Contents

REVISE Edexcel GCSE (9–1) Physical Education Revision Cards

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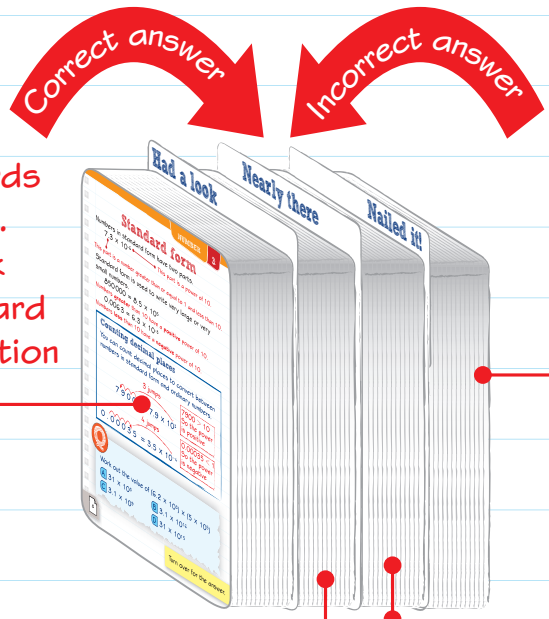
Using your dividers

Make the most of your Revision Cards by using these **dividers** to turbo-charge your revision. This is how it works:

1. Start with all the cards in the **front section**.
2. Read the front of each card and try answering the question.
3. Turn over to check your answer.
4. If you got the answer right, move the card **back one section**.
5. If you got the answer wrong, move the card **forward one section**.
6. The info on the back of each card will help you understand the answer to the question.



All the cards start here. Try to look at each card in this section in **every revision session**.

You've had a look at these cards. You can revise them **every other session**.

You've nailed these cards. Make sure you look at them again at least once **before the exam**.

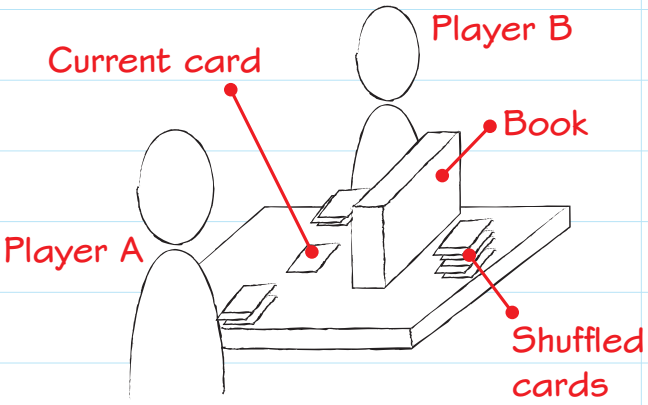
You've answered these questions correctly at least twice! Look at these cards **once a week**.

Revision game

Try playing this quick game to revise with a friend.

1. Choose some Revision Cards. You could use the whole pack or the cards from one section of your pack.
2. Shuffle those cards and place them in a pile face up. Stand up a book so neither of you can see the top card.
3. Take the top card from the pile and place it face up on the table between you.
4. The first player who thinks they know the answer to the question shouts it out.
5. Check the answer. If the player who answered got it right, they put the card in their pile. If they got it wrong, the card goes in their opponent's pile.
6. At the end of the game, the player with the most cards in their pile is the winner!

At the end of the game you could help each other revise using the cards in your pile. Go through your cards and explain how you worked out the answer to your opponent.



If you only remember one thing...

The night before your exam, try flicking through **all the cards** and looking at this section of each card!

Functions of the skeleton

You need to be able to explain how the skeleton carries out its functions by giving examples in relation to physical activity.

Key functions

The functions of the skeleton are:

- production of blood cells
- storage of minerals
- protection of vital organs
- muscle attachment
- formation of joints for movement

Aid movement

Bones provide a place for the muscles to attach to, so that when muscles contract they pull the bones to cause movement. Movement occurs at the joints of the skeleton. Bones also act as levers and allow the body to increase the force it can generate or the speed of a movement. This is helpful in physical activity. For example, a tennis player with longer levers will generate more force on a serve.

Blood cell production

Blood cells are produced in the bone marrow.

- Platelets help clotting when cut.
- Red blood cells transport oxygen to working muscles.
- White blood cells help fight infection.

The skeletal system has several functions. Describe how the skeleton aids movement.

Turn over for the answer.

And the answer is ...

The skeleton is made up of joints, and movement occurs at these joints. The skeleton also provides a place for muscle attachment, allowing movement.

This answer is focussed on movement, as the question asks. Note how it does not explain any other functions of the skeleton, such as cell production.

Mineral storage

Calcium and phosphorus are stored in bones to help strengthen them.

Protection

Your skeleton provides protection for your vital organs, including the heart. For example, your skull protects your brain if an opponent follows through wildly with their hockey stick and it hits you on the head during a game.

Watch out

Always use the words **vital organs** and try to give an example to show your understanding.

If you only remember one thing...

