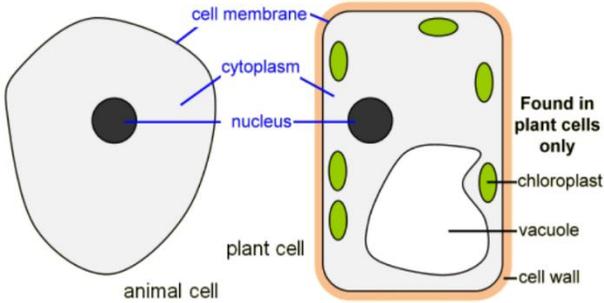


B1 Cells Knowledge Organiser

All living things are made up of cells. The structures of different types of cells are related to their functions.

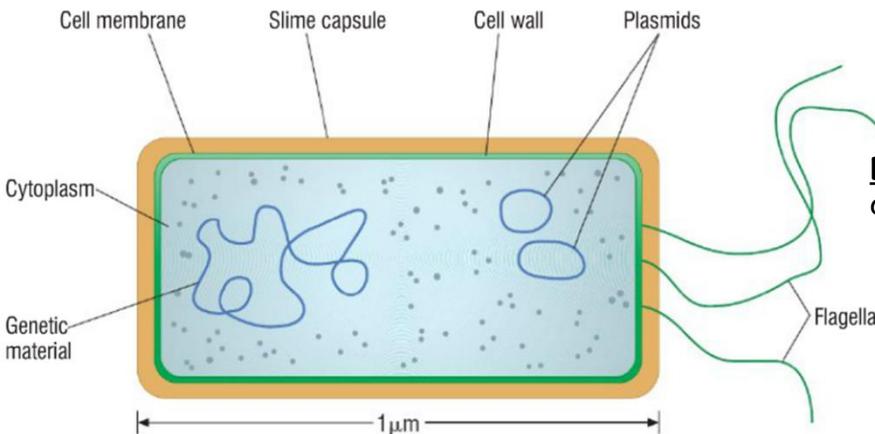
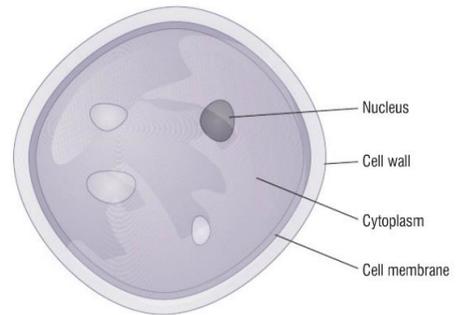


Organelles - both plant and animal	Function
Nucleus	Contains genetic material (DNA/chromosomes) which controls the activities of the cell
Cytoplasm	Most chemical processes take place here, controlled by enzymes
Cell membrane	Controls the movement of substances into and out of the cell
Mitochondria	Most energy is released by respiration here
Ribosomes	Protein synthesis happens here



Organelles - Only in plant/algal cells	Function
Cell wall	Strengthens the cell (made of cellulose)
Chloroplasts	Contain chlorophyll, which absorbs light energy for photosynthesis
Permanent vacuole	Filled with cell sap to help keep the cell turgid

Yeast cell



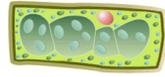
Bacteria are single celled organisms which contain:

- cytoplasm
- cell membrane
- cell wall
- no distinct nucleus**

Cells may be **specialised** for a particular **function**. Their structure will allow them to carry this function out.

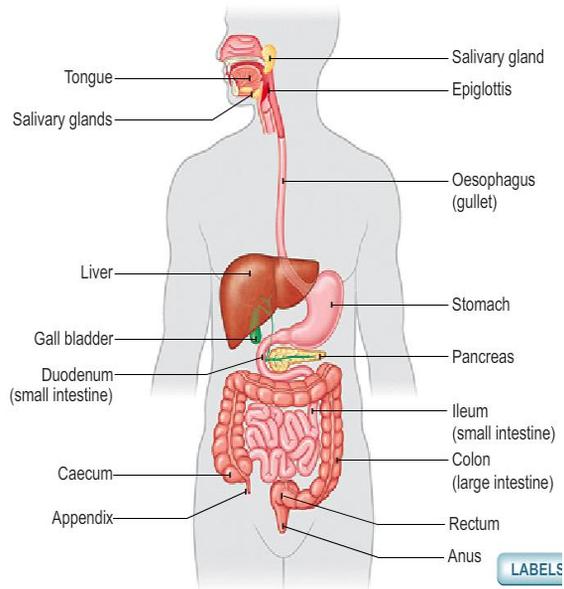
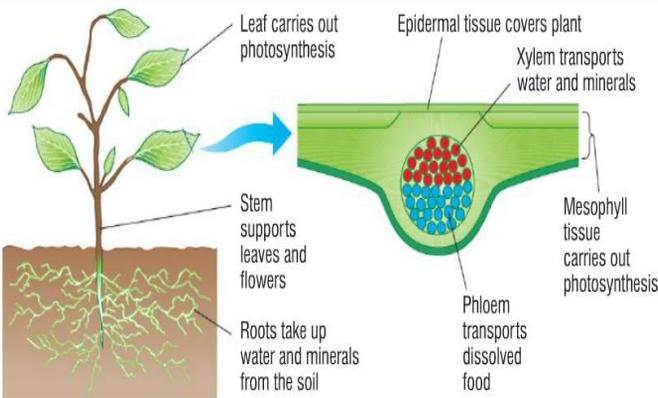
Tissues are cells with a similar function that group together. Organs are a group of tissues. They group to form Organ Systems

