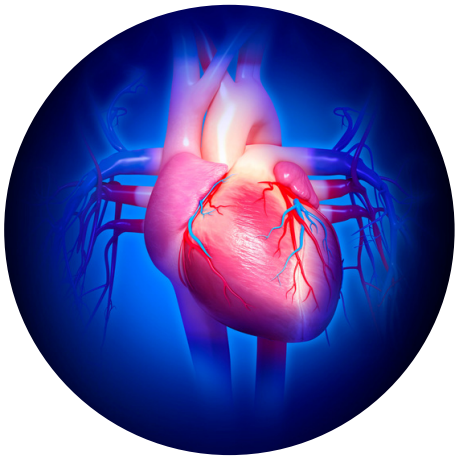
Edexcel GCSE PE

GCSE PE Revision Booklet

Applied Anatomy & Physiology

Answers



Contents Page

Introduction

This revision work-booklet includes topic overview sheets and exam questions.

The topic overview sheets include a range of key information, images and diagrams in order to help you revise each topic. There are lots of gaps within these sheets which you will need to fill in. Lets look at an example.

As you can see, there are two gaps in the definition of heart rate shown below.

Heart Rate ⇨ **The amount of _____ the heart beats each _____**

You simply need to fill in the gaps in order to complete the definition.

Heart Rate ⇨ **The amount of times the heart beats each minute**

The example below shows that you need to complete the spider diagram covering the barriers to participation.

Factors that can lead to barriers to participation in Sport

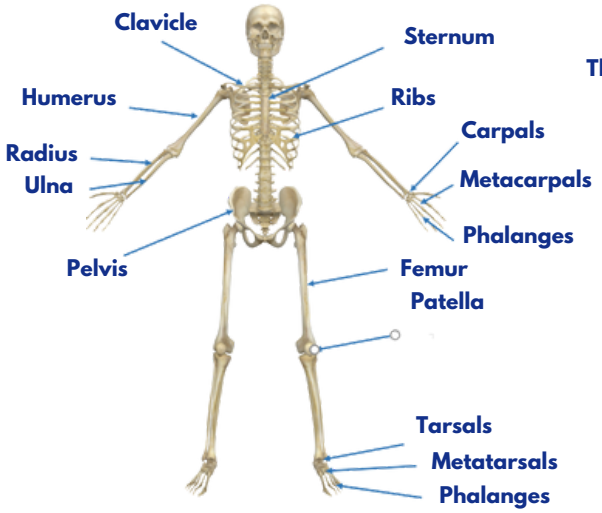
_____ _____ _____ _____

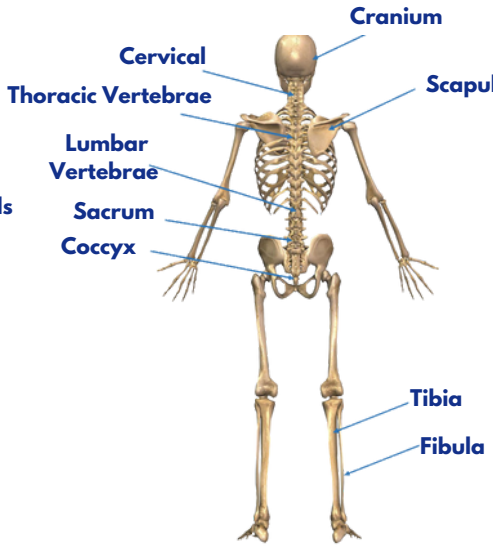
After filling in the gaps, the completed spider diagram should look like this:

Factors that can lead to barriers to participation in Sport

Age **Ethnicity** **Socio-Economic Group** **Disability** **Gender**

You will also be required to answer a number of exam questions throughout the booklet. Read each question carefully and pay close attention to the amount of marks available.





A synovial joint is a place where two or more bones meet

Joints are important for movement and rotation

Joint Actions

Flexion
Extension
Adduction
Circumduction
Abduction
Plantarflexion
Rotation
Dorsiflexion

Functions of Skeletal System

- Protection of Vital Organs
- Muscle Attachment
- Joints for Movement
- Red & White Blood Cell Production
- Storing Calcium & Phosphorus

PE COMPONENT 1 - SKELETAL SYSTEM

Condyloid Joints

Wrist Joint

Long Bones	→	Longer than they are wide	→ e.g. Humerus
Short Bones	→	Roughly same size in length, width & thickness	→ e.g. Talus
Flat Bones	→	Protect vital organs	→ e.g. Sternum
Irregular Bones	→	Have odd shapes and perform a range of functions	→ e.g. Vertebrae

Pivot Joints

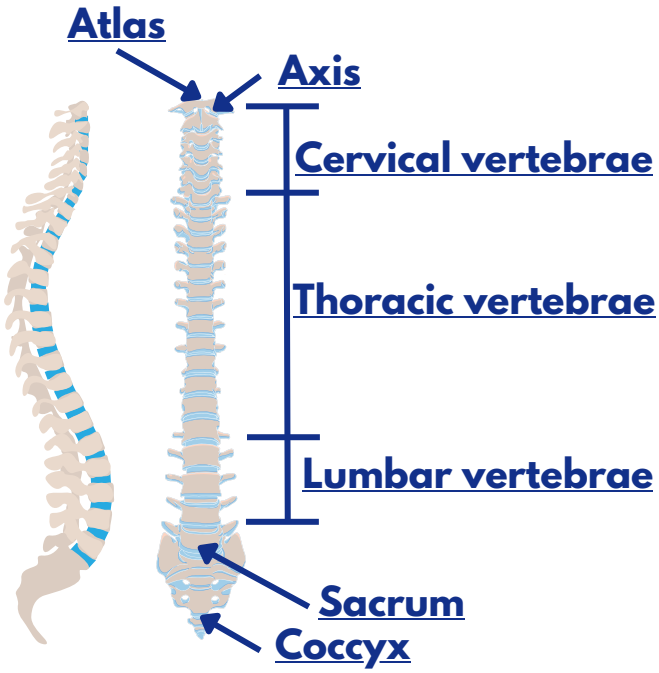
Wrist Joint
Neck Joint
Elbow Joint
Atlas and axis

Hinge Joints

Ball & Socket Joints

Classification of Bones

Type of Bone	Bones at the location
Long	1. Clavicle 2. Humerus 3. Ulna 4. Radius 5. Metacarpals 6. Femur 7. Fibula 8. Tibia 9. Metatarsals 10. Phalanges
Short	1. Carpals 2. Tarsals
Flat	1. Cranium 2. Sternum 3. Scapula 4. Pelvis
Irregular	1. Vertebrae 2. Sacrum 3. Mandible

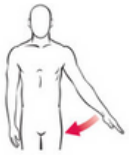
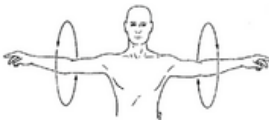


The spine is divided into five regions:

- Clavicle (7 vertebrae)
- Thoracic (12 vertebrae)
- Lumbar (5 vertebrae)
- Sacrum (5 vertebrae)
- Coccyx (4 vertebrae)

Label the diagram with these regions.

