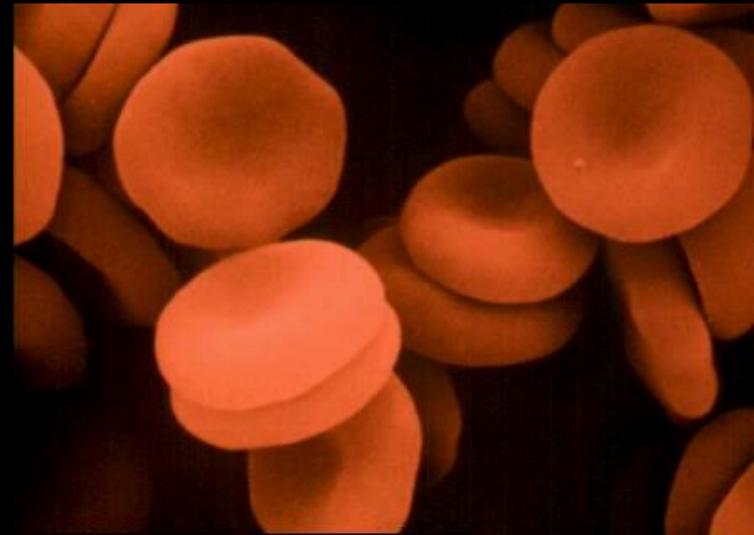


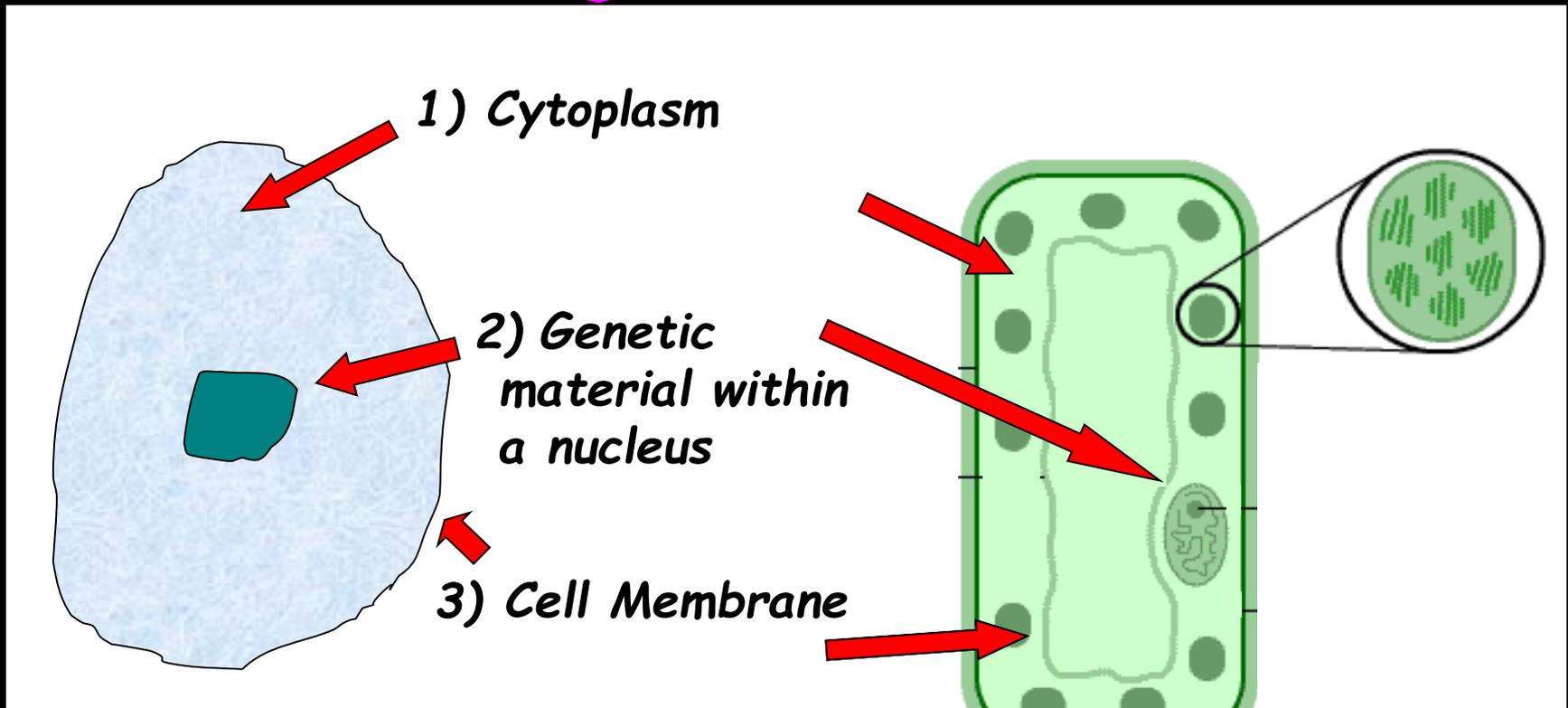
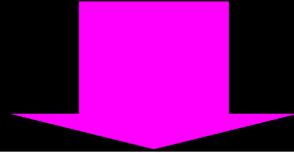
Key Concepts in Biology

EdExcel 9-1 Biology topic 1



Plant and Animal cells (eukaryotic cells)

Eukaryotic cells have these features:



Typical size of animal cell =
10-30 μm

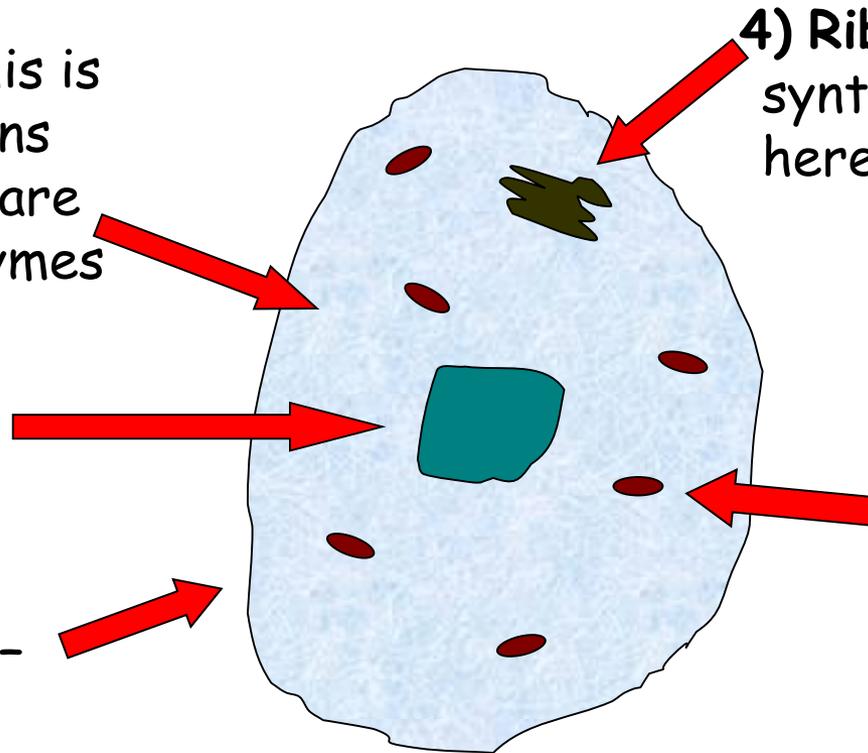
Typical size of plant cell =
10-100 μm

A Typical Animal Cell

1) **Cytoplasm** - this is where the reactions happen and these are controlled by enzymes

