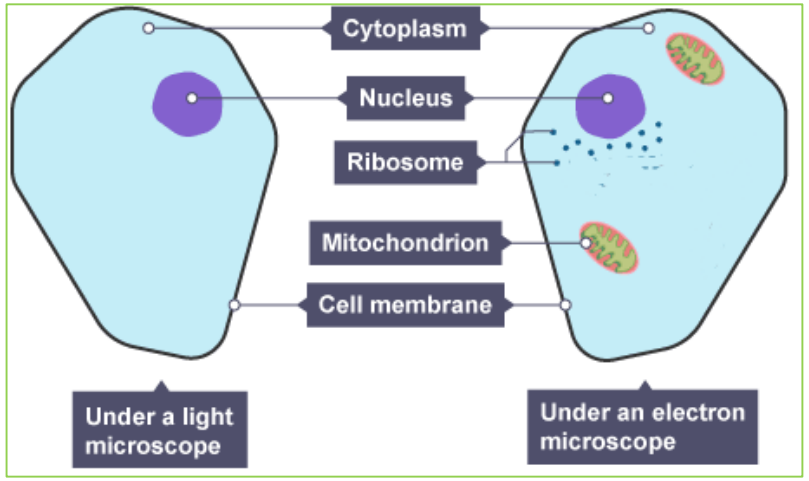
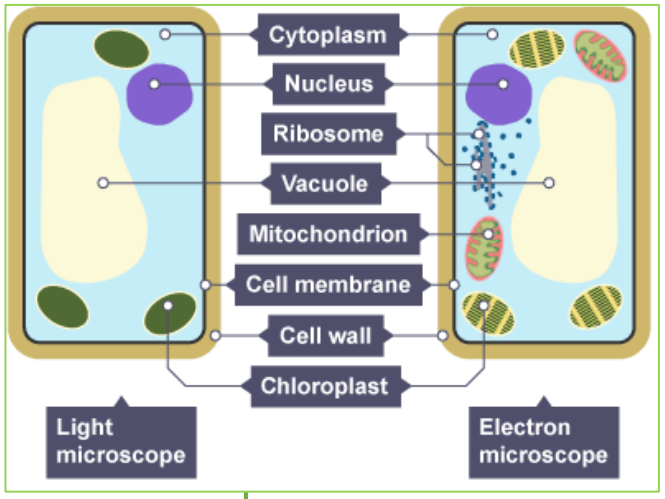
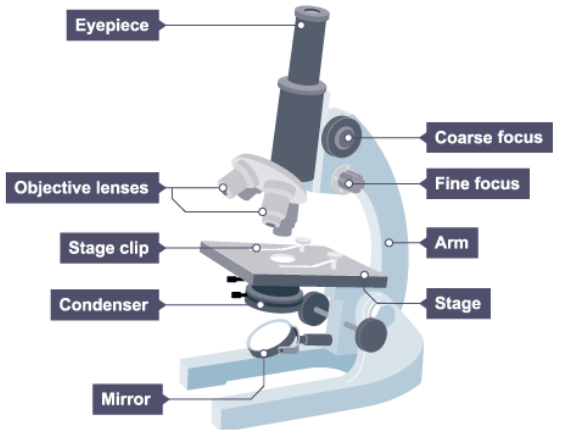






Animal Cell

Plant Cell

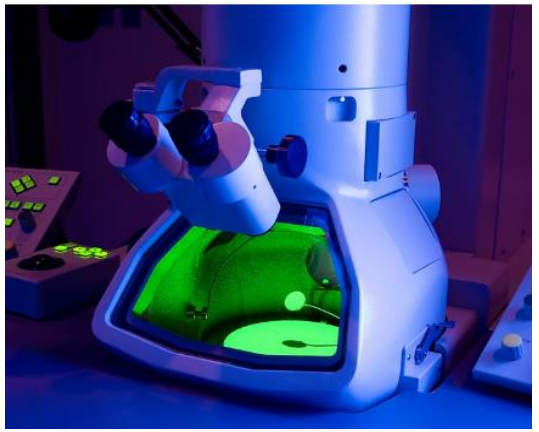
Microbiology

Light microscope

Electron microscope

light microscopes are used to study living cells and for regular use when relatively low **magnification** and **resolution** is enough

Sub-cellular structure	Function
Cell membrane	Controls what goes in and out of the cell.
Cytoplasm	Where chemical reactions take place.
Nucleus	Controls the cell. (DNA is found here)
Mitochondria	Where respiration takes place.
Cell Wall	Provides support to the cell.
Vacuole	Contains cell sap.
Ribosomes	Protein synthesis happens here.
Chloroplasts	Absorb sunlight for photosynthesis.