Tissue	Function
Muscular tissue	Contracts, bringing about movement
Glandular tissue	Produces substances such as enzymes and hormones
Epithelial tissue	Covers some parts of the body



Cell	Job	Adaptations
Leaf cell:	absorbs light for photosynthesis	lots of chloroplasts
Root hair cell:	absorbs water and mineral ions	finger like shape for large surface area
Sperm cell:	fertilises an egg	head contains an enzyme to help penetrate egg
Red blood cell:	carries oxygen to the cells	thin outer membrane so oxygen diffuses easily

Organ systems are groups of organs that carry out a particular function. For example, the **digestive system**:



There are two types of microscope -light and electron. Light microscopes have poor magnification and resolution. Electron microscopes have much higher magnification and resolution (ability to see things in high detail)

1mm = 1000µm
 1µm = 1000nm
 nm = nanometre
 µm = micrometre

When calculating magnification use the following equation.

$$\text{Real length} = \frac{\text{Image}}{\text{Magnification}}$$

REMEMBER TO MEASURE IN mm not cm!!

Diffusion is the movement of molecules down a concentration gradient (high to low)

Osmosis is the movement of water molecules through a partially permeable membrane from dilute (lots of water) to where it is more concentrated (less water/more sugar/ions)

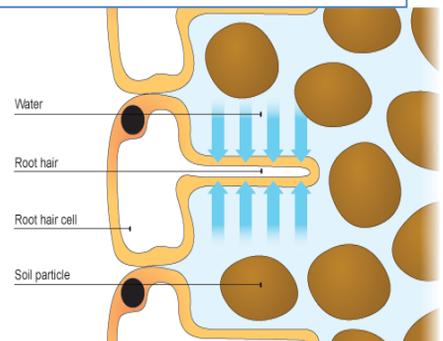
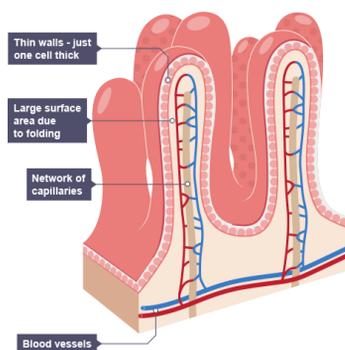
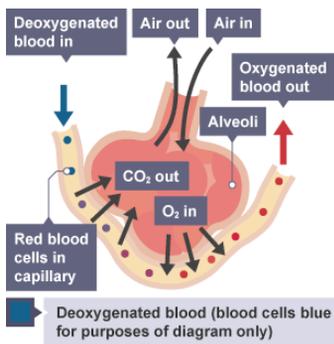
Active transport requires energy (ATP) - from respiration in mitochondria, against a concentration gradient (low to high)

Adaptations for movement of molecules - increase diffusion etc

Large surface area - microvilli/root hairs/lots of alveoli

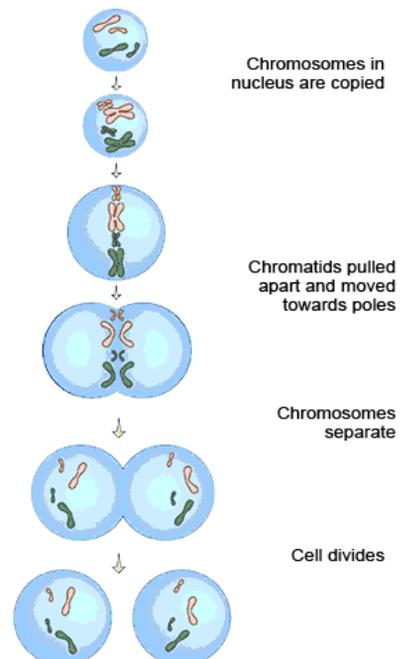
Thin - 1 cell thick - alveoli, villi, root hairs (short diffusion pathway)

Good blood supply - capillaries - this takes away the molecules - alveoli and villi



Mitosis - this is where cells divide to form two identical daughter cells - the chromosomes are copied, the cytoplasm and membrane divides - this is useful in growth and repair of cells

