B1 Cells and the Body

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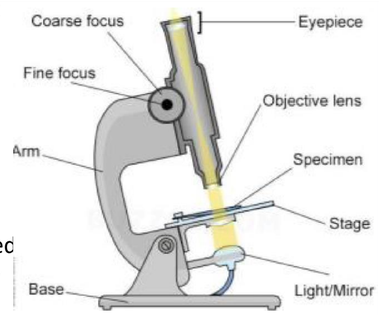
Keyword	Definition
Nucleus	Controls the cell activities, Contains DNA
Cell membrane	Controls what goes in and out of the cell
Cytoplasm	Site of chemical reactions
Mitochondria	Carries out respiration to release energy
Chloroplast	Absorbs light to carry out photosynthesis
Cell wall	Supports the cell
Vacuole	Contains cell sap, supports the cell
Cell	Smallest unit of an organism (living thing)
Tissue	Group of similar cells working together to perform a function
Organ	Group of tissues working together to perform a function e.g. heart
Organ System	Group of organs working together to perform a function e.g. digestive system

Microscope – A tool that use light and lenses to make an object look larger.
Used to view items too small to be seen with the eye.



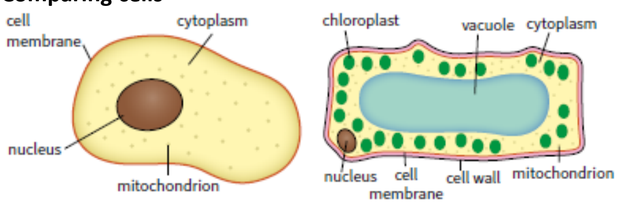
Lowest magnification used first – larger field of view

Make image clearer by turning the focus wheel

Change the magnification by changing the objective lens

Magnification = image size / actual size

Comparing cells

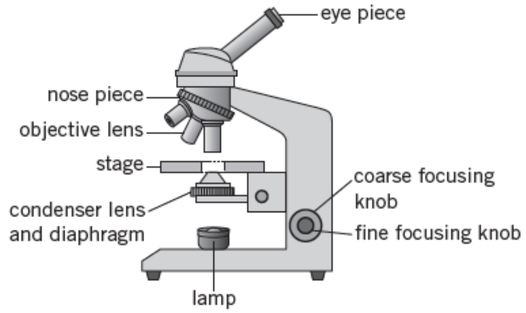


All cells have a cytoplasm and cell membrane.
Both animal and plant cells have nucleus and mitochondria.
Only plant cells have vacuole, chloroplast and cellulose cell wall.

Cells can only be seen under a microscope. A microscope magnifies an object using lenses.

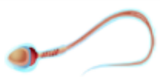
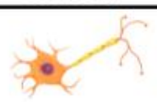
Remember that:

- the specimen needs to be thin so light can pass through
- a dye can be added to make the object easier to see.



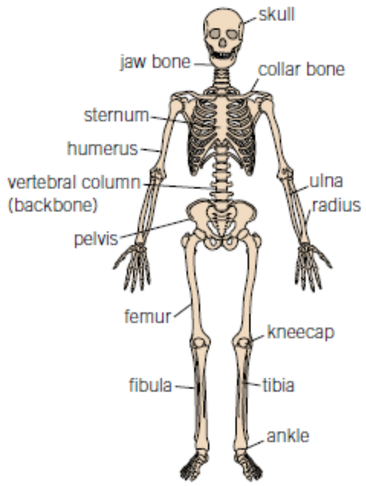
Using a microscope

1. Move the stage to its lowest position.
2. Place the slide/object on the stage.
3. Choose the objective lens with the lowest magnification.
4. Look through the eyepiece and turn the coarse-focus knob slowly until you see the object.
5. Turn the fine focus knob until it comes into focus.
6. Repeat steps 1–5 using a higher magnification lens.

