

Specialised Cells and Tissues Notes

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Red Blood Cells

Function: red blood cells carry oxygen from the lungs to the body's cells for aerobic respiration. They also carry **some** carbon dioxide back to the lungs, but most CO₂ travels dissolved in the blood plasma (the liquid part of the blood).

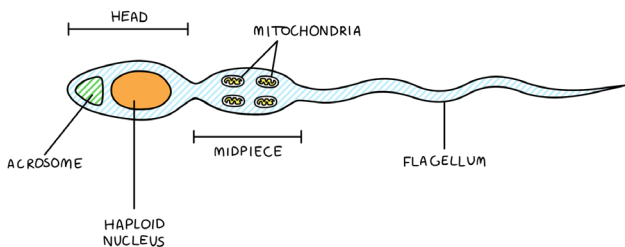


How are red blood cells adapted for their role?

1. They contain haemoglobin – this protein allows oxygen to bind to the cell. This allows the cell to carry oxygen around the body in blood vessels.
2. Red blood cells have no nucleus – this enables them to have more room for haemoglobin.
3. Red blood cells are biconcave in shape – this gives the cell a larger surface area than if they were just round. This allows them to have more haemoglobin and therefore carry more oxygen.

Sperm Cells

Function: the function of sperm cells is to carry a haploid nucleus from the male to the ovum of the female.

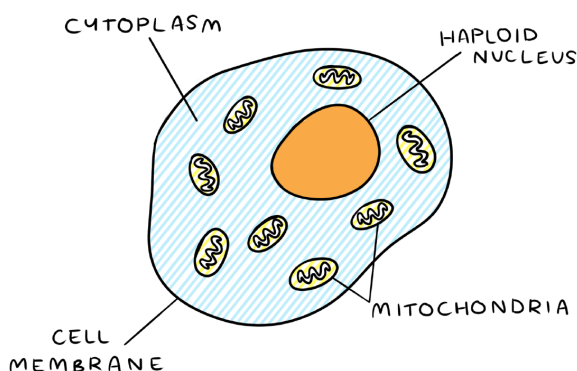


How are sperm cells adapted for their role?

1. Sperm cells have a haploid nucleus, meaning that it has 23 chromosomes (in humans) rather than 46.
2. Sperm cells have mitochondria, these provide energy for movement.
3. Sperm cells have a flagellum which is needed for movement.
4. Sperm cells have an acrosome, this contains digestive enzymes which can digest their way into the ovum.

Ovum (egg cell)

Function: the function of an ovum is to develop into an embryo if it has been fertilised by a sperm cell.



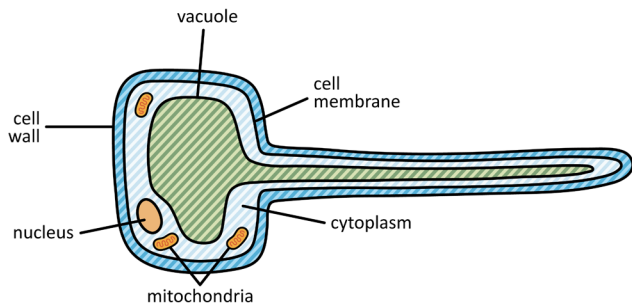
How are ovum cells adapted for their role?

1. Ovum cells have a haploid nucleus, meaning that it has 23 chromosomes (in humans) rather than 46.
2. The ovum has a large amount of cytoplasm, this provides energy for the developing embryo.
3. The ovum has a cell membrane that will only allow one sperm cell to enter.

Root Hair Cell

Root hair cell: the function of these cells is to absorb water and mineral ions from the soil and transport them to the vascular tissue.

Vascular tissue: is the plants transport system (think of them a bit like arteries and veins), it is made of xylem and phloem tissue. Xylem transports water while phloem transports sucrose.

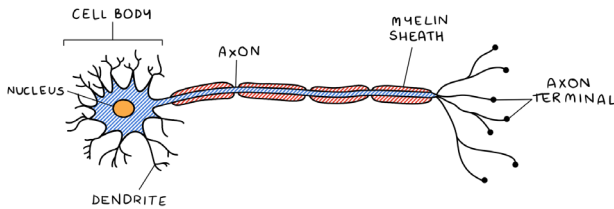


How are root hair cells adapted for their role?

1. They have thin walls which make uptake of water easier and osmosis faster.
2. They have a large projection with very thin walls into the soil. This projection increases the surface area.
3. They have many mitochondria to provide the energy required for the active transport of mineral ions from the soil into the root.

Motor Neurones

Function: motor neurones carry impulses from the central nervous system (brain and spinal cord) to the muscles and glands (effectors).

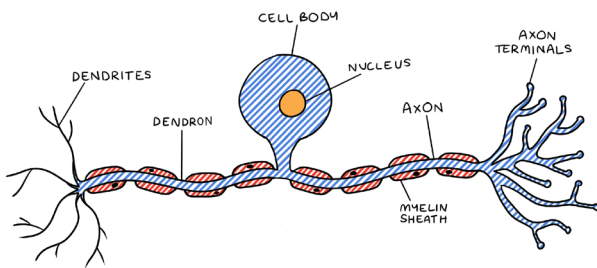


How are motor neurones adapted for their role?

1. Motor neurones have a long axon (nerve fibre) to carry the impulse to the target organ.
2. Motor neurones have a myelin sheath, this insulates the axon and speeds up the rate of transmission of the impulse.
3. **The axon terminals contain many vesicles filled with neurotransmitters.** This allows the signal to be passed chemically across a synapse to other neurones.

