

Cell structure and specialised cells

Revision notes · Sub-cellular structures in animal, plant and bacterial cells, and how sperm, egg and ciliated cells are adapted to their jobs.

For Edexcel GCSE Biology 1BI0 and Combined Science 1SC0. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

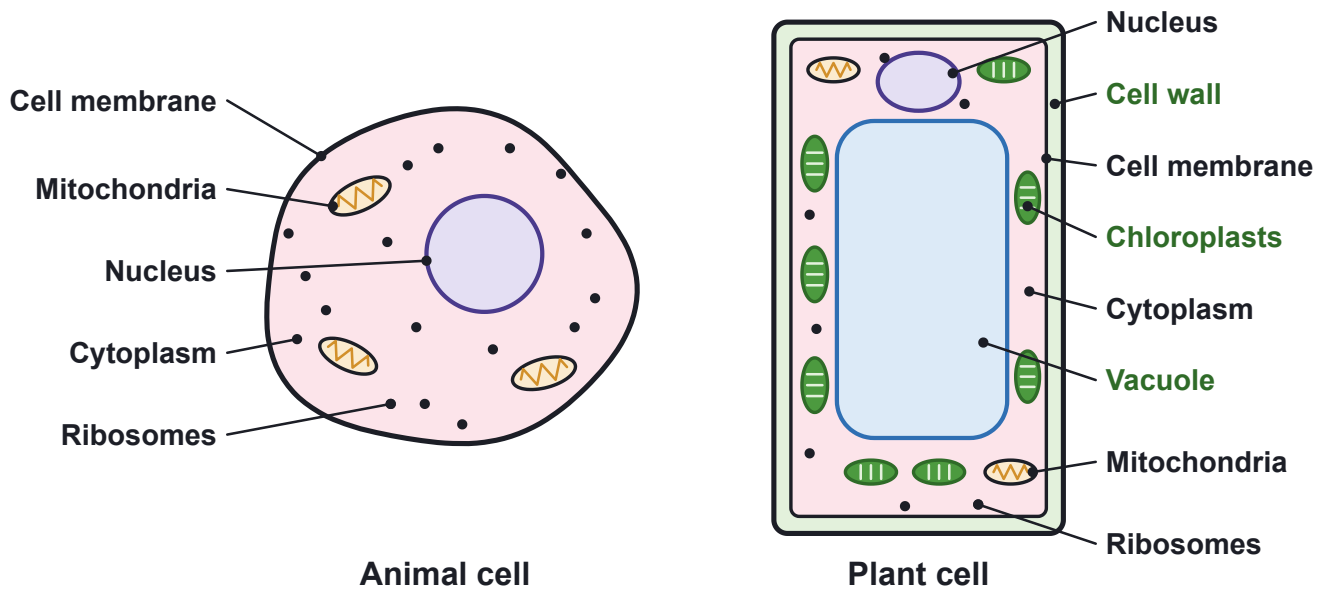
Cell structure and specialised cells **Spec 1.1-1.2**

Animal and plant cells **Spec 1.1**

Animal and plant cells are **eukaryotic** cells. Their genetic material is enclosed in a **nucleus**. Each structure inside a cell, called a sub-cellular structure, has a job, and you need to link each structure to its function.

Sub-cellular structures in animal and plant cells			
Structure	Function	Animal cell	Plant cell
Nucleus	Contains the genetic material (DNA) and controls the activities of the cell	Yes	Yes
Cell membrane	Controls the movement of substances into and out of the cell	Yes	Yes
Mitochondria	Where aerobic respiration takes place, releasing energy for the cell	Yes	Yes
Ribosomes	Where proteins are made (protein synthesis)	Yes	Yes
Cell wall	Made of cellulose. Strengthens the cell and supports it	No	Yes
Chloroplasts	Contain chlorophyll, which absorbs light for photosynthesis	No	Yes
Vacuole	Contains cell sap, a solution of sugars and salts, and helps keep the cell firm	No	Yes

Plant cells have three structures that animal cells do not: a **cell wall**, **chloroplasts** and a **vacuole**. Chloroplasts are only found in the green parts of a plant that photosynthesise, such as leaf cells.