Red Blood Cell	Sperm Cell	Root Hair Cell
		
Carries blood around the body. **Adaptations**: No nucleus, large surface area and biconcave shape.	Carries the male genes. **Adaptations**: Tail for swimming, mitochondria for energy, acrosome to break down the egg cell.	Take in water from the soil. **Adaptations**: Long & thin; large surface area for maximum water absorption. Thin cell walls.
Palisade Cell	**Nerve Cell**	**Egg Cell**
		
Production of food for the plant. **Adaptations**: Tall and thin. Lots of chloroplasts to absorb sunlight for photosynthesis.	Carry signals around the body. **Adaptations**: Long axon. Myelin sheath.	Carries the female genes. **Adaptations**: Lots of mitochondria. Outer layer hardens once fertilised.

Multicellular organisms are made up of many cells and have five levels of organisation:

cell – the smallest building block of an organism
→ **tissue** – a group of specialised cells working together
→ **organ** – a group of tissues working together
→ **organ system** – a group of organs working together
→ **multicellular organism** – a group of systems working together



All the bones in your body make up your skeleton.

The four main functions of the **skeleton** are to:

- support the body
- protect vital organs
- help the body move
- make blood cells (in the **bone marrow**).

Joints occur between two or more bones.
They allow the skeleton to bend.

Three types of joint are:

1 **Hinge joints**
forwards/backwards movements only, e.g., knees

2 **Ball-and-socket joints**
movement in all directions, e.g., shoulders

3 **Fixed joints**
no movement allowed, e.g., the skull

In a joint:
- your bone is protected with **cartilage**
- the two bones are held together by **ligaments**.

Muscles are a type of tissue – lots of muscle cells work together to cause movement.

Types of muscle include:

- **cardiac (heart) muscle**
- **smooth muscle**
- **skeletal muscle**

Muscles are attached to bones by **tendons**.

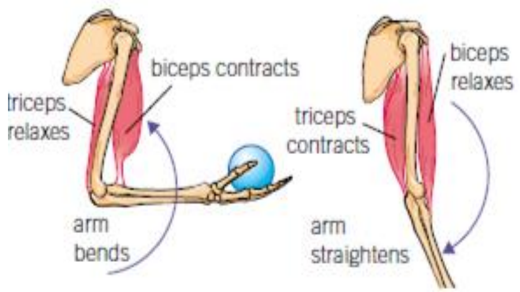
Muscles produce movement by **contracting** (getting shorter).

If a muscle contracts it pulls the bone, causing it to move.

Antagonistic muscles

Pairs of muscles that work together are called **antagonistic** muscles.
When one contracts the other relaxes.

For example, biceps and triceps work together to bend and straighten the forearm.



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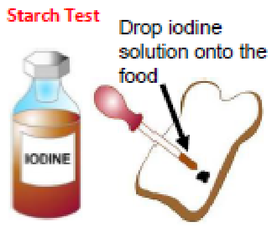
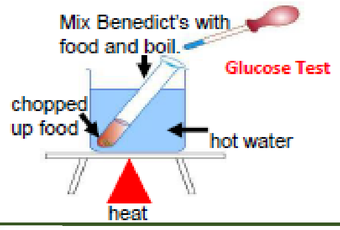
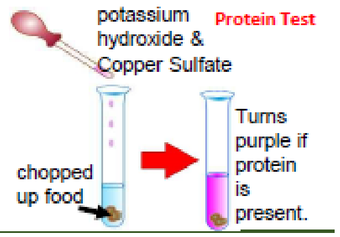
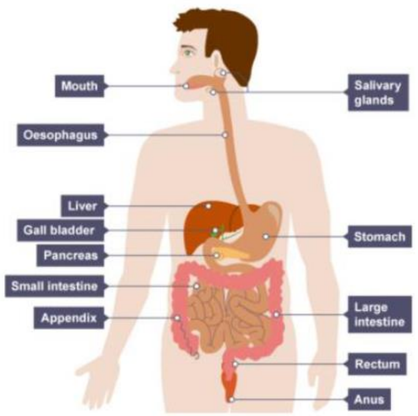




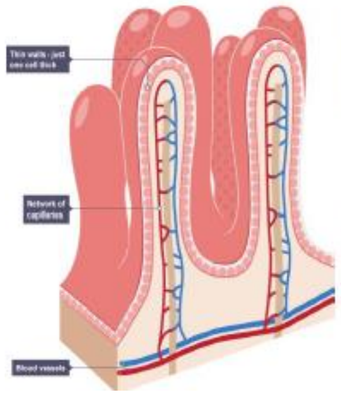


The food we eat has to be broken down into other substances that our bodies can use. This is called digestion. Without this process, we could not absorb the food unto our bodies and use it.



