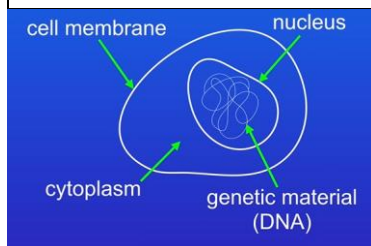
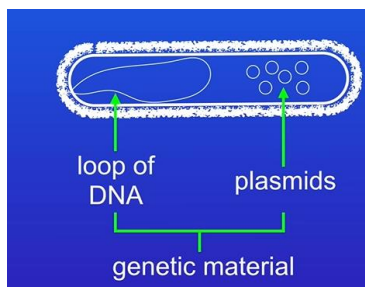


## Eukaryotes and Prokaryotes:

Eukaryotic cells	Prokaryotic cells
Contain DNA in nucleus	No nucleus
Have a cell membrane	Has a cell membrane
Has a cytoplasm	Has a cytoplasm
	Have loops of DNA
	Has small rings of DNA (plasmids)
	Smaller than eukaryote
	Has a cell wall

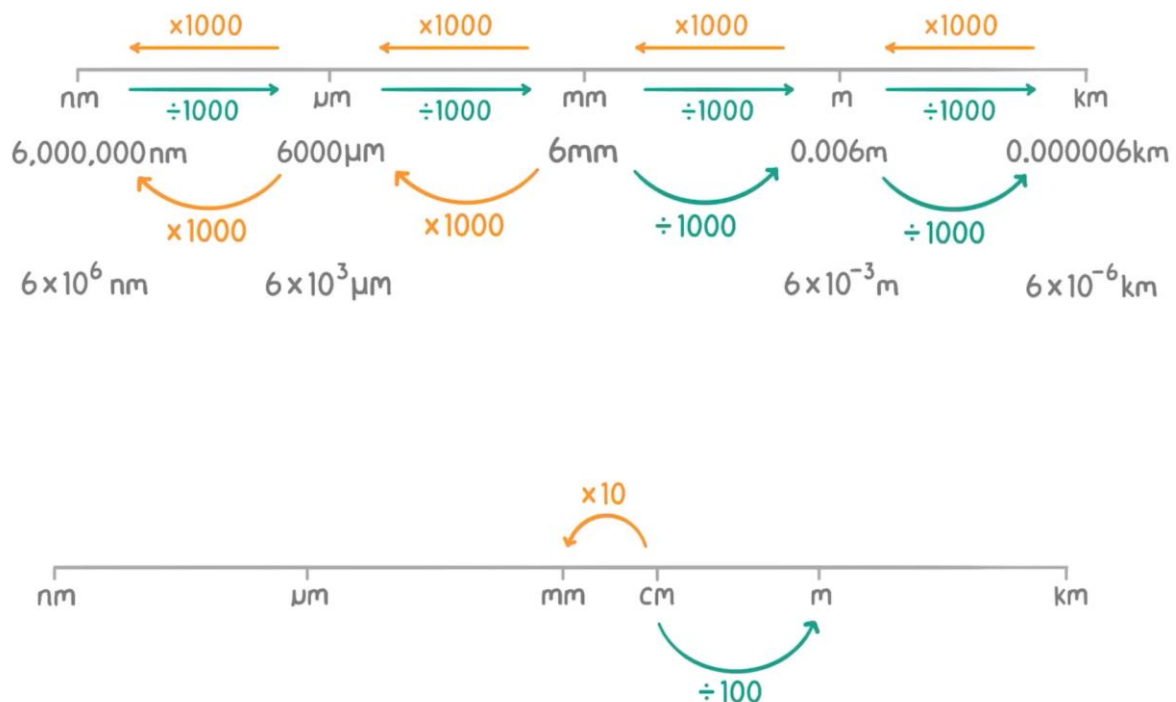


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## Sizes of cells (measurements):



## Order of magnitude:

Every order of magnitude is 10x greater than the one before

10x	100x	1000x
one zero = one order of magnitude	two zeros = two orders of magnitude	three zeros = three orders of magnitude

Example:

A fox is around 40cm long. A tick living on a fox is around 0.4cm long. How many orders of magnitude is the fox longer than the tick?