☐ **Green labels: found in plant cells only, not animal cells**

An animal cell and a plant cell. Only plant cells have a **cell wall**, **chloroplasts** and a **vacuole** (green labels).

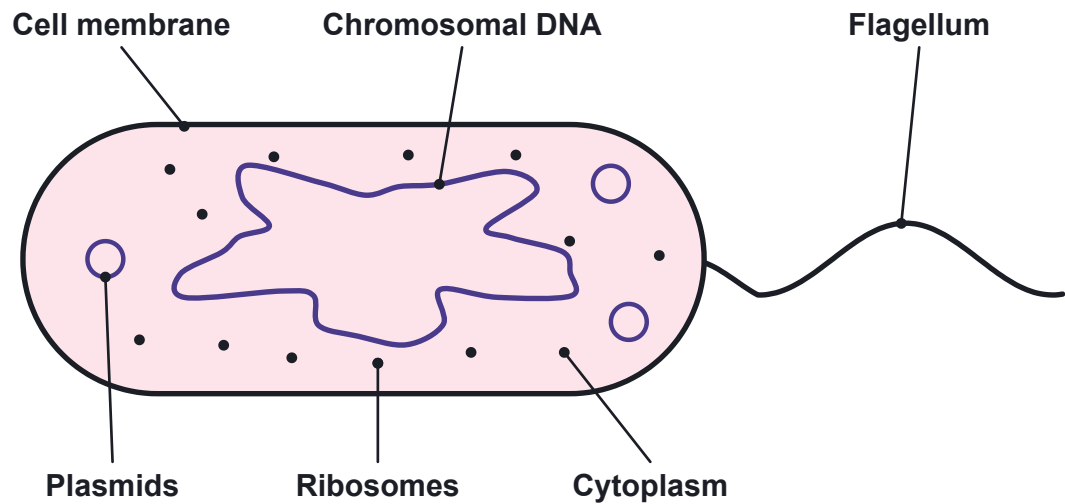
*Exam tip: Say the cell membrane **controls what enters and leaves** the cell, and that mitochondria **release energy** by respiration. Never write that the membrane 'holds the cell together' or that mitochondria 'make energy'.*

Bacterial cells Spec 1.1

Bacteria are **prokaryotic** cells. They do not have a nucleus. Their genetic material is found free in the cytoplasm.

Chromosomal DNA	A single loop of DNA found free in the cytoplasm, not enclosed in a nucleus.
Plasmid DNA	Small rings of extra DNA, separate from the chromosomal DNA.
Cell membrane	Controls the movement of substances into and out of the cell.
Ribosomes	Where proteins are made.
Flagellum	A long, whip-like structure that moves to make the bacterium swim. Some bacteria have one or more flagella.

Eukaryotic and prokaryotic cells compared		
Feature	Eukaryotic cell (animal, plant)	Prokaryotic cell (bacterium)
Nucleus	Present, contains the DNA	Absent
Where the DNA is	Inside the nucleus	Free in the cytoplasm
Plasmids	Not present	Often present
Mitochondria	Present	Absent
Flagella	Not present	Present in some



A bacterial cell: the DNA is **not in a nucleus**. It is a single loop, plus small rings called plasmids.

Common mistake: Bacteria do have genetic material. Write that it is not in a nucleus, never that bacteria have no DNA.

Specialised cells Spec 1.2

A specialised cell has features, called adaptations, that help it do its job. You need to describe how sperm cells, egg cells and ciliated epithelial cells are adapted.

Sperm cells

The job of a sperm cell is to reach an egg cell and fuse with it at fertilisation.