Keyword	Definition
Oesophagus	Connects mouth to stomach.
Liver	Produces bile to help breakdown fats
Stomach	Muscles contract to mix food, hydrochloric acid and protease
Pancreas	Makes biological catalysts called enzyme that speed up digestion.
Small Intestine	Large surface area to absorb more soluble food into the bloodstream
Large Intestine	Absorbs water
Rectum	Stores faeces
Anus	Excretes faeces

Adaptations of the Small Intestine

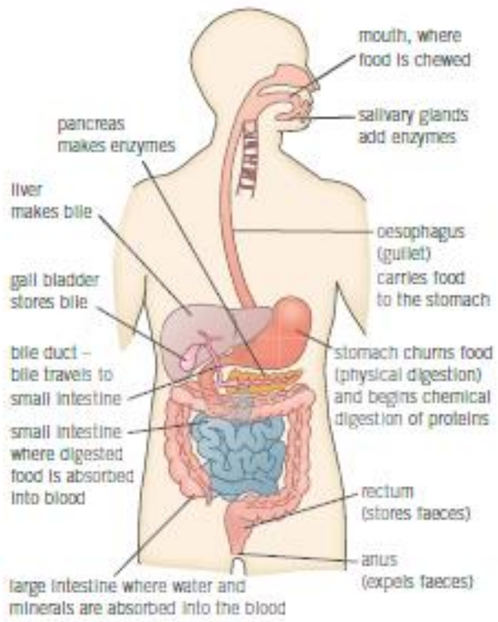


The small intestine is adapted for efficient absorption of digested food into the blood stream by:

- Having a very large surface area.
- Surrounded by lots of blood capillaries.
- Thin walls (1 cell thick) for faster absorption.

Digestion is the breaking down of large insoluble food molecules to small soluble ones. These small molecules are absorbed into the blood for your body to use.

Bacteria live on fibre in your diet in the large intestine and make important vitamins (e.g., vitamin K).



Nutrient	Role in your body
carbohydrates	main source of energy
lipids	fats and oils provide energy
proteins	growth and repair of cells and tissues
vitamins and minerals	essential in small amounts to keep you healthy
water	needed in all cells and body fluids
fibre	provides bulk to food to keep it moving through the gut (not actually a nutrient)

Further Reading:
https://www.bbc.co.uk/bitesize/topics/znyycdm
https://www.bbc.co.uk/bitesize/topics/zf339j6
https://www.bbc.co.uk/bitesize/topics/zvrrd2p

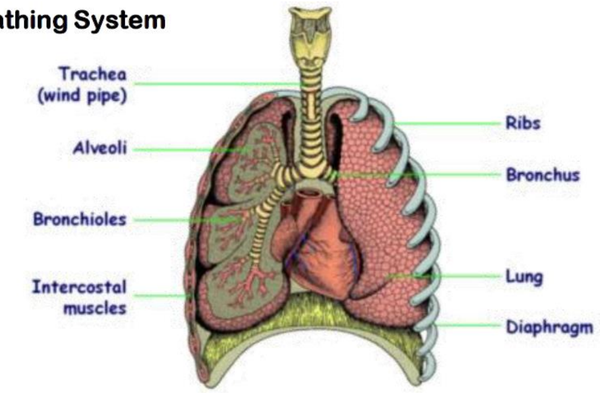
Enzymes are special proteins that can break large molecules of nutrients down into small molecules.

Enzymes are known as biological **catalysts** – they speed up **digestion** without being used up.

There are three main types of enzyme involved in digestion:

	Type of enzyme		
	carbohydrase	protease	lipase
speeds up digestion of	carbohydrates (e.g., starch)	protein	lipids
	↓	↓	↓
	sugars	amino acids	fatty acids and glycerol

The Breathing System



Keyword	Definition
Diaphragm	Contracts and flattens to increase chest volume, so air move into lungs down pressure gradient (inhalation) Relaxes and moves up, so air move out of lungs down pressure gradient (exhalation)
Lungs	Soft pair of organs that inflate when filled with oxygenated air and deflate to expel air.
Trachea	Windpipe. Air passes between mouth / nose and lungs.
Bronchi	Two wide branches off the trachea to distribute air through the lungs. One left bronchi and one right bronchi
Bronchioles	Small branches off the bronchi to distribute air through the lungs
Alveoli	Tiny air sacs in lungs for gas exchange. Millions of the alveoli to make a large surface area. More oxygen into blood, more carbon dioxide out.

