

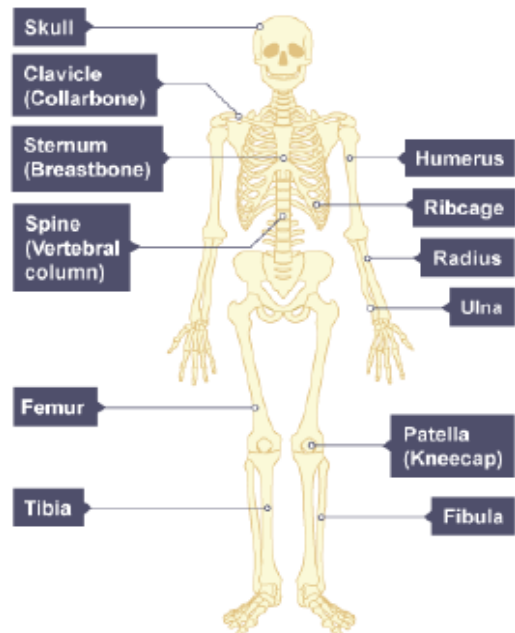
KPI 9BB 1: Explain the function of the skeleton, and describe the function of antagonistic muscles.

The skeleton - Our skeleton is made of more than 200 bones. Calcium and other minerals make the bone strong but slightly flexible. Bone is a living tissue with a blood supply. It is constantly being dissolved and formed, and it can repair itself if a bone is broken.

Function of the skeleton

The skeleton has four main functions:

- 1. Support** - to support the body e.g. Our backbone keep us upright
- 2. Protection** - Here are some examples of what the skeleton protects:
 - skull protects the brain
 - ribcage protects the heart and lungs
 - backbone protects the spinal cord



3. Movement - Some bones are joined rigidly together and cannot move e.g. Bones in the skull. Other bones are joined to each other by flexible joints. Muscles are needed to move bones attached by joints.

4. Making blood cells - There are different kinds of blood cells, including:

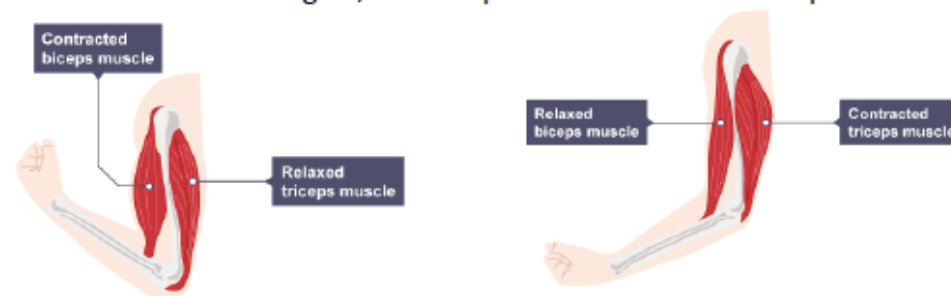
- **Red blood cells** - carry oxygen
- **White blood cells** - used in the immune system

These cells are made in the **bone marrow**. This is soft tissue inside our larger bones which is protected by the hard part of the bone which surrounds it.

Antagonistic muscles

Muscles are attached to bones by strong tendons, they can only pull and cannot push. E.g. your elbow joint has two muscles that move your forearm up or down.

- to raise the forearm, the biceps contracts and the triceps relaxes
- to lower the forearm again, the triceps contracts and the biceps relaxes



Joints - Bones are linked together by joints which allow different parts of the skeleton to move. They are called **synovial joints**.

The bones cannot move on their own - they need muscles for this to happen.

Type of joint	Example	Movement allowed
Hinge joint	Knee, elbow	Same as opening and closing a door, no rotation
Ball and socket joint	Hip, shoulder	Backwards and forwards in all directions, with rotation

You could work out the force exerted by the biceps muscle to do this using the idea of **moments**.

You will learn more about calculating moments in Physics.



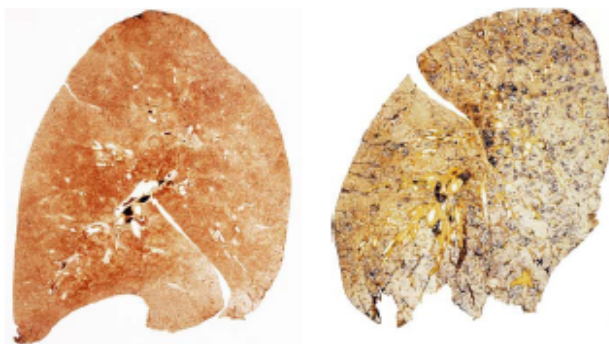
KPI 9BB 2: explain how the use of recreational drugs and smoking can affect biological systems, such as during gas exchange

Smoking

Smoking is very harmful to health. It's estimated that nearly one in every five deaths (of adults aged over 35 in England) is connected to smoking. Tobacco smoke contains many harmful substances. These include:

- tar
- nicotine
- carbon monoxide

The pictures show a section through a normal lung and one blackened by tar.



It also causes a low birth weight in babies born to mothers who smoke.

Tar - Causes lungs, mouth and throat **cancer**. It coats the inside of the lungs, including the **alveoli**, causing coughing. **It damages the alveoli, making it more difficult for gas exchange to happen.**

Smoke - Cells lining the airways produce sticky mucus. This traps dirt and microbes. **Cilia** (cells with little hairs) then move the mucus out of the lungs.