Sensory Neurones

Function: sensory neurones carry impulses from the sense organs to the central nervous system.



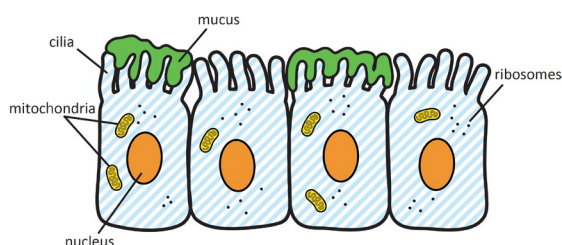
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Ciliated Epithelial Cells

Ciliated epithelial cells: are found on some tissues of the body for example the respiratory system and the reproductive system. The ciliated part of their name tells us that these cells have Cilia 😊

What is their function? Ciliated epithelial cells move some substances in the body. Mostly this substance is mucus in the respiratory system but they can also move ova/eggs in the fallopian tubes or sperm in the vas deferens.



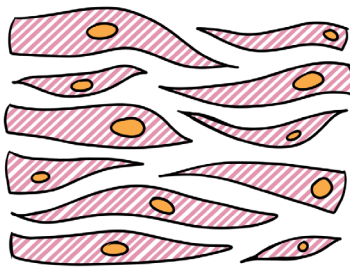
How are ciliated epithelial cells adapted for their role?

They have the following adaptations...

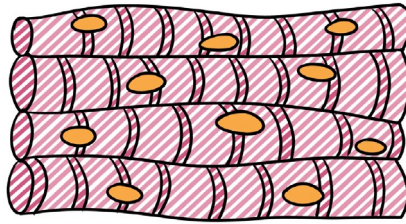
1. **Cilia** – are tiny, hair like projections that extend from the cell's surface. They beat to waft mucus in a particular direction.
2. **Mitochondria** – provide the energy needed to move the cilia through aerobic respiration.

Muscle Tissue

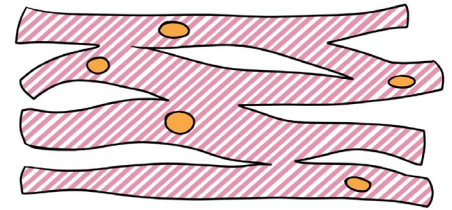
Function: the function of all muscle tissue is movement. There are three different muscle tissues that we study for the GCSE. Smooth muscle tissue, skeletal muscle tissue and cardiac muscle tissue. They are shown below.



SMOOTH MUSCLE



SKELETAL MUSCLE



CARDIAC MUSCLE

How are the muscle tissues adapted for their role?

1. Smooth muscle tissue can make up thin sheets of muscle, such as the stomach lining. They can also be arranged in bundles, or rings, like that in the anus.
2. Skeletal muscle tissue is joined to bones. Its cells contract to make bones move and joints bend.
3. Cardiac muscle does not fatigue. Meaning that it will not get tired.

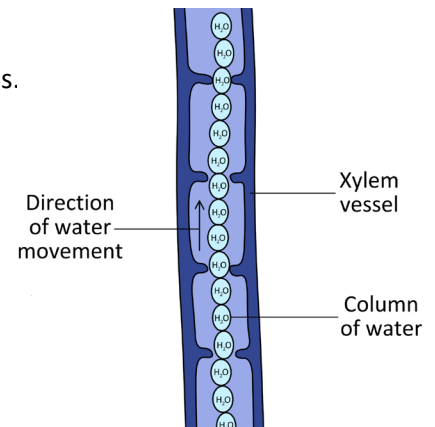
Xylem Tissue

Xylem vessels: carry water from the roots to the leaves of the plant. The movement of water through the plant is called transpiration.

Transpiration: is the flow of water into a root, up the stem and out of the leaves.

What are the adaptations of xylem to transport water?

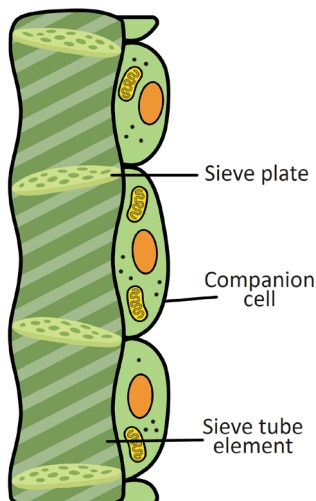
1. Xylem is made of a non-living substance called lignin.
As lignin isn't alive it doesn't absorb any of the water that it transports.
2. Xylem is impermeable, meaning once water enters, it can't get back out.
3. Xylem is very thin.
4. Xylem is very narrow.



Phloem Tissue

Phloem vessels transport sucrose from source to sink in a plant. The movement of sucrose within phloem is called translocation. The **source** is where the sucrose comes from. The **sink** is where the sucrose is used or stored.

One section of Phloem is called a sieve tube element. The figure below shows a section of phloem that is made of three sieve tube elements.



What are the adaptations of phloem to transport sucrose?

1. **Companion cells:** each sieve tube element has a companion cell.
These cells have a very large nucleus as they effectively manage both themselves and the sieve tube element they are attached to.
They are involved in controlling the direction of translocation.
2. Companion cells **contain mitochondria** these provide energy for **active transport**.
3. **Sieve plates:** allow sucrose to move through.