2) **Nucleus** - controls the cell's activities

3) **Cell Membrane** - controls what comes in and out



4) **Ribosomes** - protein synthesis happens here

5) **Mitochondria** - energy is released here during aerobic respiration

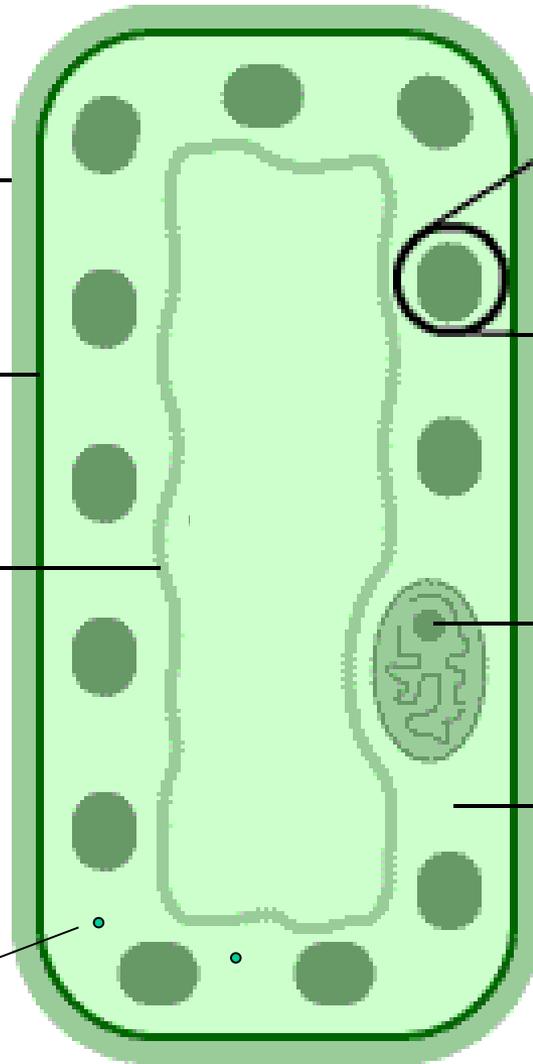
A Typical Plant Cell:

Cell wall - made of cellulose which strengthens the cell

Cell membrane - controls what comes in and out

Large vacuole - contains sap and helps support the cell

Ribosomes



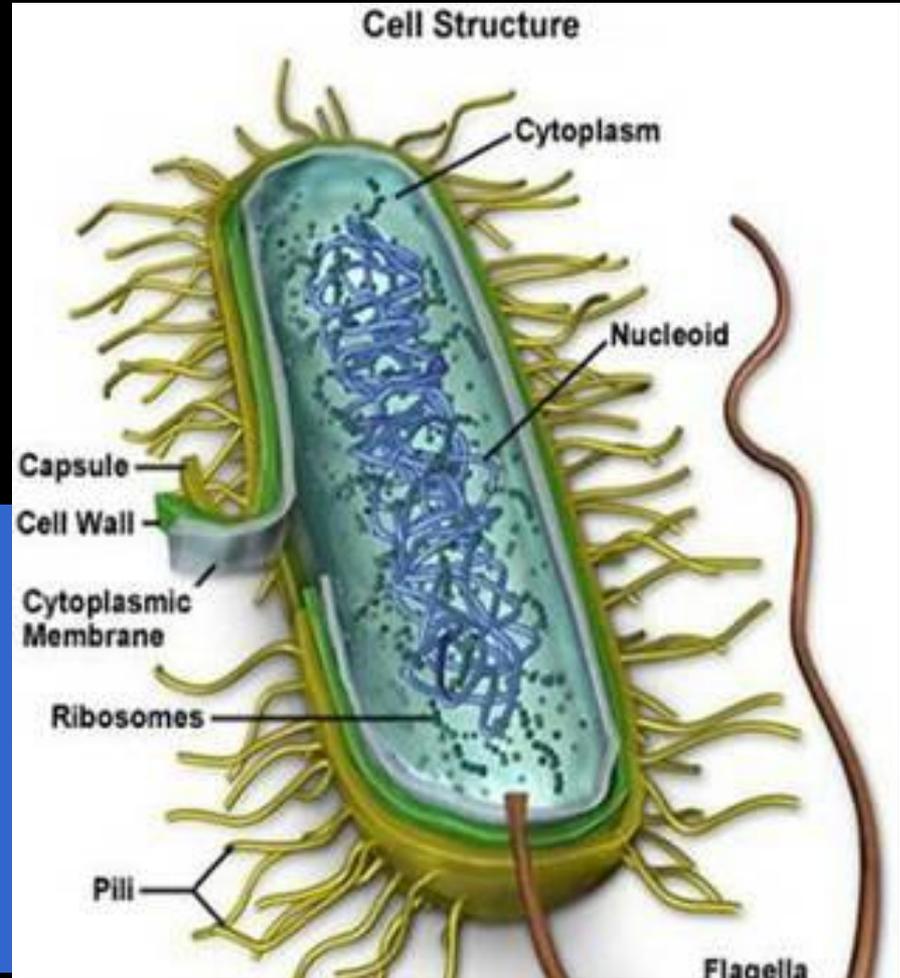
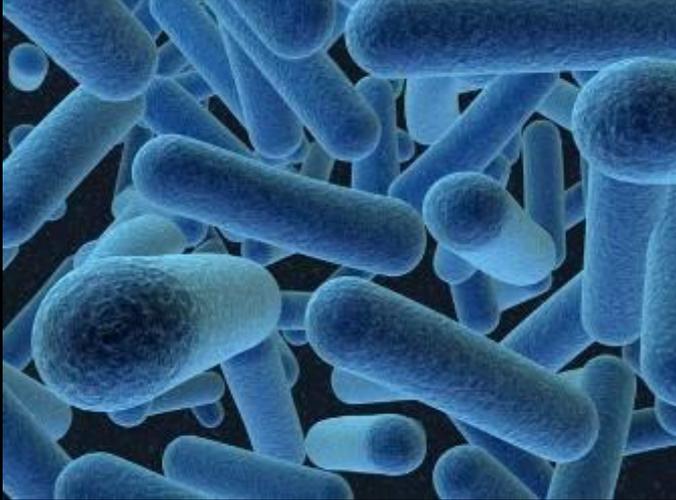
Chloroplasts (containing chlorophyll) - this is needed for photosynthesis

Nucleus - controls what the cell does and stores information

Cytoplasm - Chemical reactions happen here

Bacteria (prokaryotic) cells

Consider a bacteria cell in more detail:



Bacteria contain cytoplasm and a _____ surrounded by a cell wall. The _____ are NOT in a distinct _____ and bacterial cells do not have mitochondria or chloroplasts. They may have one or more small rings of DNA called _____.