$$\frac{40}{0.4} = 100x$$

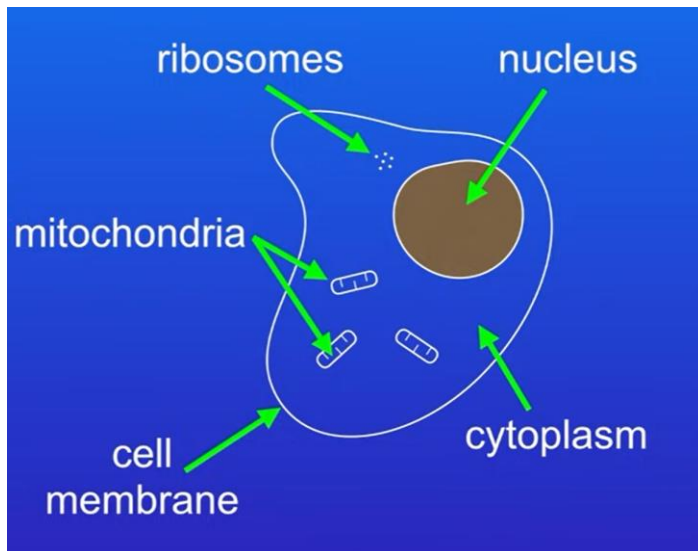
↑↑

100x is two orders of magnitude.

### Animal cells:

Part of cell	Function
Nucleus	Enclose genetic material and controls activity of cell
Cytoplasm	Where chemical reactions take place
Cell membrane	Controls which molecules enter and leave the cell
Mitochondria	Where aerobic respiration takes place

Ribosome	Site of protein synthesis
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### **Plant cells:**

<b>Part of cell</b>	<b>Function of cell</b>
Nucleus	Enclose genetic material and controls activity of cell
Cytoplasm	Where chemical reactions take place
Mitochondria	Where aerobic respiration takes place
Cell membrane	Controls which molecules enter and leave the cell
Ribosome	Site of protein synthesis
Chloroplast	Contains chlorophyll and is the site of photosynthesis

Cell wall	Made of cellulose which strengthens the cell
Permanent vacuole	Contains cell sap which helps plant stay turgid

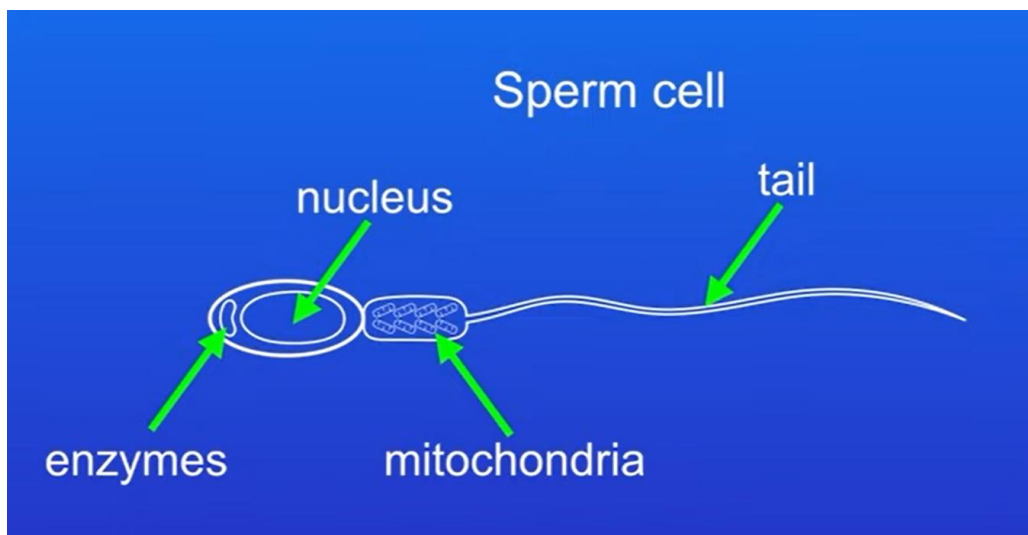
## **Animal cell specialisation:**

Most animal cells are specialised

Differentiation = When cells become specialised

### **Specialised cells:**

Sperm cell – The sperm joins with the ovum (egg cell). This process is called fertilisation. During this process, the genetic information combine