The most important property of a microscope is its **resolution** - the ability to show detail.

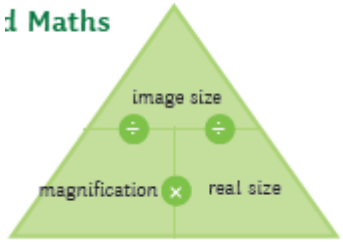
Electron microscopes pass beams of electrons through a specimen and have a much greater resolution than a light microscope.

electron microscopes provide higher magnifications and higher resolution images but cannot be used to view living cells

Microbiology

Calculating magnification

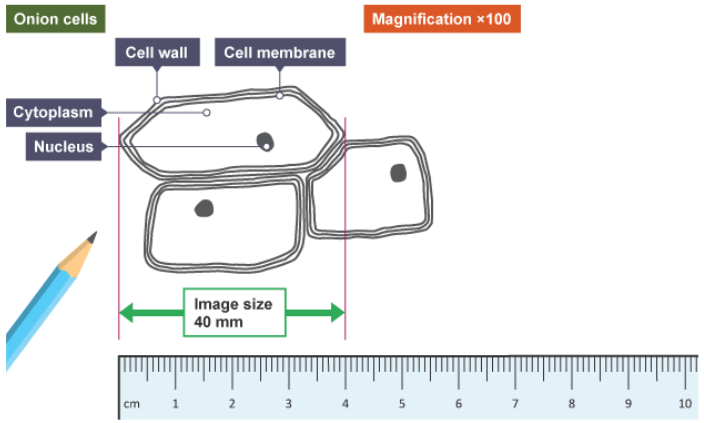
d Maths



Actual Length = length of the **I**mage divided by the **M**agnification.

Magnification = length of the **I**mage divided by the **A**ctual Length.

To convert millimetres into micrometres, multiply by 1000.



Working out magnification:

1. Measure the scale bar image (beside drawing) in mm.
2. Convert to µm (multiply by 1000).
3. Magnification = scale bar image divided by actual scale bar length (written on the scale bar).

Specialised cells

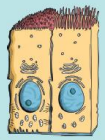
Muscle Cell

Function – To help the body to move.

Bands of protein that change shape to contract and relax the muscle.

Lots of mitochondria to release energy for muscle contraction.

Ciliated Epithelial Cell



Function – To move dust and microorganisms away from the lungs.

Tiny hairs called cilia to help to waft the mucus along the airways.

Lots of mitochondria to release energy for cilia to move.

Nerve Cell

Function – To carry nerve impulses around the body.

Long fibres allow it to carry electrical impulses up and down the body.

Branching dendrites at each end to connect to other nerves or muscles.

White Blood Cell

Function – To fight pathogens that cause disease.

Produce antibodies to kill pathogens and antitoxins to neutralise toxins.

Can change shape to squeeze out of blood vessels and engulf pathogens.

Palisade Cell

Function – To carry out photosynthesis to make glucose for the plant.

Lots of chloroplasts to absorb light energy for photosynthesis.

Tall, thin shape to give it a large surface area to maximise the absorption of light.

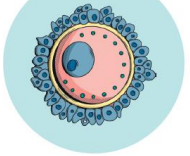
Root Hair Cell

Function – To absorb water and minerals from the soil.

Long root hair to give it a large surface area for absorption of water and minerals into the cell.

No chloroplasts due to being underground.

Egg Cell



Function – To be fertilised by a sperm cell.

Cytoplasm contains nutrients for the developing embryo.

Membrane changes after fertilisation to stop any more sperm getting in.

Sperm Cell

Function – To fertilise an egg cell.

Long tail to help it swim to the egg.

Lots of mitochondria to release energy to allow the sperm to move.

Red Blood Cell

Function – To transport oxygen around the body.

No nucleus so there is more room for haemoglobin, which binds to oxygen molecules.