Identify the joint action movement in the image and locations this occurs.

Image	Movement	Location	Example
	Flexion	Shoulder Elbow Hip Knee	 Bending of the elbow during a football throw in
	Extension	Shoulder Elbow Hip Knee	 Kicking a ball during a pass in football
	Abduction	Shoulder	 Swinging a golf club
	Adduction	Shoulder	 Arms returning to body in breaststroke
	Rotation	Shoulder	 At the shoulder in a javelin throw
	Circumduction	Shoulder	 At the shoulder whilst bowling a cricket ball
	Plantar flexion	Ankle	 Pointing the toes during ballet
	Dorsi flexion	Ankle	 Maintain stability in a squat (keeps foot flat)

Classification of joints and their impact on the range of possible movements.
If the type of joint allows a range of movement, put a tick ✓. If not, put a cross ✗.

Type	Flexion and Extension	Adduction and Abduction	Rotation	Circumduction
Pivot	✗	✗	✓	✗
Ball and Socket	✓	✓	✓	✓
Condyloid	✓	✓	✗	✓
Hinge	✓	✗	✗	✗

1 Markers

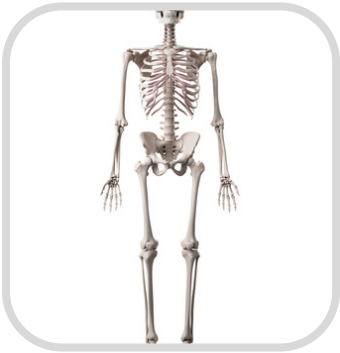
1. Give an example of a condyloid joint in the body. (1 mark)

Mark One – Wrist

2. Which one of the following bone classifications offers support when performing a handstand? (1 mark)

A) Long Bones
B) Short Bones - Correct Answer
C) Irregular Bones
D) Flat Bones

3. Which one of the following is a region of the vertebral column? (1 mark)



A) Clavicle
B) Patella
C) Cervical - Correct Answer
D) Pelvis

4. Which one of the following is the correct classification of the knee joint? (1 mark)

A Pivot
B Ball and socket
C Condyloid
D Hinge - Correct Answer

2 Marker

5. Give an example of a ball & socket joint in the body and explain how this joint is important for performance in a sport of your choice. (2 marks)

Mark One – The shoulder is an example of a ball & socket joint
Mark Two – This is important in cricket as it allows the circumduction required when bowling the ball

Accept Other Appropriate Answers (including shoulder or hip as examples of ball & socket joints)

3 Markers

6. Protection is a function of the skeletal system. Explain how the application of this function can have a positive effect on performance when heading a ball in football. (3 marks)

Mark One – When heading the ball the cranium will protect the player
Mark Two – The cranium will protect the brain from becoming injured
Mark Three – This allows the footballer to continue playing the match without becoming injured/Allows the player to make a successful header without sustaining an injury

Accept Other Appropriate Answers

7. Aside from 'protection', explain how one other function of the skeletal system allows a netball player to produce an effective performance. (3 marks)

Mark One – A function of the skeletal system is 'joints for movement'
Mark Two – An example of a joint in the body is the knee joint
Mark Three – The knee joint allows for flexion and extension which are important actions when producing an effective shot in netball

OR

Mark One – A function of the skeletal system is 'red and white blood cell production'
Mark Two – Red blood cells carry oxygen around the body
Mark Three – Having enough red blood cells is important to the netballer as they need to supply oxygen to their working muscles in order to produce energy throughout a match. This will prevent the player from becoming tired/fatigued

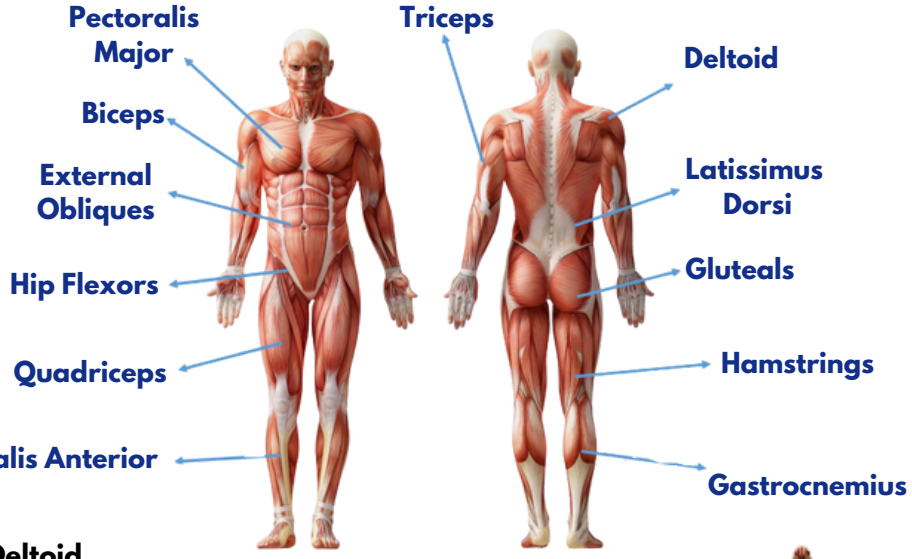
Accept Other Appropriate Answers (including 'muscle attachment' & 'storing calcium & phosphorus' as functions of the skeletal system)

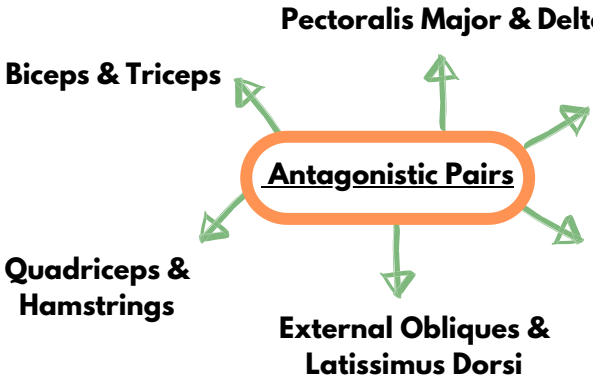
8. The shape and type of bones determine the amount of movement that is possible.

State 3 examples of long bones that can be found at the site of the arm. (3 marks)

Mark 1 - Humerus
Mark 2 - Radius
Mark 3 - Ulna

As one muscle CONTRACTS, another muscle will RELAX





PE COMPONENT 1 - MUSCULAR SYSTEM

Voluntary Muscles → A muscle which you can control

Involuntary Muscles → A muscle which you cannot control

Cardiac Muscles → A muscle found in the wall of the heart

Muscle Fibres

Type I	Type IIA	Type IIX
Slow Twitch	Fast Twitch	Fast Twitch
Slow Contrations	Fast Contractions	Very Fast Contractions
Aerobic Activity	Fatigue relatively quickly	Fatigue very quickly
e.g. Marathon	e.g. 800m	e.g. 100m

Antagonistic Pairs of Muscles

Antagonistic pairs of muscles create opposing movements at joints to allow physical activities.