The nucleus in the sperm cell is used to carry genetic information

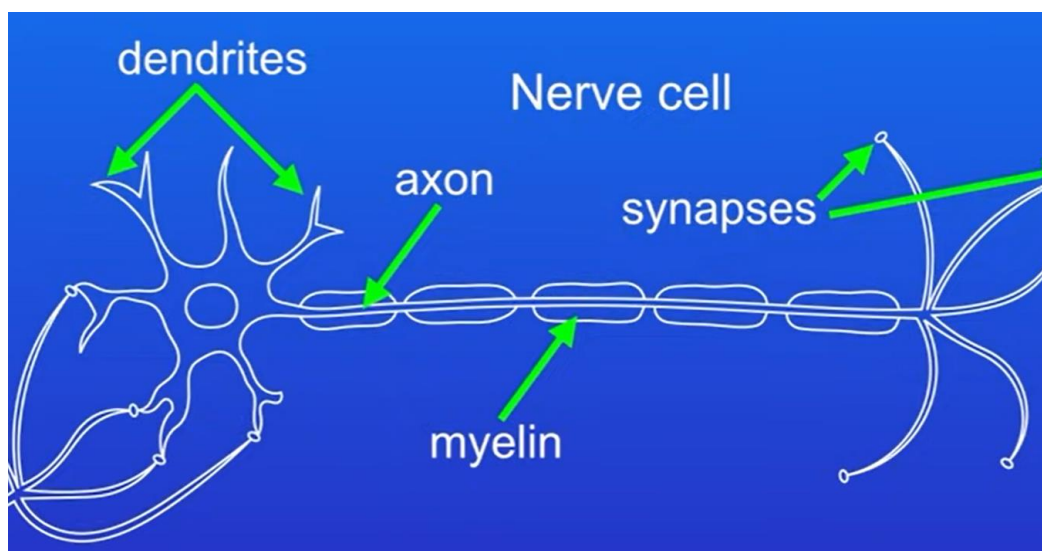
The sperm cell has a tail which can help it swim to the ovum

The mitochondria provides the sperm with the energy to swim to the ovum

Enzymes in the head can help the sperm to digest through into the ovum

### **Nerve cell:**

The job of a nerve cell is to send electrical impulses around the body



The axon carries electrical impulses

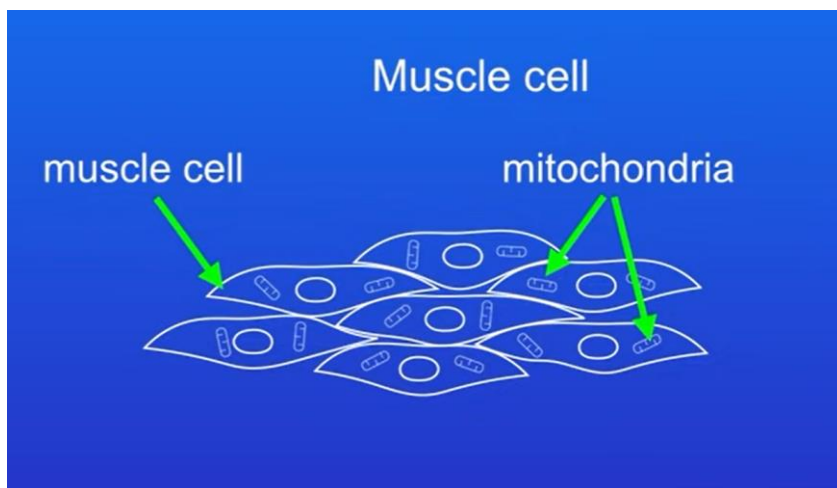
Myelin insulates the axon and speeds up the transmission of nerve impulses

Synapses are junctions which allow the impulse to pass from one nerve cell to another

Dendrites increases the surface area which helps other nerve cells connect

### **Muscle cell:**

Muscle cells can contract



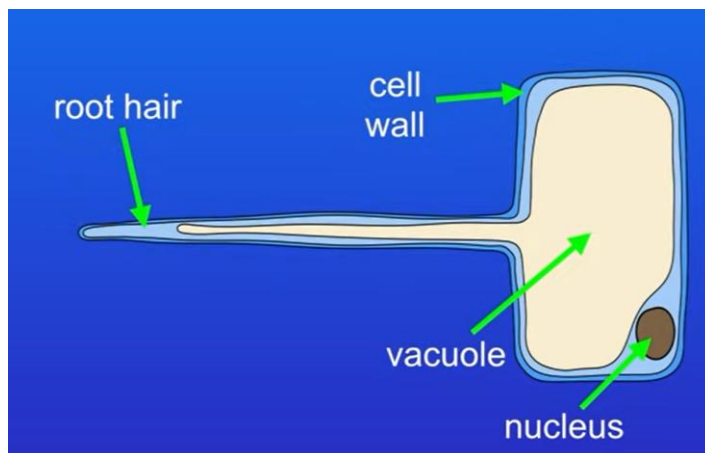
Muscle cells contain protein fibres which can change their length

Mitochondria provide energy to help the muscle cell contract

### **Plant cell specialisation:**

When cells become specialised, they have special adaptations which help them carry out their function.