Biconcave shape to give a large surface area for diffusion of oxygen.

Microbiology

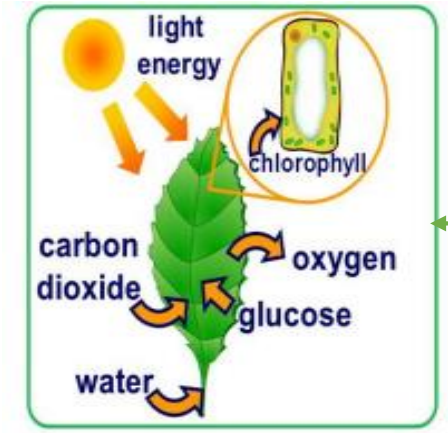
Four factors plants need to survive are; water, space, mineral ions & sunlight.

Photosynthesis

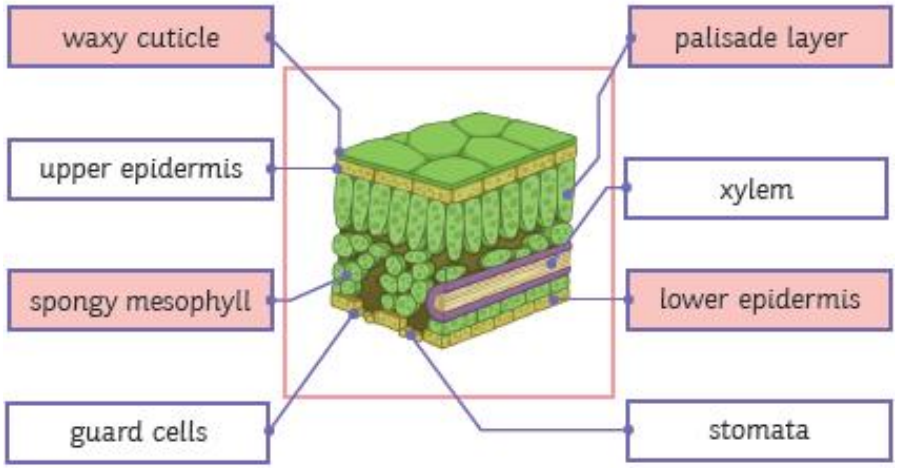
Leaves are plant organs and their main function is to absorb sunlight energy for use in **photosynthesis**. Within the cells are small organelles called **chloroplasts** which contain a green pigment called **chlorophyll**. This is the part of the plant which absorbs the sunlight and where photosynthesis occurs.

sunlight

carbon dioxide + water ⟶ oxygen + glucose



Adaptation of a leaf



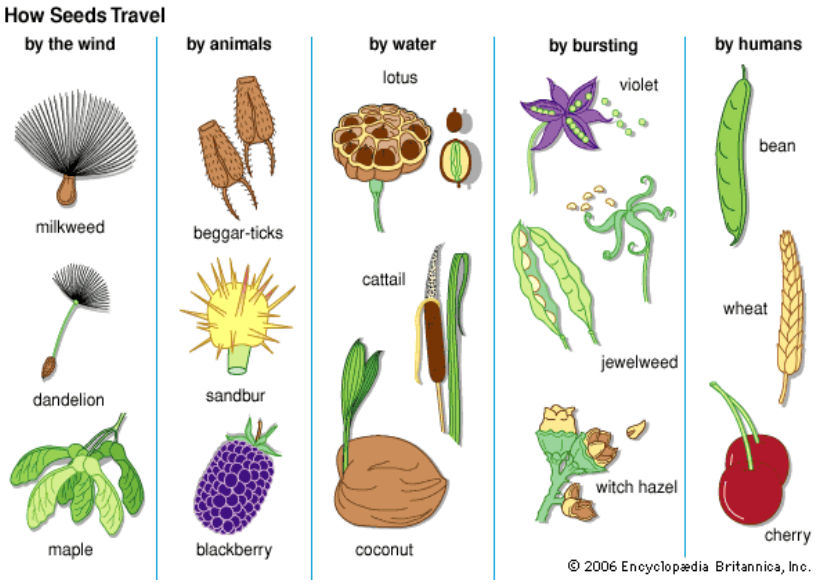
Leaves are adapted to carry out their function. Leaves are typically flat and thin with a large **surface area**. This means they have a maximum area to absorb the sunlight and carbon dioxide. The **thin** shape reduces the distance for **diffusion** of water and gases.