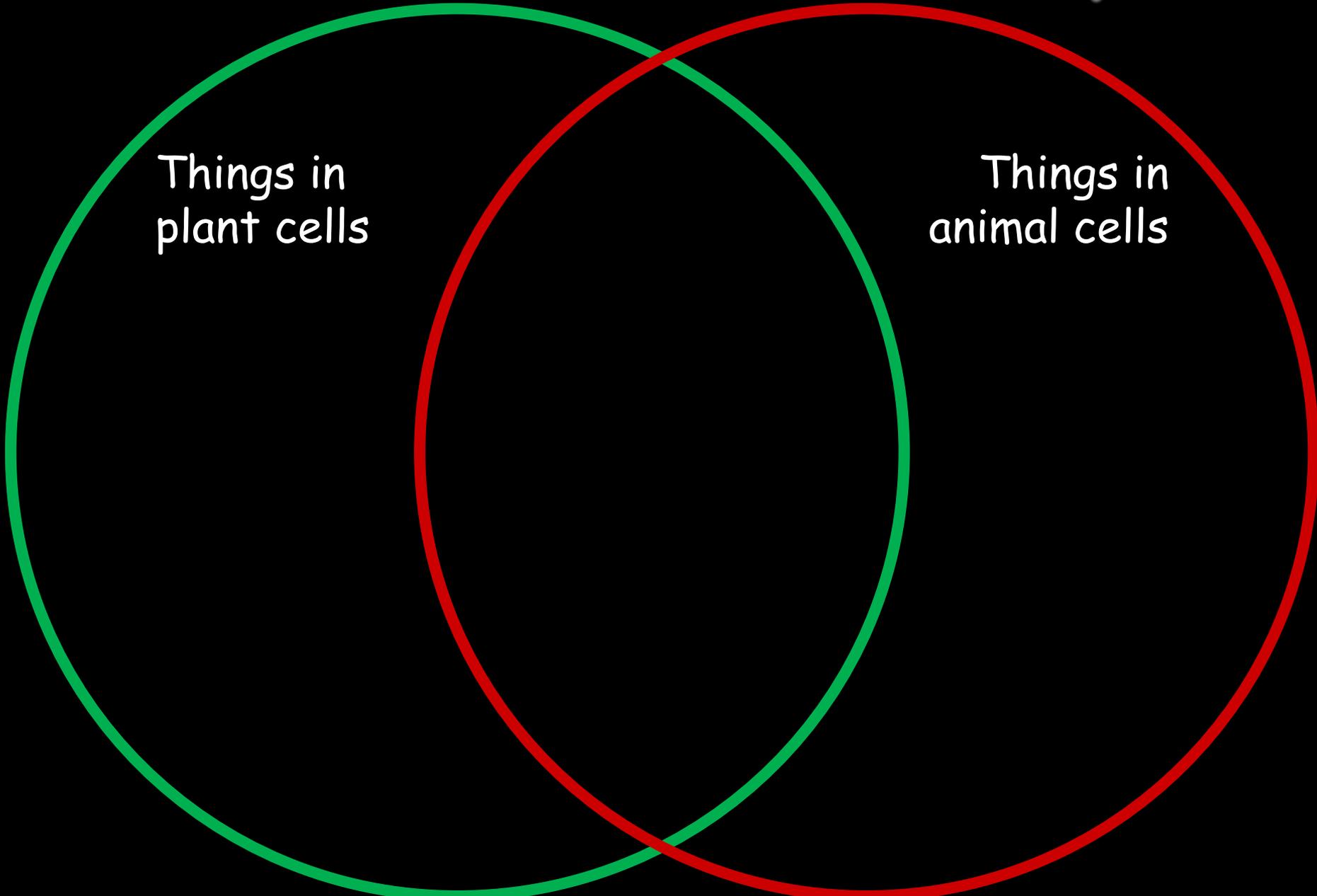
Words - nucleus, membrane, plasmids, genes

Typical size of bacterial cell = $2\mu\text{m}$

Plant and Animal Cells compared

Things in
plant cells

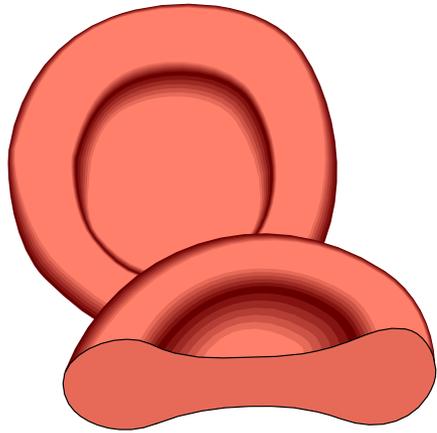
Things in
animal cells



Summary

	Plant cells	Animal cells	Bacteria
Nucleus?			
Cell membrane?			
Mitochondria?			
Chloroplasts?			
Ribosomes?			
Vacuole?			

Specialised animal cells



I.D:

Red Blood Cell

Function:

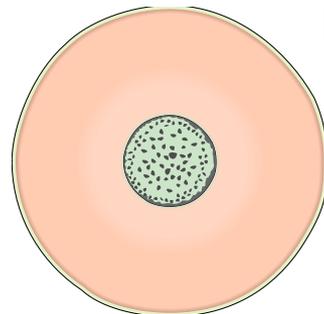
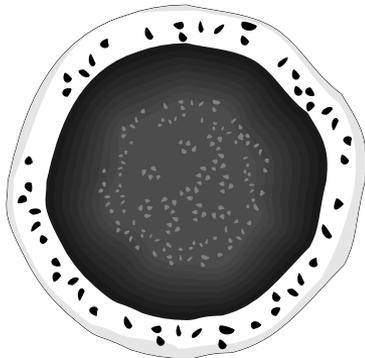
Carries oxygen around the body

Features:

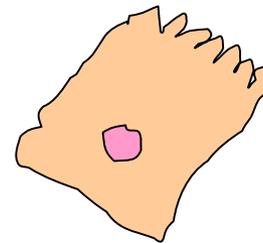
No nucleus and large surface area

Can you complete a similar description for these cells?

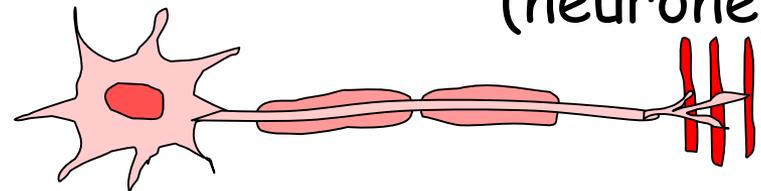
White blood cell



Egg cell (ovum)



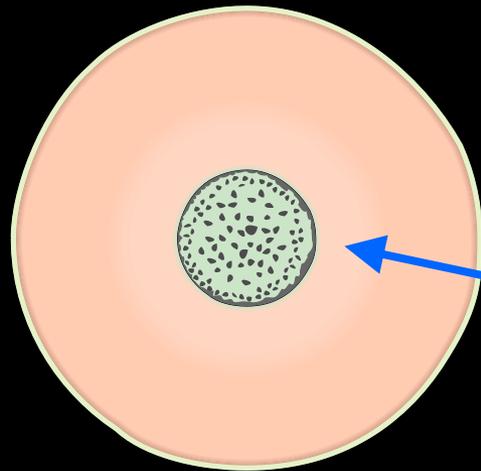
Ciliated epithelial cell



Nerve cell (neurone)

Eggs and sperm

The female egg cell and the male sperm cell are examples of _____ cells:



Each cell has a _____ nucleus

The egg cell is packed with _____ in the cytoplasm and the membrane _____ after fertilisation to stop other sperm entering.

The sperm cell is specialised in a number of ways:



Acrosome packed with enzymes to _____ its way through the egg

Mitochondria for energy

Strong tail for _____

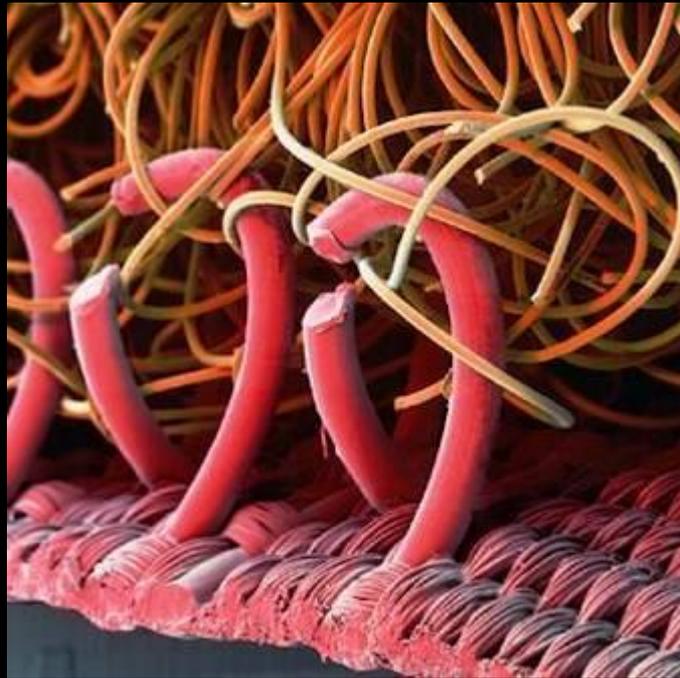
Words - changes, swimming, specialised, digest, haploid, nutrients

Microscopy

These microscopes have different powers of magnification. Consider this image of velcro:



A "stereo" microscope



An old microscope!

If the "loop" on this image is measured to be 20cm tall at a magnification of 100x how big is it really?

