directly to Eliza's events.

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## Leon the Boxer

Leon is 18 years old and has been boxing for one year. Before he started boxing with his body weight throughout his teenage years, due to an inactive lifestyle and eating unhealthy foods. Leon became fed up with feeling negative about his body image and improve his image. He had heard that boxing was a demanding sport, and could help him lose fat and gain muscle in the quickest time possible.

After just one month of training at his local boxing club Leon started to notice dramatic changes to his body composition, and his self-confidence started to improve. This increased self-confidence led to Leon wanting to compete in a boxing match. However, his coach feels that Leon still needs to improve on some areas of his fitness before he competes. His coach believes that within a year Leon will be ready to fight in his first match.

### Answer the following questions and activities on Leon:

You firstly need to identify the long-term benefits to training (AO1), then you should identify how Leon would benefit Leon (boxing) in terms of training and competition (AO2).

1. Boxing is a very physically demanding sport. Identify four differences that you would expect to see in Leon's body after six months of boxing. Then explain how each identified effect is beneficial to Leon.

- (1) .....
- (2) .....
- (3) .....
- (4) .....

2. Leon often trains by doing short high-intensity bouts of sparring. His heart rate during one of his sparring sessions reached 163 bpm. Does this heart rate show that Leon was in his target training zone? Show your working in the space provided below. (3.1.3.4)

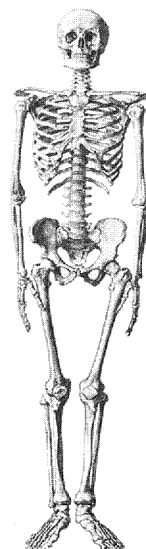
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3. Before every training session Leon completes a 10-minute warm-up and cool-down. For each of the components given for his warm-up and cool-down, write down what Leon could be doing and the benefit of each stage. (3.1.3.5)

<b>Warm-up</b>	
<b>Constituent part</b>	<b>Leon could be doing...</b>
Gradual pulse-raising activity	
Stretching	
Skill-based practices	
Mental preparation	
<b>Cool-down</b>	
<b>Constituent part</b>	<b>Leon could be doing...</b>
Maintain elevated breathing rate	
Reduction in intensity	
Stretches	

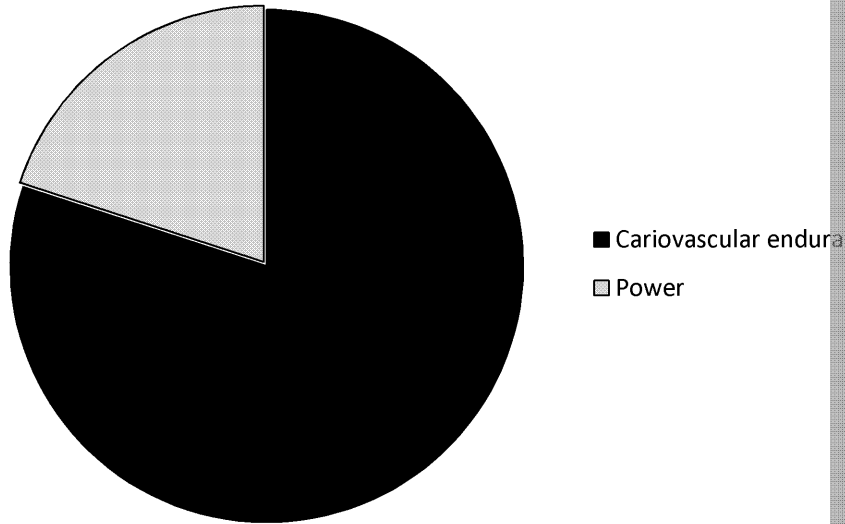
4. Below is an image of a skeleton. Label the features of the skeleton and explain how they relate to boxing performance. (3.1.1.1)



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5. Leon's coach has collected some data showing how Leon splits his training time between cardiovascular fitness and power. He decided to present it in a pie chart.



- i. What does the pie chart show? (3.1.4.3)
- .....
- .....
- ii. Do you think that Leon uses his training time well by focusing on cardiovascular fitness rather than power? Explain your answer below. (3.1.3.2)

.....

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6. Answer the following exam-style question.

Outline what weight training and interval training are and justify why to Leon as a boxer. (3.1.3.3)

For each training type, outline what it is (AO1), apply it to boxing by suggesting and fitness required (AO2), and then justify why each method is relevant to Leon.

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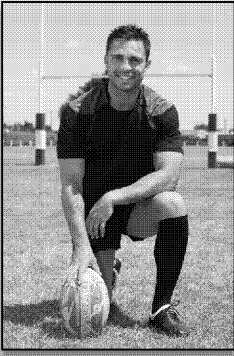
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## Connor the Rugby Player



Connor is 27 years old and is a semi-professional rugby player. He trains three times a week and plays regular fixtures every Saturday. He has to make one training session a week due to his work commitments.

Unfortunately, in the off-season Connor had suffered a knee injury, making him unable to play rugby. It is now pre-season and he needs to get back up to the standards needed for the upcoming matches. However, due to his injury, Connor has not been picked for the team, which in turn means he has lost money from his rugby club. This has meant that Connor is in a difficult financial situation, making him even more eager to return to the field.

Complete the following questions and answers on Connor.

1. Below is an X-ray of Connor's broken leg. Identify the broken bone that is broken. (3.1.1.1)



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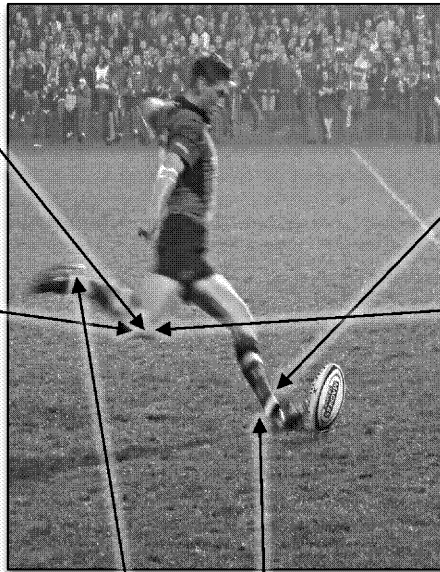
2. Before his injury, Connor was his club's conversion kicker. Due to his technique to another player who is less comfortable with kicking. Connor can give it to help his teammate learn about conversion kicking.

When analysing movements in the exam, break them down to all their constituent parts and what the question is asking!

**Bones at the knee joint:**

1. ....
2. ....
3. ....

**The Analysis of Conversions**



**Withdrawal phase  
(kicking leg)**

**Movement at the knee:**  
.....

**Agonist Muscle:**  
.....

**Antagonist Muscle:**  
.....

**Type of Contraction:**  
.....

**Movement at the ankle  
(kicking leg):**  
.....

**Agonist Muscle:**  
.....

**Antagonist Muscle:**  
.....

**Type of Contraction:**  
.....

**Movement at the ankle  
(non-kicking leg):**  
.....

**Agonist Muscle:**  
.....

**Antagonist Muscle:**  
.....

**Type of Contraction:**  
.....

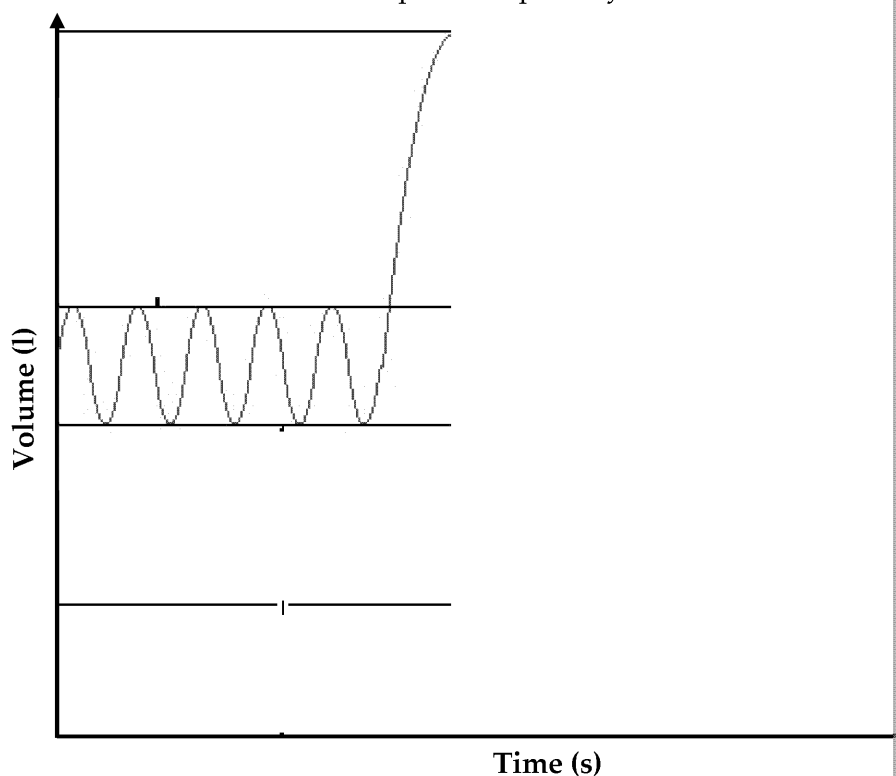
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3. Connor is aware that he needs to get back to full fitness. He decides the to use to do so are plyometric, fartlek and weight training. Give a reason help Connor get back to full fitness and ultimately help his rugby performance.

Training Type	Reason
Plyometric	
Fartlek	
Weight	

4. i. Below is an image of part of Connor's spirometer trace, taken as he breathes normally. The trace so that it shows the expected expiratory reserve volume and residual volume.



- ii. How would you expect the below values to change as Connor exercises? Tick the appropriate column in the table below.

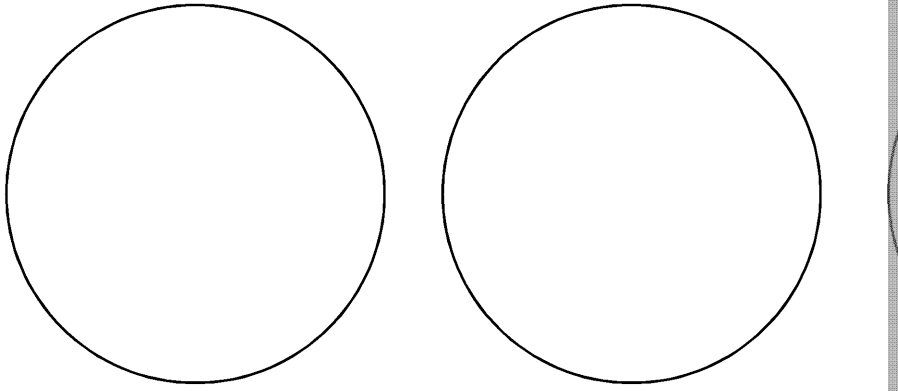
Volume	Increase	Stay the same	Decrease
Tidal volume			
Expiratory reserve volume			
Inspiratory reserve volume			
Residual volume			

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- 5. After every training session, Connor completes a full cool-down to prevent key components of a cool-down and draw an icon to represent them in



- 6. The fitness aspect that Connor has found particularly difficult is the repetition of training that have occurred during his fartlek training, as he often finds it tiring. Explain the process that this relates to. (3.1.1.3)

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## Sarah the Gym Member

Sarah is a 17-year-old college student who has never been interested in sport. However, her best friend recently told her that she looks like she has put on some weight since they left school. This has affected Sarah's confidence when she goes out socialising with friends.

As a result of this, Sarah made a New Year's resolution to exercise more regularly and she has recently joined her local leisure centre, that includes a swimming pool and gym, and holds several exercise classes at a discount to gym members. She also opted to get a personal trainer to help motivate her.

On Sarah's induction day, her personal trainer asks her a series of questions and records details such as age, weight, daily activity levels and personal goals. He also provides Sarah with a leaflet explaining the effects of exercise and information about the different types of training she could take part in.

### Complete the following activities and questions on Sarah:

1. Imagine that you are Sarah's personal trainer. You feel as though a leaflet explaining the long-term effects of exercise would help motivate Sarah to complete her goals. Create a leaflet using the template below, making sure to include as many long-term effects of exercise as you can. (3.1.1.4)

*Reach your goals!*

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- 2. One of Sarah’s goals is that she wants to ‘tone her arms and legs’. As he to give her some exercises related to these muscle groups. Identify three muscles of the arm and suggest an exercise that Sarah could do to work

**Legs**

**Arms**

- 1. ....  
.....
- 2. ....  
.....
- 3. ....  
.....

- 1. ....  
.....
- 2. ....  
.....
- 3. ....  
.....

- 3. Sarah’s personal trainer refers to Wednesday as her ‘tough training’ day as the intensity of her exercises is much higher on this day than the others of the week.

Sarah only concentrates on anaerobic exercises on this day, such as high intensity interval training. She often finds that she struggles for breath following her training.

- i. What process is Sarah experiencing during her recovery after she finishes her training?  
.....
- ii. Provide an explanation of why this process occurs.

Ensure you have identified the process correctly in 3i so you do not waste time on a wrong process in the second part of this question.