- The functions of the skeleton are: production of blood cells; storage of minerals; protection of vital organs; muscle attachment and formation of joints for movement.

Classification of bones

You need to know the classification type of each bone, its function and be able to explain the use of each in physical activity. There are **four** types of bones you need to know:

Long bones

These aid movement by working as levers.
Example: the femur and the humerus

Short bones

These are weight bearing and provide support.
Example: the carpals and the tarsals

Flat bones

These provide protection and a broad surface for muscles to attach to.
Example: the cranium, the ribs and the scapular

Irregular bones

These provide protection and a place for muscle attachment.

Example: the vertebrae

Q What type of bones are present in the wrist and how would they support a gymnast to perform a handstand?

Turn over for the answer.

And the answer is ...

The type of bones in the wrist are short bones called carpals. They are very strong therefore they can take the weight of the gymnast and allow them to hold the handstand.

If you are not sure, think about where the bone you are being asked about is on the body and if it looks similar to any other bones you know the classification of.

Watch out

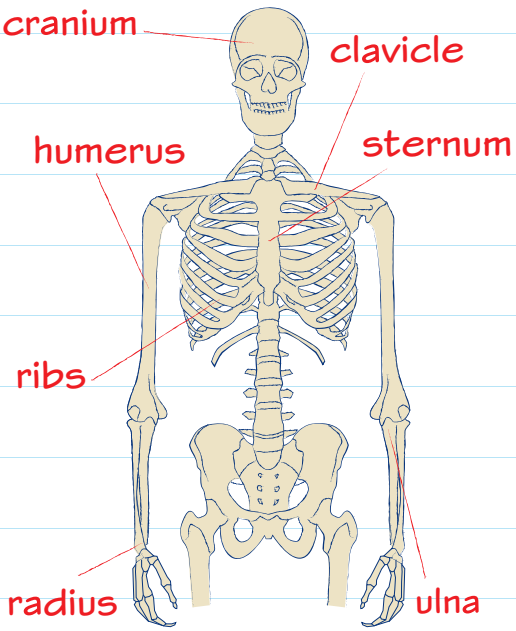
Make sure you identify the bone type in your answer by stating the correct classification, for example, 'irregular bone'.

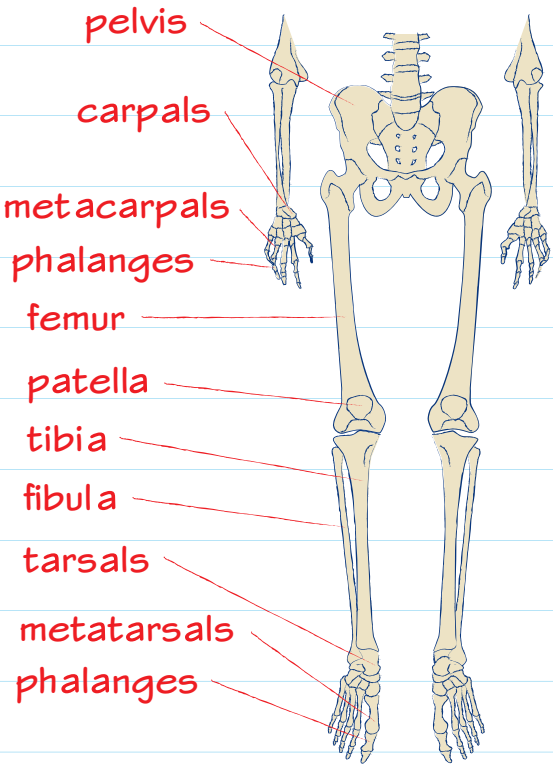
If you only remember three things...

- **Long bones** act as levers.
- **Short bones** are weight bearing.
- **Flat bones** and **irregular bones** both provide protection and a place for muscles to attach to.

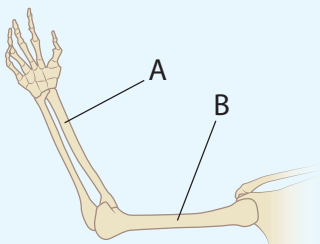
Structure of the skeleton

The skeleton provides a framework for muscle attachment. This enables movement for physical activity. Make sure you know the names and locations of the bones labelled below so that you can recognise them yourself on different diagrams.





Identify the bones at **A** and **B**.



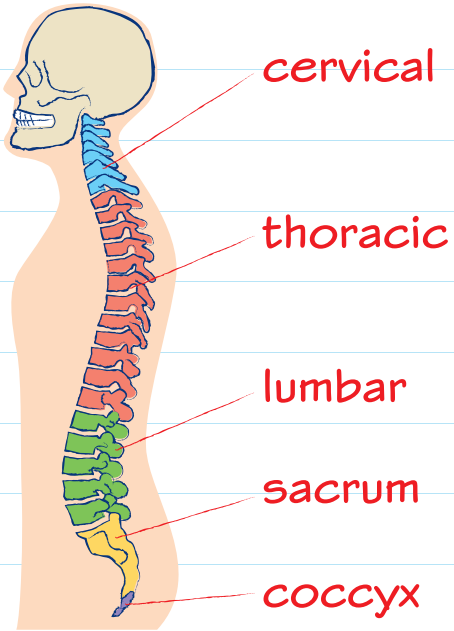
Turn over for the answer.