2mm

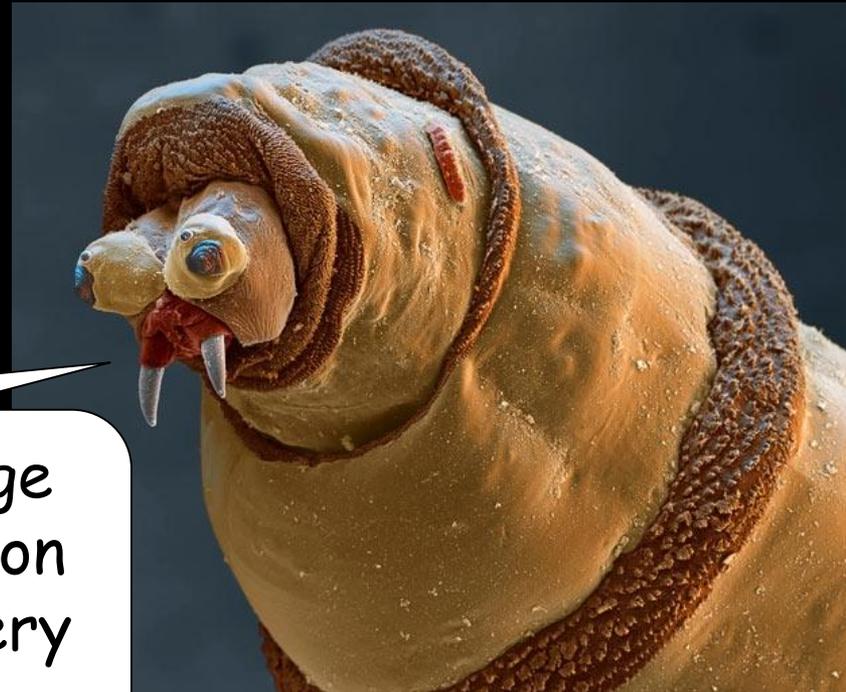
Scanning Electron Microscopes



Scanning Electron Microscopes have much higher magnification powers than light microscopes. This has led to a much greater understanding of cell structure.

An electron microscope image of a maggot...

Notice the resolution of this image of me. The high levels of resolution also make electron microscopes very useful. Now I'm going to eat you.



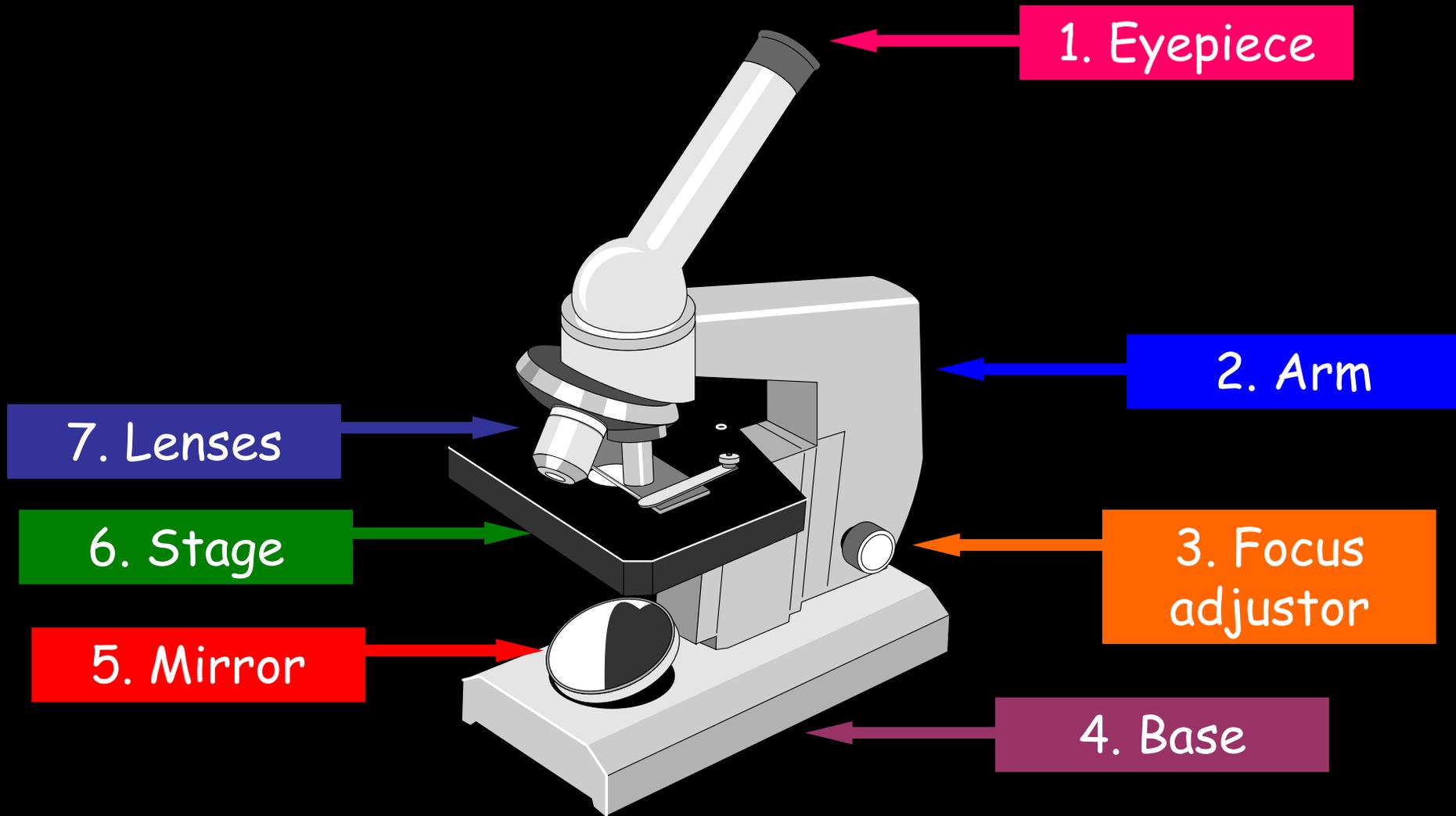
Standard Form and prefixes

Prefix	Symbol	Multiplier
Milli	m	10^{-3}
Micro	μ	10^{-6}
Nano	n	10^{-9}
Pico	p	10^{-12}

Now try these conversions (higher tier only)...

1. What is 1 metre in mm?
2. What is 1 metre in nanometres?
3. What is 10mm in metres?
4. What is 100 micrometres in metres?
5. What is 100 micrometres in mm?
6. What is 1mm in picometres?

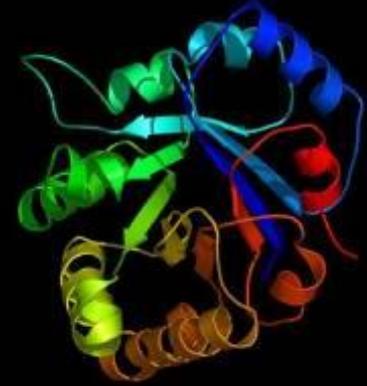
Using a microscope



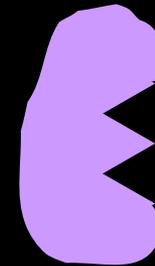
Introduction to Enzymes

Enzymes are biological catalysts. They help the reactions that occur in our bodies by controlling the rate of reaction.

An enzyme is basically a large protein molecule made up of long chains of amino acids. These molecules are then "folded" to create a certain shape.



