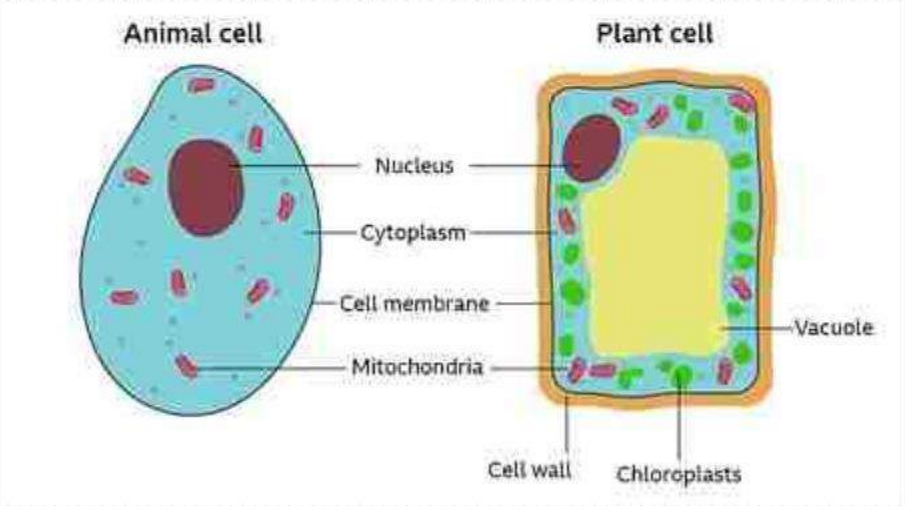
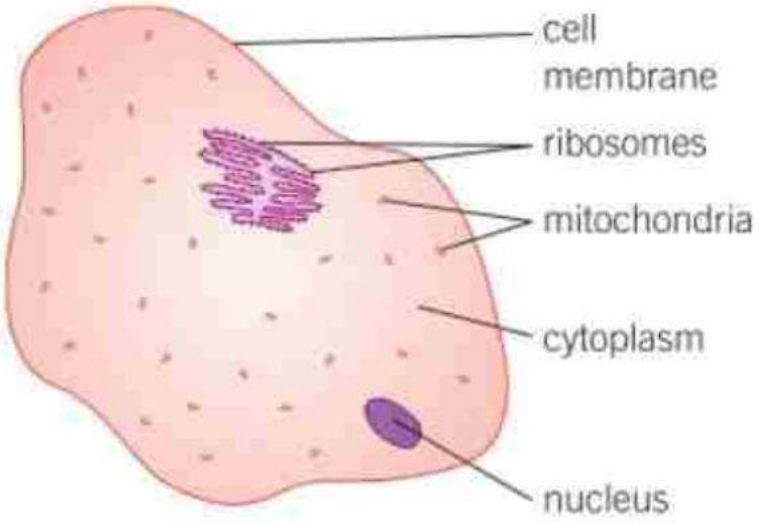
Cell Structure & Transport

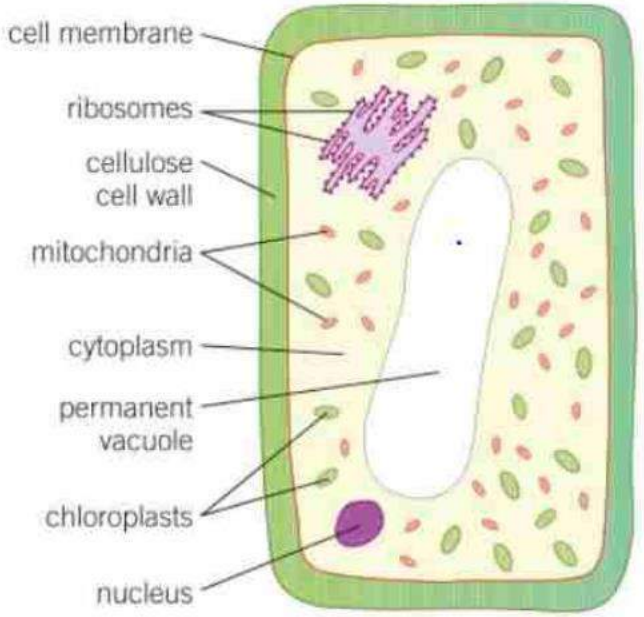


Cells

Animal Cell

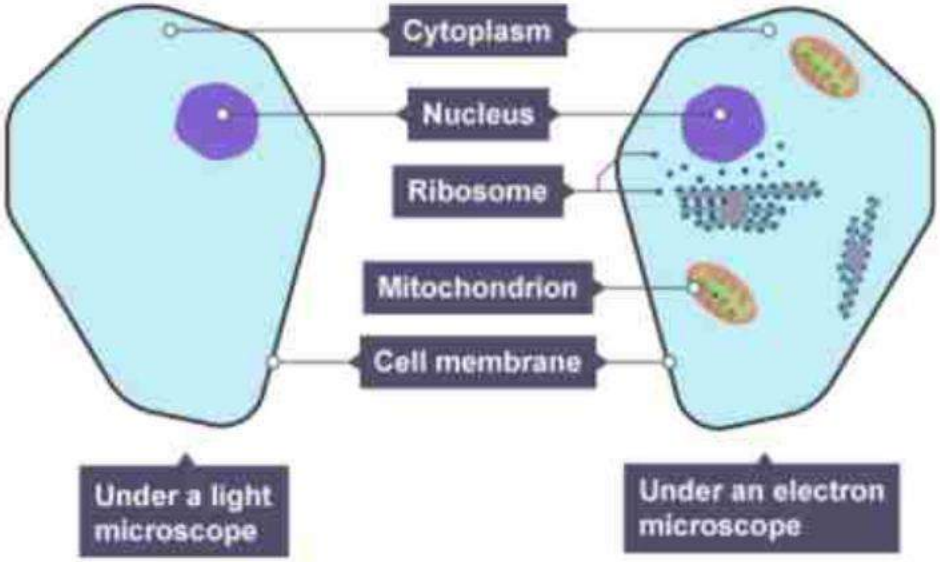


Plant Cell



Animal Cells have:

	Function
Cytoplasm	A jelly-like material that contains dissolved nutrients and salts and structures called organelles. It is where many of the chemical reactions happen.
Nucleus	Contains genetic material, including DNA, which controls the cell's activities.
Cell membrane	Its structure is permeable to some substances but not to others. It therefore controls the movement of substances in and out of the cell.
Mitochondria	Organelles that contain the enzymes for respiration, and where most energy is released in respiration.
Ribosomes	Tiny structures where protein synthesis occurs.



Plant Cells have:

	Function
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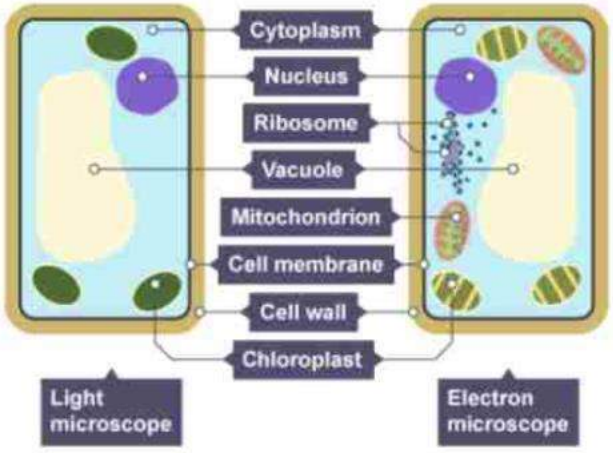
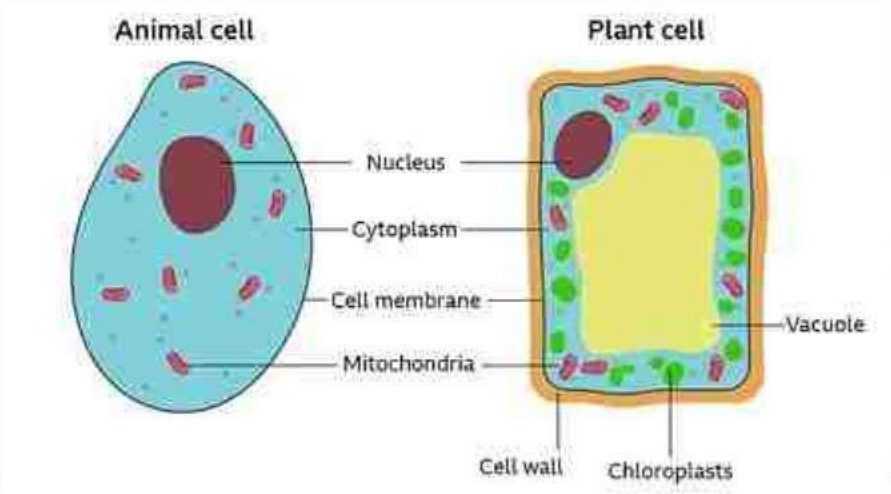
Mitochondria	Organelles that contain the enzymes for respiration, and where most energy is released in respiration.
Ribosomes	Tiny structures where protein synthesis occurs.
Chloroplast	Organelles that contains the green pigment, chlorophyll, which absorbs light energy for photosynthesis. Contains the enzymes needed for photosynthesis.
Cell wall	Made from cellulose fibres and strengthens the cell and supports the plant.
Permanent vacuole	Filled with cell sap to help keep the cell turgid.

