

Yr9 Biology Revision

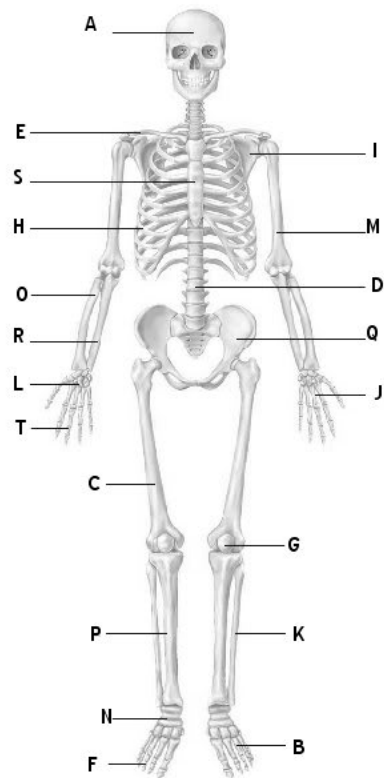
Function of the skeleton

The skeleton has four main functions:

- to support the body
- to protect some of the vital organs of the body
- to help the body move
- to make blood cells

Label the diagram

The Skeletal System

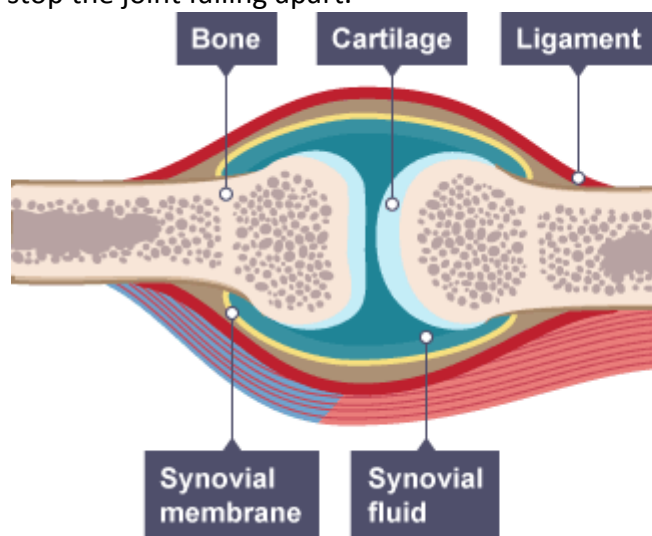


Joints

Bones are linked together by joints. Most joints allow different parts of the skeleton to move. The human skeleton has joints called **synovial joints**.

The synovial joint

If two bones just moved against each other, they would eventually wear away. This can happen in people who have a condition called arthritis. To stop this happening, the ends of the bones in a joint are covered with a tough, smooth substance called cartilage. This is kept slippery by a liquid called synovial fluid. Tough **ligaments** join the two bones in the joint and stop the joint falling apart.



The main features of a synovial joint

Movement

Different types of synovial joint allow different types of movement. The table describes two types of joint:

Type of joint	Examples	Movement allowed
Hinge joint	Knee, elbow	The same as opening and closing a door, with no rotation (turning)
Ball and socket	Hip, shoulder	Back and forth in all directions, and rotation

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

Complete the table

Type of joint	Type of movement	Example
Fixed		
Hinge		
Ball and socket		
Sliding		

Muscles

Muscles work by getting shorter. We say that they **contract**, and the process is called contraction. Muscles are attached to bones by strong **tendons**. When a muscle contracts, it pulls on the bone, and the bone can move if it is part of a joint.

Antagonistic muscles

Muscles can only pull and cannot push. This would be a problem if a joint were controlled by just one muscle. As soon as the muscle had contracted and pulled on a bone, that would be it, with no way to move the bone back again. This problem is solved by having muscles in pairs, called **antagonistic muscles**.

For example, your elbow joint has two muscles that move your forearm up or down. These are the biceps on the front of the upper arm and the triceps on the back of the upper arm:

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

Describe 2 different antagonistic muscle pairs by filling in this table

Antagonistic muscle pair	Description of movement
Biceps and triceps	The biceps _____ the arm at the elbow. The triceps _____ the arm at the elbow.
Quadriceps and hamstring	The quadriceps _____ the leg at the knee. The hamstring _____ the leg at the knee.

Reflex actions

When a receptor is stimulated, it **sends a signal to the central nervous system**, where the brain coordinates the response. But sometimes **a very quick response is needed**, one that does not need the involvement of the brain. This is a reflex action.