The enzyme's shape helps another molecule "fit" into it ("lock and key"):

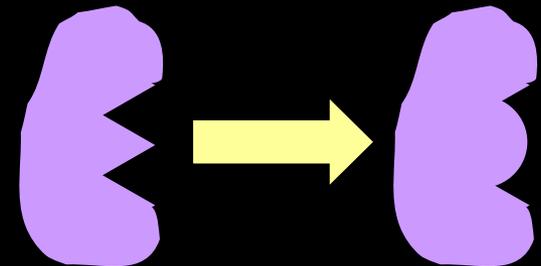


Enzyme

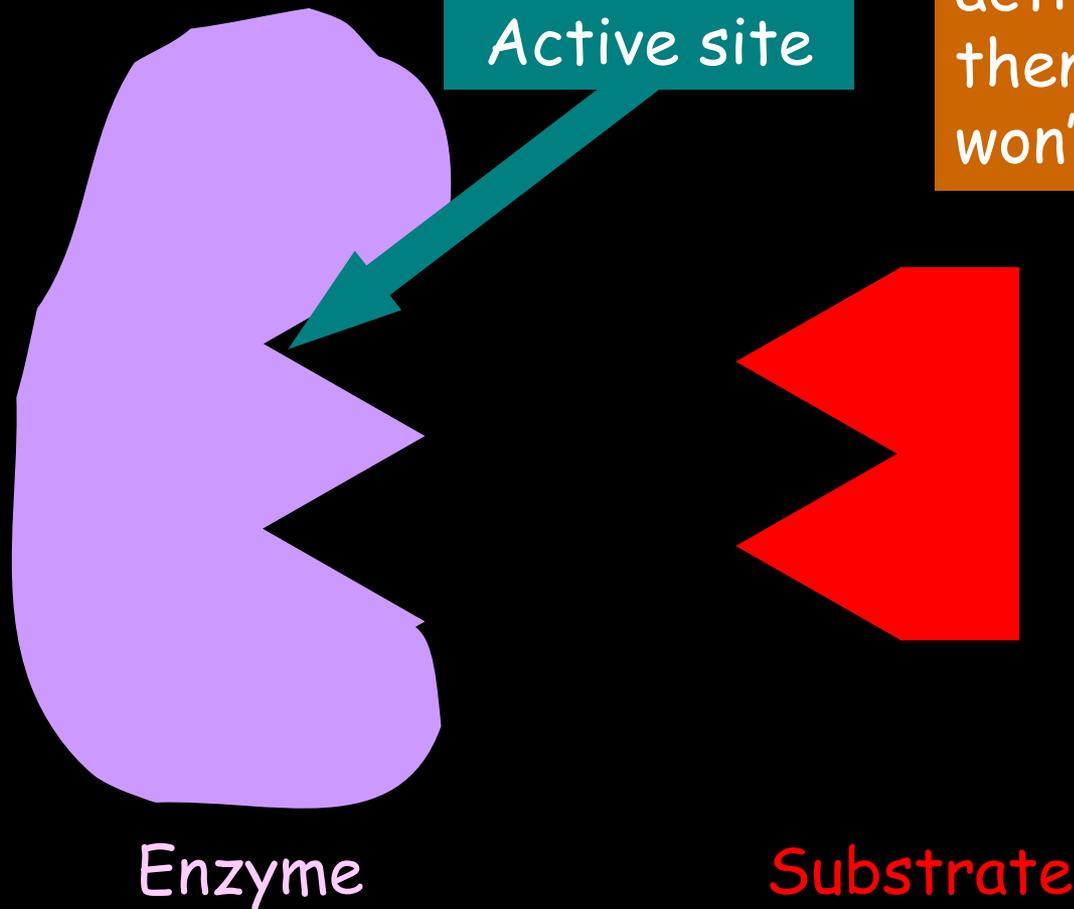


Substrate

This shape can be destroyed ("denatured") by high temperatures or the wrong pH:



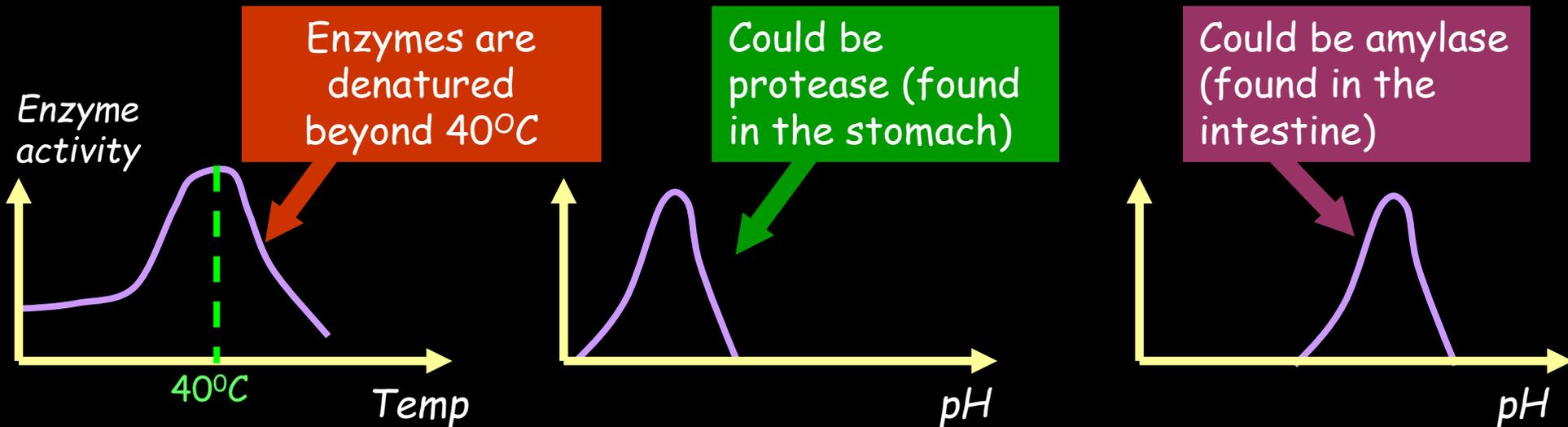
The "Active Site"



If the shape of the active site is changed then the substrate won't "fit" any more

Enzymes

Enzymes work best in certain conditions:



Notice that most enzymes are denatured at high temperatures. Different enzymes work best in different pH conditions.

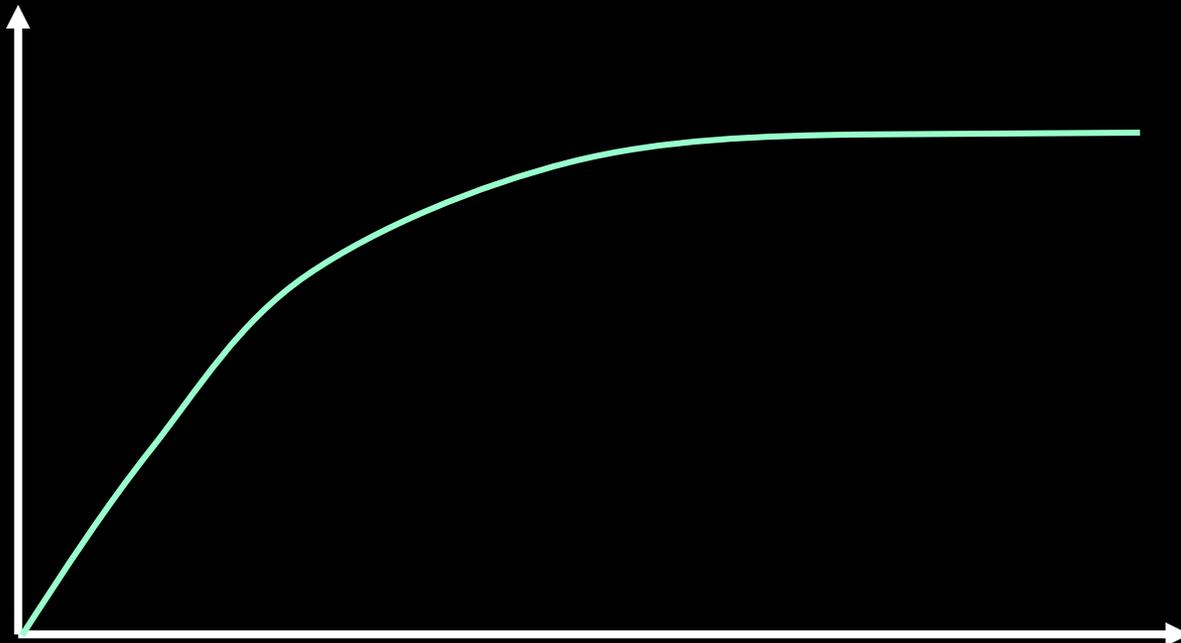
Enzyme activity and substrate concentration