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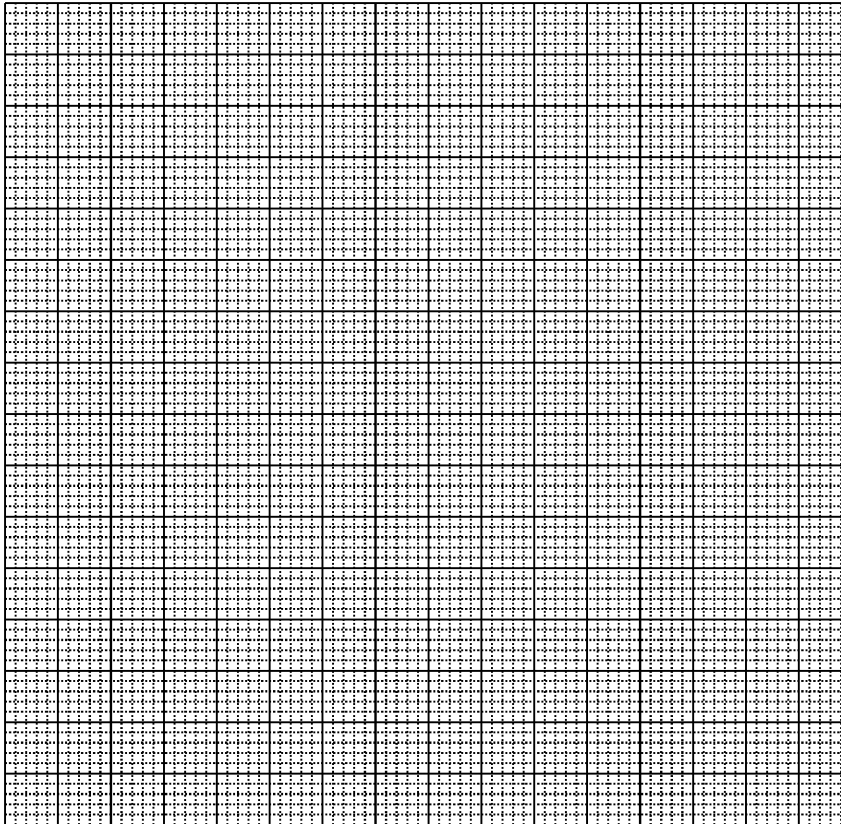
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4. i. Sarah uses a heart rate monitor at the gym that sends data to her phone. Her heart rate while using the treadmill is monitored below. How much easier is to see if it is presented in a graph.

Draw a line graph in the space below to identify changes in Sarah's heart rate.

0 min: 80 bpm 5 mins: 140 bpm 10 mins: 160 bpm 15 mins: 170 bpm



- ii. Is the data shown above qualitative or quantitative? Explain your answer.

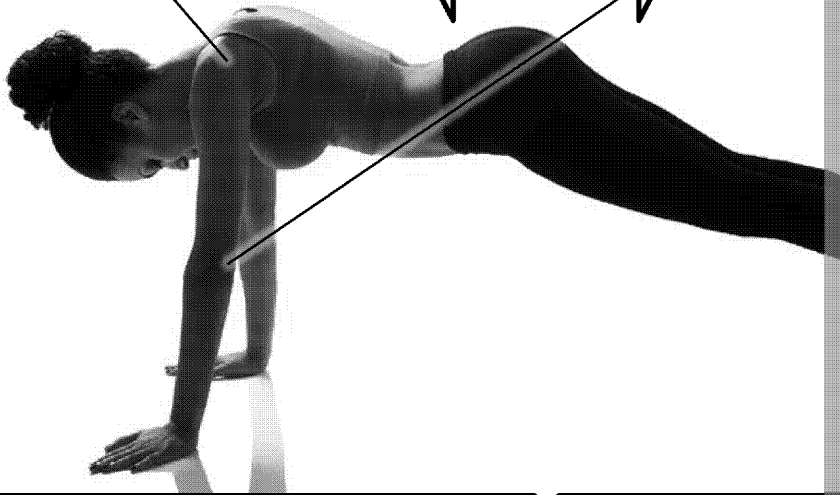
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5. i. Sarah has told you that she does not know how to correctly complete a push-up. You have asked another gym member to demonstrate the correct technique. Analyse the push-up on the image below using the text boxes to help. (3.1.2.1)

<p><b>Movement analysis at the shoulder</b></p> <p>Type of joint:.....</p> <p>Movement (upward phase):.....</p> <p>Agonist: .....</p> <p>Antagonist: .....</p> <p>Movement (downward phase):.....</p> <p>Agonist: .....</p> <p>Antagonist: .....</p>	<p><b>Muscle Contraction</b> (upward phase):</p> <p>.....</p> <p><b>Muscle Contraction</b> (downward phase):</p> <p>.....</p>	<p><b>Movement analysis at the shoulder</b></p> <p>Type of joint:.....</p> <p>Movement (downward phase):.....</p> <p>Agonist: .....</p> <p>Antagonist: .....</p> <p>Movement (upward phase):.....</p> <p>Agonist: .....</p> <p>Antagonist: .....</p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



Plane of movement:.....

Axis of movement:.....

ii. Identify the lever system being used in the movement above and complete the diagram below. (3.1.2.1)

Lever system: .....

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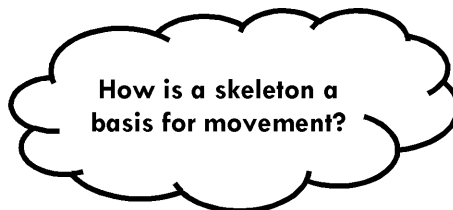
## Shane the Wheelchair Basketball Player

Shane is 16 years old and has a disability, which means that he has almost completely lost the functioning of his legs. He is a very popular boy within his school and has a large circle of supportive friends. These friends know that Shane is a huge basketball fan and regularly watches matches live and on TV. They therefore suggest that Shane should join a local wheelchair basketball team.

Shane was nervous at first, unsure of how his disability would limit him from participating. However, after learning about the safety procedures of the sport he became more confident and started greatly enjoying the sport. His friends and parents have all turned up to watch his team's first home match of the season.

### Complete the following activities and questions on Shane:

1.
  - i. In one of the first sessions that Shane took part in, he fell out of his wheelchair in a big collision. What function of the skeleton is of most importance in this situation?  
.....  
.....
  - ii. How does the skeleton provide a basis for Shane's arm movement? Draw a simple diagram below.



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- 2. Following Shane’s collision, his coach decided that he needed to create to protect his players from injury. Make a checklist for the coach which and can help him ensure that the session is as safe as possible. (3.1.3.4)

Remember to personalise this list for Shane’s environment and do not generalise. You need to apply answers to sports to get AO2 marks.

*Safety Checklist*

- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....

- 3. After a long training session, Shane finds that his right shoulder is aching and discomfort. He thinks that the reason behind this was the repeated nature of the activity where he practised free throws continuously for a 20-minute period.

- i. What type of joint is the shoulder joint?  
.....
- ii. What two bones meet to form the shoulder joint?  
..... and .....
- iii. What movement occurred at Shane’s shoulder during a free throw?  
.....
- iv. What muscles cause the movement?  
..... and .....

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4. Below are five different joints found in Shane's body.

Identify whether each joint is a ball and socket or a hinge joint and then they make up, and then also match the muscles that work at each joint (muscles can be matched and some may be used more than once). (3.1.1.1)

Fibula

Patella

Cranium

Sternum

Ribs

Humerus

Scapula

Radius

Vertebrate

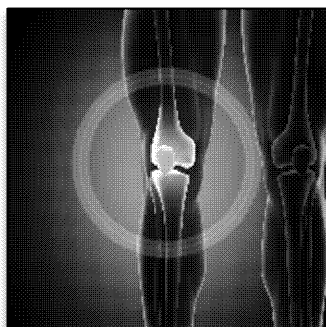
Ulna

Femur

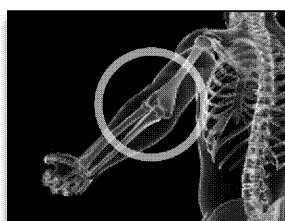
Pelvis

Tibia

Talus



Ball and Socket / Hinge Joint



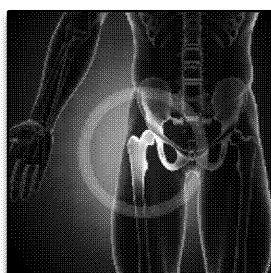
Ball and Socket / Hinge Joint



Ball and Socket / Hinge Joint



Ball and Socket / Hinge Joint



Ball and Socket / Hinge Joint

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5. i. A major reason behind Shane's improved self-confidence was being in a wheelchair during the pre-season. Describe the important features of pre-season that may have improved self-confidence. (3.1.3.4)

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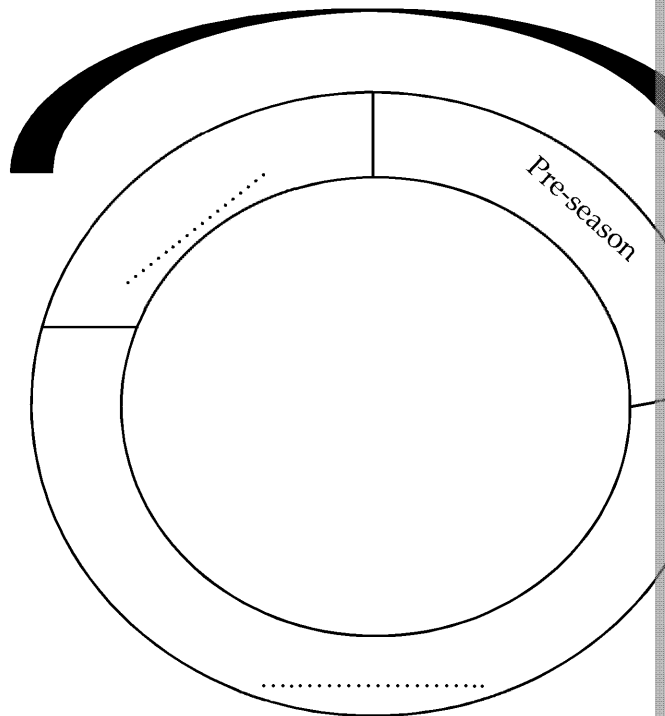
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- ii. Below is a diagram which represents Shane's training season. Only the pre-season period is completed. Complete the diagram by writing in the other two periods of the season.



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iii. How might the coach's strategy for pre-season differ between the two

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## Isla the Football Player

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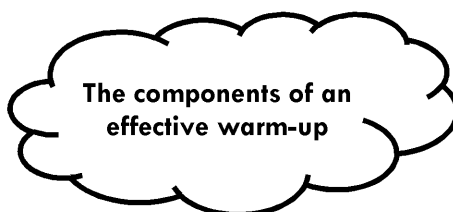
Isla is a 15-year-old girl who until recently did not enjoy sport. However, that all changed when she watched England women's football team compete at the 2015 World Cup in Canada. The player that particularly inspired her was Steph Houghton, the England captain. Isla started closely following her career and learned about Houghton's career history.

When researching this, Isla discovered that Houghton had suffered a broken leg prior to the 2007 World Cup, and then a serious ligament injury before the European Championships in 2009.

Since Isla found out about these injuries, she has made sure that whenever she plays football she focuses on her own body movements and technique so as not to get injured. She also completes a full warm-up and cool-down before, and following every match she plays.

### Complete the following activities and questions on Isla:

- i. Isla makes sure she warms up properly to reduce the likelihood of injury. Complete the diagram below by identifying the components that make up an effective warm-up.



- ii. Using your above answer as an aid, act as Isla's fitness coach and complete the template below. Make sure you keep the warm-up interesting and include all the key components.

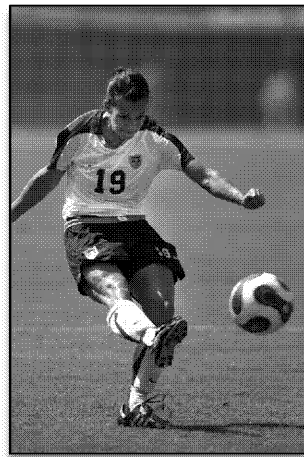
*Isla's warm-up routine*

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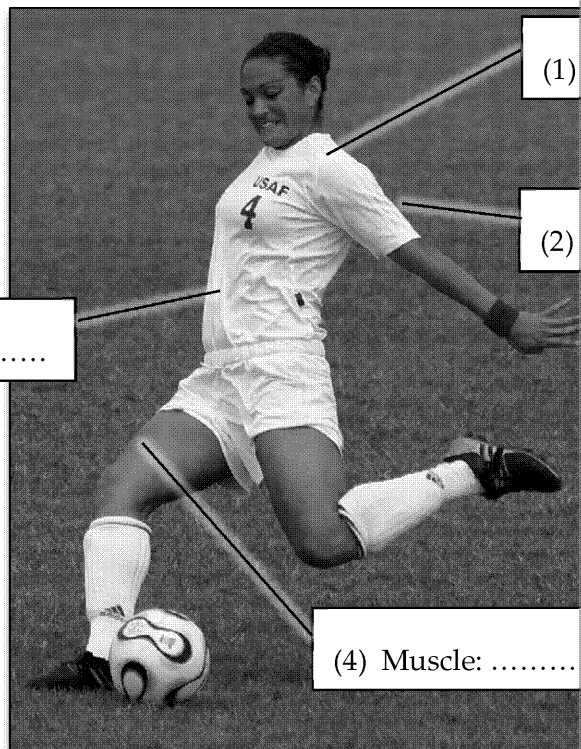
2. Here is an image of a football player attempting a long-range shot.
- i. What plane of movement does this take place in? (3.1.2.2)

Feel free to draw all planes diagrams given before identifying



- ii. Which axis does this movement take place about?

3. i. Here is another image of a football player, this time attempting a curl of the ball. (3.1.1.1)



(1)

(2)

(3) Muscle: .....

(4) Muscle: .....