Biceps and Triceps at the elbow - Football Throw-in

	Type of Movement	Agonist	Antagonist
Preparation Phase 	Elbow - Flexion	Bicep	Tricep
Throwing Action 	Elbow - Extension	Tricep	Bicep

Bicep Curl

		Agonist	Antagonist
Lifting the dumbbell 	Elbow - Flexion	Bicep	Tricep
Lowering the dumbbell 	Elbow - Extension	Tricep	Bicep

Antagonistic Pairs of Muscles

Gastrocnemius and tibialis anterior at the ankle Jumping

	Type of Movement	Agonist	Antagonist
Take off 	Ankle - Plantarflexion	Gastrocnemius	Tibialis Anterior
Throwing Action 	Ankle - Dorsiflexion	Tibialis Anterior	Gastrocnemius

Quadriceps and Hamstrings at the knee - Kicking a ball

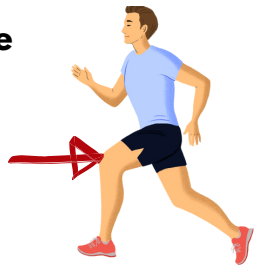
		Agonist	Antagonist
Preparation Phase 	Knee - Flexion	Hamstrings	Quadriceps
Strike 	Knee - Extension	Quadriceps	Hamstrings

Antagonistic Pairs of Muscles

Hip Flexors and Gluteus Maximus at the hip
Kicking a ball

	Type of Movement	Agonist	Antagonist
Preparation Phase 	Hip - Extension	Gluteals	Hip Flexors
Strike 	Hip - Flexion	Hip Flexors	Gluteals

Quadriceps and Hamstrings at the knee - Running

		Agonist	Antagonist
Drive 	Knee - Flexion	Hamstrings	Quadriceps
Recovery 	Knee - Extension	Quadriceps	Hamstrings

Function of Muscles

Complete the table with the function of each muscle (i.e. what type of movements they cause in combination with the skeletal system).

Muscle	Function
Deltoid	Move the upper arm in all directions from the shoulder
Pectorialis Major	Adducts the arm at the shoulder
Latissimus Dorsi	Adducts and extends the arm at the shoulder
Biceps	Elbow flexion (bending)
Triceps	Elbow extension (straightening)
External Obliques	Flexion and rotation at the spinal column Pulls the chest downwards
Gluteus Maximus	Adducts and extends the hips pulling the legs backwards
Hip Flexor	Flexes the hip, moves the hip upwards
Quadriceps	Knee extension (straightening)
Hamstrings	Knee flexion (bending)
Gastrocnemius	Plantarflexion (point of toes)
Tibialis Anterior	Dorsiflexion (pulls toes downwards)

Move the upper arm in all directions from the shoulder

Knee flexion (bending)

Flexes the hip, moves the hip upwards

Adducts and extends the hips pulling the legs backwards

Flexion and rotation at the spinal column & Pulls the chest downwards

Plantarflexion (point of toes)

Adducts the arm at the shoulder

Dorsiflexion (pulls toes downwards)

Knee extension (straightening)

Adducts and extends the arm at the shoulder

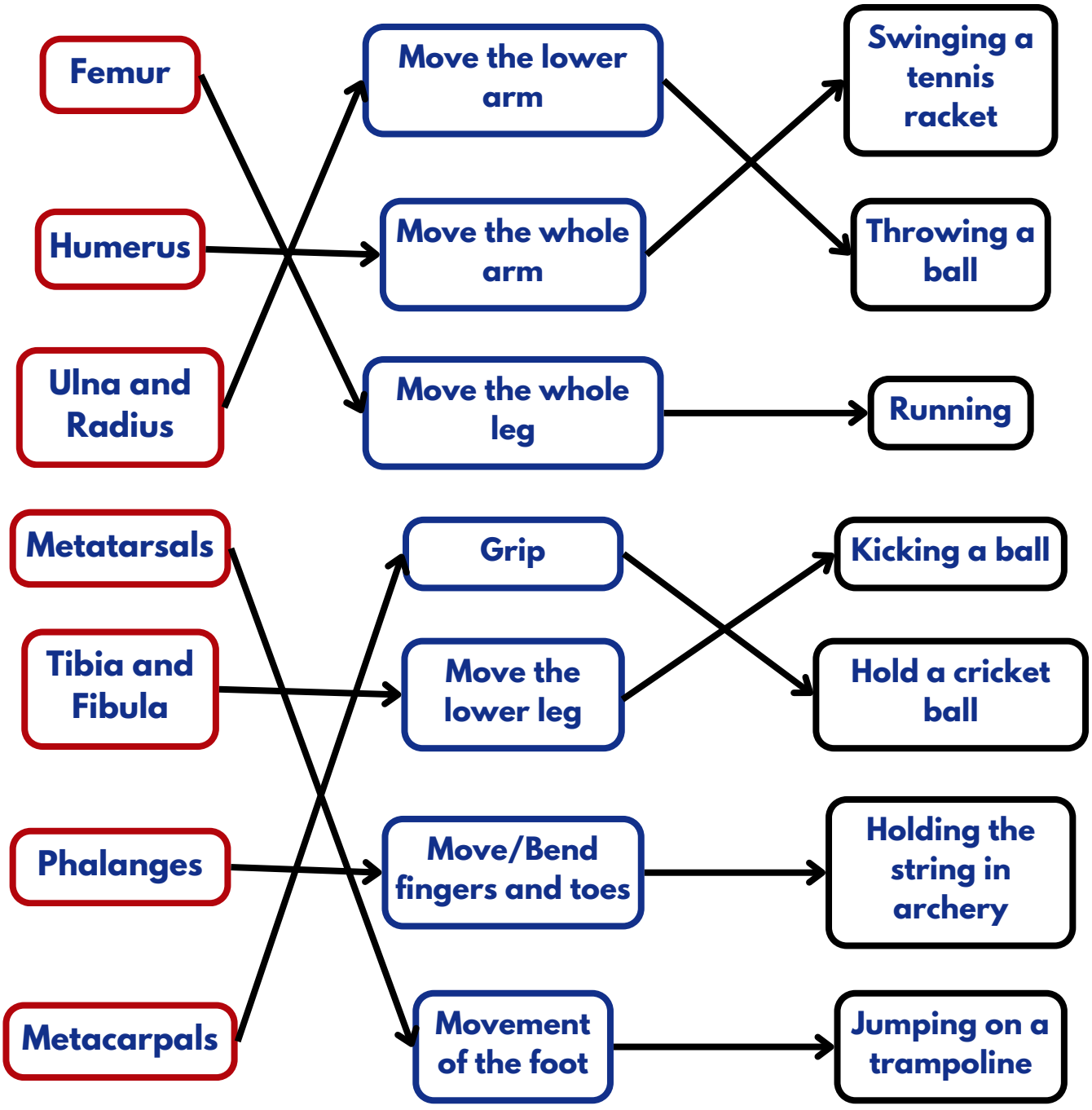
Elbow flexion

Elbow extension

How the skeletal and muscle systems work together to allow participation in sport and physical activity.