B2 Plants, Interdependence and Ecosystems

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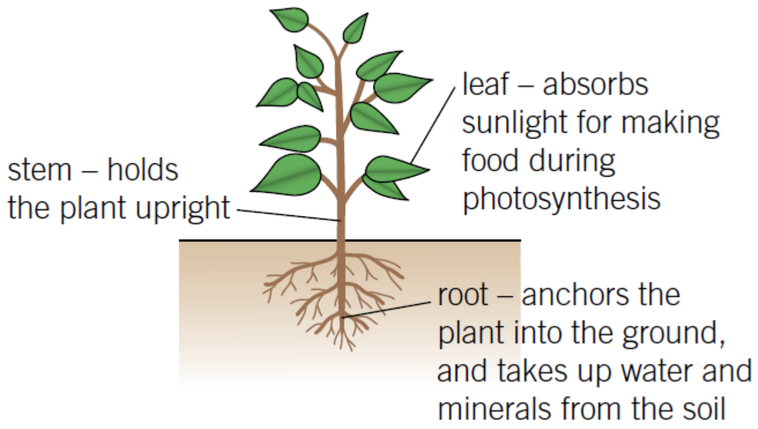
Keyword	Definition
Ecosystem	All the biotic and abiotic factors in an area
Biotic factor	Living factors that can affect populations e.g. predators / prey
Abiotic factor	Non-living factors that can affect populations e.g. temperature / pH
Habitat	Place where an organism lives
Adaptation	Feature that helps a plant or animal survive
Producer	Organisms e.g. plants/algae that make their own food by photosynthesis
Consumer	Animals that eat other organisms
Predator	Animals that kill and eat other animals
Prey	Animals that are killed and eaten by other animals
Interdependence	How populations are linked within an ecosystem
Photosynthesis	Carbon dioxide + water glucose + oxygen
Bioaccumulation	Build up of toxins in a food chain
Eutrophication	Problem caused by fertiliser in ponds and lakes
Ecosystem	All the organisms in a particular location. All the biotic and abiotic in an area
Community	All the organisms in an ecosystem
Habitat	The place a plant or animal lives
Anomaly	Data / result that does not fit the pattern



Interdependence

- Predator and prey species are **interdependent**.
- This occurs when a change in the population of one animal directly affects the population of the other.

For example, Canadian lynx and the snowshoe hare are interdependent:

- When the prey (hare) population increases, the predators (lynx) have more to eat, the lynx survive longer and reproduce more, so the number of predators increases.
- The increase in predators means that more prey are eaten, so the prey population decreases.
- The predators then do not have enough food, so their numbers decrease, and the prey population increases again.

There are two groups of factors which affect an ecosystem:

Biotic factors - living factors. The plants and animals in an ecosystem.

- predators
- competitors
- food availability

Abiotic factors - non-living factors.
The conditions in which an organism lives.

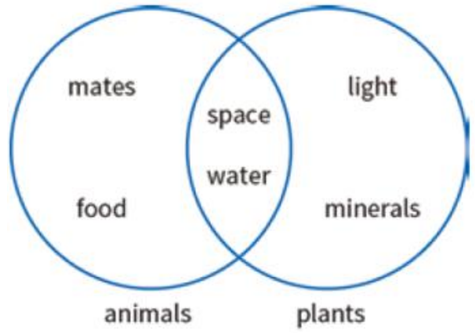
- temperature
- rainfall
- light intensity

Animals compete for:

1 food
2 water
3 space – to hunt and for shelter
4 mates – to reproduce.

Plants compete for:

1 light
2 water
3 space
4 minerals – plants do not compete for food, as they produce their own through photosynthesis.



