Biology · Revision

Cell Biology Notes

Cell structure, specialised cells, microscopy, transport and cell division at GCSE level.

Eukaryotes and prokaryotes

	Eukaryotic (animal, plant)	Prokaryotic (bacteria)
Genetic material	DNA in a nucleus	Single DNA loop, plus plasmids; no nucleus
Size	Larger	Much smaller
Cell wall	Plants only, made of cellulose	Yes, not made of cellulose

Inside a cell

Part	Job	Found in
Nucleus	Contains DNA and controls the cell	Animal, plant
Cytoplasm	Where most chemical reactions happen	All
Cell membrane	Controls what enters and leaves	All
Mitochondria	Site of aerobic respiration	Animal, plant
Ribosomes	Make proteins	All
Cell wall	Strengthens and supports	Plant, bacteria
Chloroplasts	Site of photosynthesis	Plant
Permanent vacuole	Contains cell sap, keeps the cell firm	Plant

Specialised cells

Cell	Adaptation
Sperm	Tail to swim, many mitochondria for energy
Nerve	Long, with branched connections to carry impulses
Muscle	Many mitochondria, fibres that can contract
Root hair	Large surface area to absorb water and minerals
Xylem	Hollow tubes, no end walls, to carry water
Phloem	Sieve plates and companion cells to move food

Microscopes

Magnification = image size ÷ actual size

An image is 5 mm wide and the real cell is 0.05 mm wide. Magnification = 5 ÷ 0.05 = ×100.

> **Common slip:** use the same units for both sizes. 1 mm = 1000 µm.

Moving substances

Process	Moves	Needs energy?
Diffusion	Particles, from high to low concentration	No
Osmosis	Water, from a dilute to a more concentrated solution, through a partially permeable membrane	No
Active transport	Substances from low to high concentration, against the gradient	Yes

Diffusion is faster with a larger surface area, a steeper concentration gradient and a higher temperature.

Mitosis and the cell cycle

- **Before:** the cell grows, copies its DNA and makes more mitochondria and ribosomes.
- **Mitosis:** chromosomes line up and one copy of each is pulled to each end.
- **Finally:** the cytoplasm and membrane divide, giving two genetically identical cells.
- Mitosis is used for growth and repair.

Stem cells

Stem cells are undifferentiated cells that can become other cell types. Embryonic stem cells can become most types, while adult stem cells, such as those in bone marrow, are more limited. In plants, stem cells are found in meristems. They may help treat disease, but there are ethical concerns and risks such as rejection or infection.