Reflex actions are rapid and happen without us thinking. For example, you would pull your hand away from a hot flame without thinking about it.

This is what happens:

1. receptor detects a stimulus - change in the environment
2. sensory neurone sends signal to relay neurone
3. motor neurone sends signal to effector
4. effector produces a response

For example, the way the iris in our eye adjusts the size of the pupil in response to bright or dim light is also a reflex action.

In **bright** light:

- Radial muscles of the iris relax.
- Circular muscles of the iris contract.
- Less light enters the eye through the contracted pupil.

In **dim** light:

- Radial muscles of the iris contract.
- Circular muscles of the iris relax.
- More light enters the eye through the dilated pupil.

Complete the following table

Stimulus	Response
Dust in eye	
Touching a hot surface	
Being hit below the kneecap	
Loud "bang"	
Smelling nice food	

Temperature regulation

If you become too hot or too cold, there are several ways in which your temperature can be controlled. They involve sweating, shivering, skin capillaries and hairs.

Too hot

When we get too hot:

- Sweat glands in the skin release more sweat. This evaporates, removing heat energy from the skin.
- Blood vessels leading to the skin capillaries become wider - they **dilate** - allowing more blood to flow through the skin, and more heat to be lost.

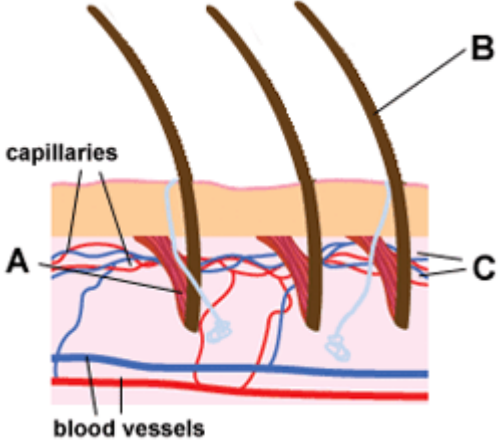
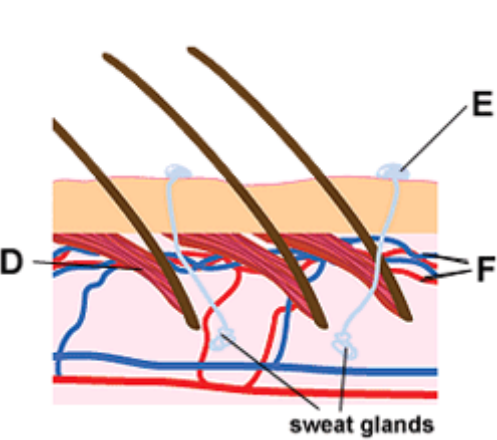
Too cold

When we get too cold:

- Muscles contract rapidly - we shiver. These contractions need energy from respiration, and some of this is released as heat.
- Blood vessels leading to the skin capillaries become narrower - they **constrict** - letting less blood flow through the skin and conserving heat in the body.

The hairs on the skin also help to control body temperature. They lie flat when we are warm, and rise when we are cold. The hairs trap a layer of air above the skin, which helps to insulate the skin against heat loss.

Controlling temperature

Too cold	Too hot
	
<p>A - Hair muscles pull hairs on end. B - Erect hairs trap air. C - Blood flow in capillaries decreases.</p>	<p>D - Hair muscles relax. Hairs lie flat so heat can escape. E - Sweat secreted by sweat glands. Cools skin by evaporation. F - Blood flow in capillaries increases.</p>

The urinary system overview

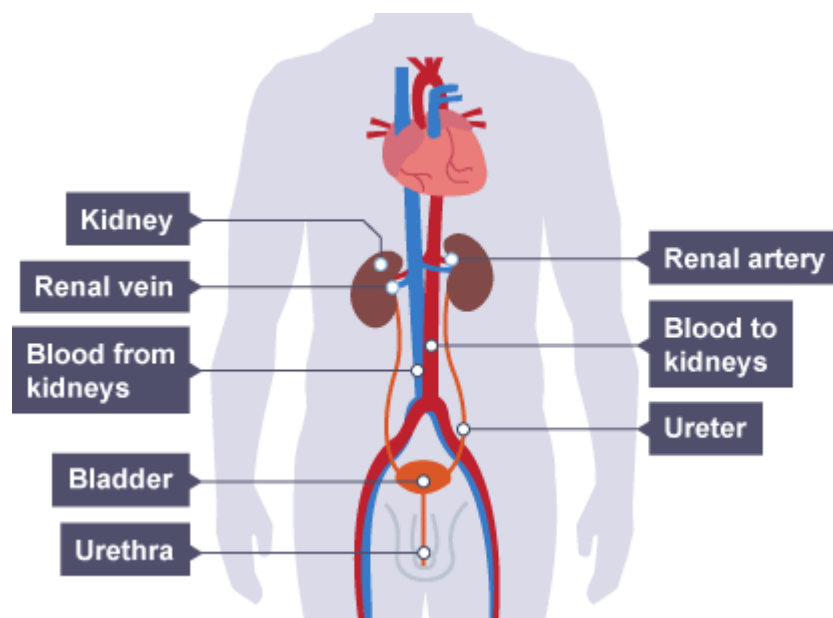
The urinary system is designed to remove waste products such as urea, as well as excess ions and water from our blood. The kidneys contain many nephrons which remove any waste, before reabsorbing any substances the body needs. Waste is stored in the bladder before being removed as urine.