Together, the skeletal and muscular systems cause movement, which allow us to participate in sport.

Match the long bones listed to the explanation of how muscles use them to result in movement and the correct example.



1 Markers

1. What is the name of the muscle shown in the image to the right? (1 mark)

Mark One – Tibialis Anterior

2. Which one of the following states the role of the hamstring? (1 mark)

A) Extension of the leg at the hip
B) Flexion of the leg at the hip
C) Extension of the leg at the knee
D) Flexion of the leg at the knee - Correct Answer

3. Which one of the following muscles works antagonistically with the gluteals? (1 mark)

A) External Obliques
B) Hip Flexors - Correct Answer
C) Gastrocnemius
D) Tricep

2 Markers

4. The image shows a long jumper during a performance. In the image, flexion is being shown at the hip joint. Name the agonist and antagonist muscles that create this action. (2 marks)

Mark One – The agonist muscle is the hip flexors
Mark Two – The antagonist muscle is the gluteals

5. Identify two types of movement that occur at the ankle.

Mark One – Plantarflexion
Mark Two – Dorsiflexion

3 Markers

6. Analyse the antagonistic muscle action taking place at the elbow as the goalkeeper makes the save. (3 marks)

Mark One – The antagonistic muscle action is extension at the elbow joint
Mark Two – The tricep is the agonist/muscle contracting
Mark Three – The bicep is the antagonist/muscle relaxing

7. Examine the muscle fibre type used by a weightlifter to maximise their performance. (3 marks)

Mark One – A weightlifter will benefit from Type IIX muscle fibres
Mark Two – Type IIX muscle fibres allow for fast, powerful contractions, although they will fatigue quickly
Mark Three – Weightlifting requires a fast, powerful contraction so that the weightlifter can lift as heavy a weight as possible

Accept other appropriate answers

8. Explain the main muscle fibre type that is used when taking off during the high jump. (3 marks)

Mark One - Fast twitch/IIx
Mark Two - This muscle fibre type will provide the required power for the movement because the action is an explosive movement
Mark Three - Type IIX muscle fibres is the most powerful type of muscle fibre

Accept other appropriate answers

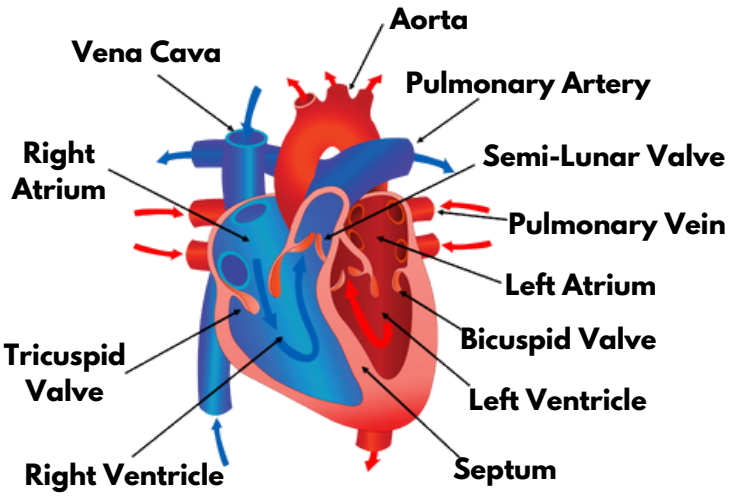
9 Marker

9. Evaluate the type of muscle fibres that would be required for a javelin thrower, a marathon runner and an 800m runner. (9 marks)

Point (A01) – A javelin thrower would mainly require fast twitch muscle fibres and specifically type IIX muscle fibres
Explanation (A02) – This is because the javelin thrower requires a short burst of explosive energy in order to create speed and power
Evaluation (A03) – This will enable the javelin thrower to throw the javelin a long way, but the limitation of Type IIX muscle fibres is that the athlete will tire quickly, and this could affect throws later in the competition. This is due to a lack of oxygen being present in type IIX muscle fibres

Point (A01) – A marathon runner would mainly require slow twitch muscle fibres and specifically type I muscle fibres
Explanation (A02) – Type I muscle fibres contain myoglobin and have a good oxygen supply, allowing a marathon runner to run for long periods of time without becoming fatigued
Evaluation (A03) – This will allow the marathon runner to complete the long distance without exhaustion. However a sprint finish may be required if the runner wants to win the race, meaning that type IIX muscle fibres will still be important for the runner

Point (A01) – An 800m runner would mainly require fast twitch muscle fibres and specifically type IIa muscle fibres
Explanation (A02) – This type of muscle fibre will allow the athlete to run at speed throughout the race but the fact that there is some oxygen supply will prevent them fatiguing quickly
Evaluation (A03) – This will allow the athlete to move quickly throughout the whole race and give them a good chance of winning. However elite 800m runners will also require type IIX muscle fibres as the last 100m of the race will require an explosive sprint finish



Regulation of Body Temperature

Vasodilation

Blood vessels move closer to the surface of the skin, allowing more heat to be lost and the body will cool down

Dilate = Diameter Increases

Vasoconstriction

Blood vessels become narrower, moving further away from the surface of the skin, therefore less heat is lost

Constrict = Diameter Decreases

Arteries	→	Carry blood away from the heart	→ Thick & muscular walls
Veins	→	Carry blood towards the heart	→ Thin walls
Capillaries	→	Connect artries & veins Allows diffusion to take place	→ Very thin walls

PE COMPONENT 1 - CV SYSTEM

Functions of CV System:

- Transport of oxygen, CO2 & nutrients
- Clotting of open wounds
- Regulation of body temperature

- Arteries carry blood at high pressure
- Veins carry blood at low pressure

Red Blood Cells → Responsible for the circulation of the blood and transporting blood cells around the body
Also known as Erythrocytes

White Blood Cells → Destroy pathogens, which can cause illness
Sometimes fights bad bacteria with chemicals called antibodies
Also known as leukocytes

Platelets → Clots blood following an injury, rushes to the site & swells to irregular shapes
If it cannot cope will send a signal for the blood vessels to slow down the flow of blood

Plasma → A pale, straw-coloured liquid made up of 90% water
Contains water, salts, enzymes, antibodies and other proteins

Average Blood Pressure

This number refers to systolic blood pressure; The pressure of the blood as the heart contracts

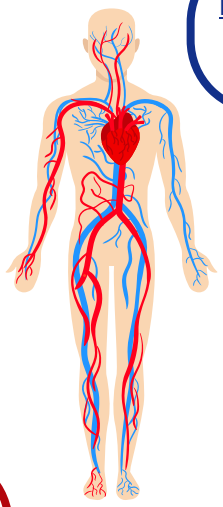
130/85

This number refers to diastolic blood pressure; The pressure of the blood as the heart relaxes