And the answer is ...

A: Radius
B: Humerus

Sometimes it is hard to remember which bone is the radius and which is the ulna. Remember: the radius is the bone that is near the thumb.

The vertebral column has five regions.



Watch out

A good way to remember the names and locations of the bones is to practise by labelling blank diagrams of the skeleton.

If you only remember one thing...

- Look at the shape of the bone to help identify what type it is.

Classification of joints

A joint is the place where two or more bones meet. It is where movement can occur.

There are **four** types of joint that you need to know:

Hinge joints

These are located at the knee, elbow and ankle.

They move through flexion and extension.

Ball and socket joints

These are located at the hip and shoulder.

They move through flexion, extension, rotation, circumduction, abduction and adduction.

Pivot joints

These are located at the neck (atlas and axis).

They move through rotation.

Condyloid joint

This is located at the wrist.

This joint moves through flexion, extension and circumduction.

What type of joint is formed at the shoulder?

A: Ball and socket **B:** Hinge

C: Condyloid **D:** Pivot

Turn over for the answer.

And the answer is ...

A: Ball and socket

Remember it is the formation of the joint that dictates the type of movement that can occur there.

Watch out

You should be able to give sporting examples of the use of each joint and see the similarities between the same types of joints.

If you only remember three things...

- A joint is the place where two or more bones meet.
- There are **four** types of joint: **hinge, ball and socket, pivot and condyloid.**
- The condyloid joint is located at the wrist.

Movement at joints 1

You need to know the range of movement that can be achieved at each of the joints, and be able to give examples of their use in sports.

- **Flexion** is the term given when the angle at a joint **decreases**.

  Example: at the knee when the player is preparing to kick a football

- **Extension** is the term given when the angle at a joint **increases**.

  Example: at the knee when following through after kicking a football

- **Abduction** is the movement of a limb **away** from the midline of the body

  Example: at the shoulder when reaching out sideways to intercept a netball

- **Adduction** is the movement of a limb **towards** the midline of the body.

  Example: at the hip in the cross-over leg action when throwing a javelin

Identify the range of movement at the shoulder during a star jump.

Turn over for the answer.

And the answer is ...

The range of movement at the shoulder during a star jump is abduction, as the arms are raised, and adduction as they are lowered again.

Remember: if a question asks for the 'range' of movement at a joint, you need to include **both** the start and finish movement for the action identified.

Watch out

Read the question carefully! Watch out for the different terms and make sure that you are not confusing joint action with joint type or muscle action.

If you only remember two things...

- If something is 'abducted' it is taken away, so **abduction** is when the limbs move **away** from the body.
- **Adduction** starts with 'add', so it is when a limb is **added** or returned to the midline of the body.

Movement at joints 2

There are **four** more joint actions you need to know:

- **Rotation** is when the bone at a joint moves around its own axis, making a **circular** movement.

  Example: at the shoulder when swimming front crawl

- **Circumduction** is the term given when the joint moves in a **conical** way (in the shape of a cone). Circumduction allows 360° of movement and occurs at ball and socket joints.

  Example: the shoulder action when swimming butterfly

- **Plantar-flexion** occurs at the ankle joint and is the movement of the foot **downwards** as you point your toes.

  Example: when a gymnast points her toes

- **Dorsi-flexion** occurs at the ankle joint and is the movement of the foot **upwards** towards your shin (decreasing the angle at the joint).

  Example: on the leading leg as an athlete jumps a hurdle

State the name of the joint type where circumduction takes place and give an example of its use.

Turn over for the answer.

And the answer is ...

Circumduction takes place at the ball and socket joint. An example is when you circle the leg at the hip during a warm up.

Make sure you read the question carefully. The question asked for the name of a joint type, not the name of a joint.

Watch out

Always try to apply your answers to examples in physical activity.

If you only remember three things...

- **Circumduction** is when the joint moves in a conical way.
- **Plantar flexion** is when the foot moves downwards.
- **Dorsi-flexion** is when the foot moves upwards.

Ligaments, tendons and muscle types

Ligaments, tendons and muscles work with the bones to ensure that the body functions well in physical activity.

- **Ligaments** are tough connective tissues that join **bone to bone.** They are important because they help to keep joints stable.
- **Tendons** are also tough connective tissue but they join (skeletal) **muscle to bone.** They are important because they help to create movement.

Muscle Types

✓ **Cardiac muscle:** this muscle forms the heart. It is unconsciously controlled and pumps blood around the body.

✓ **Voluntary muscles:** these muscles attach via the tendons to the skeleton. They are under conscious control – this means that we move them when we want to.

✓ **Involuntary muscles:** these muscles are found in blood vessels (and the stomach and intestines). They are unconsciously controlled and contract when needed by the body.

Which of the following is an example of a voluntary muscle?

A: Deltoid **B:** Heart
C: Blood vessel **D:** Tendon

Turn over for the answer.

And the answer is ...