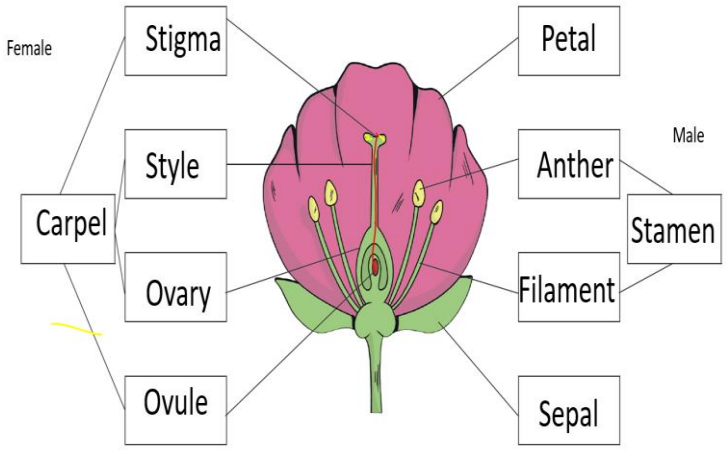
Leaves contain vessels called xylem and phloem. The **xylem** transport water and dissolved minerals toward the leaves. The **phloem** transport glucose and other products from photosynthesis around the plant.

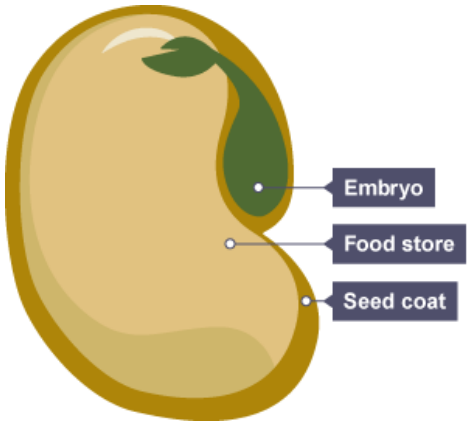
The large **air spaces** between the cells of the spongy mesophyll layer allow for the diffusion of gases. **Carbon dioxide** enters the leaves and **oxygen** exits the leaves.

The **guard cells** are specially adapted cells located on the underside of the leaf. They are positioned in pairs, surrounding the **stomata** (a small opening in the epidermis layer). The guard cells change shape to open and close the stomata, controlling the rate of **gas exchange** in the leaf.

Plant reproduction







Germination is a process, controlled by **enzymes**, in which the seed begins to develop into a new young plant. Three main factors are needed for successful germination.

Factor	Description
Water	Lets the seed swell and the embryo start to grow
Oxygen	Needed for aerobic respiration
Warmth	Increases growth rate and enzyme activity (but very high temperatures denature enzymes)

Germination

Pollination

Microbiology

Fertilisation

Organisation

Pollination

Pollination is the act of transferring pollen grains from the male anther of a flower to the female stigma. The aim of most living **organisms**, including plants, is to produce offspring for the next generation. One of the ways that plants can produce offspring is by making seeds. Seeds contain the nutrition and all the genetic instructions to grow into an adult plant.

There are two types of pollination:

Self-pollination: The pollen grain lands on the same flower it originated from.

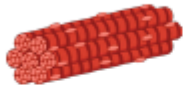
Cross-pollination: The pollen grain lands on a different flower to the one it originated from.

Flowers on the apple tree use cross-pollination

Fertilisation

When a **pollen grain** lands on the stigma of a flower of the correct **species**, a **pollen tube** begins to grow. It grows through the **style** until it reaches an **ovule** inside the ovary. The nucleus of the pollen then passes along the pollen tube and fuses (joins) with the **nucleus** of the ovule. This process is called **fertilisation**.

Principles of Organisation


cell	→ tissue	→ organ	→ organ system	→ organism
Cells are the basic building blocks of all living things.	A group of cells with a similar structure and function is called a tissue.	An organ is a combination of tissues carrying out a specific function.	Organs work together within an organ system.	Organ systems work together to form whole living organisms.