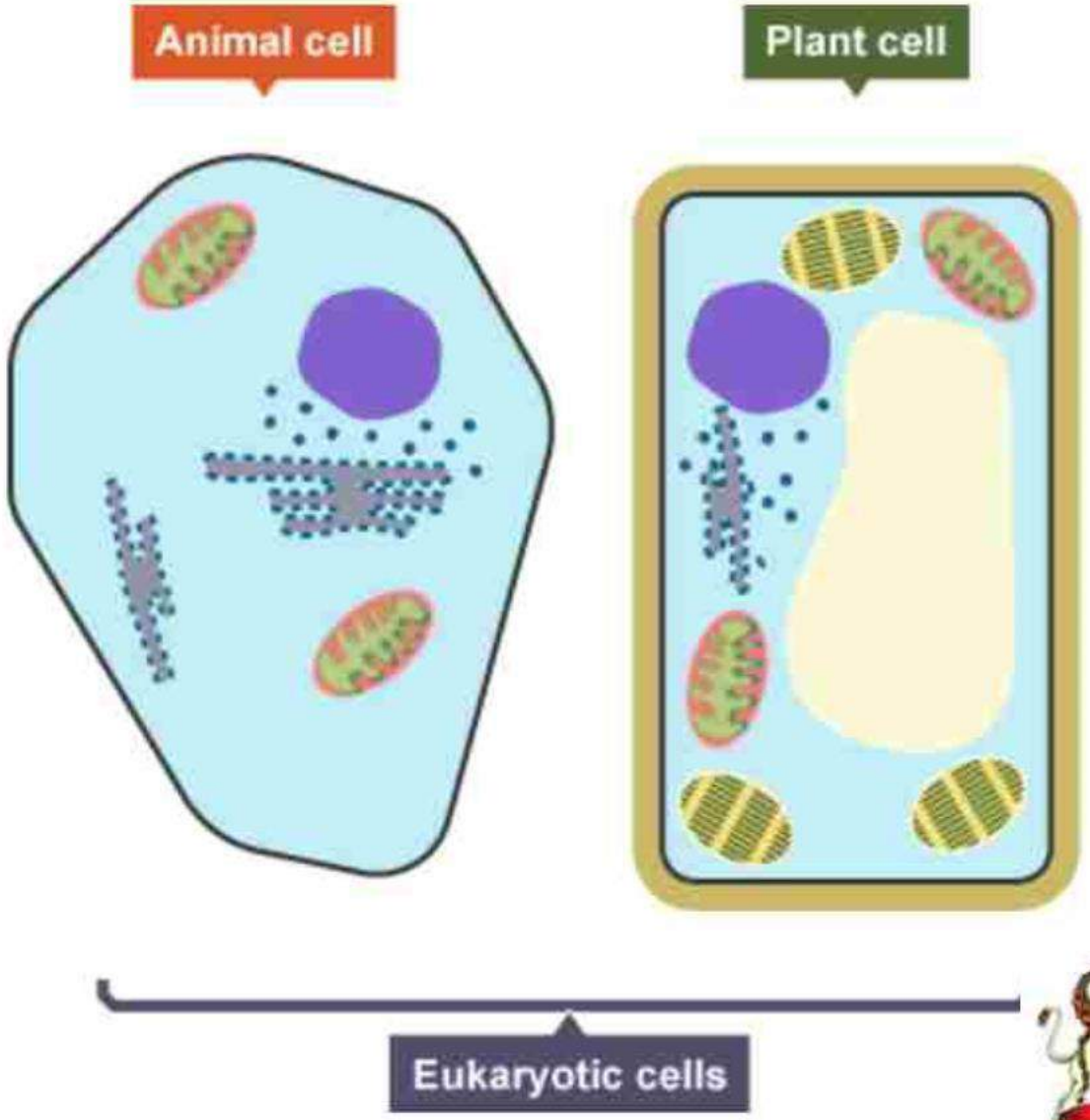


Eukaryotic Cells:

- Have a **cell membrane, cytoplasm**, and genetic material that is enclosed in a **nucleus**
- The genetic material is a chemical called **DNA**
- DNA forms structures called **chromosomes** which are stored in the nucleus
- Examples of eukaryotic cells: animal cells & plant cells



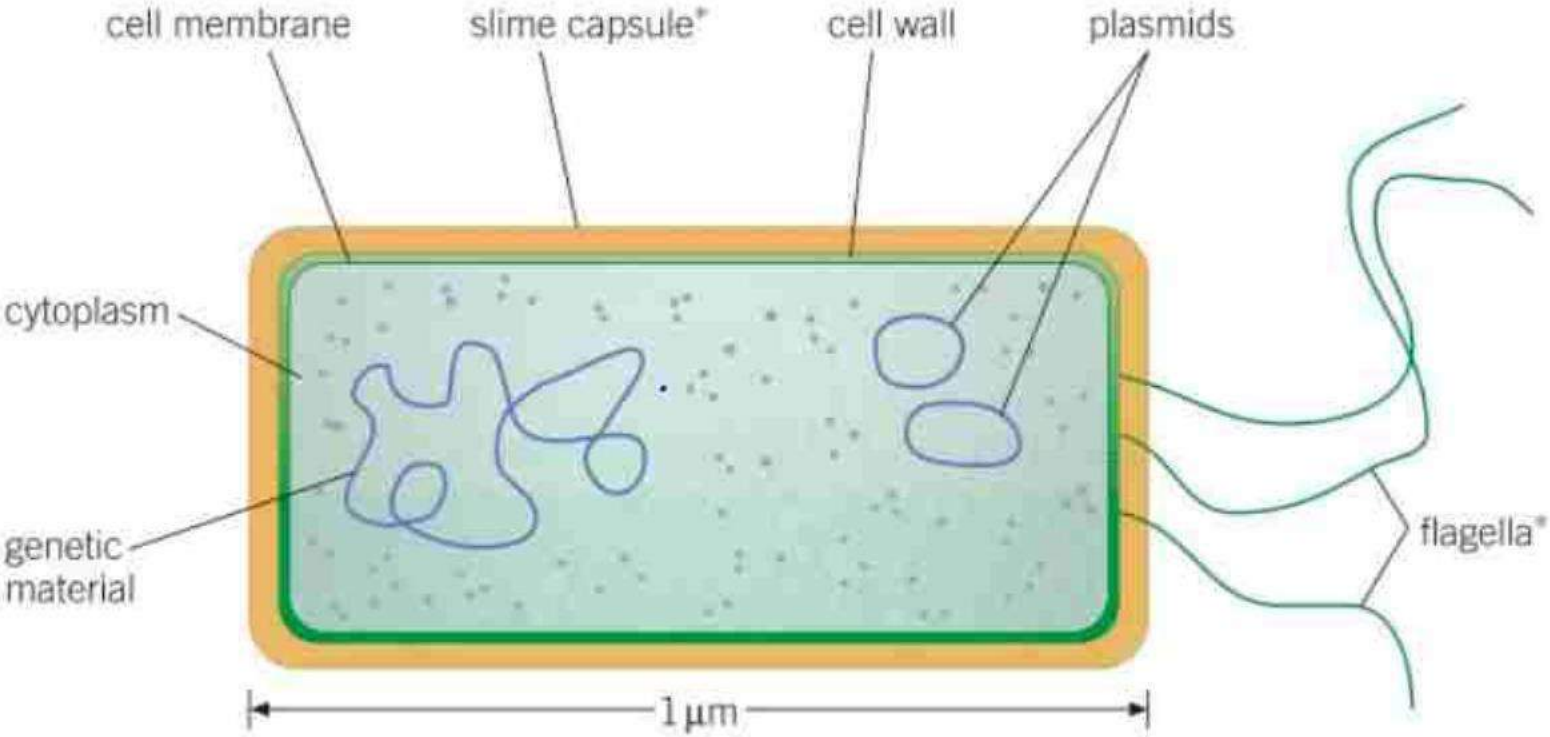
Eukaryotic Cells:



Prokaryotic Cells:

- Prokaryotic cells are much smaller than eukaryotic cells
- Prokaryotic cells are **0.2-2.0 µm**
- Example of prokaryotic cell: bacteria
- Contains **cytoplasm**, **cell membrane** surrounded by cell wall (there is no cellulose in the cell wall), **single DNA loop**
- May contain extra small rings of DNA called **plasmids** – these code for very specific features. E.g.: antibiotic resistance

Prokaryotic cell:



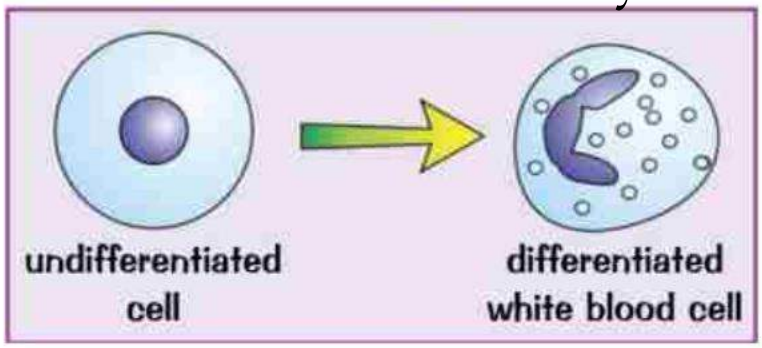
*not always present

Comparison of eukaryotic and prokaryotic cells:

	Eukaryotic cell	Prokaryotic cell
Size	Most are 5 μm – 100 μm	Most are 0.2 μm – 2.0 μm
Outer layers of cell	Cell membrane - surrounded by cell wall in plants and fungi	Cell membrane - surrounded by cell wall
Cell contents	Cytoplasm, cell organelles include mitochondria, chloroplasts in plants and ribosomes	Cytoplasm, ribosomes, no mitochondria or chloroplasts
Genetic material	DNA in a nucleus - plasmids are found in a few simple eukaryotic organisms	DNA is a single molecule, found free in the cytoplasm - additional DNA is found on one or more rings called plasmids
Type of cell division	Mitosis	Binary fission

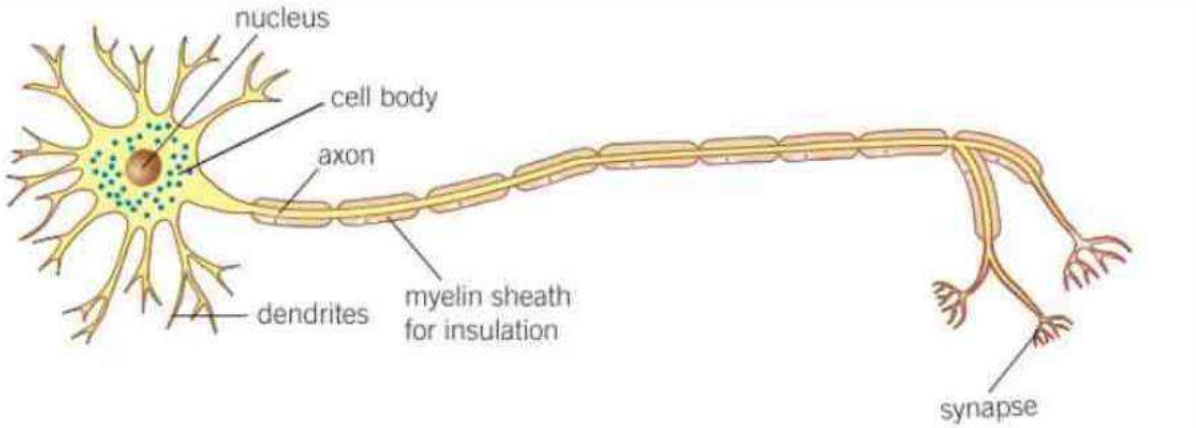
Differentiation:

- **Differentiation** is the process by which a cell changes to become specialized for its job
- As a cell changes, it develops different subcellular structures
- They become different types of cells which allows them to carry out specific functions
- In animal cells, the ability to differentiate is lost at a young age. **Stem cells** are undifferentiated cells
- Most plant cells never lose the ability to differentiate.