- ii. Look at the answers you've provided for muscles 2 and 4 on the previous page and identify the relevant antagonistic pair for these answers. (3.1.1.1)

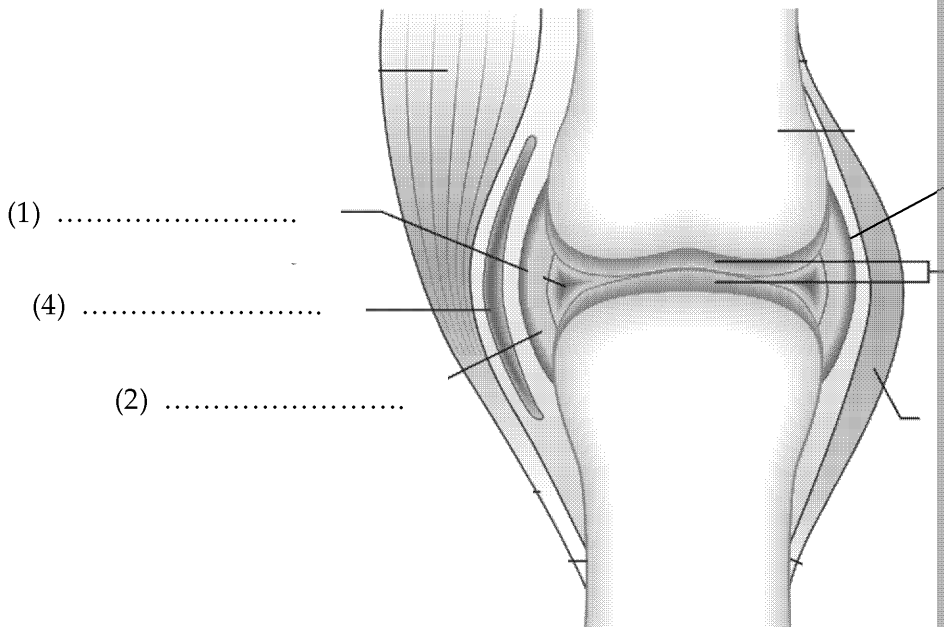
Antagonistic pair for muscle 2: .....

Antagonistic pair for muscle 4: .....

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4. Isla is aware of the structure of the joint after researching her role model. Label the image of the joint to identify the structures and how each structure functions.



- (1) .....
- (2) .....
- (3) .....
- (4) .....
- (5) .....
- (6) .....

5. Partly due to Isla's approach regarding proper warm-ups and taking injury prevention seriously, Isla rarely misses training sessions as she has not been injured this season. However, her friend has missed training sessions due to feeling ill. Provide definitions for both terms and show the difference between these two terms. (3.1.3.1)

Health: .....

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Fitness .....

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- 6. A new fitness coach has joined Isla’s team, and is keen to build the up players to give them a physical advantage. (3.1.3.4)
  - i. They first decide to test each of the players using the one-rep max one-rep max test and justify whether this is a suitable test to measure a football team.

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Consider each part of questions i and ii and ensure you answer what each is asking.

- ii. Explain how the one-rep max test can be used as part of weight training to improve muscular endurance, and how these components of fitness are important for a football team.

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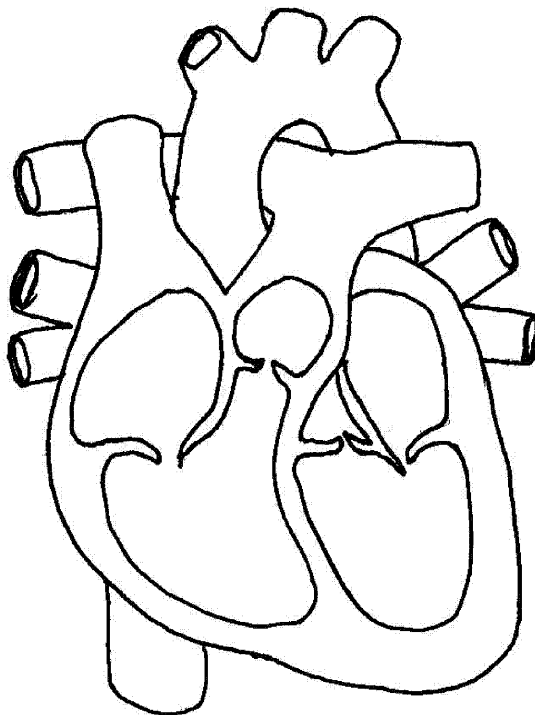
## Jacob the Student

Jacob is 14 years old and is a 'grade A student'. He has always liked the majority of subjects at school, but particularly enjoys biology and PE. He is especially interested in how the heart works to provide the body's tissues with oxygen, a subject that can be found in both biology and PE.

Unfortunately, Jacob has suffered from severe asthma throughout much of his life. This restricts his ability to exercise as this often causes Jacob to suffer from severe asthma attacks. Therefore, Jacob's parents and his PE teacher have agreed to not allow Jacob to engage in physical exercise in the lessons. To make sure Jacob does not feel left out, the PE teacher allows Jacob to collect and other students in the class. This includes recording his classmates' heart and breath

### Complete the following activities and questions on Jacob:

1. Jacob has always been interested in the cardiovascular system. Annotate the left and right atria, and the left and right ventricles. (3.1.1.2)



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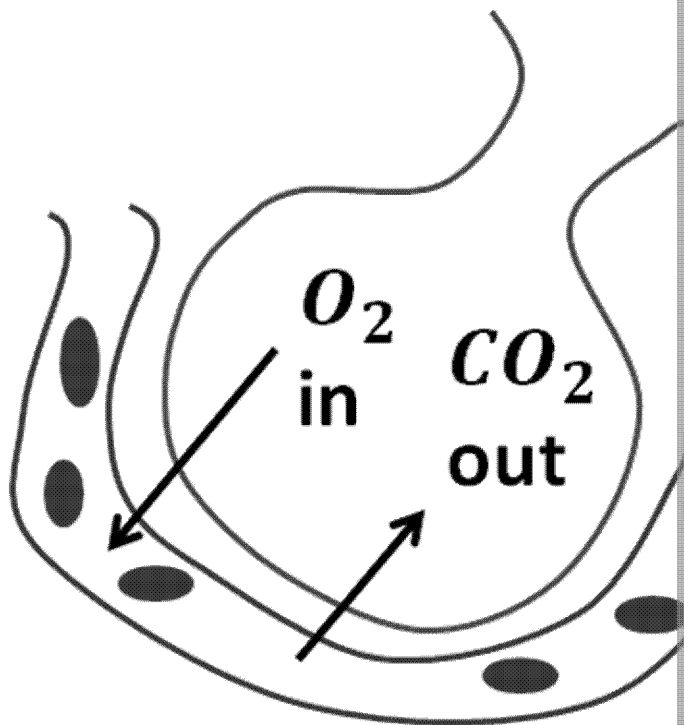
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2. Jacob has learned that the main blood vessels of the circulatory system are the arteries, capillaries and veins. Draw a capillary, artery and vein below. Make sure you label the characteristics that are different from each other. (3.1.1.2)

3. Jacob has asthma, which affects his breathing, and he is keen to understand how the features of the respiratory system assist gas exchange. (3.1.1.2)

Annotate the diagram below to explain how gas exchange at the alveolus is assisted.



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4. Jacob was interested in the data he collected on one particular student over five badminton lessons, as he found that it differed greatly from the class average. The data for student A and the class average (student A) is given below.

	Class 1	Class 2	Class 3	
Student A	145	130	120	
Class average	165	162	145	

- i. Interpret this information to draw a bar chart below. (3.1.4.2)
- ii. The data shown above is quantitative. Explain the difference between quantitative and qualitative data. For both types of data, identify a method of data collection.

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5. Jacob found himself thinking about what components of fitness were being used in badminton. Below are the notes that he made during the third badminton class of the year. Write down the fitness components provided. (You do not need to use all the components)

**Agility, reaction time, cardiovascular endurance, coordination,**

*I have noticed that to get to the net, my classmates have to move quickly as possible, so they need to possess great ..... When they hit the net, they need to quickly adjust their body position, so they can ..... I also noticed that during smashing, they have to bend their backs a lot to get into the correct position, demonstrating ..... Some of my classmates couldn't hit the shuttlecock, I guess this means they need to work on their ..... Whenever someone hit the shuttlecock really hard, it seemed more difficult to respond to the shot successfully, showing that ..... is an important fitness component of badminton.*

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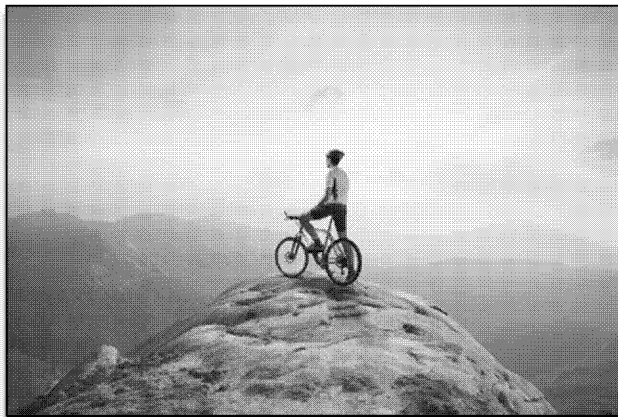
## Isaac the Cyclist

Isaac is 32 years old and a professional cyclist. He competes in cycling competitions all over the UK whenever he can. He is currently planning a trip to Bolivia, South America, to participate in a big cycling race that is taking place there in six months' time. To make sure that he is top condition for this race, Isaac is working with his coach to monitor and analyse his performance data, such as his gaseous exchange and cardiac values during his training sessions.

This is the first time that Isaac will have been outside of Europe, and he has researched Bolivia and the competition in detail. He has found out that the race is at high altitude and therefore he will need to adapt his training methods prior to the race. He has trialled a number of different training types recently and thinks he has finally found the optimal type to make sure he is in the best possible shape when he races.

### Complete the following activities and questions on Isaac:

- Before Isaac leaves for Bolivia, he has some last-minute doubts whether the performance level or not. Help Isaac by providing a pros and cons list of altitude training.



Providing a table like this for questions that involve a pros and cons list is a good way to ensure you cover all the points. You should also apply the same activity if the question asks for a list of advantages and disadvantages.

Pros of altitude training	Cons of altitude training

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2. This competition is the last event in Isaac’s competition season. How will he spend his post-season? (3.1.3.4)

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3. When Isaac met some of the other cyclists that are competing in the same event, they discussed the types of training that they had undergone prior to the race. Most of them but the most popular were continuous training and interval training. Write down the advantages and disadvantages of both of these training types for cyclists? (3.1.3.3)

Continuous Training		Interval Training
Advantages	Disadvantages	Advantages

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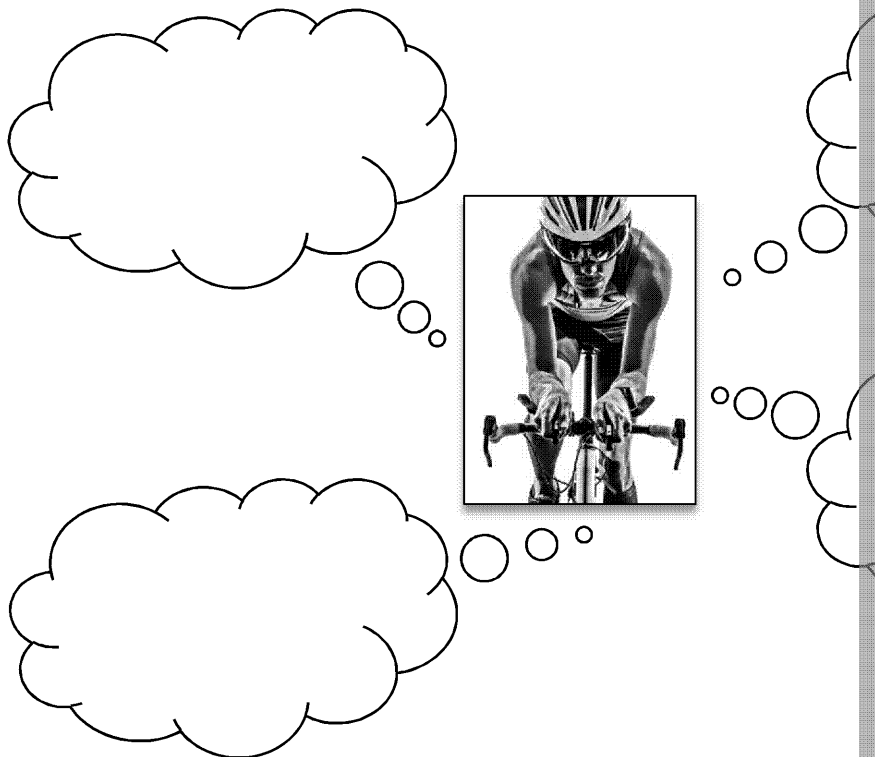


4. i. As Isaac starts the race, he finds that the preparation for altitude training has made him more capable of racing in these conditions. However, he still shows signs of exercise having an immediate effect on his body. Imagine you are a commentator or a news reporter and comment on the effects Isaac may be experiencing during the race and why they are occurring.

Here you should discuss the immediate effects of exercise on the body. Use this to suggest what factors you will evaluate during the race.

Handwriting practice area with a solid top line and ten dashed lines below it.

- ii. Isaac finishes the race in eighth position. His flight back to the UK is long. Use a series of images in the bubbles below to outline the short-term effects of exercise on the body and how he might feel the next day. (3.1.1.4)



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5. Isaac initially finds training at altitude very difficult, and often finds this more difficult than normal. Why might this be? (3.1.3.4)

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6. Complete the equation below to show the combination of oxygen with haemoglobin.  
Oxygen + Haemoglobin  $\longrightarrow$  .....