Root hair cell:



These cells are found in the root

The root hair increases the surface area of the root

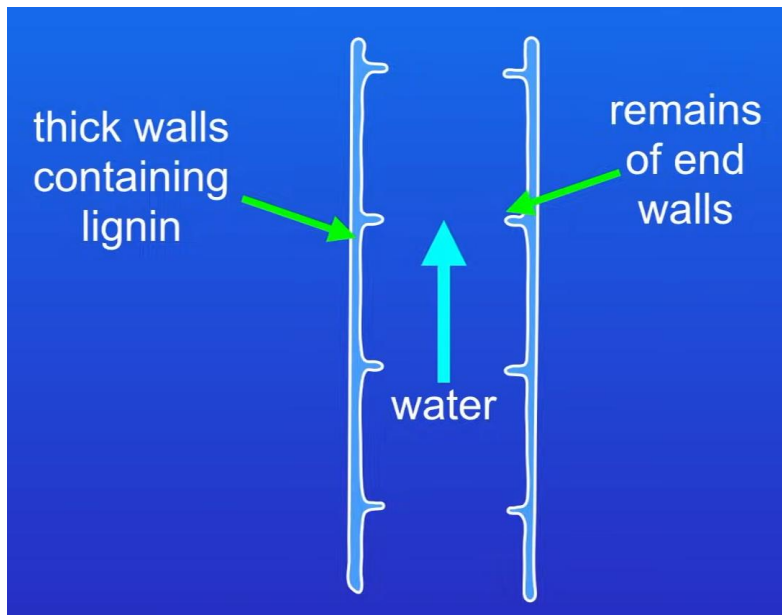
Root hair cells don't contain chloroplast because they are underground

Xylem:

Xylem is found in the plant stem.

Xylem transports water



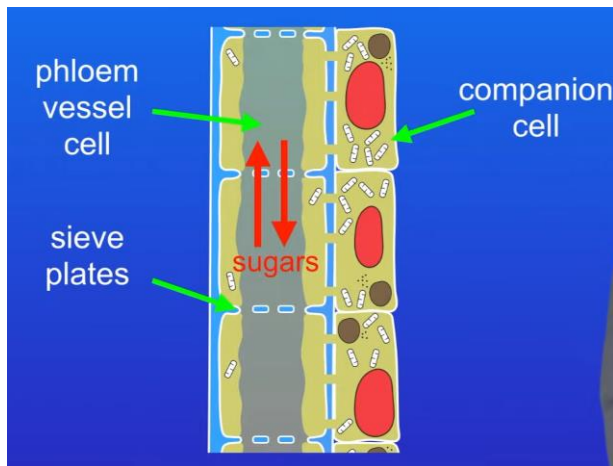


Xylem has thick cell walls which contains lignin which supports the plant. This causes the xylem cells to die because it is very thick.

The end walls between the cells have broken down. This causes the cells to form long tube so water and dissolved minerals can easily flow

Xylem cells have no internal structures which makes it easier for water to flow

Phloem cell:



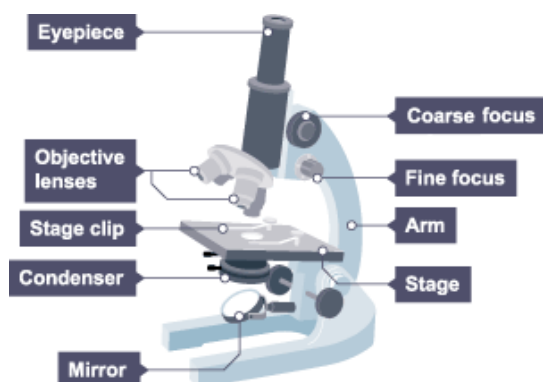
Phloem tubes carry dissolved sugars up and down the plant

Phloem consists of two types of features:

- Phloem vessel cells – Has no nucleus and only limited cytoplasm
- The end walls have pores called sieve plates