A: Deltoid

Watch out

You could be asked to **analyse** a particular muscle type. If you are, you need to really look at each characteristic and see how it links to the particular role of that muscle type.

Ligaments prevent unwanted movement that might cause an injury, such as a dislocation when playing sport.

Examples of muscles in exercise

- **Cardiac muscle** in the heart contracts to pump blood around the body.
- **Involuntary muscles** in the blood vessels help regulate blood flow for vascular shunting.
- When we choose to perform a bicep curl we are using a **voluntary muscle**.

If you only remember three things...

- **Tendons** hold muscle to bone.
- **Ligaments** join bone to bone.
- **Muscles** can be **cardiac, voluntary** and **involuntary.**

Muscles

You need to know the names, location and specific functions of the main muscles that work with the skeleton to produce movement and be able to give examples of their use in sport.

Deltoid – top of the shoulder

- This muscle abducts the arm at the shoulder.
- For example, used when lifting your arms above your head to block a ball.

Latissimus dorsi – side of back

- This muscle adducts the upper arm at the shoulder / rotates the humerus.
- For example, bringing arms back to side after a star jump.

Pectoralis major – front of upper chest

- This muscle adducts the arm at the shoulder.
- For example, following through from a forehand drive in tennis.

External obliques – between lower ribs and abdomen

- This muscle rotates the trunk and helps to pull the chest down.
- For example, rotating trunk while throwing the javelin.

Q Name the movement that occurs when the deltoids contract and give an example of its use in a physical activity of your choice.

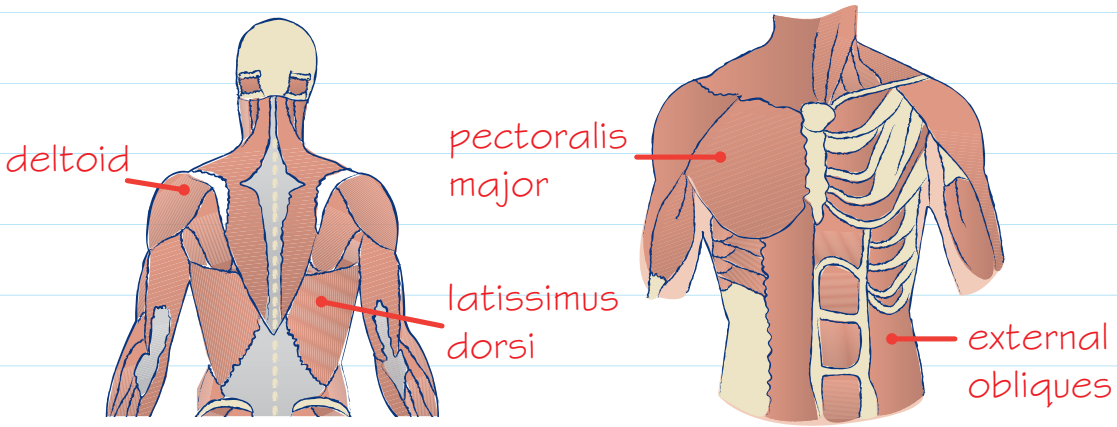
Turn over for the answer.

And the answer is ...

When the deltoids contract, the movement is abduction. In physical activities, this can be used to reach above your head, for example, in the preparation phase of an overarm throw in cricket.

If you are not sure, you can move your own body to help you work out which muscles are contracting.

You need to know the names and locations of the main muscles that help to produce movement. Study the images below.



If you only remember one thing...

- Learn the names, locations and specific functions of the main muscles that work with the skeleton to produce movement.

Antagonistic muscle pairs 1 and 2

Antagonistic pairs of muscles create opposing movement at joints when one muscle contracts (the **agonist**) and the other relaxes (the **antagonist**). You need to know about **four** different antagonistic pairs.

1 Biceps and triceps

- **Biceps** are located on the front of the upper arm. They create flexion of the arm at the elbow which bends the arm upwards.
- **Triceps** are located at the back of the upper arm. They create extension of the arm at the elbow which straightens the arm out.

2 Quadriceps and hamstrings

- **Quadriceps** are located at the front of the upper leg. They create extension of the leg at the knee, which straightens the leg.
- **Hamstrings** are located at the back of the upper leg. They create flexion of the leg at the knee which bends the leg.

Q Describe what is happening to the antagonistic pair of muscles in the arm when an athlete lifts a weight in a bicep curl. Use the words 'agonist' and 'antagonist' in your answer.

Turn over for the answer.

And the answer is ...

The antagonistic pairs of muscles in the arm are the biceps and triceps. When an athlete lifts a weight in a bicep curl, the bicep is the agonist as it contracts, lifting the arm upwards. The tricep is the antagonist as it relaxes to allow this.

If you are not sure of the correct spelling of muscle names, write them like they sound.

Remember, muscles are connected to bones via tendons. When the muscles contract, they pull on the tendon which pull on the bone. This creates movement.

Watch out

Always write the name in full, for example, 'quadriceps', not 'quads'.

If you only remember three things...