Summarise the characteristics of each blood vessel type

	Size/Diameter	Wall Thickness	Valves
Arteries	Up to 10mm	Thick & Muscular	No
Veins	Up to 10mm	Thin	Yes
Capillaries	5-10 micrometers	Thin	No

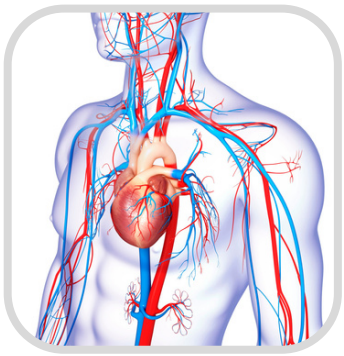
Pathway of blood (starting from the right ventricle)



Right ventricle → Pulmonary Artery → Lungs (gaseous exchange - blood is oxygenated) → Pulmonary Vein → Left Atrium → Left Ventricle → Aorta → Body (gaseous exchange - blood is deoxygenated) → Vena Cava → Right Atrium → Right ventricle

1 Markers

1. The cardiovascular system has three functions. Describe one of these functions. (1 mark)



Mark One – Transport of oxygen, carbon dioxide and nutrients around the body
OR - Clotting of Open wounds
OR - Regulation of body temperature

2. Which one of the following blood vessels takes oxygenated blood away from the heart to the body? (1 mark)

A Pulmonary vein
B Pulmonary artery
C Aorta - Correct Answer
D Vena cava

3. What type of blood vessel carries blood away from the heart? (1 mark)

Mark One - Artery

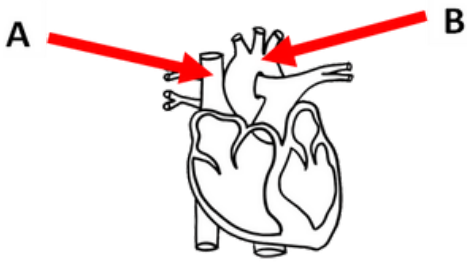
4. Which of the following is the correct definition of Stroke Volume? (1 mark)

A) The amount of times the heart beats each minute
B) The amount of blood that is ejected from the heart each beat - Correct Answer
C) The amount of blood that is ejected from the heart each minute
D) An increase in heart rate that typically occurs just before an activity is to be undertaken

2 Marker

5. What do letters A & B represent in the image below? (2 marks)

Mark One – A represents the Vena Cava
Mark Two – B represents the Aorta



3 Markers

6. Using a sporting example of your choice, explain how vasodilation can result in the body cooling down. (3 marks)

Mark One – Vasodilation is the widening of blood vessels/blood vessels get closer to the surface of the skin/diameter increases
Mark Two – This results in more heat being lost from the body and therefore the body will cool down
Mark Three – For example a 5000m runner will experience vasodilation as their body temperature will naturally rise during a race/during a race on a hot day

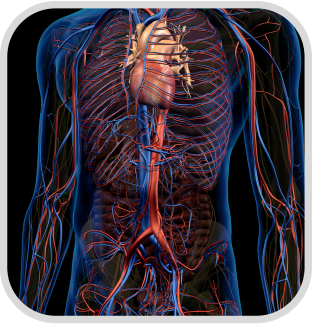
Accept other appropriate answers and examples

7. Define the term vascular shunting and explain how vascular shunting will occur during a 400m swim. (3 marks)

Mark One – Vascular shunting is a process that increases blood flow to active areas during exercise/diverts blood flow away from inactive areas/the redistribution of blood flow
Mark Two – During the 400m swim, the blood vessels leading to active areas such as the arms and legs will experience vasodilation (they will widen). This will allow more oxygenated blood to reach these active areas
Mark Three – During the 400m swim, the blood vessels leading to inactive areas such as the stomach/digestive system will experience vasoconstriction (they will narrow). This will restrict the blood flow as the inactive areas do not require as much oxygenated blood

Accept other appropriate answers

8. Outline three features of veins. (3 marks)



Mark One – Veins contain valves which prevent the backflow of blood
Mark Two – Veins carry blood at low pressure
Mark Three – Veins have thin walls

Accept other appropriate answers

9 Markers

9. Explain how the redistribution of blood flow occurs and evaluate how this process can benefit a hockey player throughout a match? (9 marks)

A01 – Redistribution of blood flow is also known as Vascular Shunting
A02 – This is where oxygen is redistributed away from inactive areas, towards active areas during exercise
A03 – This allows muscles such as the quadriceps and hamstrings to gain the oxygen they require to produce energy throughout a hockey match. These are vital muscles that need continued energy for running, dribbling and bending in order to pass or shoot the ball

A01 – Vasoconstriction narrows the internal diameter of the arteries supplying oxygenated blood to the inactive areas
A02 – This prevents as much oxygen getting to inactive areas such as the digestive system during a hockey match
A03 – The intensity levels will also change frequently throughout a match between running, jogging, walking and rest. During periods of rest vasoconstriction will also occur, after recovery has taken place

A01 – Vasodilation widens the internal diameter of the arteries supplying oxygenated blood to the active areas
A02 – During periods of high intensity such as when a midfielder must track back to defend following an attack, vasodilation will occur to ensure that the required oxygen reaches the active areas
A03 – This is particularly important towards the end of the match when the hockey player is beginning to get fatigued. Vascular shunting can ensure that the required oxygen reaches the active muscles so that lactic acid isn't produced throughout any period of the match

Accept Other Appropriate Answers

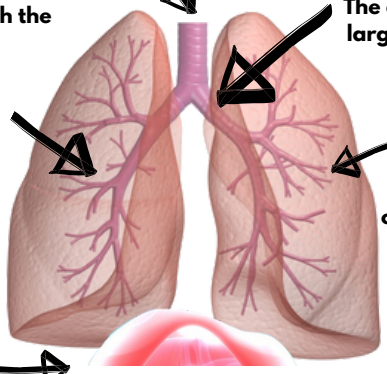
PE COMPONENT 1 - RESPIRATORY SYSTEM

TRACHEA
AKA Wind Pipe. Air travels through the trachea to reach the lungs

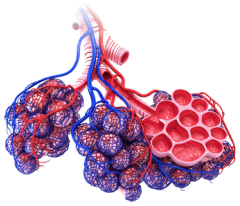
BRONCHI
The air travels through larger branches called Bronchi

BRONCHIOLES
The air then reaches smaller branches called Bronchioles

ALVEOLI
At the end of the bronchioles lies millions of tiny air sacs called alveoli. This is where gas exchange takes place



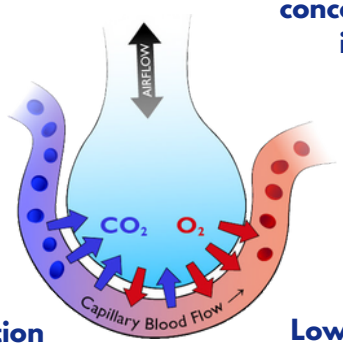
DIAPHRAGM
Responsible for inspiration
Moves to a flat position when inhaling to push the lungs up, enabling air to rush in
When exhaling moves to a dome position, allowing the lungs to lower and air to rush out