These features allow dissolved sugars to move through the cell interior

## **Required practical – Microscopes:**



Steps to practical:

1. First we place slide onto stage and use the clips to hold it in place
2. Select the lowest power objective lens
3. We need to turn the coarse focus to move the objective lens closer to the slide
4. We look into the eyepiece and then turn the coarse focusing dial until it comes into focus
5. We use the fine focusing dial to make it more clear to see the slide
6. Magnification = Eyepiece magnification x Objective lens magnification
7. We need to adjust the objective lens by selecting a higher power lens
8. We need to again adjust the coarse focus to bring the stage more closer
9. When drawing the cell on the stage, make sure to include a magnification scale:
  - Get a ruler and place the ruler on the stage
  - Draw the scale bar when drawing the image

### **Microscopy:**

<b>Advantages of light microscope</b>	<b>Disadvantages of light microscope</b>
---------------------------------------	--

Cheaper	Limited magnification
Portable	Limited resolution
Easy to use	

<b>Advantages of electron microscope</b>	<b>Disadvantages of electron microscope</b>
Greater magnification	Not portable
Higher resolution	Needs to be in controlled room
	Expensive

Magnification = size of image/size of real object  
I/AM

### **Bacterial division:**

Bacteria divide using binary fission

number of bacteria =  $2^n$

number of rounds of division

The diagram features a blue background with white text. The equation 'number of bacteria = 2^n' is displayed. A green arrow points from the text 'number of rounds of division' to the superscript 'n' in the equation.

### **Cell division by mitosis:**

Human body cells contain 23 pairs of chromosomes in the nucleus (46 chromosomes).

#### **Mitosis:**

Stage 1 – DNA replicates to form two copies of each chromosomes. The cell also grows and copies it's internal structures

Stage 2 – One set of chromosome is pulled to each end of the cell and the nucleus divides

Stage 3 – The cell membrane and the cytoplasm divide to form to genetically identical daughter cells

## **Function of mitosis:**

- Essential for growth and development of multicellular organisms (plants etc.)
- Takes place when an organism needs to repair itself
- Happens during a asexual reproduction

## **Stem cells:**

A stem cell can differentiate to form more cells of it's same type and can differentiate to form other types of cells

Stem cells can be found:

- Embryo
- Bone marrow which produces stem cells which differentiate into blood cells

Bone marrow transplants:

If there is cancer in the bone marrow, the patient has to destroy it using radiation

They receive a transplant from a donor

The stem cells divide and differentiate to form blood cells

Problems:

- Donor has to be compatible with patient otherwise white blood cells can attack the patient
- There is a risk of viruses being spread during transplant

Therapeutic cloning:

An embryo is produced with same genes and then transplanted into the patient which has stem cells and then differentiate into other cells

There may be religious or ethical objections to this

Plant stem cells:

Roots and buds contain meristem tissue. These can differentiate into any type of cell during the plants lifetime

We are able to clone plants using meristem tissue

## **Diffusion:**

Diffusion is when the particles move from a higher area of concentration to a lower area of concentration.

Molecules which diffuse in the human body:

- Oxygen
- Carbon dioxide
- Urea (waste product by cells)

Rate of diffusion is affected by:

- Concentration gradient (differences in concentrations)
- Temperature (high temp is good)
- Surface area of cell membrane

## **Surface area to volume ratio:**

How to calculate surface area : volume ratio:

- Find full surface area of shape
- Find volume of shape



## Surface area : Volume ratio



$$\text{surface area of each side} = 1\text{mm} \times 1\text{mm} = 1\text{mm}^2$$

$$\text{total surface area} = 1\text{mm}^2 \times 6 = 6\text{mm}^2$$

$$\text{volume} = 1\text{mm} \times 1\text{mm} \times 1\text{mm} = 1\text{mm}^3$$

When the cell grows diffusion may not work very well due to surface area not increasing

Animals solve this by having large surface area for cells and they have a transport system to transport gases

## Osmosis:

Osmosis is the diffusion of water molecules from a dilute solution (area of high concentration) to a concentrated solution (area of low concentration) through a partially permeable membrane