- The **biceps and triceps** are an antagonistic pair.
- The **quadriceps and hamstrings** are an antagonistic pair.
- **Agonist** muscles contract; **antagonist** muscles relax.

Antagonistic muscle pairs 3 and 4

Make sure you know the names and locations of these muscles and can give examples of their uses.

3 Gastrocnemius and tibialis anterior

- The **gastrocnemius** is located on the back of the lower leg. It allows plantar-flexion at the ankle which helps when pointing the toes.
- The **tibialis anterior** is located at the front of the lower leg. It allows dorsi-flexion at the ankle, which helps to bring the toes up toward the shins.

4 Hip flexors and gluteus maximus

- The **hip flexors** are located at the very top of the front of the upper leg. They create flexion of the leg at the hip.
- The **gluteus maximus** muscles are located on the buttocks. They create extension of the leg at the hip.

Q Name the agonist that brings the knees up to the chest in a tuck jump, and identify the joint action occurring at the hip.

Turn over for the answer.

And the answer is ...

The agonist that brings the knees up to the chest in a tuck jump is the hip flexor. The joint action occurring in the hip is flexion because the angle at the hip joint is decreasing.

Notice the words 'flexion' and 'extension' are used for the action at the hip as well as the knee. The same rules apply.

- Flexion occurs when the angle at the joint gets smaller.
- Extension occurs when the angle at the joint gets bigger.

Watch out

- ✓ Double check if a question is asking for the agonist or the antagonist.
- ✓ When asked to give an example, always use the most obvious example to make sure it is correct, rather than giving a more obscure answer.
- ✓ Always use the correct name for the gastrocnemius, rather than 'calf'.

If you only remember two things...

- The **gastrocnemius and tibialis** are an antagonistic pair.
- The hip **flexors and gluteus maximus** are an antagonistic pair.

Muscle fibre types

Skeletal muscles are made up of different muscle fibres, which are either **fast twitch** or **slow twitch**. Muscle fibres fall into three main categories:

1. Slow twitch type I

- Produce low force
- Slow speed of contraction
- High endurance
- Good for endurance activities like cross country

2. Fast twitch type IIa

- Produce high force
- Moderate speed of contraction
- Medium endurance
- More resistant to fatigue than type IIx – for example, in a 400-metre sprint

3. Fast twitch type IIx

- Produce very high force
- Fast contracting
- Low endurance
- Good for short, explosive actions like a sprint start

Describe a characteristic of type IIx muscle fibres and how it is an advantage to a basketball performer.

Turn over for the answer.

And the answer is ...

One characteristic of type IIx muscle fibres is that they produce very high force. This is an advantage for a basketball performer because they help to power short, explosive actions that require strength and speed, such as jumping high to intercept a shot.

Remember: 'characteristic' means a quality or feature that specifically belongs to the item.

The different types of muscle fibres have different capabilities and are recruited depending on the task required. Each type has its advantages and disadvantages, which you should be familiar with.

Watch out

You should always make it clear in your answer whether you are referring to type IIa or type IIx twitch fibres.

If you only remember three things...

- **Slow twitch type I** are low force, high endurance muscles.
- **Fast twitch type IIa** are high force, medium endurance muscles.
- **Fast twitch type IIx** are very high force, low endurance muscles.

Cardiovascular system 1

The cardiovascular system consists of three parts: the blood; the blood vessels and the heart. It has a number of functions:

Transport of nutrients

- Macro- and micronutrients are transported in the blood. They are essential for an athlete's performance.

Regulation of body temperature

- The blood vessels increase (vasodilation) and decrease (vasoconstriction) in order to keep our body temperature constant.

Transport of oxygen

- Oxygen is carried **to** the muscles and vital organs to help with energy production.

Transport of carbon dioxide

- Carbon dioxide is carried **away** from the muscles as it is a by-product of energy production.

Clotting of open wounds

- **Platelets** are transported in the blood and are needed to prevent blood loss in the event of an injury.

Explain how the cardiovascular system helps regulate body temperature when a skier starts to get cold.

Turn over for the answer.

And the answer is ...

When a skier starts to get cold, the body temperature drops. When this happens, the blood vessels under the skin vasoconstrict. This reduces the amount of warm blood flowing to the surface of the skin, so less heat is lost.

The cardiovascular system

The cardiovascular system consists of:

- **the blood** – the medium that the gases, blood cells and nutrients are transported in
- **the blood vessels** – the structures that carry the blood
- **the heart** – which circulates the blood around the body by squeezing blood out to the blood vessels each time it beats.

