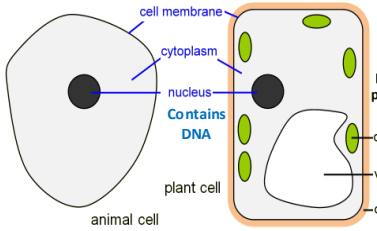
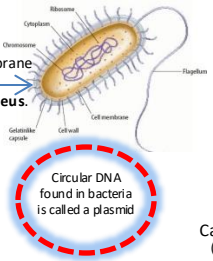
Biology Paper 1

Don't forget the **ribosomes** they both have that **make proteins**!

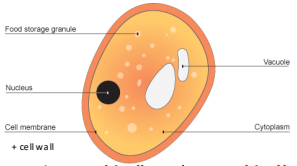


Bacteria Cell:
Has cytoplasm, a cell membrane and a cell wall.
But its **DNA is not in a nucleus.**
Found in plant cells only
- **For photosynthesis**
- **Contains chloroplasts**
- **Filled with sap**
- **Gives cell strength**



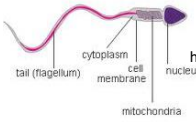
Yeast Cell

Bigger than Bacteria



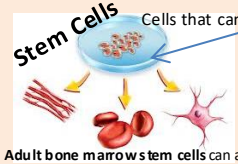
Can respire **aerobically** and **anaerobically**
(this will make ethanol and is also called fermentation)

Specialised Cells



Remember cells are specialised for their job. Sperm cells have long tails and are good swimmers. They also have lots of mitochondria to provide the energy they need. Other examples include fat cells, cone cells and root hair cells.

Stem Cells



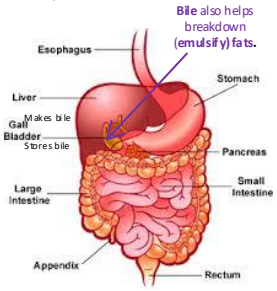
Cells that can become anything - **undifferentiated**

Embryonic stem cells can be made into any type of cell *(curing all sorts of disease)* **but** come from aborted embryos *(which can be a problem)*
We also don't know the long term effect of their use yet.

Adult bone marrow stem cells can also be used but can't be made into as many different things **but** you can give permission to have them taken. Beware the operation might be painful!

Adaptations of the digestive system

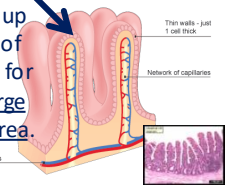
Acid in the stomach giving a low pH for enzymes there.
Large surface area for absorption in the **small intestine**.
Bile to **neutralize** acid and create alkaline condition for enzymes in the intestine.



- **Large surface area**
- **Short diffusion pathway**
  (only one cell between blood and air in lungs)
- **Good blood supply**
  (to take absorbed products of digestion – using diffusion and active transport to get it from the intestine to the blood)

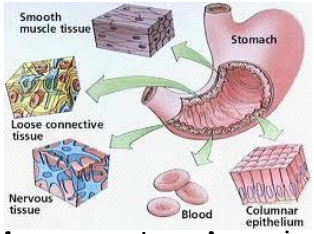
Adaptations for exchange in the intestines (absorbing your food)

Villi/villus - Creased up surface of intestine for really large surface area.



Body structure

A group of **cells** with similar function make up **TISSUE**.
Tissues that all work together make up an **ORGAN**.
(this the same in plants – a leaf is an example of an organ)
Organs together make up an **ORGAN SYSTEM**. Like the digestive system.

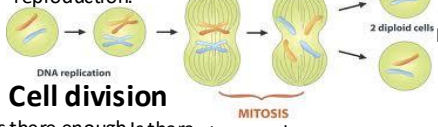


Many organs systems = An organism!

Cell division

Good for repair and growth. Or Asexual reproduction.

Normal cell division - Mitosis



Two identical daughter cells are made from one parent cell. Each **containing 23 complete pairs of chromosomes.**

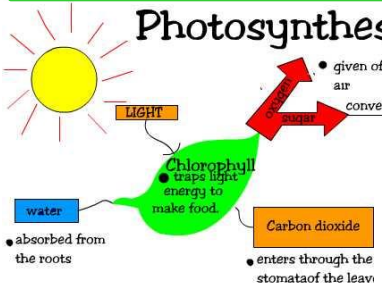
Is there enough **light**? (more important to plants)
Is there enough **water**?
Is enough **oxygen** or CO_2? (for respiration and photosynthesis)

Don't forget **enzymes are proteins** made up of amino acids.

Super IMPORTANT!!!