However, hot smoke and tar from smoking damages the cilia. As a result of this, smokers cough to move the mucus and are more likely to get **bronchitis**.

Nicotine - is **addictive** and also increases the heart rate and blood pressure, and makes blood vessels narrower than normal. This can lead to **heart disease**.

Carbon monoxide - is a gas that takes the place of oxygen in red blood cells, reducing the amount of oxygen that the blood can carry. It means that the **circulatory system** has to work harder, causing heart disease

Drugs

A drug is a substance that has an effect on the body:

- medicines are drugs that help people suffering from pain or disease
- recreational drugs are taken by people because they like the effects they have on their bodies

Depressants

A depressant slows down messages in the brain and along the nerves. E.g. Alcohol, heroin and solvents.

Short term effects	Long term effects
• Feelings of well being	Damage to the liver, brain and heart
• Lower inhibition	Alcohol – weight gain, damage to the foetus as it passes through the placenta
• Slowed thinking and muscle activity	Solvents – rash around mouth and nose
• Distorted view/hallucinations	Loss of memory and increased risk of mental illness

Stimulants

Speed up messages in the brain and along the nerves, making you feel more alert.

- **Legal stimulants** – nicotine and caffeine make you feel more energetic and alert.
- **Illegal stimulants** - Cocaine, ecstasy and amphetamines also can damage the liver and heart. They can also cause loss of memory and concentration, and bring an increased risk of mental illness.

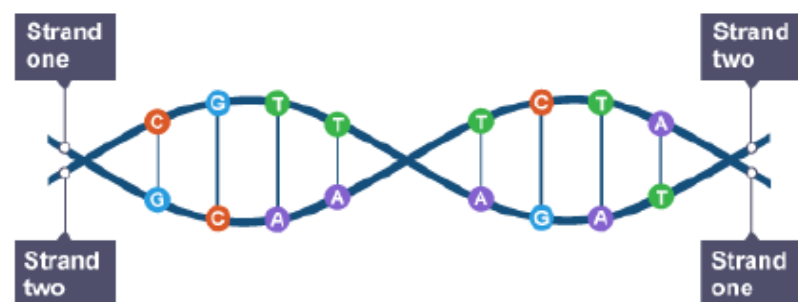
KPI 9BB 5: describe how genetic material can be inherited, and the role of Watson, Crick, Wilkins and Franklin in the discovery of DNA

Structure of DNA

Genetic information is passed from one generation to the next. This is called **heredity** and why we resemble our parents. The genetic information is in molecule called **DNA**. Scientists worked out the structure of DNA in the 1950s.

Name	What they did
Rosalind Franklin	Made X-ray diffraction images of DNA
James Watson & Francis Crick	Used information from one of Franklins images to work out a model for the structure of DNA
Maurice Wilkins	Supported their model

Watson, Crick and Wilkins were awarded the 1962 Nobel Prize in Physiology or Medicine for their discovery. Franklin had died before then and so could not be awarded it with them

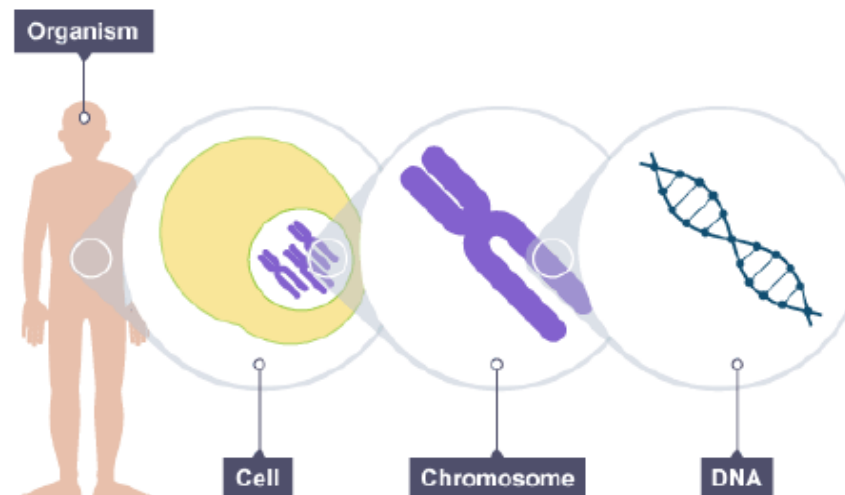


- there are two strands
- the strands are twisted around each other to form a double helix
- the strands are held together by bonds between base pairs

Chromosomes, DNA and genes

The DNA in all of your cells is approximately two metres long. Because it is so long it is very thin and coiled into structures called **chromosomes**.

The chromosomes are found in the **nucleus** of each cell.



The heredity process

Human body cells each contain 23 pairs of chromosomes, half of which are from each parent. So, human **gametes (eggs and sperm)** each contain 23 chromosomes. When an egg is fertilised by a sperm, it becomes a cell with 23 pairs of chromosomes. ***This is why children resemble both their parents – half of their chromosomes and DNA come from their mother, and half from their father.***

A **gene** is a section of DNA that is responsible for a characteristic like eye colour or blood group. DNA makes up genes, which makes up chromosomes. One copy of all your chromosomes is called your genome.