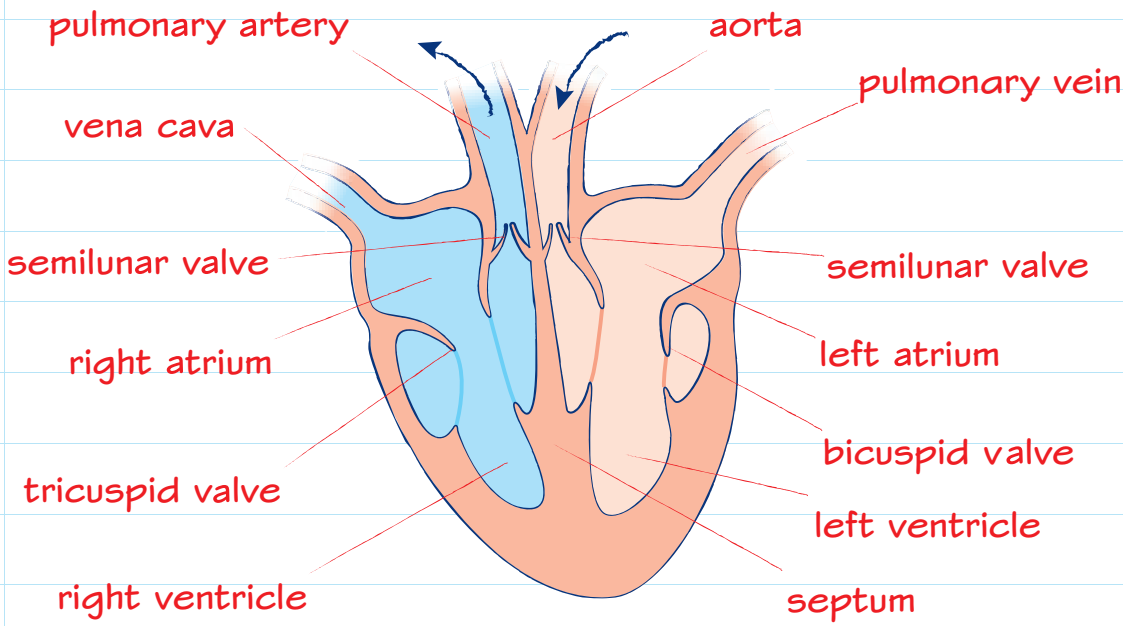
If you only remember three things...

- **Vasodilation**: blood vessels under the skin **increase** in diameter to increase blood flow.
- **Vasoconstriction**: blood vessels under the skin **decrease** in diameter to decrease blood flow.
- The cardiovascular system has **five** functions: to transport nutrients; to regulate body temperature; to transport oxygen; to transport carbon dioxide and to clot open wounds.

Cardiovascular system 2

Make sure you know the names and locations of the labelled components. You should know their role in maintaining blood circulation during physical activity.

- The **right** side of the heart receives **de**oxygenated blood and the **left** side receives **oxy**genated blood.



- The **vena cava** is the main vein bringing deoxygenated blood into the heart.
- The **pulmonary artery** receives the deoxygenated blood and takes it to the lungs.
- The **pulmonary vein** receives oxygenated blood back from the lungs.
- The **aorta** is the main artery carrying oxygenated blood away from the heart.

Q Explain the function of the pulmonary artery.

Turn over for the answer.

And the answer is ...

The pulmonary artery carries deoxygenated blood from the heart to the lungs so that blood can get oxygen, which is eventually pumped to the working muscles.

If you are asked to **explain** an answer you should use linking words such as 'so' and 'therefore' to demonstrate that you can apply your knowledge.

- **Valves** help keep the blood moving forward by shutting behind blood that has passed through, to prevent it flowing back the way it came.
- The **septum** is the wall that separates the left and right sides of the heart.

Watch out

Remember: diagrams of the heart show a cross-section, viewed from the front. So the right-hand side is actually on the left of the diagram! Imagine your own heart to check you have the sides correct.

If you only remember two things...

- The **right** side of the heart receives **de**oxygenated blood.
- The **left** side of the heart receives **oxy**genated blood.

Blood vessels

You need to know the **structure** and **function** of blood vessels and how it's **relevant** to physical exercise.

Arteries

Structure: Thick muscular, elastic walls with small internal diameter (lumen)
Functions: Carry **oxygenated** blood at high pressure away from the heart
Relevance: The arteries contract and relax automatically to allow more room for the blood to travel through as needed.

Capillaries

Structure: Very thin walls (only one cell thick) with small internal diameter
Functions: Link smaller arteries with smaller veins and carry blood at very low pressure
Relevance: Gases and nutrients pass through the thin walls, taking oxygen to the muscles and carbon dioxide away.

Veins

Structure: Thin walls, large internal diameter and contain valves
Functions: Carry **deoxygenated** blood at low pressure towards the heart
Relevance: Wide internal diameter so blood passes easily through. Valves prevent backflow.

State the type of blood vessel that holds blood at high pressure.

Turn over for the answer.

And the answer is ...

Arteries hold blood at high pressure.

Blood pressure increases due to exercise because the working muscles demand more oxygen. To allow this, the artery walls relax to allow more room for the blood to travel through. This helps to regulate blood pressure during exercise.

Watch out

The pulmonary artery and pulmonary vein are exceptions! The pulmonary artery carries **de**oxygenated blood **away** from the heart to the lungs. The pulmonary vein carries **oxy**genated blood from the lungs **to** the heart!

If you only remember two things...

- All **arteries** carry blood **away** from the heart.
- All **veins** carry blood **towards** the heart.