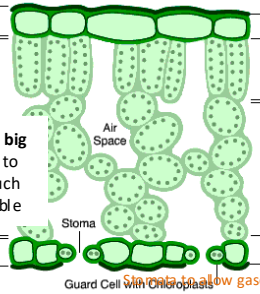
CO_2 + Water → Glucose + O_2

Photosynthesis



Chloroplasts are found in the **green parts** of plants and contain the **chlorophyll**

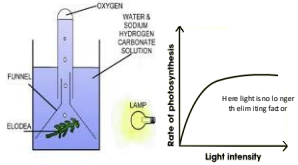
Leaves are adapted for photosynthesis



Leaves have a **big surface area** to absorb as much light as possible

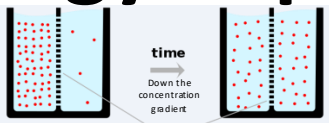
The **Xylem** brings **water** to the leaves from the roots.
The **Phloem** transports the **sugars** made in photosynthesis to the rest of the plant.

Plants also use Magnesium to make chlorophyll **No Magnesium = Yellow leaves**



Remember photosynthesis will increase with the limiting factors. Once you get to a maximum for that factor another one will be limiting.

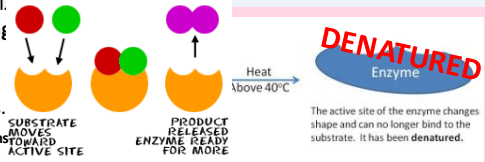
How things get in and out of cells...



... Like oxygen and glucose.

Diffusion is where dissolved substances move from a high concentration (where there's lots of them) to a low concentration (where there's less) through a semi-permeable membrane.
Steeper gradient (bigger difference between the sides) = faster diffusion!

Enzymes are biological catalysts (they speed up reactions but aren't used up)



To begin with heat will help increase collisions between the enzymes and substrates BUT **too hot and it will denature.**
(remember denature NOT die)

Enzymes can **build up or break down** substrates. Substrates include carbohydrates, proteins and fats.

Remember the **active site is very specific.** Only the matching **substrate** will fit.

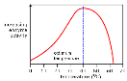
Enzymes are also easily affected by **pH changes.** We need highly specific conditions to keep them working at their best. **OPTIMUM CONDITIONS!**
(each enzyme has its own favourite conditions)

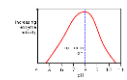
Produced in the:	Enzyme	Substrate	Products
Mouth, Pancreas and small intestine	Carbohydrases (amylase)	Carbohydrates	Sugars
Stomach	Proteases	Protein	Amino Acids
Pancreas and small intestine	Lipases	Lipids (fats)	Fatty acids and Glycerol

Enzymes can be used to treat and diagnose disease.

Useful Enzymes: Proteases used in **baby food.**
Biological washing powders contain enzymes to break down food stains.

Isomerase is used to make the sweeter fructose syrup.





Increasing the temperature will speed up photosynthesis to the point it gets too hot and **enzymes denature.**

Greenhouses can use our knowledge of limiting factors to maximise production, making plants grow faster.

Limiting Factors

The rate of photosynthesis may be slowed by a lack of **light, CO_2** or if its too cold. (**temperature** is a limiting factor as enzymes are effected)

Hydroponics is a way of growing plants in water with the perfect balance of nutrients. The temperature is also controlled. Lights are kept on and CO_2 is pumped into the greenhouse.

Glucose

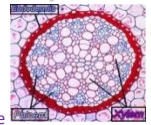
Use in **respiration**
Use to produce proteins for **growth**
Used to produce fats and oils for storage
Stored as insoluble **Starch**

To make **proteins** plants also need to absorb **Nitrates** from the soil to build amino acids.
No nitrates will lead to stunted growth

Biology Paper 1

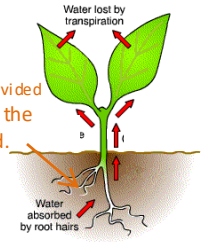
Transport in Plants

The **phloem** transports **dissolved sugars** to the rest of the plant from the leaves.



The **xylem** transports **water and minerals** up the plant from roots to leaves.

Water moves from the roots to the leaves, up the **xylem** via the **TRANSPIRATION STREAM**

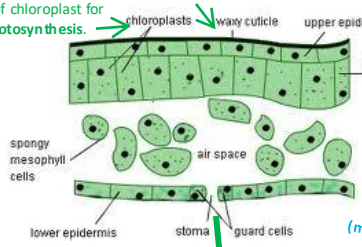


Roots also have a **large surface area** (provided by **root hair cells**) as they **absorb** most of the **water and minerals** a plant will need.

