

4.1.1 Cell structure, Prokaryotic cells



Studying cells, Microscopy

Light microscopes use light and lenses to magnify. Individual cells can be seen, as well as large organelles e.g. Nucleus.

Electron microscopes (transmission, scanning electron microscope) use electrons, for a higher magnification and higher resolution.

Magnification calculation

Magnification = $\frac{\text{Image size}}{\text{Actual size}}$

10 µm with a 100x magnification = 1000 µm or 1 mm = 1000

Before Resolution: the ability to distinguish between two points which are close together (resolution)

Before Magnification: increasing the size of an object.

Viewing a specimen: use a stain to provide contrast.

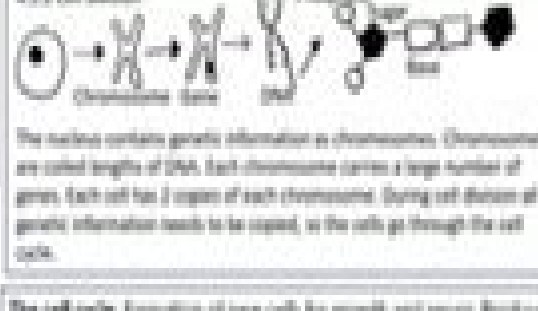
Staining a specimen: Stains provide, bits of the same, for coloring or clearing, all from brown, continuous, include magnification.

Use (H&E) (in 100µm, 1000µm, 10000µm, 100000µm)

Cell differentiation: Cells specialise at an early stage of embryo development, by turning genes off and on.

Cells which are not specialised are called stem cells and they are found in early stage embryos and some fully developed organs.

4.1.2 Cell division

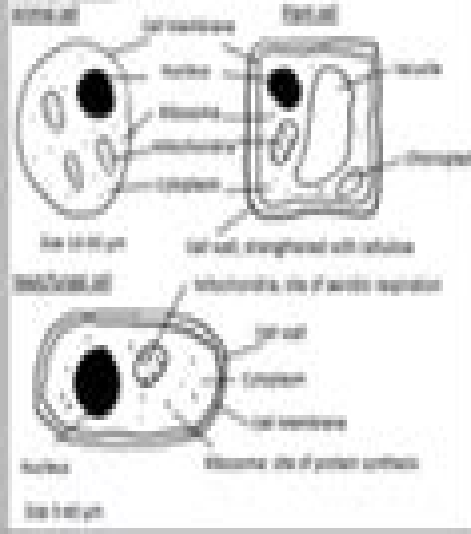


The cell cycle



The cell cycle: formation of new cells for growth and repair. Produces identical daughter cells with the same number of chromosomes. There are 3 stages: Growth and replication of organelles, Mitosis and cell division.

4.1.3 Cells, Prokaryotic



Specialised cells Biology Trilogy paper 1 Higher page 1

Cells	Name	Function	Adaptation
	Sperm cell	Fertilise the egg	Half the genetic info, lots of mitochondria to release energy
	Neuron	Carry electrical impulses	Long strand of cytoplasm, branched to connect to other neurones
	Root hair cell (epidermal cell in a plant cell)	Take up water and mineral ions (osmosis, diffusion and active transport)	Large surface area
	Muscle cell	Contract	Contains lots of mitochondria to release energy
	Xylem	Transport water and minerals up the plant	Dead, hollow tube, transpiration stream
	Phloem	Transport sugars around the plant	Living, tubes joined end to end, translocation



Fast tissues and organs

Stem cells in plants: found just below the tip of the shoots and roots. Undifferentiated cells which can become any type of cell.

Stem cells in animals: found in embryos and a very early stage. Can become any type of cell. Adult stem cells, found in most tissues. Can only differentiate into a few different types of cell.

4.1.4 Transport in and out of cells

Three methods of transport:

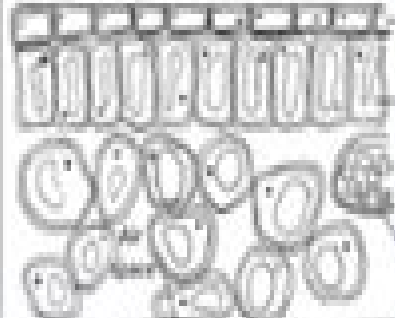
Diffusion: substances move from an area of high concentration to an area of low concentration. It is random and passive (does not require energy).

Osmosis: the water moves from the high to the low and water moves from the high to the low, and in the direction of water moving towards the low.

Active transport: The movement of a substance against a concentration gradient, from high to low. Requires energy and a carrier protein.

Features of a good exchange surface

- Good blood supply
- Short diffusion pathways (cells close together)
- Large surface area to volume ratio
- Good ventilation (air or water)
- Good temperature control
- Good pH control
- Good oxygen control
- Good carbon dioxide control
- Good glucose control
- Good mineral ion control
- Good waste removal
- Good pH control
- Good temperature control
- Good oxygen control
- Good carbon dioxide control
- Good glucose control
- Good mineral ion control
- Good waste removal



Water uptake in a root

Upper epidermis, transparent

Palisade mesophyll layer contains chloroplasts for photosynthesis

Spongy mesophyll contains air spaces for gas exchange

Guard cells, control opening and closing of the stomata

Xylem/Phloem

Uses of stem cells and problems:

Uses: Cure diseases, treat paralysis, muscle regeneration in the heart, diabetes.

Problems: Transgenic cloning, use stem cells to clone humans, live, rejection at some antigens.

Problems: Ethical potential, human life, companies making with stem cells, but it's not ethical.

4.1.5 Cell specialization

Cells: basic building blocks.

Specialize: to give a particular function. Muscle cells contract and generate force.

Epithelial cells: group of cells working together. Muscle tissue.

Epithelial cells: group of cells working together to perform a specific function. Epithelial tissue.

Epithelial cells: group of cells working together to perform a specific function. Epithelial tissue.

Spongy mesophyll: contains air spaces for gas exchange

Lower epidermis: contains guard cells. Guard cells control the opening and closing of the stomata. The stomata are holes which control the movement of gases into and out of the leaf.

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