7. Identify the features that aid the gas exchange that occurs at Isaac's altitude.

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# Answers

## Marquise the Gymnast

1. Bones correctly labelled

Fibula (thinner bone)

Tibia (thicker bone)

Talus



2. i. Any one of the following reasons:

- She didn't complete a suitable warm-up prior to her gymnastics training
- She was training too hard leading up to the regional competition
- Impact injury from not practising on gym mats
- She did not use the correct technique
- She did not have enough rest between sessions, so did not recover
- Any other suitable example

ii. Any one of the following suggestions:

- Ensure she completes a thorough warm-up before practising, including stretching
- She could wear suitable footwear to reduce impact (if appropriate)
- She could ensure she always practises on soft gymnastics flooring to reduce impact
- She could wear taping on the old injury, to prevent re-injuring the area
- She should ensure she uses correct technique
- Maintain hydration before, during and after training
- Should consume a healthy balanced diet, including the nutrients for muscle repair
- Allow appropriate rest between sessions
- Train for less time, cut sessions down to an hour and a half

(Students must match up their reasons with the appropriate suggestion to form a pair)

iii.

Recovery method suggested	Brief explanation of each suggested method	
'Changing her diet'	<ul style="list-style-type: none"> <li>• She should consume more proteins after training to repair torn muscle fibres</li> <li>• She should also consume carbohydrates for energy, and water to stay hydrated</li> </ul>	<ul style="list-style-type: none"> <li>• Rep</li> <li>• Incr</li> <li>• Ren</li> </ul>
'Have ice baths'	Cold therapy from ice baths, allows muscles to repair, by restricting blood vessels and reducing swelling	<ul style="list-style-type: none"> <li>• Red</li> <li>• Rep</li> <li>• Red</li> </ul>
'Stretch often'	Stretching will maintain her flexibility and reduce injury	<ul style="list-style-type: none"> <li>• Hel</li> <li>• Mai</li> </ul>

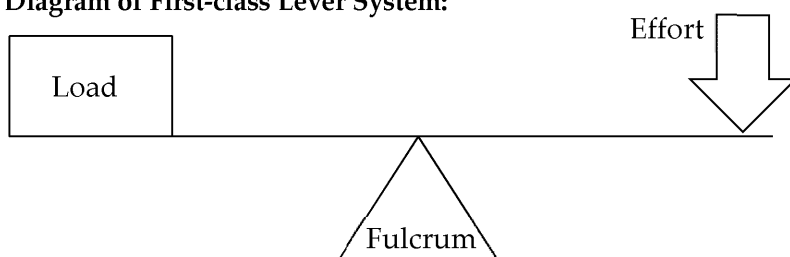
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3. i. **Pommel horse (any of the following, with explanations)**  
**Balance** – To stay on the pommel horse  
**Coordination** – To enable the correct positioning/timing of hand movements  
**Flexibility** – To be able to get the body into the correct positions  
**Power** – To be able to explosively move into the next position  
**Dynamic strength** – To be able to continuously complete movements which require suitable answers
- ii. **Vault (any of the following, with explanations)**  
**Coordination** – To enable correct hand timing and positioning on the vault  
**Flexibility** – To get the body into the correct position during the routine  
**Power** – To produce an explosive movement from the vault into the air  
**Speed** – Needed to approach the vault at a speed quick enough to generate momentum from the vault
- iii. **Floor routine (any of the following, with explanations)**  
**Agility** – To be able to quickly change direction during the routine  
**Balance** – To be able to maintain a stable position during the routine  
**Coordination** – To be able to time the movements correctly  
**Flexibility** – To be able to move the body into the necessary positions  
**Muscular endurance** – To be able to undergo repeated movements which require suitable answers  
**Power** – To be able to generate explosive movements during the routine  
**Static strength** – To be able to hold movements steady, e.g. holding a handstand  
**Speed** – To be able to get into different areas of the floor quickly

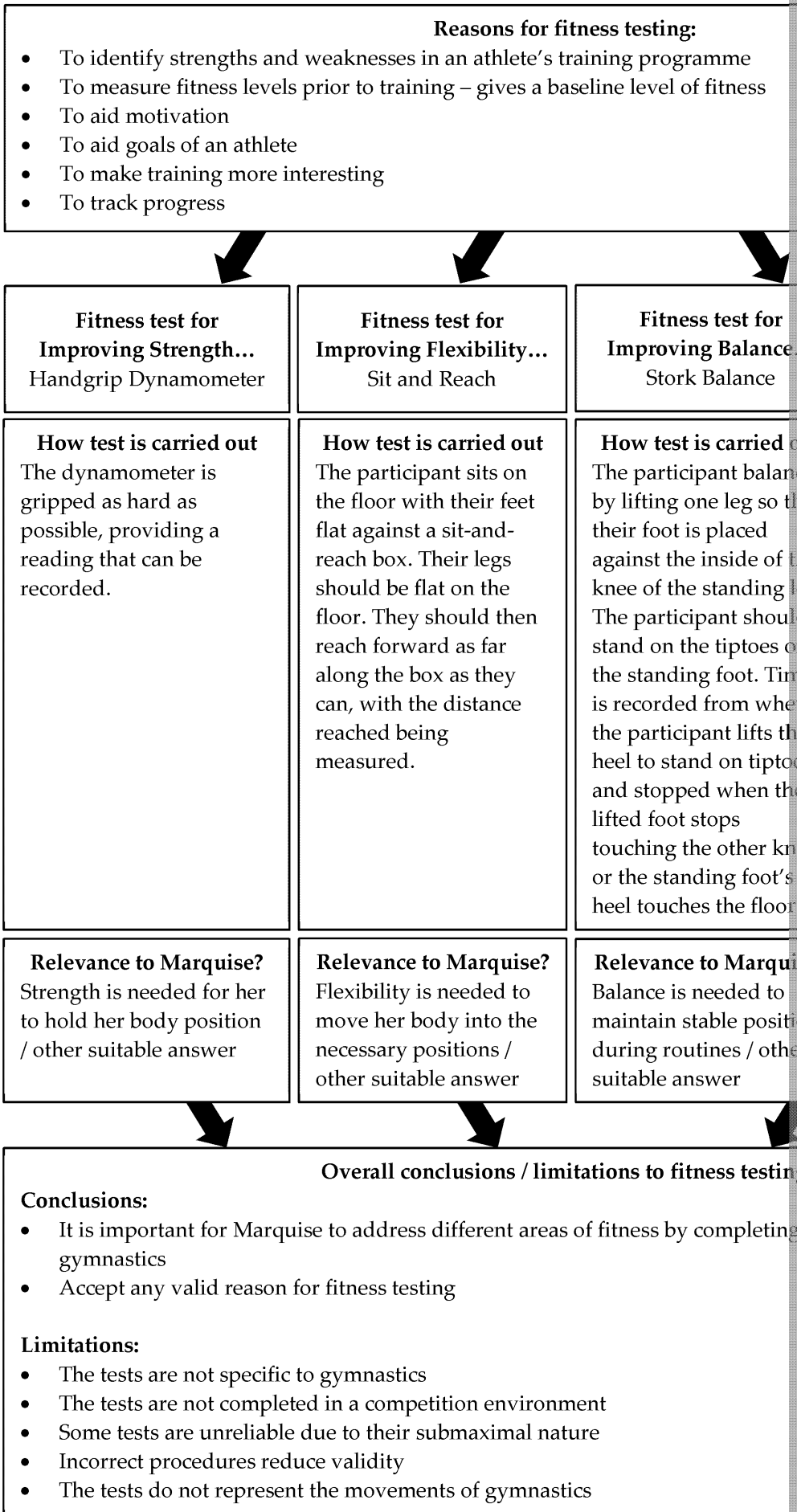
4. i. **Plane of movement:** Frontal Plane  
**Action at the ankle:** Dorsiflexion (ankle is ready to land)  
**Action at the shoulder joint:** Accept either: Rotation of shoulder or Abduction  
**Lever System:** First-class  
**Diagram of First-class Lever System:**



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5.



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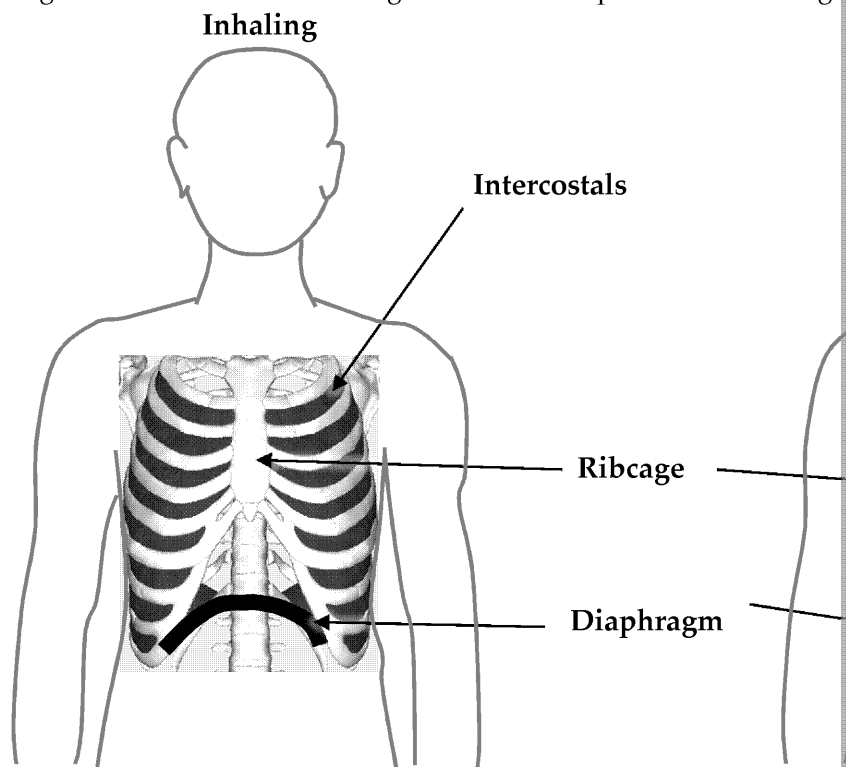
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## Jayden the 5,000 m Runner

1. i. **Type of exercise:** Aerobic  
**Reasons:**
  - Lower intensity
  - Long duration
  - Oxygen is present to enable aerobic respiration
- ii. Aerobic exercise equation:  $\text{glucose} + \text{oxygen} \rightarrow \text{energy} + \text{carbon dioxide}$
2. i. (1) mouth/nose  
(2) trachea  
(3) bronchi  
(4) bronchioles
- ii. Diagrams to include the following features with explanations to each given



### Role when inhaling:

- Intercostals – these contract, causing the ribcage to expand
- Ribcage – moves outwards and upwards
- Diaphragm – contracts, moving downwards and increasing chest volume

### Role when exhaling:

- Intercostals – these relax, causing the ribcage to move down and inwards
- Ribcage – moves down and inwards
- Diaphragm – relaxes, reducing chest volume

- iii.
  - Pectorals
  - Sternocleidomastoid

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3. **Immediate effects**
- Increased skin temperature / sweating / raised body temperature
  - Raised heart rate
  - Raised breathing rate and greater depth of breathing

**Short-term effects**

- Dizziness / light-headedness
  - Fatigue
  - Nausea
  - DOMS / painful muscles / similar answer
  - Any other suitable answer
4. Definition of health:
- Being in a state of complete physical, mental and social well-being
- Relationship between health and fitness:
- As fitness increases, so can the physical component of health
  - However, you can be considered fit but not healthy
- Definition of fitness:
- Being able to physically complete daily tasks

5. **Fitness test:** Multi Stage Fitness Test

**This will test Jayden's:** Cardiovascular fitness

**Equipment and facilities needed:** Hall / open space / other suitable area. Con suitable equipment

**Procedures:** A set of cones are spaced 20 m apart. Jayden is to start on one set of cones, before a prerecorded beep is emitted by the machine. Jayden should cannot reach a set of cones before the beep, he is exhausted, or he completes the

**Measurements:** The level and shuttle achieved should be noted.

What the measurements tells us: This can then be entered into a calculation to

- 6.

**Training Programme notes**

During the first week of the programme, make sure to complete at least four x 1500 m runs. You should also run one x 5,000 m as fast as you can complete it. Try and aim to complete this 5,000 m within 13.5 minutes.

For this first week, stick to only running as your training method. Over the next few weeks we will experiment with cycling and swimming to see the effect that this has on your cardiovascular fitness.