Waste products are produced by our cells. These include carbon dioxide from respiration and urea from the breakdown of excess amino acids in the liver.

Carbon dioxide is removed by our lungs. Our urinary system is responsible for producing, storing and removing urine from our bodies. Our urine contains urea and any excess water.

The kidneys

The kidneys are part of the urinary system, together with the ureter, urethra and bladder. Humans have two kidneys. They are bean-shaped organs - approximately 11.5 cm long – which are found just below our ribcage, one on either side of our spine.



location of kidneys in abdominal cavity.

Variety within a species

Natural selection

Within a population of animals, plants or any living organisms, there will be **variations**. Variation has two causes; **Inherited (genetic)** and **environment**.

Complete the table: -

Characteristic	Cause
Eye colour	
Accent	
Hair colour	
Age	

Selective breeding

Artificial selection is when people use **selective breeding** to produce new varieties of a species. A variety is a type of a particular species that is different in some clear way from other varieties of that species.

For example, pedigree dogs come in lots of different varieties, called breeds of dog. They may be different colours and sizes, but they are all still dogs. They are all still the same species. Different varieties of dog have been produced by selective breeding.



Different breeds of dogs

Selective breeding of cows

Suppose you wanted a variety of cow that produced a lot of milk. This is what you could do:

- choose or select the cows in your herd that produce the most milk
- let only these cows reproduce
- select the offspring that produce the most milk
- let only these offspring reproduce
- keep repeating the process of selection and breeding until you achieve your goal.

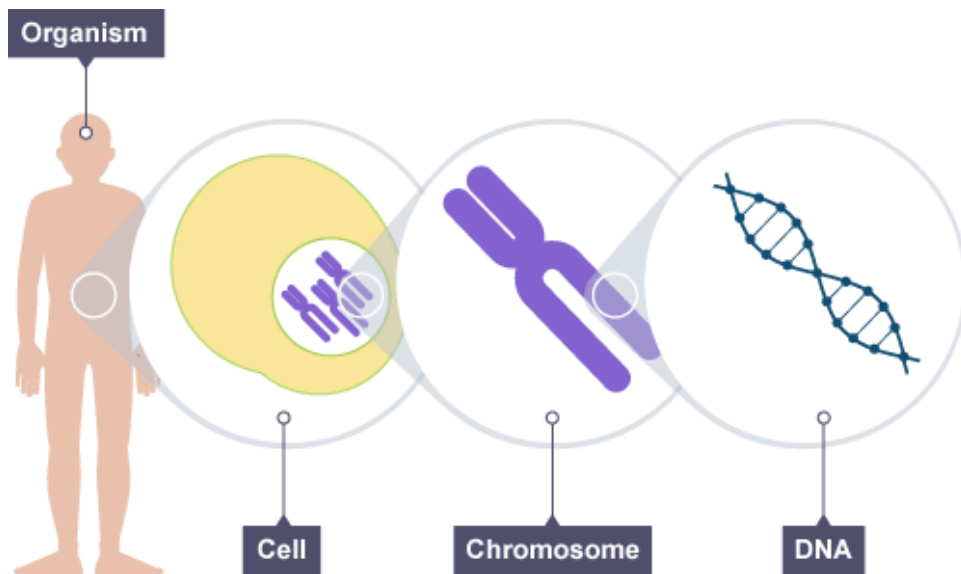
Other examples of selective breeding

The key here is to identify the feature you want, and only breed from the individuals that have that feature. Here are some examples of what selective breeding can produce:

- hens that lay big eggs of a particular colour
- cattle that produce lots of meat
- tomato plants that produce lots of tomatoes
- crops that are resistant to certain plant diseases.