Vascular shunting

During exercise, your heart rate and stroke volume increases so more blood is circulating your body every minute. Your working muscles need more oxygen and so blood (which has oxygen attached to the red blood cells) is diverted (shunted) away from inactive areas towards active muscles.
This is called **vascular shunting.**

Vasoconstriction

To restrict the blood supply reaching inactive areas of the body during exercise (such as the digestive system), the blood vessels are constricted (squeezed) to make them smaller.
This is called vasoconstriction.

- **Constrict = to make smaller**

Vasodilation

To increase the blood supply reaching active areas of the body during exercise, the blood vessels are dilated to make them bigger.
This is called vasodilation.

- **Dilate = to make bigger**

Explain what happens to the blood flow to the digestive system during exercise.

Turn over for the answer.

And the answer is ...

During exercise, the blood vessels leading to the digestive system constrict because it needs less oxygen and nutrients, compared to the working muscles. Therefore, the blood flow to the digestive system decreases during exercise.

You could use alternative words to 'decrease' and 'increase', such as 'more', 'less' or 'greater', but always re-read your answer to make sure the meaning is clear.

When you start to exercise, chemical changes trigger signals from your nervous system to make vascular shunting happen.

If you only remember three things...

- Working muscles need **more** oxygen during exercise.
- **Vasoconstriction**: the blood vessels are made smaller to reduce blood flow
- **Vasodilation**: the blood vessels are made bigger to increase blood flow

Plasma, platelets and blood cells

There are **four** main components of the blood that you need to know about. Each plays a role in enabling physical activity to take place.

1 Plasma Plasma transports the blood cells, platelets and nutrients to the different parts of the body. It is the liquid part of blood.	**2 Platelets** Platelets help prevent bleeding as they can stick to each other and to the walls of the blood vessels. If an athlete gets a cut, the platelets stick together and form a plug to prevent further blood loss.
3 Red blood cells Red blood cells carry oxygen and remove carbon dioxide. Oxygen is needed for aerobic exercise.	**4 White blood cells** White blood cells help fight infection. They travel around the body in the plasma and fight infections or diseases.

Q Explain why plasma is so important to sports performance.

Turn over for the answer.

And the answer is ...

Plasma is the liquid component of the blood. Because it is liquid, it flows through the blood vessels, allowing transportation of anything within it. Therefore, plasma can carry the blood cells within it, supplying oxygen to the working muscles for physical activity.

When answering 'explain' questions you need to **show your knowledge** and either **apply** or **justify the point** you are making. Follow this structure in your answers to ensure you give a full response:

- **Knowledge** (what is it?)
- **Application** (what is the impact?)
- **Justification** (why is it important?)

If you only remember two things...

- There are **four** main components of the blood: **plasma, platelets, red blood cells** and **white blood cells.**
- Always try to apply the topic to physical activity.

Composition of air

You need to know the composition of inhaled and exhaled air and the impact of physical activity and sport on this composition.

Inhaled and exhaled air

Inhaled air	
Nitrogen	78%
Oxygen	21%
Carbon dioxide	0.04%

Exhaled air	
Nitrogen	78%
Oxygen	16%
Carbon dioxide	4%

1 **Nitrogen**

- The level of nitrogen that we breathe in and out remains constant.
- The body does not use or produce nitrogen during physical activity.

2 **Oxygen**

- We exhale less oxygen than we inhale because it is used up in the body for energy production or for recovery.

3 **Carbon dioxide**

- Carbon dioxide is a by-product of energy production, therefore we exhale more carbon dioxide than we inhale.

Q State **two** reasons why the level of nitrogen remains the same in inhaled and exhaled air.

Turn over for the answer.

And the answer is ...

The level of nitrogen remains the same in inhaled and exhaled air because nitrogen is not used by the body in energy production and is not made as a by-product of respiration.

Nitrogen makes up the largest percentage of the gas we inhale.

Watch out

Remember – the reason these three gases do not add up to 100% is due to the rest of the air being made up of tiny percentages of other gases. You do not need to know these other gases for your exam.

If you only remember three things...

In exhaled air:

- the **oxygen** levels have **decreased**
- the **carbon dioxide** levels have **increased**
- the **nitrogen levels** stay the **same**.

Lung volumes

Make sure you know the difference between tidal volume and vital capacity, as well as the impact of physical activity on the lungs.

Tidal volume

This is the amount of air inspired (inhaled) or expired (exhaled) in a **normal** breath.

During exercise you need to increase the airflow into and out of your lungs because:

- you need to get more oxygen to your bloodstream to produce additional energy
- you need to breathe out the additional carbon dioxide that you are producing.

To do this, your tidal volume has to increase.

Vital capacity

This is the **maximum** amount of air the lungs can expire after the maximum amount they can inspire.

- The maximum volume that you can breathe in is called the **inspiratory reserve volume**.
- The maximum volume that you can breathe **out** is called the **exspiratory reserve volume**.

During exercise, tidal volume will increase, becoming nearer to the lungs' vital capacity. Define the term **vital capacity.**

Turn over for the answer.

And the answer is ...

Vital capacity is the **maximum** amount of air the lungs can expire (breathe out) after the maximum amount they can inspire (breathe in).