7. Training programme is working for the following reasons:
- Average 5,000 m time has improved – indicating improvements in his overall cardiovascular fitness
  - Heart rate has been lowered – showing an increase in his cardiovascular endurance is brought about in increased size of the heart, resulting in more efficient blood flow
  - Breathing rate has been lowered – indicating his respiratory system is more efficient

Training programme is not working for the following reason:

- The final 500 m time, which is what Jayden had identified as an area he needed to have been improved.
8. High-altitude training involves:
- Training at high altitude (2,400 m above sea level)
  - There is less oxygen in the air, so oxygen-carrying capacity is reduced
  - The body pays for this by making more red blood cells to carry oxygen to the muscles

**Benefits**

- + Could improve Jayden's aerobic capacity
- + Improves Jayden's cardiovascular endurance when you return to sea level
- + Improved ability to cope with lactic acid build-up, which could help reduce fatigue at the end of a race

**Limitations**

- Benefits are not long-lasting, when Jayden returns to sea level
- Jayden could experience altitude sickness
- Sickness may lead to Jayden being unable to train

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## Isabella the Swimmer

1.
  - i. FALSE – the alveoli have a large surface area
  - ii. TRUE
  - iii. FALSE – the diffusion pathway is short, reducing the time taken for gases to diffuse
  - iv. TRUE
  - v. FALSE – gas moves from a high concentration to a low concentration
  - vi. FALSE – the walls of the alveoli are only one cell thick
  - vii. TRUE

2.
  - i. **Definitions:**
    - Heart rate – the number of times the heart beats per minute
    - Stroke volume – the volume of blood that is ejected per beat
    - Cardiac output – the volume of blood that the heart ejects per minute

### Changes during exercise:

- Heart rate – increases
- Stroke volume – increases (also accept increases up until a point then decreases)
- Cardiac output – increases

### Relationship equation:

- Cardiac output = stroke volume x heart rate

- ii. Cardiac output = stroke volume x heart rate

$$\text{Cardiac output} = 130 \text{ ml} \times 175 \text{ bpm}$$

$$\text{Cardiac output} = 22,750 \text{ ml/min or } 22.75 \text{ L/min}$$

- iii. Maximum heart rate =  $220 - \text{age}$

$$220 - 20 = 200 \text{ bpm. Note: Units needed}$$

- iv. **Aerobic training zone:**

Aerobic training zone = 60–80% of maximum heart rate

$$\text{Maximum heart rate} = 220 - \text{age} = 220 - 20 = 200 \text{ bpm}$$

$$60\% \text{ of } 200 \text{ bpm} = 120 \text{ bpm}$$

$$80\% \text{ of } 200 \text{ bpm} = 160 \text{ bpm}$$

Aerobic training zone = Between 120 and 160 bpm

### Anaerobic training zone:

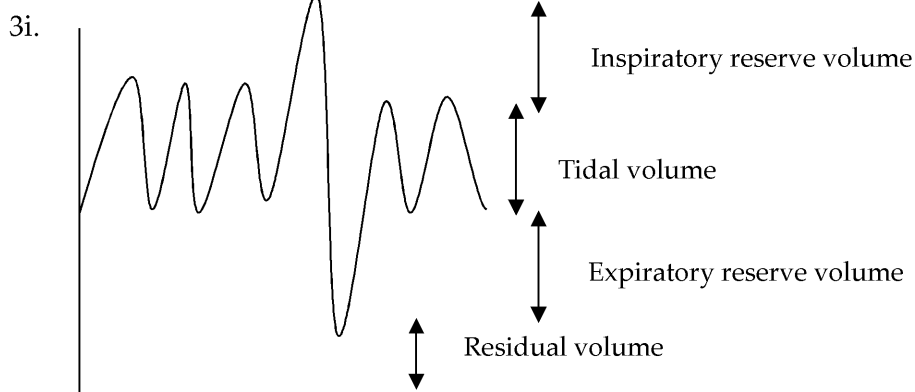
Anaerobic training zone = 80–90% of maximum heart rate

$$\text{Maximum heart rate} = 220 - \text{age} = 220 - 20 = 200 \text{ bpm}$$

$$80\% \text{ of } 200 \text{ bpm} = 160 \text{ bpm}$$

$$90\% \text{ of } 200 \text{ bpm} = 180 \text{ bpm}$$

Anaerobic training zone = Between 160 bpm and 180 bpm



- ii. **During exercise:**

Tidal volume increases

Expiratory reserve volume decreases

Inspiratory reserve volume decreases

Residual volume stays the same

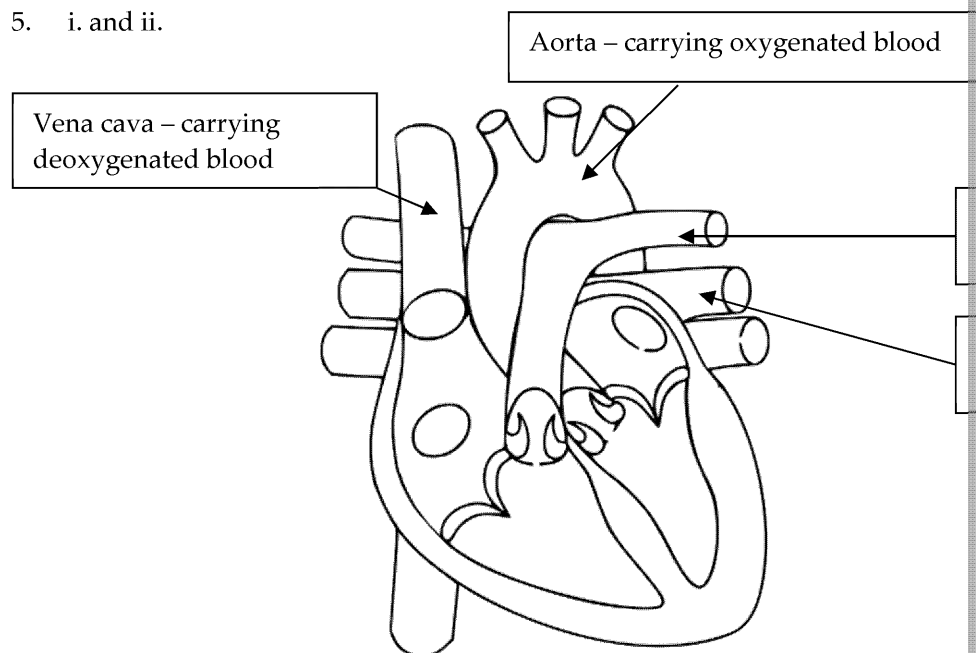
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4. Any of the following long-term effects of exercise with link to swimming.
- Specific fitness components – swimming training can be tailored to focus on
  - Muscular strength – swimming training involves weight training which
  - Speed – swimming can improve muscular power which contributes to in example
  - Stamina – swimming is a physically demanding sport, with long distance other suitable example
  - Muscular endurance – swimming involves many repeated muscular movements during front crawl, building the muscular endurance in these muscles / a
  - Suppleness – swimming involves movements which require a large range of motion suitable example
  - Cardiovascular endurance – swimming improves the strength of the heart to transport blood to the muscles / other suitable example
  - Hypertrophy – swimming causes the heart to beat quickly to pump oxygenated blood this can in time lead to the improved size and strength of the heart
  - Bradycardia – swimming improves the heart's strength via hypertrophy, lower heart rate / other suitable example

5. i. and ii.



iii. The cardiac cycle (the following points should be considered):

1. Deoxygenated blood enters the right atrium
2. This flows from the atrium into the right ventricle
3. The pulmonary artery carries the deoxygenated blood to the lungs
4. Blood becomes oxygenated / gas exchange
5. The pulmonary vein carries oxygenated blood to the left atrium
6. This flows from the atrium into the left ventricle
7. Oxygenated blood is pumped to the body through the aorta
8. Diastole should be mentioned in the stages of chamber relaxation
9. Systole should be mentioned in the stages of chamber contraction
10. Increase in pressure causes valves to open
11. Valves close to prevent blood flowing the wrong way

iv. How this helps Isabella to sustain her swimming intensity:

- The blood is redistributed to the exercising muscles
- The arteries supplying the muscles vasodilate (widen)
- Providing more blood and oxygen to the working muscles
- The arteries supplying the non-active organs (stomach etc.) vasoconstrict
- Reducing the blood and oxygen being delivered so it can be delivered to the muscles

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## Ethan Training for the Army

- Specificity** – Ethan could train specific components of fitness that he is not strong in  
**Progressive Overload** – Ethan could slowly increase his workload so that he can reach higher fitness levels / other suitable example  
**Reversibility** – Ethan must make sure that he keeps training so that he does not lose his fitness / other suitable example  
**Tedium** – Ethan should keep his training enjoyable so that he keeps training and does not get bored / other suitable example
- Inhaling:**
    - Intercostals: The intercostals contract, causing the ribcage to expand, lowering chest air pressure
    - Ribcage: The ribcage is expanded, and moves upwards and outwards, lowering chest air pressure
    - Diaphragm: The diaphragm contracts, moving downwards, increasing chest air pressure
  - Exhaling:**
    - Intercostals: The intercostals relax, causing the ribcage to be lowered, increasing chest air pressure
    - Ribcage: The ribcage is lowered and moves inwards, reducing chest air pressure
    - Diaphragm: The diaphragm relaxes, moving up, reducing chest volume, increasing chest air pressure
  - The air pressure in the lungs is decreased when inhaling, causing air to enter the lungs
    - The air pressure in the lungs is increased when exhaling, causing air to leave the lungs
  - (1) False
    - (2) False
    - (3) True
    - (4) True
- Anticipatory rise
  - It shows when the heart rate is increasing in preparation for the body to be active
  - This is from an increase in adrenaline being released from the adrenal glands, causing the sympathetic nervous system to be activated and heart rate increased
- Cool-down:**
  - Safely reduces body temperature and heart rate
  - Allows physical recovery
  - Removes lactic acid / waste products
  - Helps to prevent DOMS**Manipulation of diet:**
  - Repair damaged muscle fibres from training
  - Increase in energy
  - Remain hydrated**Ice baths / massage:**
  - Reduced swelling/inflammation
  - Repair of torn muscle fibres
  - Reduce onset of DOMS

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5. i.

Level	Marks	Description
3	7-9	Strong and accurate knowledge of the benefits and limitations with correct terminology and good grammar used. Application to fitness tests is appropriate and effective. Examples have been given, with a near equal split between benefits and limitations.
2	4-6	Good knowledge of the benefits and limitations, but examples and limitations lack a sufficient number of examples. Benefits and limitations may be unequal. The answer is lacking moderate use of correct terminology.
1	1-3	Knowledge is lacking of the limitations and benefits. There is a lack of evidence of correct terminology, with very few benefits or limitations.
	0	No appropriate answer is given.

**Marks to include:**

*Benefits of fitness training*

- Help monitor improvements/decreases in performances
- Can result in personal targets
- Helps to prevent tedious training sessions
- Can be compared against others
- Identifies base level of fitness
- Shows what is necessary to target
- Can identify strong and weak parts of performance levels

*Limitations of fitness training and how these can be improved upon*

- Not relevant to training needs – fitness tests such as multi-stage fitness tests, cardiovascular endurance on land, such as running, and not suitable for all
- Tests rely on motivation / unreliable – tests such as one-rep max test as they rely on motivation levels of participants
- Don't follow normal sporting movements – tests such as stork balance test, different types of balance such as dynamic balance
- Precise steps need to be followed – if procedures for tests such as the stork aren't followed accurately (including calibration of equipment) it may affect results
- Do not replicate competitive environments – ruler drop test measures reaction time in a quiet environment, which doesn't replicate reaction times required in sport

ii. Relevant limitation identified and appropriate recommendation provided

- Not relevant to training needs – tweak to make more relevant to fitness training
- Tests rely on motivation / unreliable – make maximal tests where possible, e.g. Ethan of trying his hardest / other suitable answer
- Don't follow normal sporting movements – as mainly for fitness for fun, not to replicate standard cardiovascular activities such as running/sprinting
- Precise steps need to be followed – clearly explain procedures to ensure accuracy of results

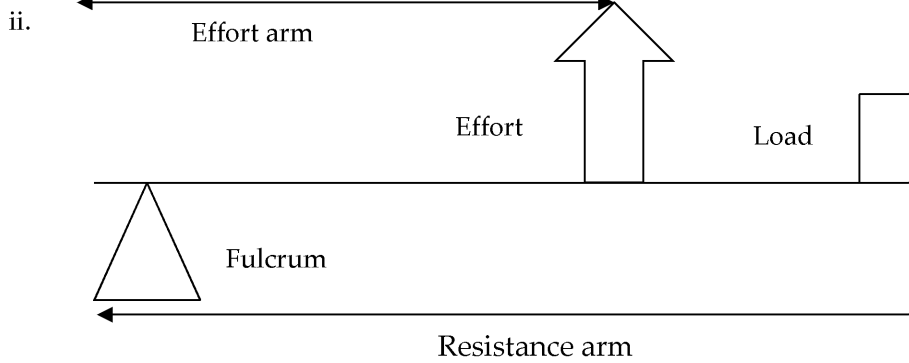
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## Ava the Rock Climber

1. i. Third-class lever



iii. Mechanical advantage = effort arm ÷ resistance arm

- iv.
- The resistance arm is longer than the effort arm
  - This allows for a large range of motion, and also quick movement
  - Not much force can be applied

2. (1) Appropriate warm-up – make sure that Ava follows a full warm-up before temperature / heart rate is raised suitably / other suitable example
- (2) Correct clothing and footwear – make sure that her footwear has sufficient fitting / other suitable example
- (3) Make sure that you are hydrated – make sure that Ava drinks whenever / other suitable example
- (4) Taping when required – make sure that any previous injuries are strapped / other suitable example
- (5) Use the correct technique – make sure that Ava copies her instructor's technique / other suitable example
- (6) Allow suitable recovery periods – make sure that Ava rests when tired / other suitable example
- (7) Do not overstretch or stretch when bouncing – make sure that Ava does not overstretch / other suitable example
- (8) Do not overtrain – make sure that Ava has sufficient rest periods / other suitable example

3. i. Muscles and suggestions from the following:

- **Biceps** – help lift the upper body upwards
- **Abdominals** – help to improve stability when climbing
- **Deltoid** – used when stretching high above the head to reach a high point
- **Latissimus dorsi** – help pull the body upwards / move the arms inward
- **Rotator cuffs** – help pull the body upwards on overhanging rocks
- **Triceps** – help lift the upper body upwards
- **Hip flexors** – help to flex the body into the necessary positions when climbing
- **Gastrocnemius** – helps to support body weight and push the body upwards
- **Quadriceps** – help extend the leg and push up off the rock
- **Tibialis anterior** – allows dorsiflexion at the ankle to help push the body upwards

- ii.
- Tendons attach muscles to bone
  - When the muscles contract they pull on the bones,
  - causing movement at the joint in which they operate

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4. • **Support** – helps to support the tissues and muscles required to move when climbing a rock / other suitable example
- **Protection of vital organs** – helps to prevent Ava suffering a serious injury when climbing a rock / other suitable example
- **Movement** – enables limb movement to climb the rock / other suitable example
- **Structural shape** – helps to keep the body upright when scaling a rock / other suitable example
- **Muscle attachment** – allows muscle contraction to move the limb / other suitable example
- **Mineral storage** – stores minerals which help maintain the health of other suitable example
- **Blood cell production** – allows more oxygen to be carried to Ava's exercising muscles

5. i.