Low concentration CO2 in alveoli

along pressure gradient

High Concentration CO2 in blood vessel



High concentration O2 in alveoli

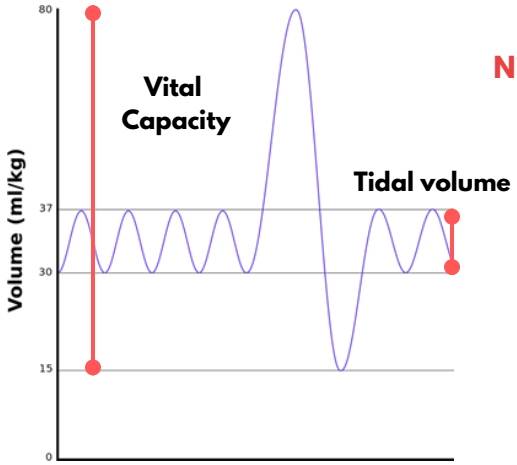
along pressure gradient

Low Concentration O2 in blood vessel

Gas Exhange at the Alveoli

- The oxygen in the alveoli diffuses into the bloodstream and is transported to the working muscles
- The CO2 from the bloodstream diffuses into the alveoli in order to be exhaled by the lungs

Labelling a Spirometer Trace

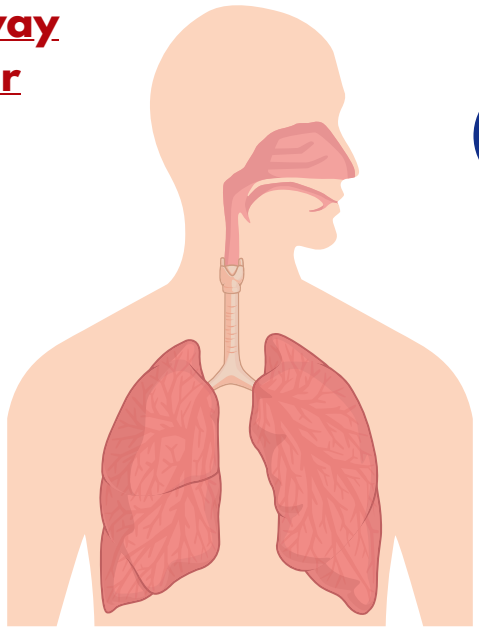


	Inhaled Air	Exhaled Air
Oxygen	21%	16%
Carbon Dioxide	0.04%	4%
Nitrogen (+ other gases)	79%	79%

Alveoli

- Tiny sacs of air that have a high concentration of oxygen after breathing in
- Oxygen diffuses through the moist, thin walls & into the blood stream
- Alveoli have a large surface area and are surrounded by capillaries

Pathway of air



Mouth/nose

↓

Trachea

↓

Bronchi

↓

Bronchioles

↓

Alveoli

Mechanics of Breathing

At Rest

	Inhalation	Exhalation
Intercostals	Contract	Relax
Rib Cage	Upwards and Outwards	Downwards and Inwards
Diaphragm	Contracts/Flattens	Relaxes/Domed

During Exercise

	Lungs expand/contract due to
Inspiration	Use of pectorals and sternocleidomastoid
Rib Cage	Abdominal muscles cause rib cage to be pulled down quicker

1 Markers

1. Gas exchange takes place at the alveoli. Describe one feature of the alveoli which makes it ideal for gas exchange. (1 mark)

Mark One – The alveoli have thin walls
OR – The alveoli have a large surface area
OR – The alveoli are surrounded by capillaries

Accept other appropriate answers

2. Which part of the respiratory system is also known as the 'wind pipe'? (1 mark)

A Bronchi
B Trachea - **Correct Answer**
C Bronchioles
D Diaphragm

2 Markers

3. The air that we inhale contains 21% oxygen. The air that we exhale contains 16% oxygen. Explain why there is a difference between these numbers. (2 marks)

Mark One – The difference in the two numbers is because some of the oxygen has been used by the body in order to produce energy
Mark Two – Therefore less oxygen is exhaled/Co2 is exhaled

Accept other appropriate answers

4. Define tidal volume and explain what will happen to tidal volume during exercise. (2 marks)

Mark One – Tidal volume is the amount of air inspired or expired with each normal breath (at rest or during exercise)
Mark Two – During exercise tidal volume will increase due to an increase in breathing rate/increase in demand for oxygen

3 Marker

5. Gas exchange takes place at the alveoli. Describe three features of the alveoli which makes it ideal for gas exchange. (3 marks)

Mark One – The alveoli have thin walls
Mark Two – The alveoli have a large surface area
Mark Three – The alveoli are surrounded by capillaries

4 Marker

6. Diffusion takes place at the site of the lungs. Explain the process of diffusion at the site of the lungs. (4 marks)

Mark One – Diffusion is when gases move from an area of high concentration to an area of low concentration
Mark Two – (At the lungs) the alveoli have a high concentration of oxygen and a low concentration of carbon dioxide
Mark Three – The bloodstream has a high concentration of carbon dioxide and a low concentration of oxygen
Mark Four – Therefore the oxygen will travel down the concentration gradient from the alveoli to the bloodstream/The Co2 will travel down the concentration gradient from the bloodstream to the alveoli

Accept other appropriate answers

PE COMPONENT 1 - AEROBIC & ANAEROBIC RESPIRATION

Aerobic Respiration

Glucose + Oxygen = Energy + CO2 + Water

Anaerobic Respiration

Glucose = Energy + Lactic Acid

Lactic Acid

- Lactic acid builds up following anaerobic exercise due to a lack of oxygen being present in the muscles. This is known as oxygen debt
- This is toxic and causes your muscles to ache and cramp (and eventually stop working)

Anaerobic Respiration - high intensity exercise e.g. weightlifting

As we exercise anaerobically, our muscles produce energy without the presence of oxygen

There is an increase in the production of Co2, causing a build up of lactic acid within the muscles

Oxygen debt occurs as a result of these processes

EPOC will take place in the form of an increased breathing rate

Aerobic Respiration - low intensity exercise e.g. long distance running

Fats

- Broken down into fatty acids and stored in muscle cells
- Found in foods such as butter, cheese, fish and nuts
- A marathon runner would use this energy source
- Should form around 30% of your total diet
- Fuel source for aerobic activity

Carbohydrates

- Should form up to 70% of your total diet
- Turn to fats if not used within 24 hours
- Fuel source for both aerobic and anaerobic activity
- Found in foods such as bananas, rice and pasta
- A weight lifter would mainly use this energy source
- Broken down into glucose and stored as glycogen
- Split into 'complex' and 'simple'

1 Markers

1. Write out the equation for anaerobic respiration. (1 mark)

Mark One – Glucose = Energy + Lactic Acid

2. Describe the calculation used to work out anaerobic target zone. (1 mark)

Mark One – Anaerobic target zone is equal to 80-90% of maximum heart rate

3. A cool-down is most important following

A) Aerobic Exercise
B) Anaerobic Exercise - Correct (1 mark)