Rate of enzyme activity could be calculated by using an equation like this:

$$\text{Rate} = \frac{\text{Amount of product formed}}{\text{Time}}$$

Q. What do you think this graph would look like?

Rate of enzyme activity



Concentration of substrate

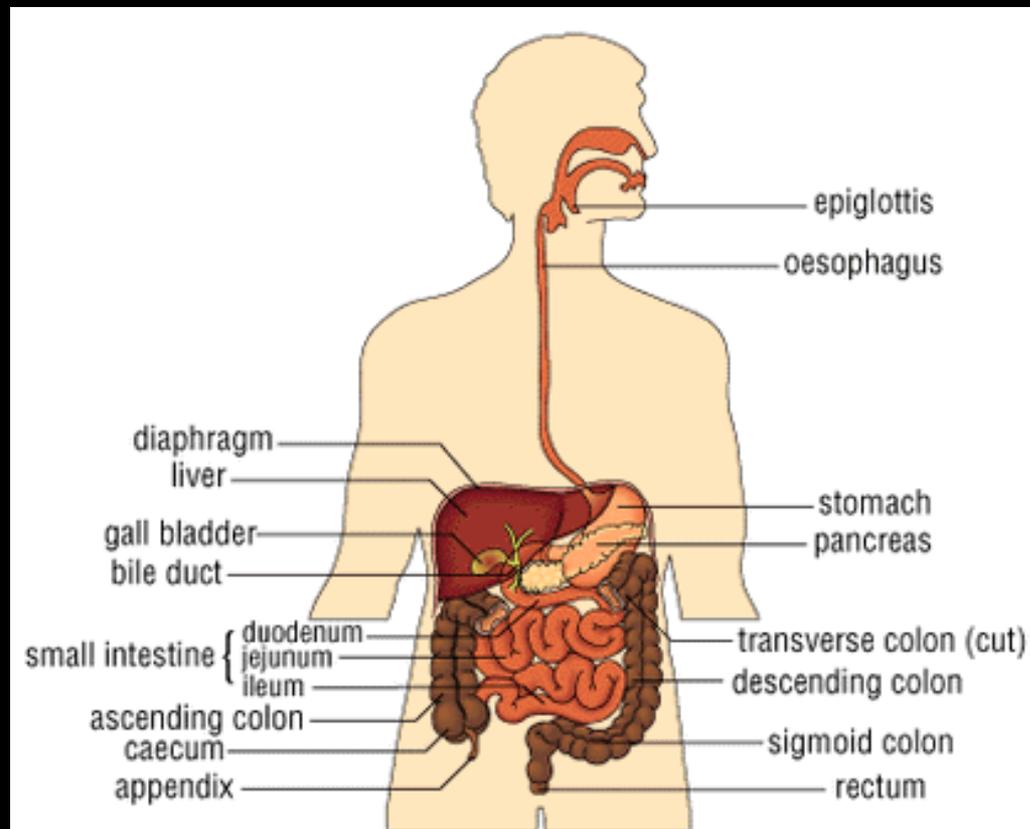
Quiz on the last few slides on Enzymes

- 1) What are enzymes?
- 2) What do they do in your body? What is their basic function?
- 3) What are enzymes made up of?
- 4) What term describes the way an enzyme "fits" a specific substrate?
- 5) What temperature do bodily enzymes often work quickest at?
- 6) What happens to an enzyme if it gets too hot?
- 7) What approximate pH range would you want an enzyme in your stomach to work best at?
- 8) Name 3 places in your digestive system that enzymes are produced in.

The Digestive System

What's the point of the digestive system?

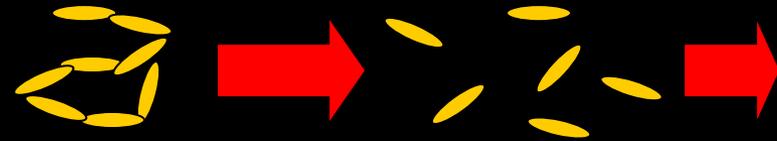
The whole point of digestion is to break down our food into small molecules which the body can then use to make carbohydrates, lipids and proteins. Here's how enzymes are involved:



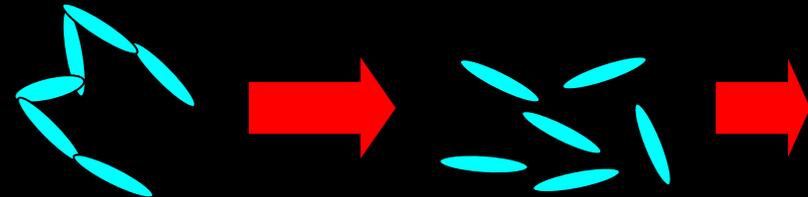
Enzymes in digestion

Enzymes can be produced by the body to help _____. When they come into contact and react with food they break it down into _____ pieces which can then pass into the _____:

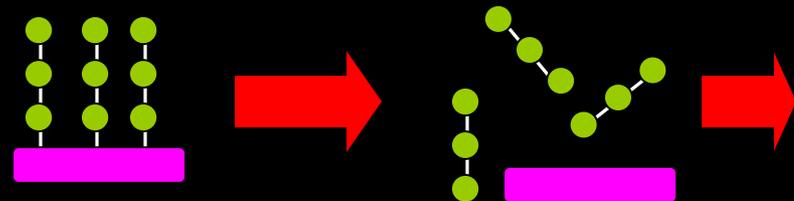
Amylase (produced in the mouth, pancreas and small intestine) breaks _____ (a carbohydrate) down into glucose:



Protease (produced in the stomach, pancreas and small intestine) breaks _____ down into amino acids:



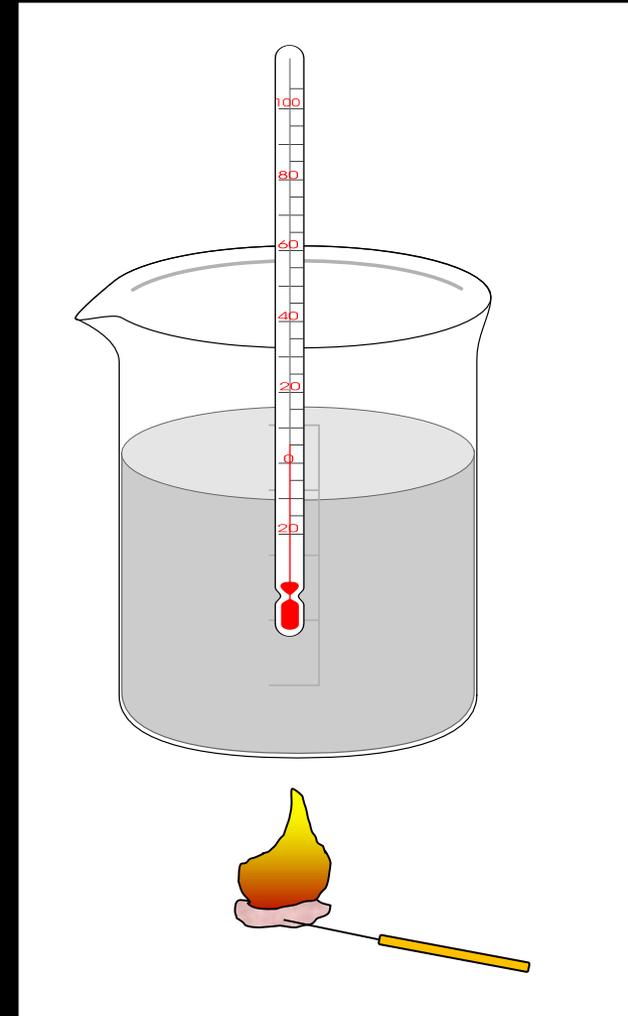
Lipase (produced in the pancreas and small intestine) breaks fats (_____) down into fatty acids and glycerol:



Words - blood, lipids, proteins, digestion, starch, smaller

Calorimetry

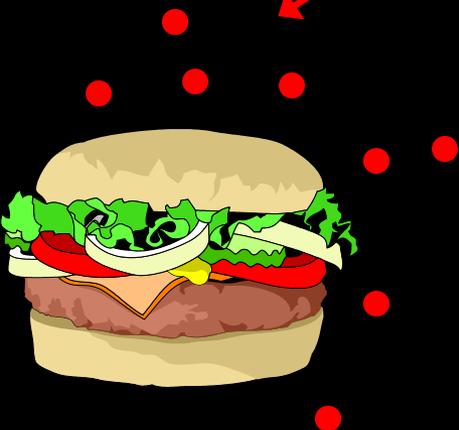
We can use apparatus like this to investigate the amount of energy contained in different foods:



Diffusion

Diffusion is when something travels from an area of high concentration to an area of low concentration. For example, consider the scent from a hamburger...