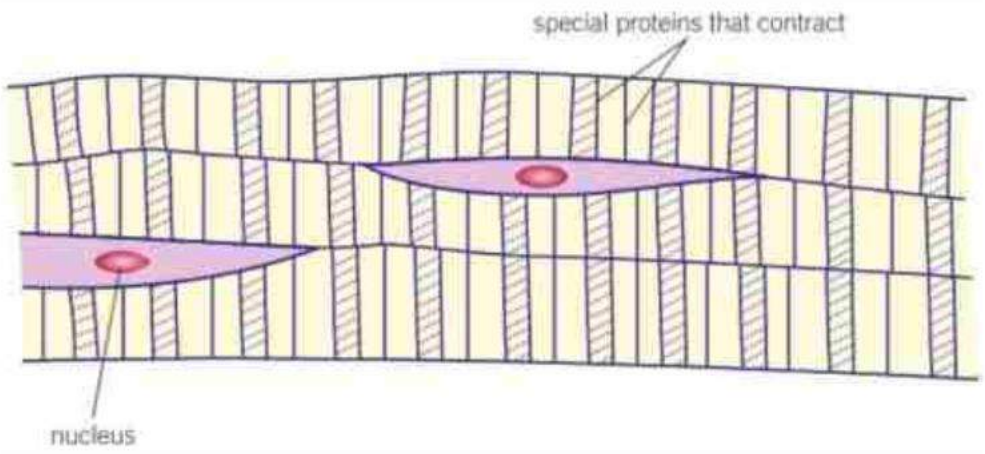
Nerve cells:

- **FUNCTION**: carry electrical signals from one part of the body to another
- **ADAPTATIONS:**
- **Lots of dendrites** to make connections to other nerve cells
- **Axon** – carries nerve impulse from one place to another
- **Long** – cover more distance
- **Synapses** – pass impulses to another cell using special transmitter chemicals



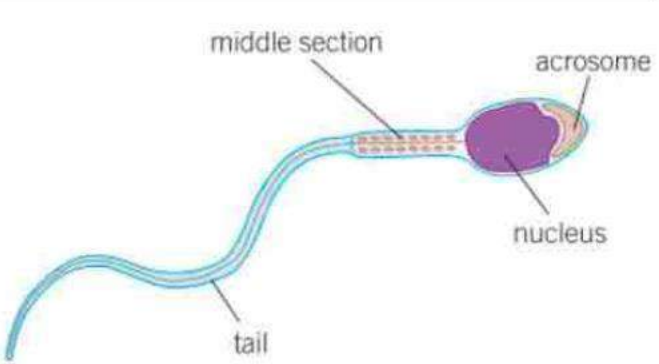
Muscle Cell:

- **FUNCTION**: to contract quickly
- **ADAPTATIONS**:
- Contain **special proteins** which slide over each other, making fibers contract
- **Many mitochondria** – transfer energy needed for cells to contract and relx
- Store **glycogen** which can be broken down and used in cellular respirtion



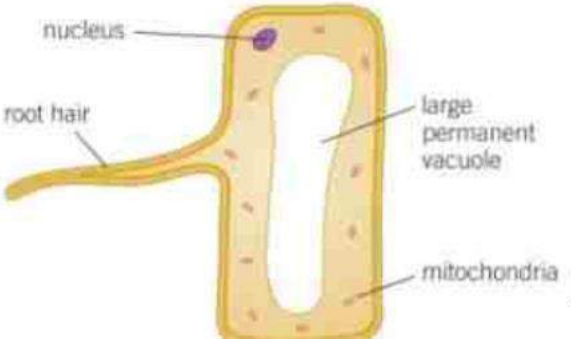
Sperm Cells:

- **FUNCTION**: to get amle DNA to female DNA
- **ADAPTATION**:
- **Long tail** – helps sperm move fast
- Lots of **mitochondria** in middle section – to transfer energy needed by tail to move
- An **acrosome** – stores digestive enzymes to break down outer layers of egg cell
- **Large nucleus** – contains genetic information



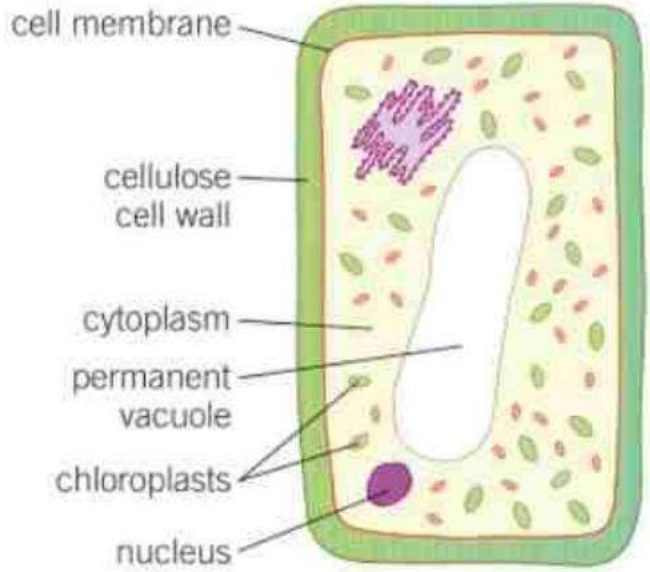
Root hair cells:

- **FUNCTION**: absorb water and mineral ions
- **ADAPTATIONS**:
- **Increase surface area** of plant for absorbing water and mineral ions from soil
- Have a **large permanent vacuole** – speeds up movement of water by osmosis
- Many **mitochondria** – transfer energy needed for active transport of mineral ions into root hair cells