When our bodies are at rest, breathing is slower and shallower than when exercising. This is because the demand for energy is less.

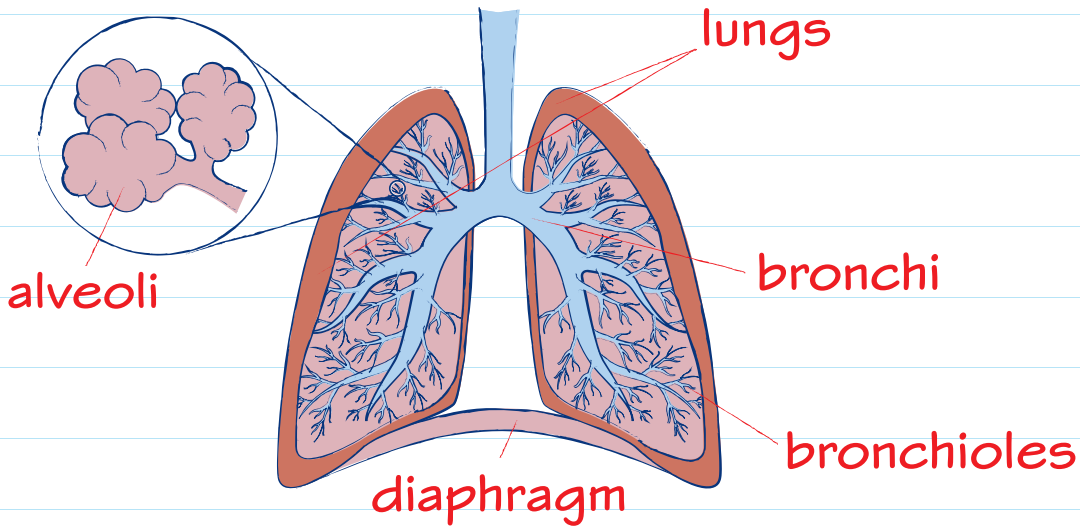
Lung volume refers to the capacity of the lungs (how much air they can hold). The greater the volume of the lungs, the more air they can hold.

If you only remember three things...

- **Tidal volume** is the amount of air inspired or expired in a **normal** breath.
- **Vital capacity** is the **maximum** amount of air the lungs can expire after the maximum amount they can inspire.
- During exercise you need to increase the airflow into and out of your lungs.

The respiratory system

You need to know the location of the **five** main components of the respiratory system and their role in the movement of oxygen and carbon dioxide in and out of the body.



- **The lungs** allow the movement of air in and out of the body (ventilation) through inspiration and expiration.
- The air travels to the lungs through the **bronchi.**
- The bronchi subdivide into the **bronchioles**, which carry the air from the bronchi to the alveoli.
- The **alveoli** are tiny air sacs that exchange oxygen for carbon dioxide.
- The **diaphragm** contracts and flattens during inspiration to make more space for air in the lungs. During expiration it relaxes, helping to force the air from the lungs.

Q Explain the role of the diaphragm during inspiration.

Turn over for the answer.

And the answer is ...

The diaphragm contracts and flattens to make more room for the lungs to expand into, so that more air can be taken into the body. The increase in space helps to draw the air in from the atmosphere to the lungs.

Due to the demand for additional oxygen from the working muscles during exercise, the rate and depth of breathing increase. This enables carbon dioxide to be removed at a faster rate.

Watch out

Read the question carefully! Questions about the **respiratory system** are just about the process and mechanics of breathing and gas exchange. Questions about the **cardio-respiratory system** are about both the respiratory and the cardiovascular system.

If you only remember one thing...

The respiratory system has five main components:

- the lungs
- the bronchi
- the bronchioles
- the alveoli
- the diaphragm.

The alveoli and gas exchange

You need to know how the structure of the alveoli enables gas exchange, as well as the process of gas exchange to meet the demands of exercise.

Alveoli

The alveoli are made of very tiny air sacs with very thin walls. They are surrounded by capillaries. The alveoli contain a high concentration of oxygen. This moves through the thin walls and into the capillaries, which have a lower concentration of oxygen, so that it can be transported around the body.

The reverse happens with carbon dioxide. The capillaries contain a high concentration of carbon dioxide that moves into the alveoli, which contain a lower concentration of carbon dioxide, to be breathed out.

Watch out

During and after aerobic exercise there is an increased breathing rate and so a greater gas exchange.

Q Explain **one** reason why carbon dioxide can diffuse from a capillary to the alveoli.

Turn over for the answer.

And the answer is ...

There will be high levels of carbon dioxide in the capillaries and lower levels in the alveoli, therefore the carbon dioxide will move from high pressure in the capillaries to the alveoli to try to even out the concentration of carbon dioxide.

Although the question only asked for one reason you should always explain your answer.

Watch out

Remember: gases always move from areas of high concentration to areas of low concentration.

If you only remember three things...

- Gas exchange occurs between the **alveoli** and the **capillaries** and between the capillaries and the **muscle tissue**.
- Gas exchange varies due to the intensity of exercise.
- Gases move from areas of high concentration to areas of low concentration.