The "scent particles" from this hamburger are in high concentration here:

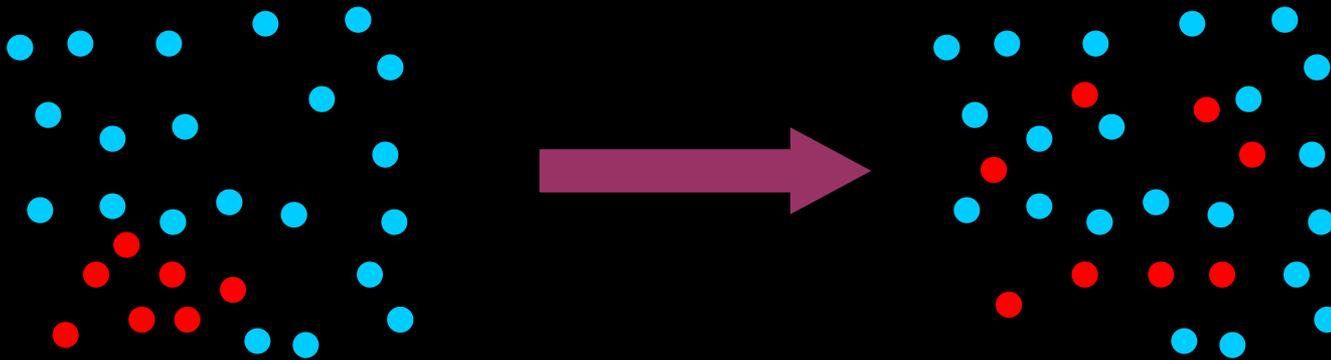


Eventually they will "diffuse" out into this area of low concentration:

Substances can move across a cell membrane by diffusion.

Diffusion Summary

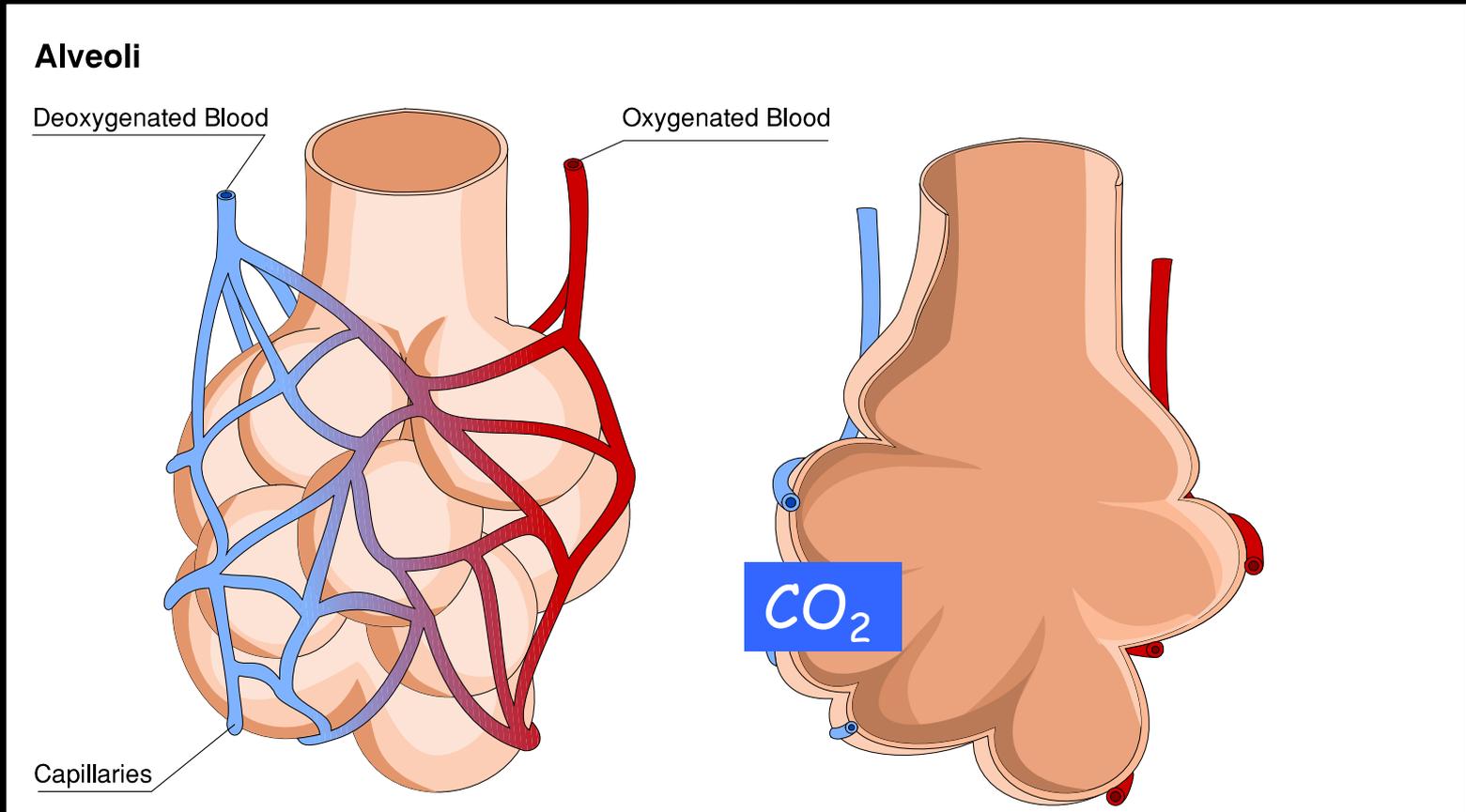
Diffusion is when particles spread from an area of high concentration to an area of ___ concentration. The particles move along a "concentration ____". Diffusion can be accelerated by increasing the _____ of the particles, which makes them move _____, or by making the surface area of the membrane _____.



Words - faster, low, gradient, temperature, bigger

An example of Diffusion: the lungs

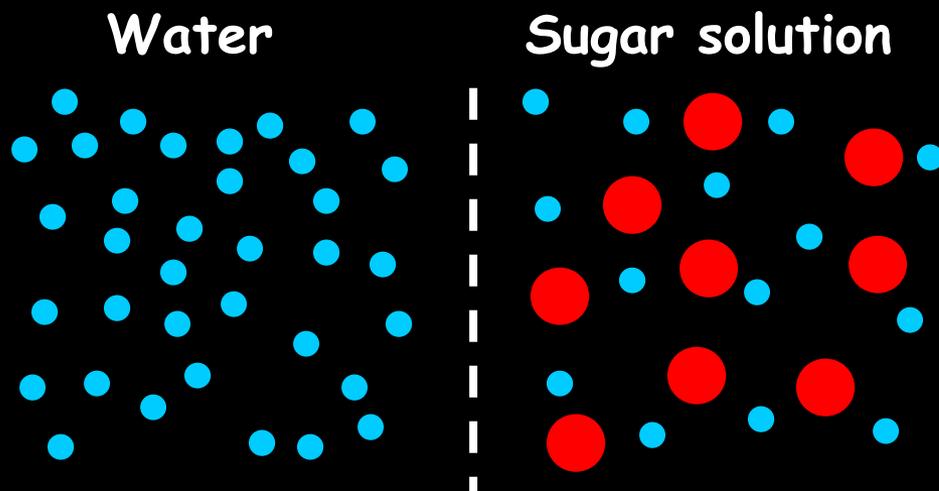
Oxygen diffuses in and carbon dioxide diffuses out of blood in the lungs:



Diffusion also occurs in cells - urea diffuses out of cells into blood plasma for excretion in the kidney.