2 Markers

4. Give an example of a sport which requires aerobic respiration. Justify your answer. (2 marks)

Mark One – Marathon runner
Mark Two – A marathon takes place over a long period of time (low intensity) so the performer has time to create energy with oxygen present

Accept other appropriate answers

5. Activity can be described as either aerobic or anaerobic. Discuss the energy sources that provide fuel for each of these activities. (2 marks)

Mark One – Fats produce energy slowly and therefore provide energy for aerobic activity
Mark Two – Carbohydrates produce energy quickly and therefore provide energy for anaerobic activity

3 Markers

6. Charlie is 17 and is a X-country runner. Showing your working, calculate Charlie's aerobic target zone. (3 marks)

Mark One – Maximum HR is 220-17. Therefore Charlie's MHR is 203
Mark Two – Aerobic target zone is 60-80% of MHR
Mark Three – Therefore Charlie's aerobic target zone is 121.8 – 162.4

Accept answers that have been rounded (122-162)

7. Discuss whether weight training is an aerobic or anaerobic activity. (3 marks)

Anaerobic – (sub-max 2 marks)
- **Weight training is usually a high intensity (heavy weights/low reps) which means it can only be performed over a short period of time**
- **Lactic acid may be produced due to a lack of oxygen available to the muscles**

Aerobic – (sub-max 2 marks)
- **Weight training can be at a lower intensity (light weights/high reps) which means it can be performed over a long period of time**
- **Little rest in between sets or exercises replicates cardiovascular / muscular endurance which is aerobic**

8. State three benefits that can be experienced from cooling down immediately after exercise. (3 marks)

Any three from:
- **Allows breathing rate or heart rate to return to its resting state slowly**
- **Brings body temperature back down to its normal level**
- **Removes lactic acid / CO2 /waste products**
- **To help repay the oxygen debt**

9 Marker

9. Sara has worked hard to prepare for her first marathon and is considering her diet in the lead up to the event. Discuss the food sources that she should take on in the lead up to and during the race. (9 marks)

A01 – In the weeks leading up to the event she should focus on taking on plenty of fats
A02 – Fats, found in foods such as cheese and eggs, produce a slow release of energy
A03 – This means that she will have the energy required to take part in long distance training runs without getting fatigued or burning out. Her body will also have large stores of fats ready to use as energy on the day of the race, meaning that her performance will be improved

A01 – On the day before the event she should focus on taking on complex carbohydrates
A02 – Complex carbohydrates, found in foods such as pasta and rice, produce energy relatively quickly. If taken on within 24 hours of her race, these can be turned to glycogen and used for energy during the race
A03 – This will allow her to have an effective start to the race, burning off these complex carbohydrates relatively quickly at the beginning of the race before switching to her fat stores after approximately one hour

A01 – Towards the end of the race she may need to take on simple carbohydrates
A02 – Simple carbohydrates produce energy very quickly and may be required if she has depleted her other energy stores. She may take on 'energy gels' for this reason
A03 – This will enable her to produce a fast finish at the end of the race in order to gain the fastest time possible. Following a long period of aerobic exercise the simple carbohydrates may allow a sprint finish through the use of anaerobic respiration

Accept Other Appropriate Answers

PE COMPONENT 1 - EFFECTS OF EXERCISE

The Short Term Effects of Exercise ⇨ During or immediately after exercise

The Long Term Effects of Exercise ⇨ Months or Years of taking part in training/exercise

The Short-Term Effects of Exercise

Muscle Fatigue →

Lactic Acid →

Increased Oxygen Debt →

The Short-Term Effects of Exercise on Cardio-Respiratory System:

- Increased Heart Rate
- Increased Breathing Rate/Depth
- Increased Stroke Volume

The cardiovascular and respiratory system work together so that the concentration gradient of oxygen and carbon dioxide at the lungs (alveoli and capillaries) remain high

The Long Term Effects of Exercise

- Increased Resting Stroke Volume
- Increased Strength of Diaphragm/Intercostal Muscles
- Decreased Resting Heart Rate
- Cardiac Hypertrophy
- Increased Lung Capacity/ Vital Capacity
- Increased Maximum Cardiac Output
- Increased number of alveoli and increased capillarisation
- Faster recovery back to resting heart rate

The Long-Term Effects of Exercise on Musculoskeletal System

Increased Bone Density → Weight bearing activities such as jogging strengthen the muscles and bones

Muscular Hypertrophy → Increase in size and strength of skeletal muscles

Increased Strength of Ligaments/ Tendons → This will mean that an athlete is less likely to pick up injuries

Fill in the Gaps

Short Term Effects of Exercise

During exercise which causes the anaerobic energy system to be used, lactic acid is produced. If this happens for a long time, this causes lactate accumulation in the blood. This immediately causes pain and muscle fatigue. Oxygen is required to remove the lactic acid and recover - the amount required is called oxygen debt. If this occurs, you might need to stop, rest, slow down or perform at a lower intensity for the debt to be repaid. This can have a negative effect on a performance, but can be an important aspect of training.

Also, this additional energy production will cause more heat to be generated in the muscles, which raises body temperature and can cause discomfort and sweating.

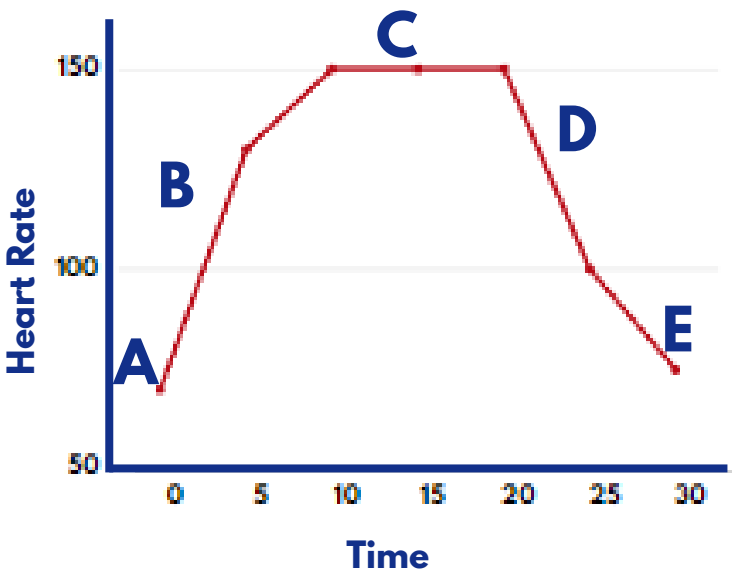
In order to get this additional oxygen to working muscles, breathing rate and depth increases, causing an increase in tidal volume. This in turn helps increase the rate of breathing out, and thus the rate of carbon dioxide removal. This is particularly useful if using the aerobic energy system as it enables to exercise for a longer period of time.