Differences in characteristics include:

Inherited variation

The genetic material you inherit from your biological parents.

genetic diseases
eye colour
blood group

Environmental variation

Surroundings affect your characteristics.

dyed hair
tattoos
accent

Both

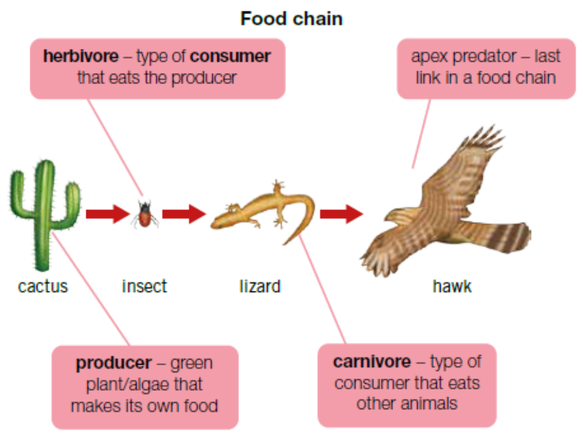
Many characteristics are affected by both types of variation.

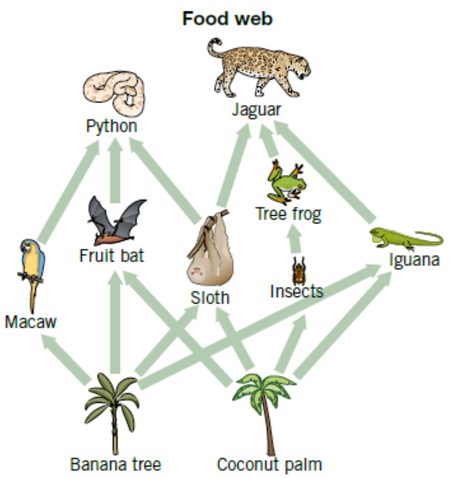
height
body mass
leaf surface area

You can tell whether characteristics are caused by the environment, genetics, or both by recording observations over a long period of time.

Twins are useful to study for this, as identical twins will have the same **genetic variation** and similar **environmental variation**, whereas non-identical twins will have different genetic variation, but similar environmental variation.

Food chains show the transfer of energy between organisms – the arrows represent the direction of energy transfer.
Food webs show how lots of food chains are connected in an ecosystem.





Prey: an organism eaten by another organism.
Predator: an organism that eats another organism.
Bioaccumulation is the build up of chemicals, like insecticides, passed along a food chain.

B2 Plants, Interdependence and Ecosystems

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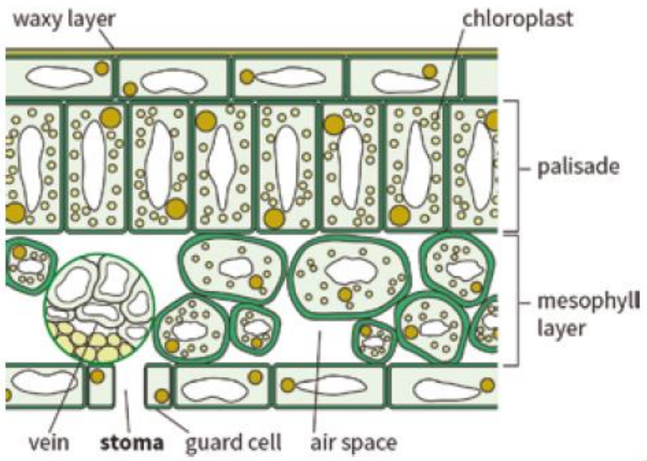
Photosynthesis

carbon dioxide + water → glucose + oxygen

Photosynthesis takes place in chloroplasts.



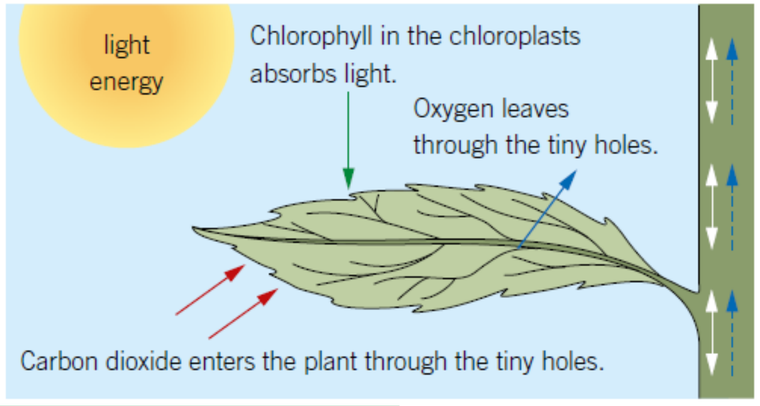
Leaves are specially adapted for photosynthesis. They have a large surface area, are thin, have veins, and contain chlorophyll for photosynthesis.