### **Required practical – Effects on osmosis on a plant tissue:**

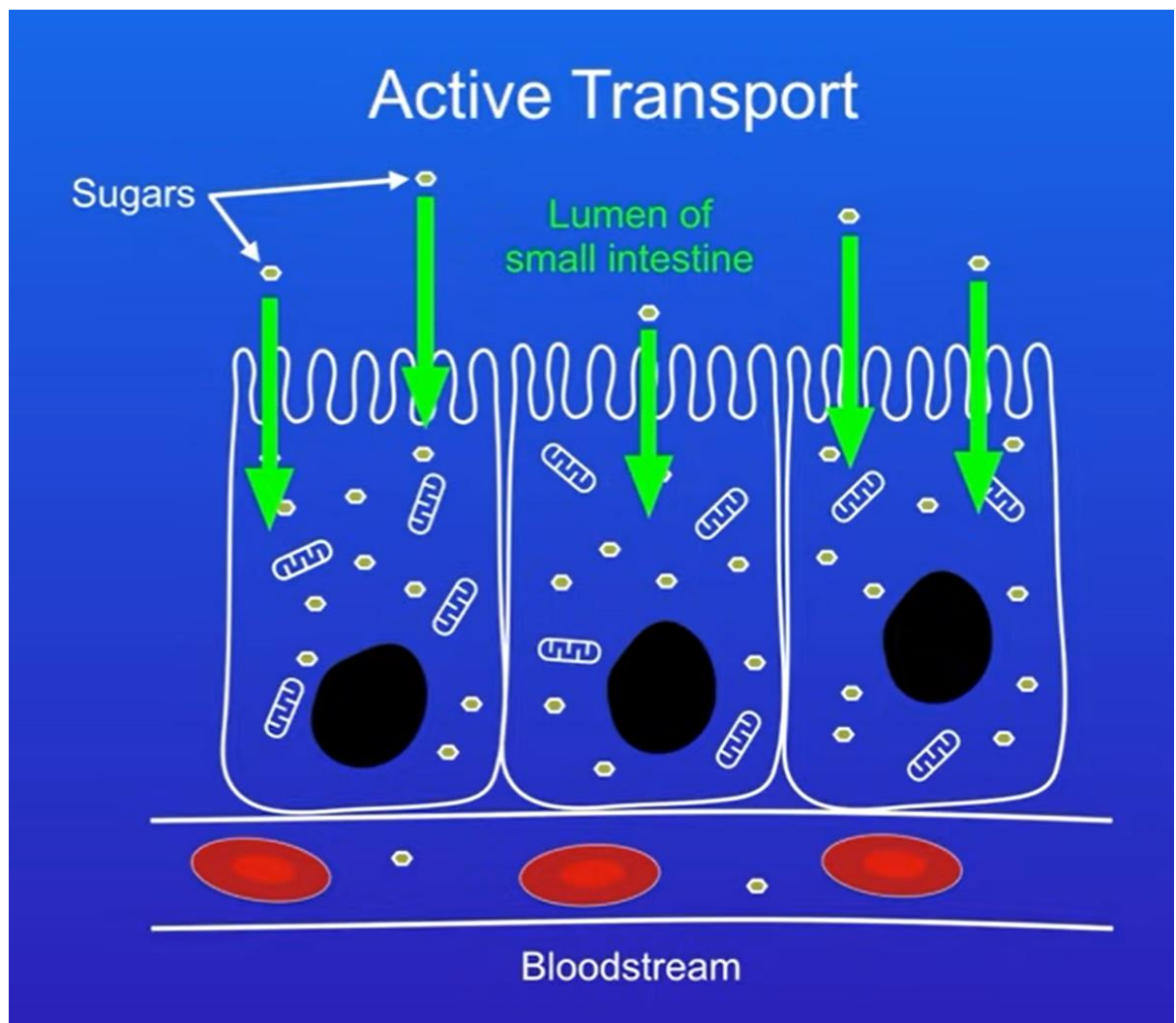
Steps to do practical:

1. Peel the potato, this is because the skin can affect osmosis
2. We get a cork borer to produce three cylinders of potato
3. Use a scalpel to trim the cylinders to 3cm
4. Measure the length of each cylinder and the mass of each
5. Place each cylinder into a test tube
6. Add 10cm<sup>3</sup> of 0.5 molar sugar solution in the first tube
7. Add 10cm<sup>3</sup> of 0.25 sugar solution to the second tube
8. Add 10cm<sup>3</sup> of distilled water to the third tube
9. Leave these overnight
10. Paper dry these gently
11. Remeasure and weigh the cylinders

## Active transport:

Active transport is the movement of substances against their concentration gradient, from a region of lower concentration to a region of higher concentration, using energy from respiration

Example of active transport:



## Active transport