Upper body joint	Muscles at the joint	Movements
Elbow	<ul style="list-style-type: none"> <li>• Biceps</li> <li>• Triceps</li> </ul>	<ul style="list-style-type: none"> <li>• Flexion</li> <li>• Extension</li> <li>• Abduction</li> <li>• Adduction</li> <li>• Rotation</li> </ul>
Shoulder	<ul style="list-style-type: none"> <li>• Rotator cuffs</li> <li>• Deltoid</li> <li>• Pectoral</li> <li>• (also accept biceps and triceps)</li> </ul>	<ul style="list-style-type: none"> <li>• Flexion</li> <li>• Extension</li> </ul>

ii. Justification to include:

**Shoulder joint/muscles:**

- Allow rotation of the shoulder to move the arm into the correct position
- Allow a large range of motion to get to difficult climbing spots
- Any other suitable example

**Elbow joint/muscles:**

- Enable the climber to pull themselves upwards
- Help to take some strain off the wrist joint
- Any other suitable example

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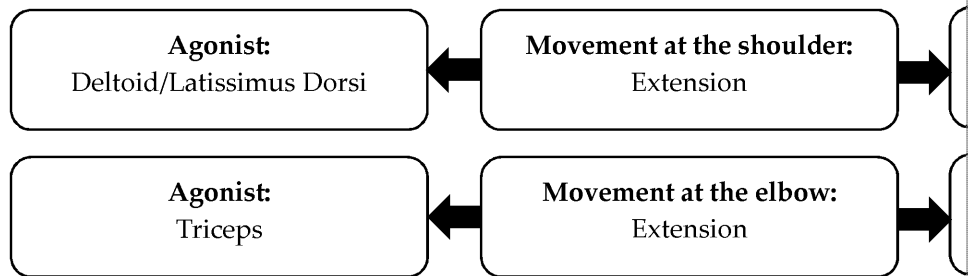


## Emily the Table Tennis Player

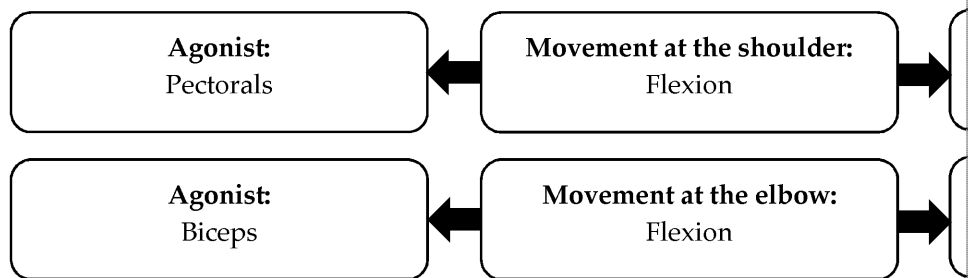
1. i. **Health:** being at a state of complete mental, physical and social well-being  
**Fitness:** the capability to complete daily tasks / any other suitable definition
- ii. Emily can have a full state of well-being, but an injury could prevent her from performing successfully / any other suitable answer

2.

### Pull-back phase



### Follow-through phase



3. i. The sign should include:
  - The amount of weight / repetitions should be dictated by the fitness
  - Spotters should be used for heavy weights / bench press
  - Weights can be used to increase muscular endurance / muscular strength
  - Do not lift weights which are too heavy
  - Always use the correct technique
  - Safe practice is paramount
- ii. **Any of the following pros (advantages)**
  - Improves bone density, reducing future skeletal injuries
  - Increases strength of connective tissues such as ligaments and tendons, reducing the risk of suffering any dislocations or muscular injuries
  - Increases strength, improving muscular performance, resulting in the ability to produce same contractions
  - Can be completed any time and incorporated into her training regime
  - It can be tailored to meet the movements required in table tennis, e.g. backhand shot using pectorals
  - Or any other appropriate advantage
- Any of the following limitations to fitness testing (disadvantages)**
  - Strength is improved with weight training which is not the most important for table tennis
  - Requires equipment such as weights and machines which may not be available
  - If wrong technique is used, it may cause more injuries to Emily and other players
  - Or any other appropriate limitation

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4. Drawings should include:
- An appropriate warm-up
  - The inclusion of recovery periods
  - Avoiding overtraining
  - Wearing appropriate clothing and footwear
  - Using the correct technique
  - Using taping/bracing
  - Staying hydrated
  - Not overstretching / doing ballistic stretching

5. The email should contain the following:

**Type of joint:**

- Ball and socket

**Structures to include:**

- **Synovial fluid** – lubricates the joint, reducing frictional damage from wear
- **Joint capsule** – allows the joint to be stable, protecting the joint from excessive movement
- **Synovial membrane** – produces the synovial fluid which lubricates the joint
- **Bursae** – prevents frictional damage at the joint
- **Ligaments** – absorb shock / help to prevent against dislocation / have a stabilising function
- **Cartilage** – absorbs shock / reduces friction

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1. i. **Circuit training:**
  - Involves a variety of exercises at a number of different stations
  - Recovery periods can be put into place either throughout the circuit
  - Can be tailored to focus on particular components of fitness
  - Often involves different equipment**Continuous training:**
  - A steady-state exercise is maintained
  - No recovery periods
  - Aerobic exercise
  - Lasts a long time (greater than 20 minutes)**Weight training:**
  - Involves a variety of free weights / weights machines
  - Can tailor for different strength-related components of fitness
  - Involves sets and repetitions
  - Using the correct technique is very important**Fartlek training:**
  - Involves changing the speed / recovery periods / terrain
  - Can use both aerobic and anaerobic exercise
  - A mix between continuous and interval training
- ii. The most suitable training types include:
  - Circuit training: can be adapted to work on golf skills as well as improve fitness
  - Weight training: will increase Chris's strength and power to get more power in his swing / other suitable suggestion
  - Continuous training: will increase Chris's fitness levels that he will be able to walk longer distances around the golf course / other suitable suggestion
  - Accept suitable other training type with relevant suggestion
- iii.
  - Any perceived improvement that this training might have on fitness and performance may make Chris more likely to persist with golf
  - A combination of training type may reduce chances of boredom

2. **Specificity:**

**Enjoyment:** Chris can train on a specific part of golf that he enjoys the most. As a result, he may enjoy achieving them.

**Fitness:** Chris can train a specific component of fitness relevant to golf such as strength and endurance / other suitable answer

**Progressive Overload:**

**Enjoyment:** Chris can ensure that he is not overloaded too quickly by building up his fitness gradually, so he remains motivated and enjoys his training programme

**Fitness:** Gradually increasing overload can help to promote positive fitness adaptations / other suitable answer

**Reversibility:**

**Enjoyment:** Ensure this does not take place as this could demotivate Chris. Varying his training to ensure Chris doesn't lose his fitness levels, which enhance his success and enjoyment

**Fitness:** Ensure this does not take place as this could demotivate Chris and he may stop training on specific areas of his fitness / other suitable answer

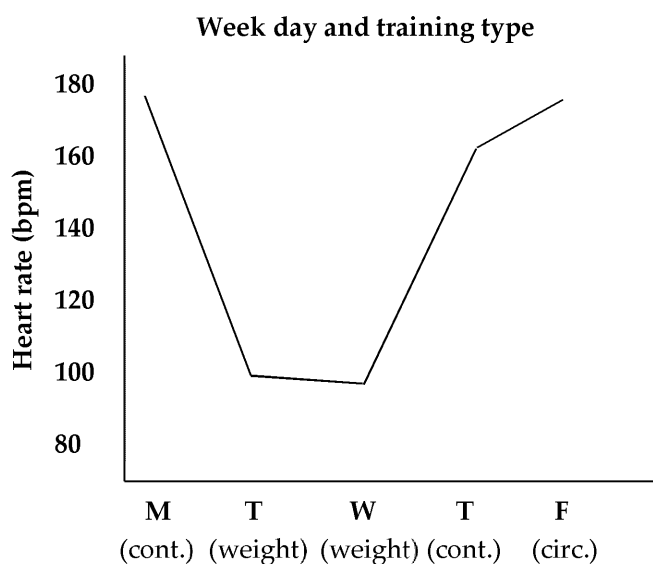
**Tedium:**

**Enjoyment:** Ensure this does not take place as this could demotivate Chris

**Fitness:** Ensure this does not take place as this could demotivate Chris and he may stop training / other suitable answer



3. i.



- ii. The training type that Chris found hardest (most intense) physically was  
 The training type that Chris found the least difficult physically was Tues  
 The training type that Chris enjoyed the most was weight training.  
 The training type that Chris enjoyed the least was Monday's continuous

4. **Pre-season:**

- **Description:** This is to allow the performer to prepare for the upcoming  
general fitness / improve skills
- **Justification:** Golf requires good cardiovascular fitness when walking and  
the ball far

**Competition:**

- **Description:** The main reason why the performer plays the sport / compete  
levels high
- **Justification:** Golf is a skilful game with many different skills needing to  
competitions for golf which it is important to compete well in / fitness needs  
around the course and hit the ball powerfully

**Post-season:**

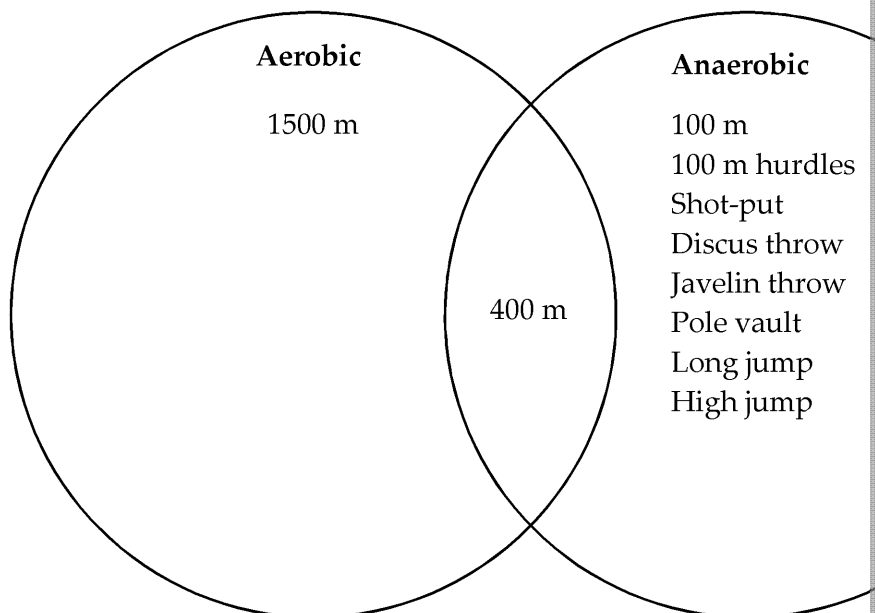
- **Description:** Recovery from the competition, gentle training to keep fit
- **Justification:** Golf has a long competition season, meaning that sufficient  
performance levels high for the next competition seasons / fitness needs to  
complete pre-season successfully to subsequently prepare well for compete

**How could a poor pre-season negatively affect Chris?**

- He might not be fit enough for the competition season, which could lead
- Poor performance in competition could lead to demotivation or a lack of
- If he is injured during competition this will affect his post-season as he w  
good level of fitness

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1. i.



ii. **Justification for aerobic exercises:**

- Require oxygen
- The event lasts a while / uses continuous exercise
- Lower intensity than anaerobic exercise
- Other suitable justification

**Justification for anaerobic exercises:**

- Do not require oxygen
- Event involves a short burst / high-intensity exercise
- Performer may suffer from adverse effects of lactic acid
- Other suitable justification

**Justification for aerobic and anaerobic**

- A suitable justification that includes a mixture of anaerobic and aerobic

2. i.