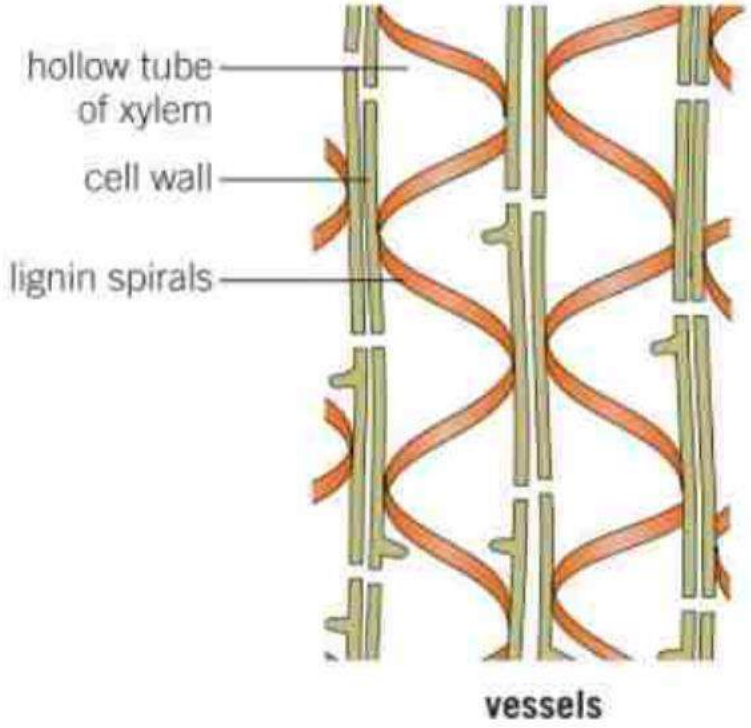
Photosynthetic cells:

- **FUNCTION**: to make food for the plant – glucose
- **ADAPTATIONS**:
- Have **chloroplasts** containing **chlorophyll** to trap light needed for photosynthesis
- Have a **large permanent vacuole** – keeps cell rigid



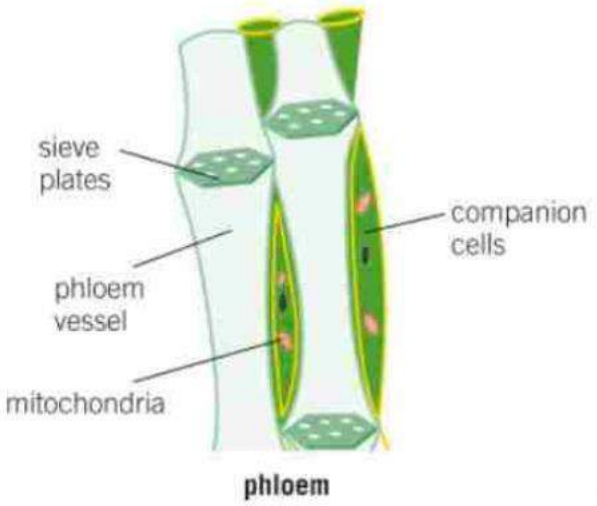
Xylem Cells:

- **FUNCTIONS**: to transport water and mineral ions from the roots to the stem and leaves and to support
- **ADAPTATIONS**:
- **Lignin** builds up – makes tubes of xylem very strong



Phloem:

- **FUNCTION**: tissue that transports food made during photosynthesis
- **ADAPTATIONS**:
- **Companion cells** contain **mitochondria** that transfer energy to aid the movement of dissolved food in the phloem
- Cell walls between phloem cells break down to form sieve plates

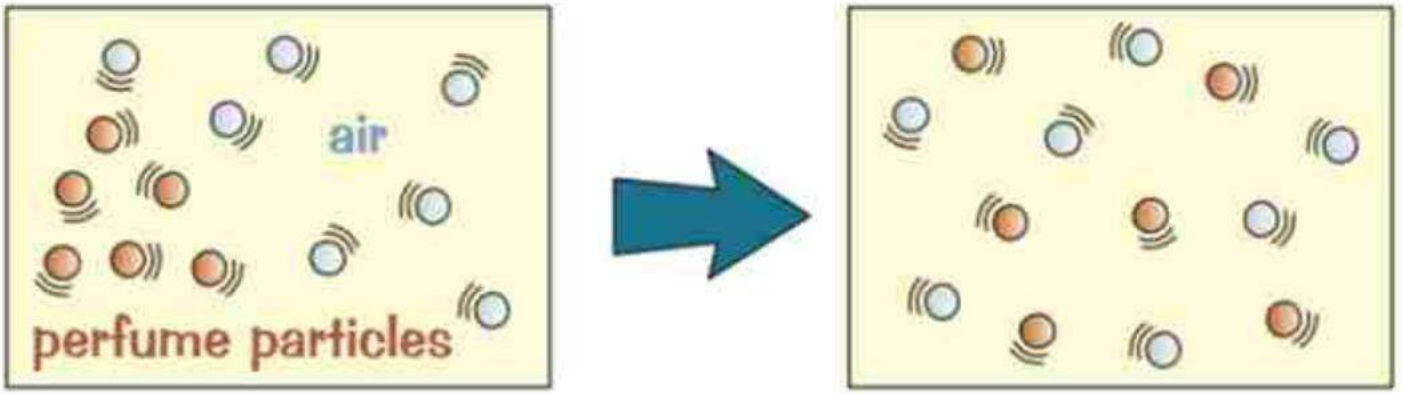


Diffusion

- **Diffusion** is the spreading out of particles of a gas or of any substnce in solution (a solute)from an area of high concentration to an area of low concentration
- The net movement into or out of cells depends on the concentration of particles on each side of cell membrane
- Concentration gradient – difference in concentration between two areas
- Examples of diffusion:
- Diffusion of oxygen and glucose into cells of the body from the bloodstream for respiration
- Diffusion of carbon dioxide into actively photosynthesizing plant cells

Increasing rate of diffusion:

- A larger difference in **concentration** will result in a faster rate of diffusion
- An increase in **temperature** causes particles to move faster so the rate of diffsuion will increase



Osmosis:

- Osmosis is the diffusion of water molecules across a partially permeable membrane from an area of high water concentration to an area of low water concentration

~~KEY WORDS~~

- Isotonic – if two solutions have the same concentrtions
- Hypertonic – the solution is MORE conentrted
- Hypotonic – soltuion is more dilute

Osmosis in animals:

- Animal cells that are surrounded by a hypotonic solution will swell and can burst as water moves into the cell by osmosis

- Animal cells surrounded by hypertonic solution will result in water moving out of cells, so cell will shrink

Osmosis in plants:

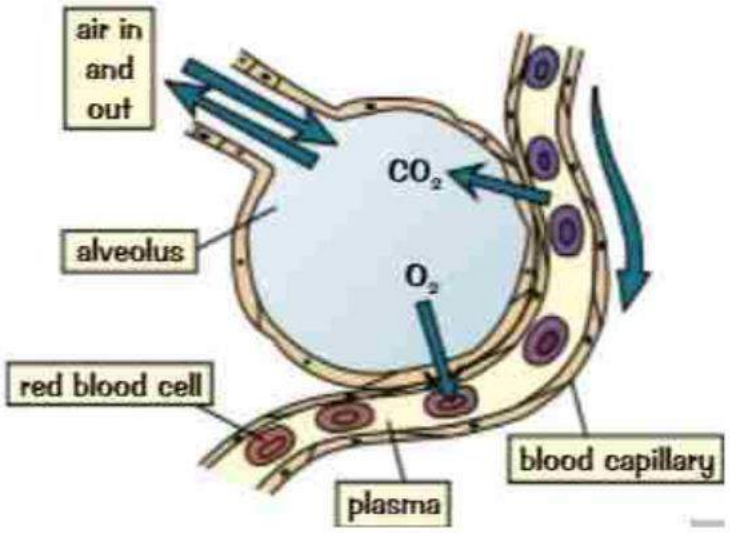
- Turgor pressure occurs when no more water can enter a cell due to the pressure inside
- Plant cells in a hypertonic solution lose water and become flaccid – plant wilts
- **Plasmolysis** – when the vacuole and cytoplasm shrink, causing the membrane to then pull away from the cell wall.
- To investigate osmosis in plants cells, you can carry out an experiment with different solutions and potato

Active transoprt:

- Active transport is the movement of substances from a dilute solution to a more concentrated solution against a concentration gradient, this requires energy from respiration
- Cells use this when they need to absorb substances that are in short supply
- Examples of active transport taking place:
- Root hairs taking in minerals
- In the gut when there is a lower concentration of nutrients in the gut and a higher concentration of nutrients in the blood

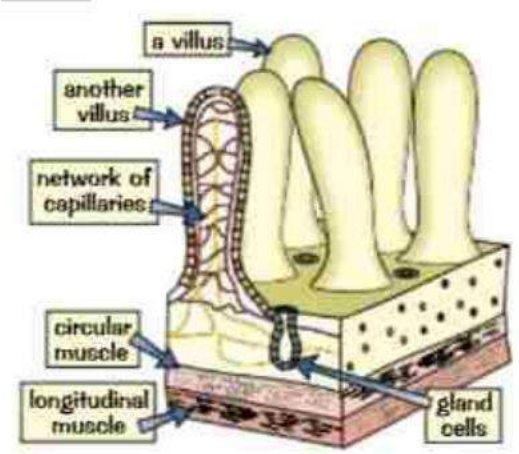
Exchanging materials: Gas exchange In lungs

- Job of lungs : transfer oxygen to the blood and remove waste carbon dioxide
- Lungs contain millions of little airs sacs called alveoli – where gas exchange takes place
- **Adaptations of alveoli**
- Enormous hrface area
- Moist lining fr dissolcing gases
- Thin walls
- Good blood supply



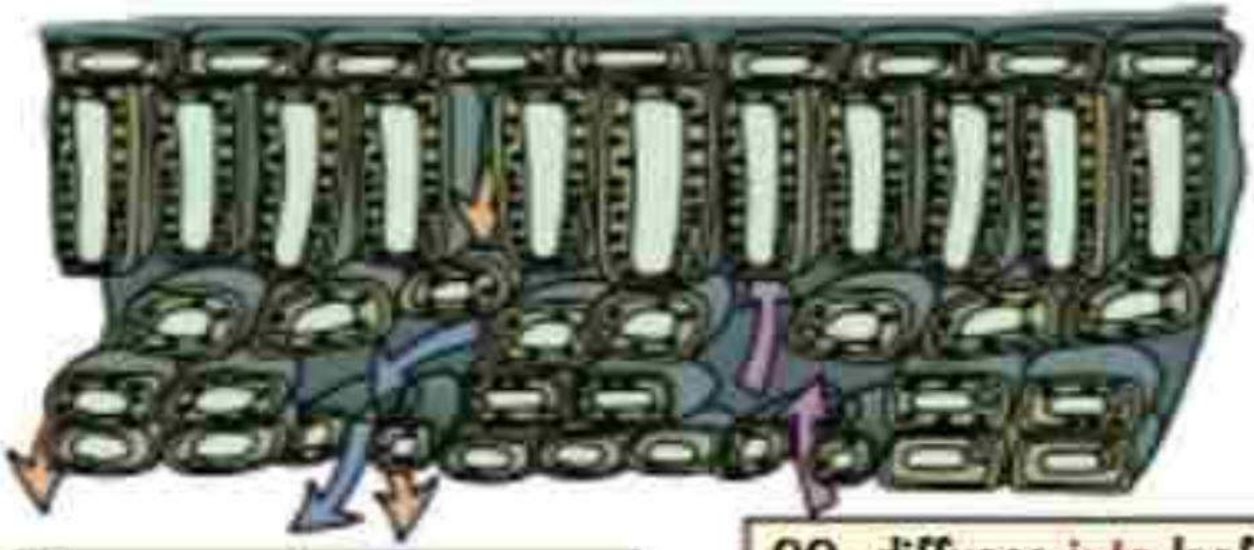
Small intestine

- Inside of the small intestine is covered in millions of tiny projections called **villi**
- They increase surface area so the digestd food is absorbed much quicker into the blood
- **Adaptations**
- A single layer of surface cells
- Very good blood supply to assist quixk absorption