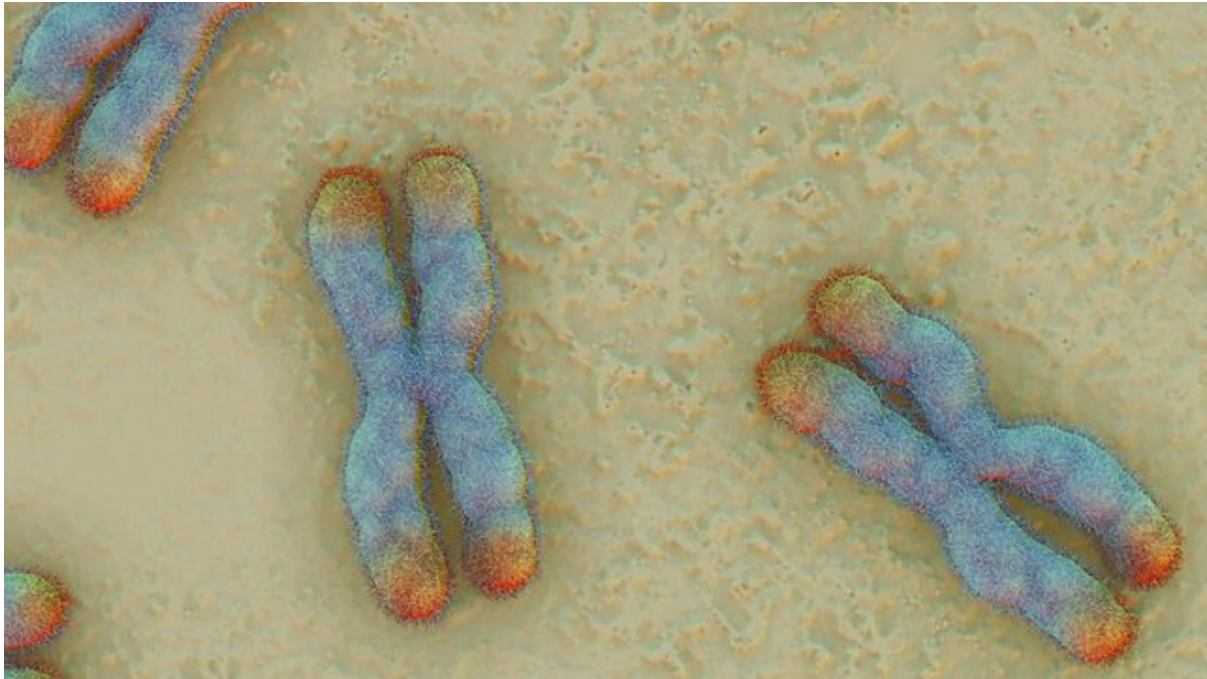
Chromosomes, DNA and genes

The DNA in all of your cells is approximately two metres long, except red blood cells which have none and sperm or eggs which only have about one metre. 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.



Each cell with a nucleus contains chromosomes, which are made from DNA

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 collection of human chromosomes

A **gene** is a section of DNA that is responsible for a characteristic like eye colour or blood group. Humans have around 20,000 genes. DNA makes up genes, which makes up chromosomes. One copy of all your chromosomes is called your genome.

Genetic diagrams (Punnett squares)

Genetic diagrams or **Punnett** squares are used to show the possible outcomes of a particular cross. A dominant allele is shown by a capital letter, and a recessive allele by a lower case letter.

Cystic fibrosis

Cystic fibrosis (CF) is caused by a recessive allele. In the genetic diagram below, it is written as **f**.

People with CF produce abnormally thick and sticky mucus in their lungs and airways. As a result, they are more likely to get respiratory infections. Daily physiotherapy helps to relieve congestion, while *antibiotics* can fight infection. CF also affects the gut and pancreas, so food is not digested efficiently.

Inheriting copies of the allele

You need to inherit two copies of the faulty allele to be born with CF. If you have just one copy, you are a carrier, but will not experience any symptoms. If two carriers have a child together, there is a one in four chance (or 25 per cent) of it inheriting the disorder.

The genetic diagrams below shows why.

f is the cystic fibrosis allele

		mother	
		F	f
father	F	FF	Ff
	f	Ff	ff

Cystic fibrosis is an inherited disorder caused by a recessive allele. This genetic diagram shows the possible outcomes when both parents are heterozygous for the faulty allele. There is a one in four chance or 25 percent of the offspring being homozygous for the faulty allele, and so having cystic fibrosis.