Joint	Action	Agonist	Antagonist
Ankle	Plantar flexion	Gastrocnemius	Tibialis anterior
Knee	Extension	Quadriceps	Hamstrings
Hip	Extension	Gluteals	Hip flexors

ii. **Plane:** Sagittal

**Axis:** Transverse

iii. The discus takes place in the transverse plane  
(also accept horizontal plane)

3. Corrections:

Max heart rate is  $220 - 16 = 204$

Aerobic training zone = 60%–80%

60% of 204 bpm = 122.4 bpm

80% of 204 bpm = 163.2 bpm

So Eliza's heart rate of 158 bpm fits in the aerobic training zone

4. i. c  
ii. d  
iii. b  
iv. d  
v. a

5. i. **x-axis:** week  
**y-axis:** stage
- ii.
  - Eliza's fitness levels were low in the first week (stage 7)
  - These increased quite quickly due to her training improving her cardio
  - Plateaued / stayed the same from week 3 onwards (at stage 11)
  - Eliza's fitness levels may have plateaued due to not applying progressive
- iii. **Frequency:** Keep completing those sessions Eliza! #FrequencyFitness / other suitable  
**Intensity:** Always Give 100% #HardTrainingToKeepGaining / other suitable  
**Time:** Keep going for that extra minute! #LongerAndStronger / other suitable  
**Type:** Focus on what you're trying to achieve #KeepYourTrainingRelevant
- iv. **Agree:**
- It is not specific to any of her events
  - Not the main muscle used in her events
- Disagree:**
- Having strong abdominals can help her in events such as jumping, j
  - It can improve other aspects such as improve body composition, etc
- Another relevant test:** Speed test (30 m sprint test) / also accept cardiovascular

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## Leon the Boxer

- Any four of the following differences to include with relevant associated benefits
  - Greater muscular strength/power – allows him to provide more powerful rounds in competition.
  - Improved cardiovascular fitness / endurance / stamina – allows him to not be fatigued in later rounds.
  - Improved body shape/composition – could support him getting into relevant weight classes.
  - Increased speed – to dodge opposition punches and reduce chances of injury.
  - Hypertrophy – leads to increase strength to make more effective contact with punches.
  - Bradycardia – heart is stronger and increases stroke volume to pump more blood, so during rest the heart has to work less during rest (reduced resting heart rate).
  - Increased flexibility – to support Leon to avoid opposition punches.

- Maximum heart rate =  $220 - 18 = 202$  bpm  
Anaerobic threshold is 80–90% of max heart rate  
80% of 202 bpm = 161.6 bpm  
90% of 202 bpm = 181.8 bpm  
163 bpm falls in between these values so Leon was working within the anaerobic zone.

### 3. Warm-up

#### Gradual pulse-raising activity

- Leon could be doing – light jogging / skipping / other suitable example
- Benefit – raises muscle temperature / heart rate / other suitable example

#### Stretching

- Leon could be doing – any example of a relevant stretch
- Benefit – increases the range of movement of a joint / helps prevent injury

#### Skill-based practices

- Leon could be doing – sparring with a partner / other suitable example
- Benefit – prepares his body for movements that he will complete in the session / other suitable example

#### Mental preparation

- Leon could be doing – imaging ducking a punch / other suitable example
- Benefit – can increase focus / confidence / other suitable example

#### Cool-down

##### Maintain elevated breathing rate

- Leon could be doing – light jogging / other suitable example
- Benefit – maintains gaseous exchange / oxygen transport / other suitable example

##### Reduction in intensity

- Leon could be doing – slowly his jogging to a walking pace / other suitable example
- Benefit – safely lowers heart rate / muscle temperature / other suitable example

#### Stretches

- Leon could be doing – any relevant stretch
- Benefit – increases the range of movement of a joint / helps prevent injury

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4. • Enables movement – labelled arm region for punching / leg region for kicking / any other suitable example
- Protection of vital organs – ribs / skull / pelvis any other suitable example
- Allow muscles to attach to them which enables movement – any suitable example
- Shape of the bone affects the range of movement – long bones such as femur / tibia allows large punching swing / any other example of long bone or short bone such as hand allowing a fist to be made / any other suitable example
- The variety of joints allow different movements – shoulder joint allows for a wide range of movement / any other suitable example
5. i. The pie chart shows that Leon spends more of his training time focusing on cardio rather than power
- ii. Accept either answer with relevant justification:  
**Yes** – Cardiovascular is important, albeit not the most important component of fitness  
**No** – Power and muscular endurance are the most important components of fitness, and Leon is dedicated to these / agility is not included

6.

Level	Marks	Description
3	7-9	Strong and accurate knowledge of each of the two training methods, with good terminology and good grammar used to answer the question. The answer is mostly suitable. Strong justification for the relevance that each method has for Leon as a boxer, reaching strong conclusions.
2	4-6	Good knowledge of the two training methods, but the description is not detailed. The balance between information provided for the different methods is unequal, with a lack of justification for the relevance of the methods. The answer is lacking in coherence, with moderate use of terminology.
1	1-3	Knowledge is lacking of the training methods, with a general description of the methods related to boxing. There is a lack of justification for the relevance that each method has for Leon as a boxer.
	0	No appropriate answer is given.

**Weight training**

**AO1 knowledge:**

- Involves lifting a variety of free weights / weights machines involving repetition

**AO2 application to boxing:**

- Can help produce more powerful movements
- Can help to land harder-hitting punches
- Can be used to move up a weight category
- Other suitable answer

**AO3 justification:**

- Developing power can help Leon hit harder punches and potentially win rounds
- Can tailor for different strength-related components of fitness used in boxing
- Can easily be integrated alongside an interval programme

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**Interval training:**

**AO1 knowledge:**

- Involves repeating a cycle of high-intensity exercise followed by a period

**AO2 application to boxing:**

- Develops anaerobic fitness which is needed in short bursts of activity in boxing

**AO3 justification:**

- Intensity of work and number of recovery periods can be tailored to suit the demands of boxing competitions
- Can be completed in a boxing gymnasium
- Requires little equipment
- Can be incorporated into boxing training sessions, by changing intensity
- Can help to develop cardiovascular endurance which will increase the efficiency of the working muscles
- Supports anaerobic fitness which is most used energy system in boxing

Credit other suitable responses.

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## Connor the Rugby Player

1. Tibia

2. **Bones at the knee joint:**

- (1) Femur
- (2) Tibia
- (3) Patella

**Bones at the ankle joint:**

- (1) Tibia
- (2) Fibula
- (3) Talus

**Withdrawal Phase (Kicking Leg)**

**Movement at the knee:** Flexion

- Agonist muscle: Hamstrings
- Antagonist muscle: Quadriceps
- Type of contraction: Isotonic concentric

**Movement at the ankle (Kicking Leg):** Plantar flexion

- Agonist muscle: Gastrocnemius
- Antagonist muscle: Tibialis anterior
- Type of contraction: Isotonic concentric

**Follow-through Phase (Kicking Leg)**

**Movement at the knee:** Extension

- Agonist muscle: Quadriceps
- Antagonist muscle: Hamstrings
- Type of contraction: Isotonic concentric

**Movement at the ankle (Non-kicking Leg):** Dorsi flexion

- Agonist muscle: Tibialis anterior
- Antagonist muscle: Gastrocnemius
- Type of contraction: Isotonic concentric

3. **Plyometric training:**

Can help to regain power in his legs / helps explosive movements needed in r  
suitable example

**Fartlek training:**

Can help develop both aerobic and anaerobic fitness, both of which are needed

**Weight training:**

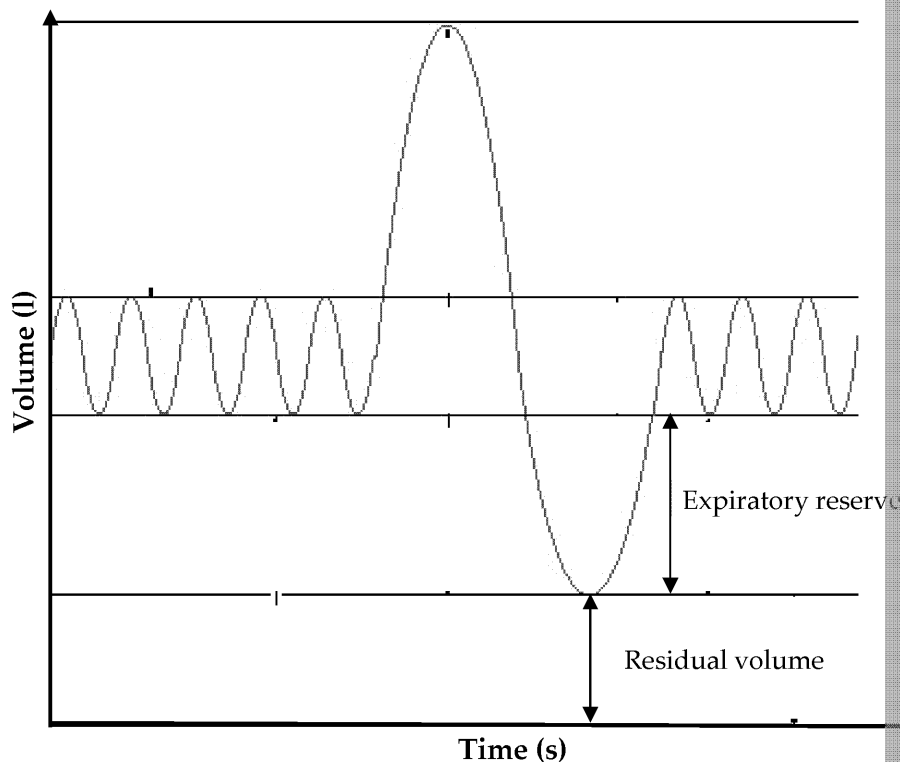
Can help develop muscular strength to aid tackling / pass distance / other suit

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4. i. Accept a trace similar to the one below with labels to identify Expiratory Residual volume.



ii.

Volume	Increase	Stay the same	
Tidal volume	✓		
Expiratory reserve volume			
Inspiratory reserve volume			
Residual volume		✓	

5. Components that should be included with relevant icons to represent:
- Keep a high heart rate / temperature (icon illustrating high heart rate or temperature)
  - Stretching (icon illustrating stretch, e.g. spring being stretched)
  - Gently reduce the level of intensity (icon illustrating reduction, e.g. a downward arrow)
- 6.
- The process is known as EPOC / Excess Post-Exercise Oxygen Consumption
  - Follows anaerobic exercise
  - This anaerobic exercise produces lactic acid
  - Connor will need to maintain high breathing rate following exercise
  - This increases oxygen intake to repay the oxygen debt

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## Sarah the Gym Member

1. Long-term effects can include:
  - Her components of fitness can be improved
  - She can become stronger
  - Her body shape/composition can be altered
  - She can improve her muscular endurance
  - She can become more flexible
  - She can improve her cardiovascular endurance / stamina
  - Hypertrophy
  - Reduced resting heart rate / bradycardia

2. **Legs**

- Gastrocnemius (Calf raises)
- Hamstrings (Hamstring curls)
- Quadriceps (Squats)
- Gluteals (Kickbacks)

- Arms**

- Biceps (Bicep curl)
- Triceps (Tricep dip)

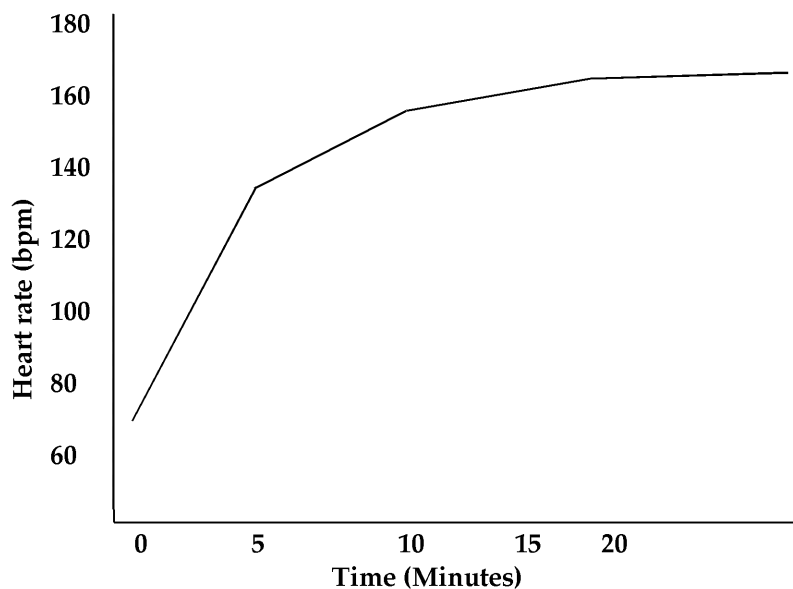
Students should provide an appropriate exercise for each identified muscle.

3. i. Excess Post-Exercise Oxygen Consumption / EPOC

- ii. Explanation of EPOC:

- It involves an increased breathing rate to repay oxygen debt
- Following anaerobic exercise
- This increased oxygen aids the removal of blood lactate

4. i.