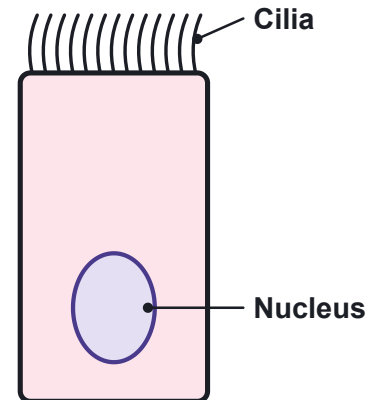
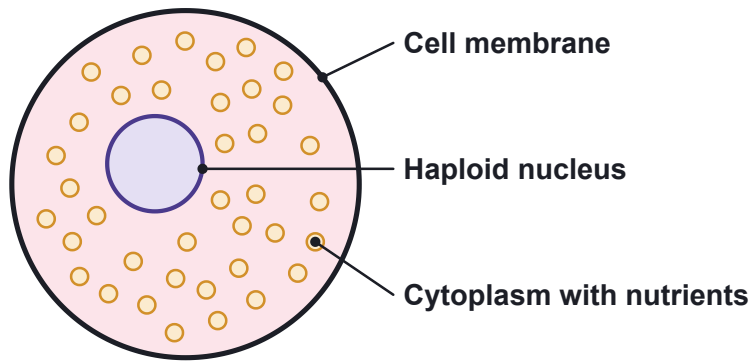
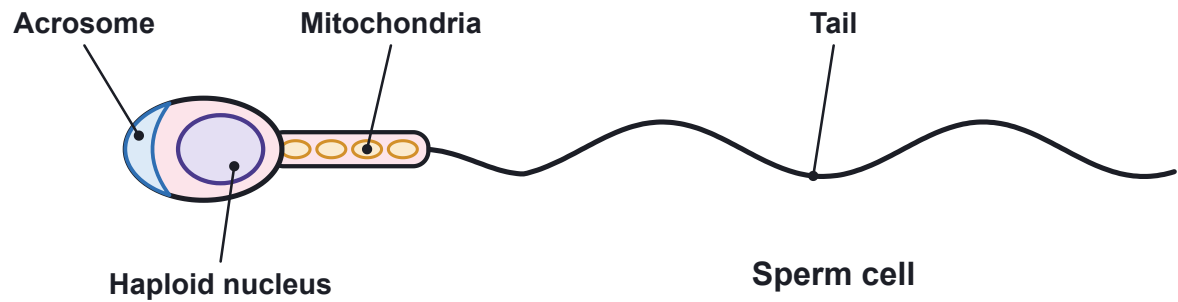
Adaptation	How it helps
Acrosome	Contains digestive enzymes that break down the outer layers of the egg cell so the sperm can get in
Haploid nucleus	Contains half the number of chromosomes of a normal body cell, so fertilisation restores the full number
Many mitochondria	Release energy by aerobic respiration for the tail to move
Tail	Moves from side to side to push the sperm along, so it can swim to the egg

Egg cells

Adaptation	How it helps
Nutrients in the cytoplasm	A food store that supplies the early embryo with nutrients and energy to grow
Haploid nucleus	Contains half the number of chromosomes, which join with the sperm nucleus at fertilisation
Changes in the cell membrane after fertilisation	The membrane changes straight after a sperm enters, so no more sperm can get in

Ciliated epithelial cells

These cells line parts of the airways. Their surface has **cilia**, tiny hair-like projections. The cilia beat together and move mucus, which has trapped dust and microorganisms, away from the lungs.



Three specialised cells and their adaptations (not drawn to scale: the egg cell is much bigger than the sperm cell).

Exam tip: Name the adaptation, then say how it helps the cell do its job. 'It has a tail' gets no mark, but 'it has a tail to swim to the egg' does.

Quick check

1. Name the three structures found in plant cells but not in animal cells.
2. Where is the DNA in a bacterial cell?
3. What is the function of the acrosome?
4. Why does a sperm cell have a haploid nucleus?
5. What do the cilia on ciliated epithelial cells do?

Quick check answers

Cell structure and specialised cells

1. Cell wall, chloroplasts and vacuole.
2. Free in the cytoplasm, as chromosomal DNA and plasmid DNA. There is no nucleus.
3. It contains enzymes that digest the outer layers of the egg.
4. It has half the chromosomes, so fusing with the egg nucleus gives the full number.
5. They move mucus containing trapped dust and microorganisms away from the lungs.