Osmosis

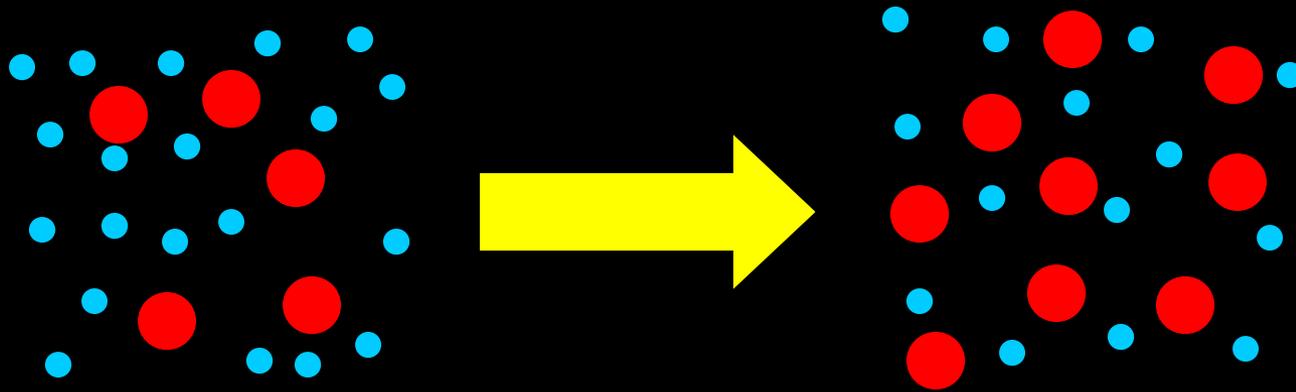
Osmosis is a "special kind of _____". It's when water diffuses from a _____ area to a less concentrated area through a partially permeable _____ (i.e. one that allows water to move through but not anything else):



In this example the water molecules will move from left to right (along the concentration _____) and gradually _____ the sugar solution.

Words - membrane, concentrated, dilute, diffusion, gradient

Potato cells

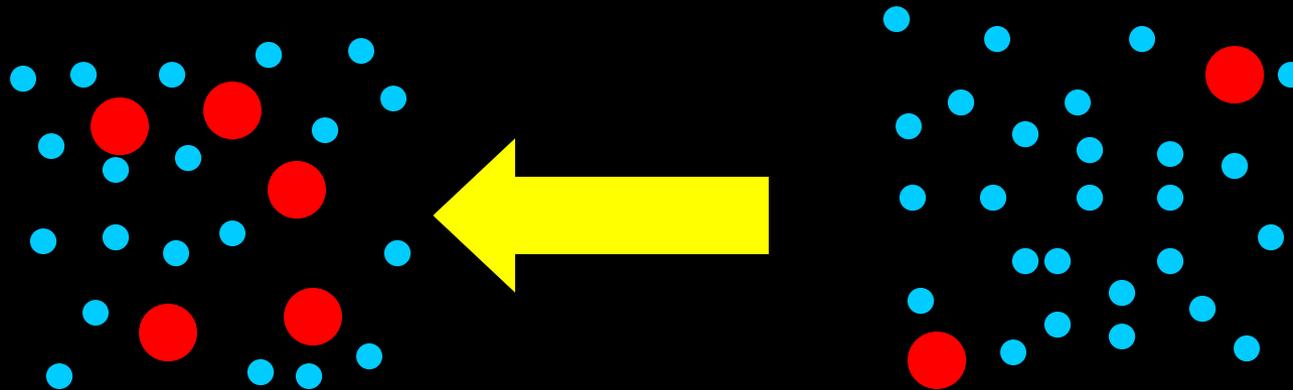


Strong
sugar
solution

We can easily calculate the % gain or loss in mass using the equation:

$$\% \text{ gain/loss} = \frac{\text{change in mass}}{\text{original mass}}$$

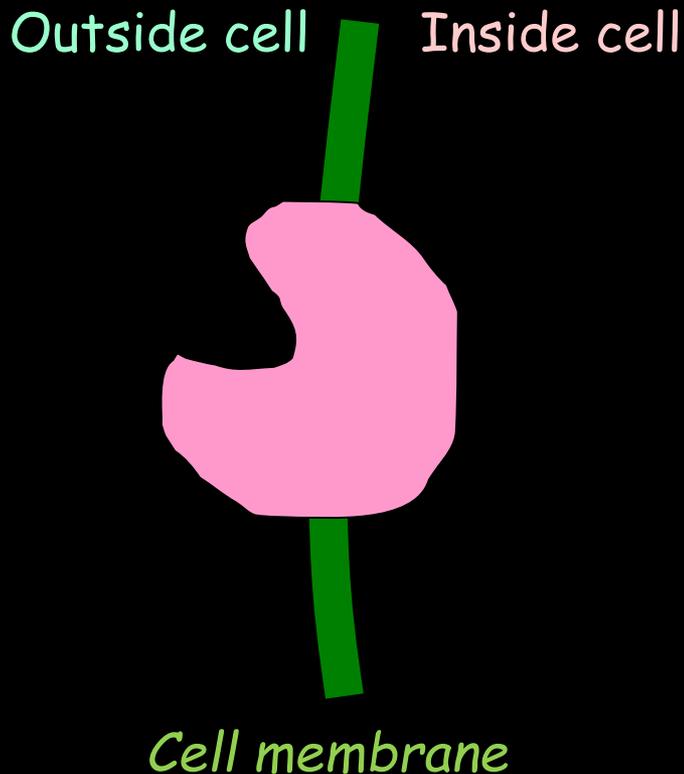
Medium
sugar
solution



Weak
sugar
solution

Active Transport

In diffusion substances moved along a concentration gradient.
In active transport, substances move against this gradient:



This process takes _____ and
this comes from _____.
It enables cells to take in
substances even though there
are in very small _____.
Root hair cells take in _____
using active transport.

**Words - concentration, energy,
respiration, nutrients**

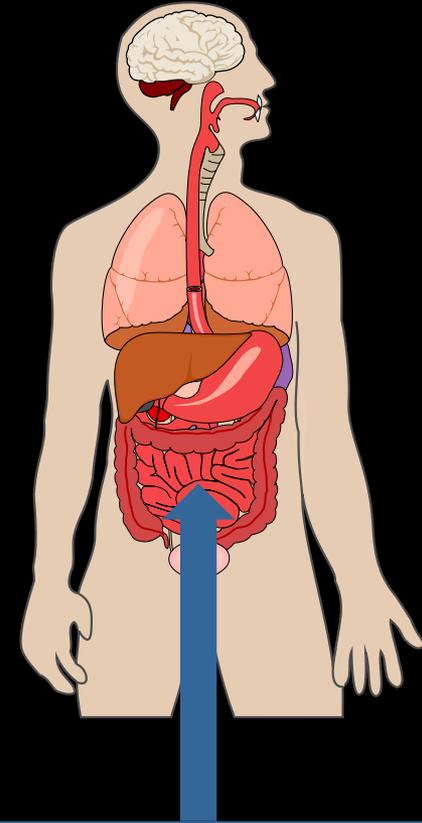
Active Transport in plants and humans

Mineral

Less
concentrated

More concentrated

Plant nutrients are taken in by root hair cells using active transport.



Sugar molecules are absorbed from the gut into blood by active transport.

Comparing Diffusion, Osmosis and Active Transport

27/09/2017