- ii.
  - Quantitative
  - The data is in numerical form / any other suitable example

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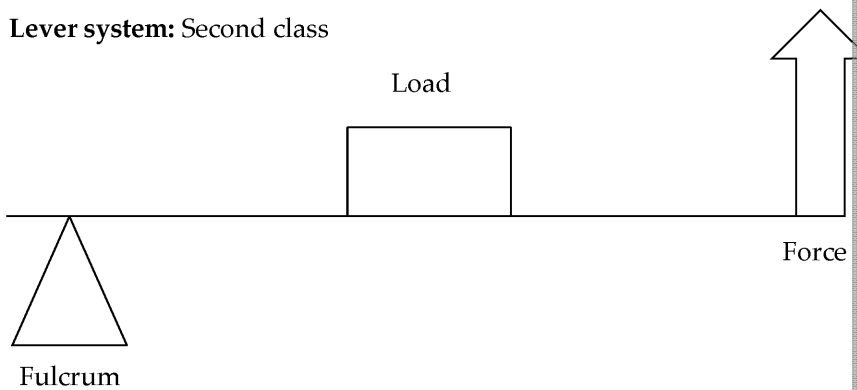


5. i. **Movement analysis at the shoulder**  
**Type of joint:** Ball and socket  
**Movement (upward phase):** Horizontal extension  
**Agonist:** Pectorals  
**Antagonist:** Deltoid / Latissimus dorsi  
**Movement (downward phase):** Horizontal flexion  
**Agonist:** Deltoid / Latissimus dorsi  
**Antagonist:** Pectorals  
**Muscle contraction (upward phase):** Concentric  
**Muscle contraction (downward phase):** Eccentric

**Movement analysis at the elbow**  
**Type of joint:** hinge  
**Movement (upward phase):** Extension  
**Agonist:** Triceps  
**Antagonist:** Biceps  
**Movement (downward phase):** Flexion  
**Agonist:** Biceps  
**Antagonist:** Triceps

**Plane of movement:** Sagittal  
**Axis of movement:** Frontal

- ii. **Lever system:** Second class



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## Shane the Wheelchair Basketball Player

1.
  - i. The flat bones protect the body's vital organs / other suitable answer which
  - ii. How a skeleton acts as a basis for movement:
    - Muscles attach to bones, enabling muscular contraction to move the
    - Enables movement at the joint
    - Each joint type allows a different movement
    - Regulates the ranges of movement
2. Safety considerations to include (each should be relevant for Shane):
  - Make sure that they have a thorough warm-up before each session
  - Prevent the use of excessive force during contact
  - Ensure the coach teaches the correct technique when performing/stretching
  - Ensure any necessary taping is used for current injuries
  - Allow sufficient rest periods
  - Do not train at an unnecessarily high intensity
  - Use the correct equipment
  - Ensure correct footwear/clothing is worn
  - Ensure chairs are in safe working order
  - Any other suitable answer
3.
  - i. Ball and Socket
  - ii. Humerus and Scapula
  - iii. Flexion
  - iv. (Anterior) Deltoid and Pectoralis Major
4. **Ankle joint:**
  - Type: Hinge
  - Bones: Talus, tibia, fibula
  - Muscles: Tibialis anterior, gastrocnemius**Knee joint:**
  - Type: Hinge
  - Bones: Tibia, femur, patella
  - Muscles: Quadriceps, hamstrings, gastrocnemius**Shoulder joint:**
  - Type: Ball and socket
  - Bones: Humerus, scapula
  - Muscles: Biceps, triceps, pectorals, rotator cuffs, deltoid, latissimus dorsi**Hip joint:**
  - Type: Ball and socket
  - Bones: Femur, pelvis
  - Muscles: Hamstrings, hip flexors, gluteals, also accept quadriceps**Elbow joint:**
  - Type: Hinge
  - Bones: Humerus, ulna, radius
  - Muscles: Biceps, Triceps
5.
  - i. Pre-season should include:
    - Increased fitness levels to be ready for the season / the relevant movement
    - Practise the general physical skills needed for the season
    - Any other suitable answers
  - ii. **Competition:** following pre-season  
**Post-season:** following competition
  - iii. **Competition:** fitness levels are kept high and particular physical skills are  
**Post-season:** recovery from exercise, fitness levels are preserved using general

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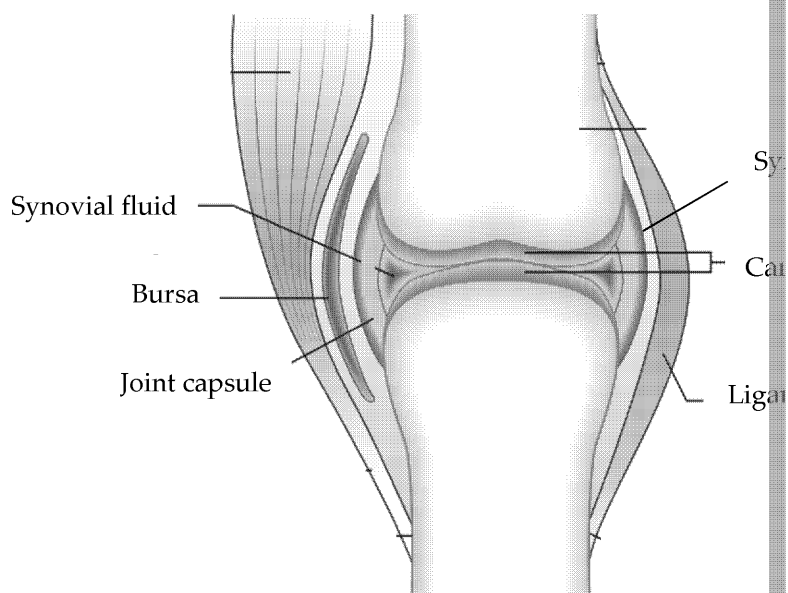
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## Isla the Football Player

1.
  - i. Components of an effective warm-up include:
    - Light exercise to increase the heart rate
    - Stretching
    - Practising of physical skills / set plays
    - Mental rehearsal
    - Increased muscle temperature
  - ii. The warm-up routine should include:
    - 5 minutes of jogging / any other suitable form of light exercise to increase temperature
    - 5 minutes of varied stretching / any other suitable form of stretching
    - 3 minutes doing a drill of short passing to teammates / any other suitable physical skills / set plays
    - 2 minutes of picturing what she would do if she finds herself through form of mental rehearsal
2.
  - i. Sagittal (also accept frontal)
  - ii. Frontal
3.
  - i.
    - (1) Deltoid (Abduction/ Flexion)
    - (2) Triceps (Extension)
    - (3) Abdominals (Flexion)
    - (4) Quadriceps (Extension)
  - ii. **Antagonistic pair for muscle 2: Biceps**  
**Antagonistic pair for muscle 4: Hamstrings**

4.



- (1) Synovial fluid – lubricates the joint, reducing frictional damage from wear
- (2) Joint capsule – allows the joint to be stable, protecting the joint from excessive movement
- (3) Synovial membrane – produces the synovial fluid which lubricates the joint
- (4) Bursae – prevents frictional damage at the joint
- (5) Ligaments – absorb shock / help to prevent against dislocation / have a strong tensile strength
- (6) Cartilage – absorbs shock / reduces friction

5. **Health:** Being at a full state of physical, mental and social well-being / other suitable definition  
**Fitness:** Being physically able to complete daily tasks, but not necessarily having a high level of fitness

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6. i. **Explanation:**
- One-rep max involves Isla lifting the most weight that she can with

**Justification:**

- It would show the maximal strength of the football team, which would
- However, it is perhaps more important to test the types of strength / power/dynamic

- ii. **For power training:**

- Need heavier weights, with a lower amount of repetitions
- The weights should be 70% + of 1RM
- 3 sets are recommended with 4–8 repetitions
- As it improves maximal strength, this can help improve the amount more quickly, thus improving power / other suitable example

**For muscular-endurance training:**

- Lower weights, with a higher amount of repetitions
- <70% of 1RM
- 3 sets are recommended with 12–15 repetitions
- It can result in the individual being able to withstand heavier weight suitable example

**Importance of power:**

- Powerful movements for jumping / sprinting / powerful shots / any

**Importance of muscular endurance:**

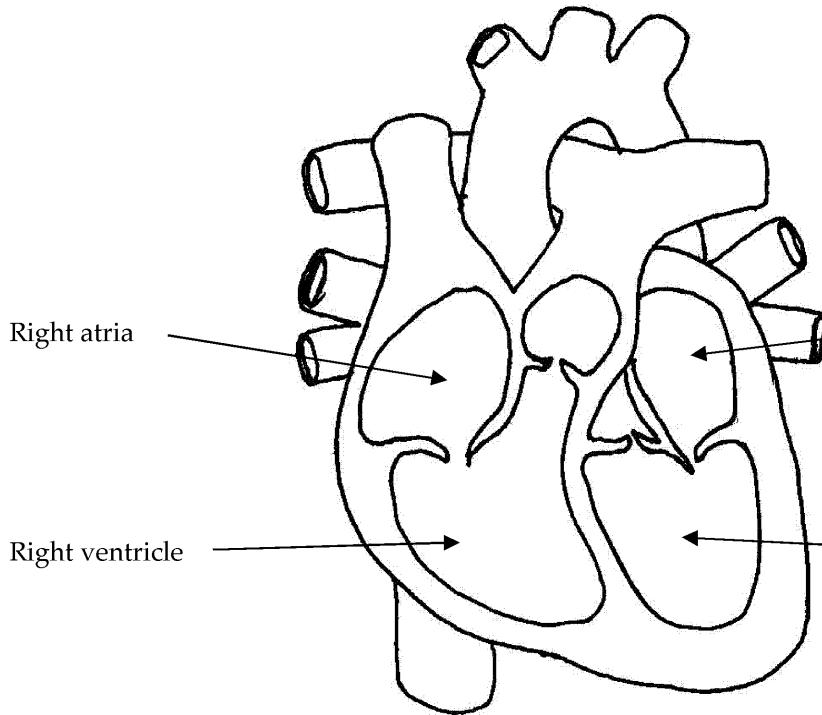
- Football is a long game with muscles having to work hard throughout suitable example

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1.



2. Diagrams to include the characteristics shown in the table below:

Capillaries	Arteries
Very thin walls	Thick walls
Smallest diameter	Medium diameter
No valves	No valves
Lowest blood pressure	High blood pressure

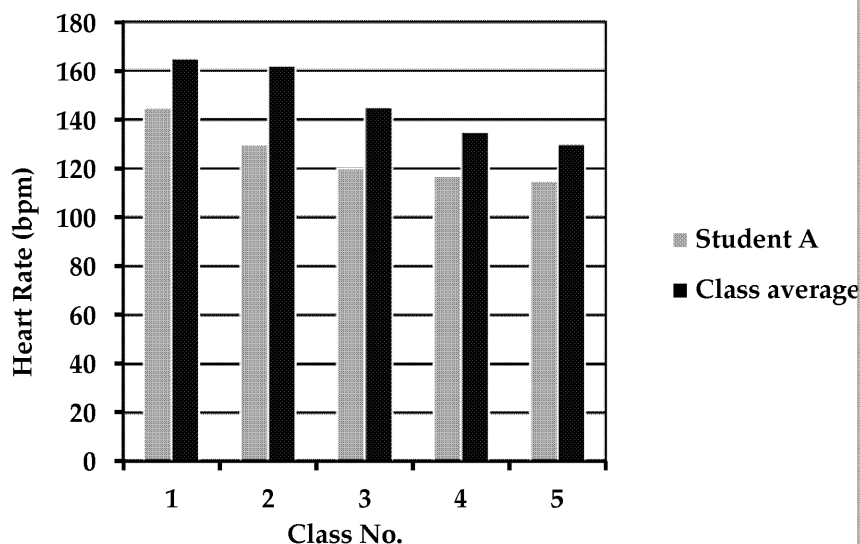
3. Labels to include:

- Alveoli have very thin/moist walls – aiding diffusion
- Alveoli have a large surface area – more alveoli, higher diffusion rate
- High amount of capillaries – increasing diffusion rate
- Gas flows from high concentration to low concentration – oxygen is contained and carbon dioxide diffused out – concentration gradient is maintained.
- The diffusion pathway is short – reducing time in which diffusion can occur
- Large supply of blood – more red blood cells available to transport oxygen haemoglobin

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4. i.



**Note:** Needs correct use of x-axis (lessons) and y-axis (heart rate) in answer

- ii. Quantitative data concerns numerical values whereas qualitative data concerns non-numerical values.  
 Qualitative: observation / interview / other suitable answer  
 Quantitative: survey / questionnaire / other suitable answer

5. I have noticed that to get to the net, my classmates have to cover a short distance, so they need to possess great **speed**. If the shuttlecock hits the net, they need to be in the correct position, so they also need high levels of **agility**. I also noticed that during smashes, they bend their backs a lot to get into the correct position, demonstrating the need for **flexibility**. Some of my classmates couldn't hit the shuttlecock at all! I guess this means they need to have good **coordination**. Additionally, whenever someone hit the shuttlecock really hard, it seemed much harder to return the shot successfully, showing that **reaction time** is an important fitness component.

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## Isaac the Cyclist

1.

Pros of altitude training	Cons of altitude training
Higher concentration of red blood cells	Difficult to train at altitude
Improved oxygen-carrying capacity / VO <sub>2</sub> max	Can suffer from illness
Positive effects last for up to 20 days afterwards	Positive effects only if you train at altitude
Any other suitable answer	Any other suitable answer

2. Post-season should involve:

- Rest/recovery
- Maintaining fitness by completing light exercises
- Any other suitable example

3.

Continuous Training		Intermittent Training
Advantages	Disadvantages	Advantages
Specific to cycling	Can be boring	Can prepare the body for periods of intense work
Improves cardiovascular endurance	Time-consuming	Not much equipment needed
Can improve body composition	Any other suitable example	Does not take as long as continuous training
Not much equipment needed		Any other suitable example
Any other suitable example		

4. i. Immediate effects of exercise may include:

- Raised breathing rate and depth of breathing – increased demand for oxygen and there is a need to rid of carbon dioxide
- Sweating / redness of the skin / increased temperature – muscles produce heat and need to be pumped to your skin surface so heat can be lost via radiation and convection
- Raised heart rate – so more blood (oxygen) can be delivered to the working muscles
- Any other suitable example

ii. Short-term effects of exercise may include:

- Light-headedness / dizziness
- DOMS / aching muscles
- Feeling nauseous
- Fatigue
- Any other suitable answer

5. There is less oxygen at high altitude, meaning that the breathing rate has to increase to increase the amount of oxygen entering the body

6. Oxygen + Haemoglobin  $\longrightarrow$  Oxyhaemoglobin

7. These features aid gas exchange

- Alveoli have very thin/moist walls
- Alveoli have a large surface area
- High amount of capillaries
- Gas flows from high concentration to low concentration
- The diffusion pathway is short
- Large supply of blood

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