Mitosis is also used in asexual reproduction in some organisms such as bacteria



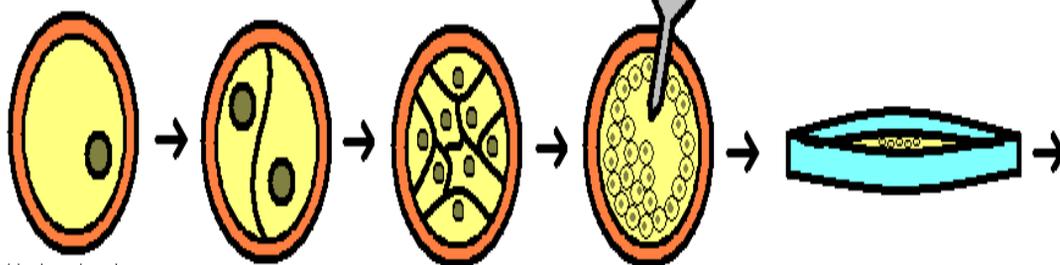
- Stem cells - are undifferentiated cells that can become a variety of cells - useful in treating disease/repair damaged tissue - embryos can be used as these can become any type of cell - these are often discarded - could become life?
- Adult stem cells only have the ability to become a small range of cells

Therapeutic cloning

If you were to receive medical treatment with cells grown from stem cells, your body's immune system would recognise the cells as foreign, and they would be rejected and die. But this would not happen if you received cells with the same genes as you.

This could be done by cloning one of your cells to produce an embryo, then taking stem cells from this. This is called therapeutic cloning. Here are the steps involved:

Therapeutic Cloning



Nucleus is taken out human egg cell. It is replaced with a nucleus from one of the patient's cell.

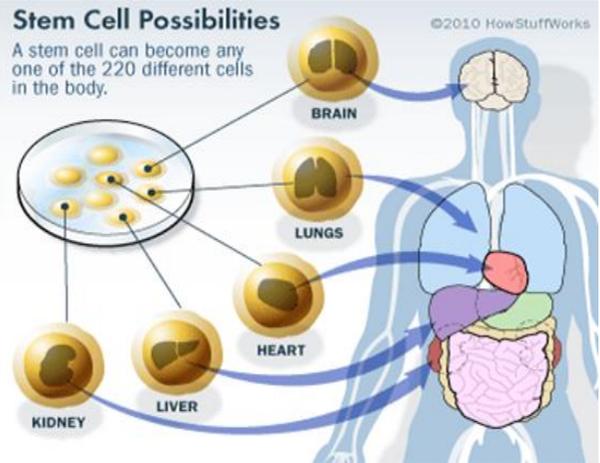
The egg cell is triggered to develop into an embryo.

3 days

5 days
Cells are removed from the embryos with a pipette.

Stem cells from the embryo are grown in a dish containing nutrients.

Stem cells develop into different tissues and organs. These can be used for medical treatment.



Advantages and Disadvantages to Embryonic and Adult Stem Cells.

Embryonic S.C.	Adult S.C.
"Pluripotent" (can become any cell)	"Multipotent" ("can become many but not any")
Stable. Can undergo many cell divisions.	Less Stable. Capacity for self-renewal is limited.
Easy to obtain but blastocyst is destroyed	Difficult to isolate in adult tissue.
Possibility of rejection??	Host rejection minimized

Culturing Microorganisms



Culturing microorganisms

The action of antibiotics and disinfectants can be investigated using cultures of microorganisms (populations of microorganisms that have been grown for a purpose).

It is important that the cultures are uncontaminated by other microorganisms, so sterile conditions are needed:

- the Petri dishes, nutrient agar jelly and other culture media must be sterilised
- the inoculating loops used to transfer microorganisms must be sterilised (usually by passing the metal loop through a Bunsen burner flame)
- the lid of the Petri dish is sealed with sticky tape to stop microorganisms from the air getting in and contaminating the culture.

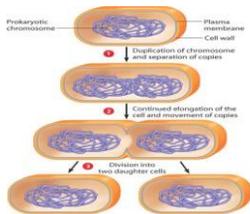


Bacteria grow and reproduce more quickly when they are warm than when they are cold. It would be dangerous to incubate (keep and grow) cultures at temperatures close to body temperature (37°C) because doing so might allow the growth of pathogens harmful to health. So the maximum temperature used in school and college labs is 25°C. However, higher temperatures can be used industrially, and these produce faster growth.

Bacteria can be grown on a agar plate (colonies) or nutrient broth solution

Bacteria divide by **BINARY FISSION** a type of **ASEXUAL** reproduction

This can happen as often as every 20 minutes if they have enough nutrients and a suitable temperature.



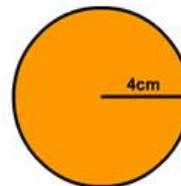
These micro organisms are used to test the action of disinfectant and antibiotics

We can measure clear zones around colonies or colonies themselves by using the equation below

BACTERIAL GROWTH

Time (minutes)	Number of Bacteria
0	1
20	2
40	4
60	8
80	16
100	32
120	64

Area of a circle



$$\begin{aligned}
 \text{Area} &= \pi r^2 \\
 &= \pi \times 4^2 \\
 &= \pi \times 16 \\
 &= 50.27 \text{ cm}^2
 \end{aligned}$$

Play again