Leaves have several layers:

- waxy layer - protects the leaf and prevents water loss
- **epidermis** (upper and lower) - transparent to allow light to reach cells below
- **palisade mesophyll** - column shaped and packed with chloroplasts
- **spongy mesophyll** - loosely packed with air spaces for gas exchange
- **stomata** and guard cells-open and close to allow gases in and out of the leaf whilst reducing water loss.

Photosynthesis is a chemical reaction that takes place in the **chloroplasts** to produce **glucose**.

carbon dioxide + water → oxygen + glucose

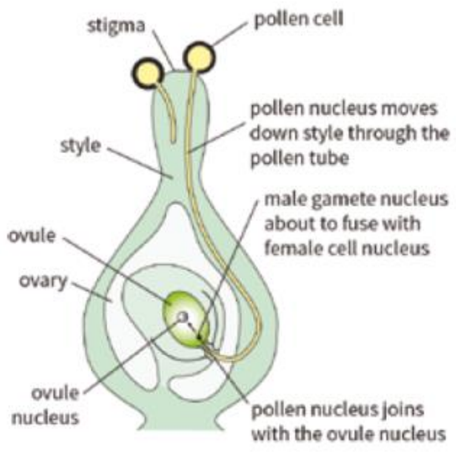


Glucose (white arrows) is transported to all parts of the plant. Water (blue dashed arrows) is transported from the roots to the stem and leaves.

Sexual reproduction - plants

A pollen cell joins with an ovule to create a seed which will germinate and grow into a new plant.

- pollen and ovule are from different plants in sexual reproduction
- mixture of genetic material
- offspring have slightly different characteristics



Seed Dispersal is Scattering Seeds

Seeds are dispersed or spread out so that they can grow without too much competition from each other. Here are some ways in which the seed can be dispersed:

1) Wind dispersal

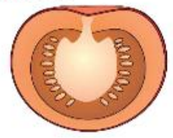
Dandelion fruit. Parachutes catch the wind.

Sycamore fruit.

Wings help it fly away from the parent tree.

2) Animal dispersal

Tomato fruit.



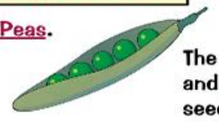
Fruit gets eaten. Seeds come out in the animals' droppings.

Burdock fruit.

Hooks catch animals' coats.

3) Explosions

Peas.



The pods dry out and flick the seed out.

4) Drop and Roll

The heavy fruit falls down from the tree. It splits when it hits the ground and the seeds roll out.

Horse Chestnut fruit.

The seeds then tend to be further dispersed by animals.

	Insect Pollinated	Wind Pollinated
Petals	Large, brightly coloured – to attract insects	Small, dull in colour – no need to attract insects
Smell	Sweet smell – to attract insects	No scent – no need to attract insects
Nectar	Contains nectar – to attract insects	No nectar – no need to attract insects
Pollen quantity	Not much required – less wastage than with wind pollination	Huge quantities required – most of the pollen doesn't reach another flower
Pollen characteristic	Sticky or spiky – to stick to insects	Light, dry and smooth – so it doesn't clump together and can be blown by the wind
Anthers position	Firm and inside flower – to brush against insects	Loose and outside flower – to release pollen into the wind
Stigma position	Inside flower – so that insect brushes against it	Outside flower – to catch the drifting pollen
Stigma characteristic	Sticky – so that pollen from insect sticks to it	Stick but also feathery and / or net like – to catch drifting pollen

Further Reading:

https://www.bbc.co.uk/bitesize/topics/znyycdm
https://www.bbc.co.uk/bitesize/topics/zvrrd2p
https://www.bbc.co.uk/bitesize/topics/zybbkqt
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