Heart rate and stroke volume increase during exercise. This means that the number of beats per minute increase as well as the amount of blood each ventricle pumps with each contraction. Therefore, cardiac output is increased. This increases the blood (and oxygen) delivery to working muscles which the higher breathing rate provides, so that they have the oxygen needed to respire/pay off the oxygen debt and also increases the rate of carbon dioxide removal from working muscles to the lungs to be breathed out.

Immediately following the cessation of exercise, breathing rate, heart rate, stroke volume and cardiac output remain higher than rest until oxygen debt is fully paid off.

Interpreting Graphical Presentations

Summarise what is happening at each letter in one sentence



A - The person is about to start exercise (resting heart rate)

B - The person has started to exercise

C - Workout is at it's highest intensity

D - The person has stopped exercising or are cooling down

E - The person has finished exercising (return to resting heart rate)

This graph shows heart rate across time, but you may also see stroke volume and cardiac output in the exam. Ensure you pay attention to the axes titles so you interpret the graph correctly.

Long Term Effects of Exercise

Match the long term effect of exercise to the correct explanation

Increased Resting Stroke Volume	The heart muscle gets larger (cardiac hypertrophy), so contracts more strongly to pump more blood per beat.
Decreased Resting Heart Rate	Heart has to beat less to pump the same amount of blood per minute.
Increased Maximum Cardiac Output	Lung capacity increases because chest cavity has become larger (also increases vital capacity)
Stronger Diaphragm and External Intercostal Muscles	Diaphragm and external intercostal muscles become stronger so contract harder creating more space.
Increased Lung Capacity and Vital Capacity	Veins and arteries get bigger and walls more elastic
Lower Blood Pressure	More red blood cells to deliver blood and increased capillarisation, more alveoli to transfer blood
Faster recovery to resting heart rate	

2 Markers

1. Name and explain a short-term effect of exercise on the Cardiovascular System. (2 marks)

Mark One – Heart rate will increase during exercise
Mark Two – This means that the heart will beat more times per minute in order to supply the working muscles with greater blood flow/oxygen

OR

Mark One – Stroke Volume will increase during exercise
Mark Two – This means that more blood will be injected from the heart per beat

2. Name and explain a short-term effect of exercise on the Respiratory System. (2 marks)

Mark One – Breathing rate will increase
Mark Two – This means that more breaths will be taken per minute in order to supply the working muscles with an increased amount of oxygen

OR

Mark One – Breathing depth will increase/tidal volume will increase
Mark Two – This means that more air is taken in each breath in order to supply the working muscles with an increased amount of oxygen

3. Name and explain a short-term effect of exercise on the Muscular System. (2 marks)

Mark One – Muscle temperature will increase
Mark Two – Respiration takes place more frequently to provide more energy. This results in more heat being released

OR

Mark One – Muscle fatigue/lactic acid/oxygen debt will occur
Mark Two – This is due to anaerobic activity and an increase in CO2/decrease in oxygen in the muscles

3 Markers

4. Naomi is a long-distance swimmer. She has taken part in a six-week training programme.

Name a long-term effect of exercise that Naomi will have experienced on her Cardiovascular System. Evaluate how this long-term effect will have an impact on her performance in swimming. (3 marks)

Mark One – Naomi will have a faster recovery rate following exercise
Mark Two – This means that her heart rate will return to resting rate quicker
Mark Three – Therefore Naomi will recover faster during training and will be able to complete more sets (interval training), ultimately improving her performance in swimming

OR

Mark One – Naomi will have experienced Cardiac Hypertrophy
Mark Two – This is when the heart has grown in size and strength
Mark Three – This means that during exercise Naomi's heart will be capable of pumping out more blood per beat (stroke volume) in order to maximise the blood flow to her muscles. This means that during a race she will take longer to fatigue

Accept other appropriate answers (e.g. increased resting stroke volume/lower resting HR/increased maximum cardiac output)

5. State three long-term effects of exercise on the musculo-skeletal system. (3 marks)

Mark One - Muscular Hypertrophy
Mark Two - Increased Bone Density
Mark Three - Increased strength of ligaments/tendons

Accept other appropriate answers

UNIT CHECKLIST
Skeletal System

Functions of the Skeleton

- Understand the 5 functions of the skeletal system and be able to apply each function to performance in physical activity. ☐

Classification of Bones

- Understand how bones can be classified in four different ways. Be able to give examples of each type of bone and describe its features. ☐

Bones/Skeleton

- Identify the bones at the body and understand their use during sporting perofrmance ☐

Classification of Joints

- Classify joints within the body as pivot, hinge, condyloid or ball and socket ☐
- Understand the movement possibilities at each joint; flexion/extension, abduction/adduction, plantar flexion/dorsiflexion, rotation, circumduction. Apply these movements to specific sporting actions ☐

UNIT CHECKLIST
Muscular System

Muscles of the Body

- Understand that there are three different types of muscle; voluntary, involuntary, cardiac. ☐
- Identify the location of the muscles within the body: ☐
- Understand the role of tendons (attaching muscle to bones) and ligaments (attaching bones to bones). ☐
- Describe how muscles work together as antagonistic pairs in order to create movement ☐
- Explain the characteristics of fast and slow twitch muscle fibres ☐

UNIT CHECKLIST
Cardiovascular System

Functions

- Understand the functions of the CV system and how they are applied to sporting performance ☐

Blood Vessels - Structure & Functions

- Understand the three type of blood vessels and their differing features ☐
- Understand the role that blood vessels have in gas exchange, blood flow, redistribution of blood flow. ☐

Structure of the Heart

- Positioning of the atria, ventricles. valves, arteries & veins ☐

Cardiac Cycle & Pathway of Blood

- Understand the pathway of blood as it moves between the lungs-heart-body ☐

UNIT CHECKLIST
Respiratory System

Pathway of Air

- Identify the pathway that air takes from the nose/mouth through to the alveoli ☐

Gas Exchange

- Understand where and how gas exchange takes place. Be able to describe the features of the alveoli that make gas exchange possible/efficient ☐

Composition of Air

- Understand the composition of inhaled and exhaled air ☐

Tidal Volume/Vital Capacity

- Define/describe tidal volume and vital capacity ☐
- Explain what happens to tidal volume and vital capacity during exercise ☐

UNIT CHECKLIST
Aerobic v Anaerobic Exercise

Aerobic Exercise

- Understand and define aerobic exercise. Be able to give practical examples of sports whereby aerobic respiration takes place ☐

Anaerobic Exercise

- Understand and define anaerobic exercise. Be able to give practical examples of sports whereby anaerobic respiration takes place ☐

Energy Use

- Explain how fats and carbohydrates can be used as energy sources for different types of exercise ☐

UNIT CHECKLIST
The Effects of Exercise

Short-term effects of exercise on the musculo-skeletal system

- Give examples of theshort-term effects of exercise ☐

Short-term effects of exercise on the cardio-respiratory system

- Give examples of the short-term effects of exercise ☐

Long-term effects of exercise on the musculo-skeletal system

- Give examples of the long-term effects of exercise ☐

Long-term effects of exercise on the cardio-respiratory system

- Give examples of the long-term effects of exercise ☐

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