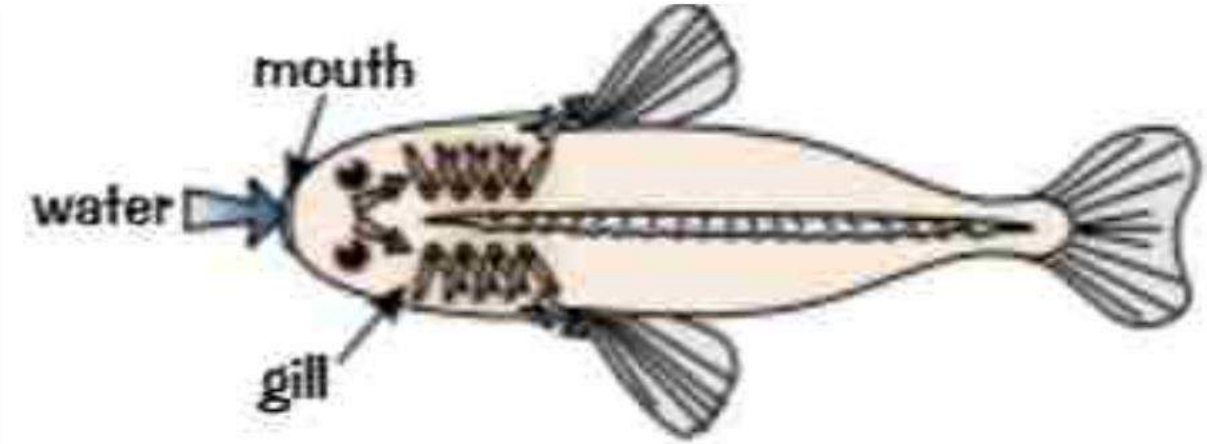
Structure of leaves: stomata

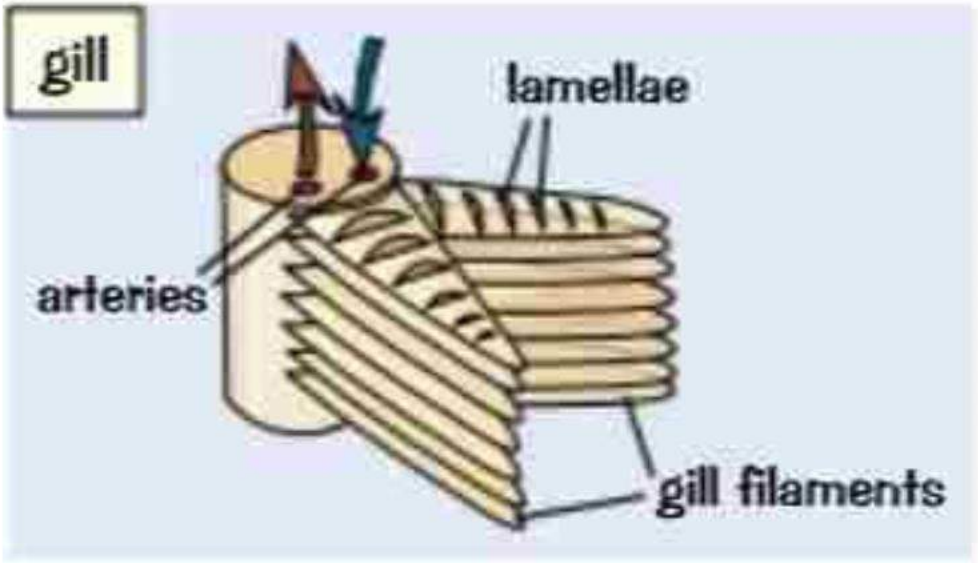
- Carbon dioxide diffuses into the leaf through the **stomata**
- Oxygen and water vapour diffuse out through stomata
- Size of stomata is controlled by **guard cells** – they close the stomata if the plant is losing water faster that water is being replaced in the roots. Without guard cells the plant would soon wilt
- **Flat shape** of leaf increases area of the exchange surface so it is more effective
- **Air spaces** inside leaf increase area so there is more chance for carbon dioxide to get into the cells


Oxygen and water vapour diffuse out of the leaf
CO_2 diffuses into leaf

Gills in fish:

- Water enters the fish through its mouth and passes out through its **gills**
- As this happens, oxygen diffuses from the water into the blood in gills
- Carbon dioxide diffuses from blood into the water
- Gills are made of **gill filaments** which give a big surface area for exchange of gases
- Gill filaments are covered in **lamellae** which increase the surface area even more
- Lamellae have lots of **blood capillaries** to speed up diffusion
- They have a **thin surface layer** of cells to minimise diffusion distance
- Blood flows through the lamellae in one direction and water flows over in the opposite direction – this maintains the large concentration gradient between water and blood
- The concentration of oxygen in the water is always higher than in the blood


mouth
water
gill


gill
lamellae
arteries
gill filaments