Waxy cuticle – water and gas proof

Stops too much water loss.

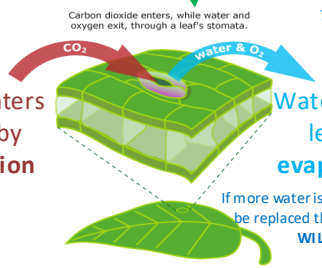
Lots of chloroplast for **photosynthesis**.



Water is lost more quickly when...

- **Its windy**
- **Its dry** (steeper concentration gradient between leaves and air)
- **Its hot** (more photosynthesis takes place so more stomata are open)

Water loss from the leaves is called **TRANSPIRATION**



CO_2 enters leaf by **diffusion**

Water leaves leaf by **evaporation**

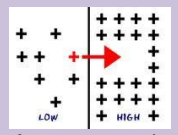
If more water is lost then can be replaced the plant will **WILT**.

Leaves are thin and flat giving them a **large surface area** for **diffusion of gases** (CO_2 in and oxygen out).

Guard cells around stomata can **open and close** to let CO_2 in but **stop too much water being lost!**

Active Transport

This is when some thing moves **against the concentration gradient**. Low to High!

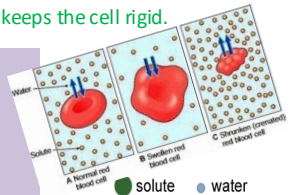


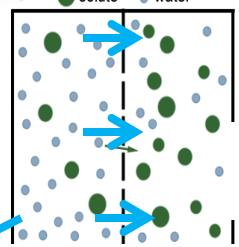
It **needs energy** to happen!

But means ions can be absorbed from soil and sugars and salts can move

Through a **partially permeable membrane**.

Water moved up a plant stem from cell to cell by osmosis. Lots of water keeps the cell rigid.





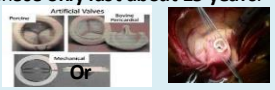
Osmosis

WATER diffusing from where it is a lot of it to where there is less of it.

Fixing leaky valves

Under high pressure valves can become **damage allowing blood to flow backwards**.

We can replace valves with **biological animals valves** but these **only last about 15 years**.



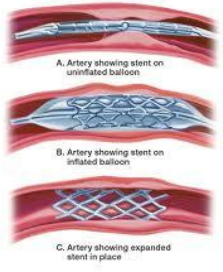
Use **Mechanical valves** made form plastics and metals but you will **need lifelong medicine** to stop blood clotting problems.

How to remove a blockage...

Blockages in blood vessels ca stop oxygen reaching the hea This can happen due to age o bad diet.

Step 1: Find a doctor!

Step 2: Get a **STENT**!

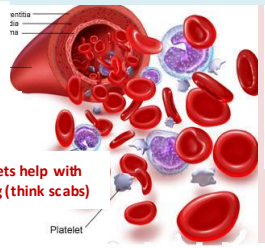


Stents can open up narrow or blocked arteries.

White Blood cells Help defend the body against disease

Red Blood cells carry oxygen

Platelets help with clotting (think scabs)

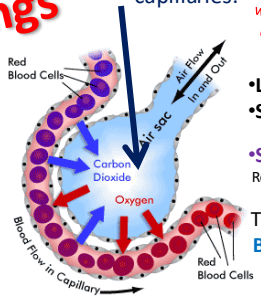


Remember: Red blood cells are **biconcave** discs giving them a **bigger surface area** and have **no nucleus** to fit in more **haemoglobin**. This lets them **carry more oxygen** as **oxyhaemoglobin**.

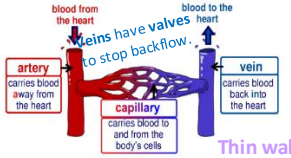
Lungs

Alveoli – Air sacs in the Lungs!

You have loads of these wrapped in capillaries.



Arteries need thick walls as they are under a lot of **pressure!**

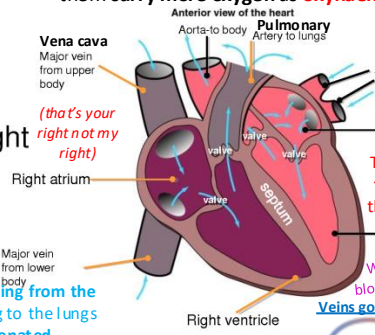


- **Large surface area**
- **Short diffusion pathway** (only one cell between blood and air in lungs)
- **Steep concentration gradient.**

Remember: a substance will move from where there's a lot to where there's a little.

This is helped with **good blood supply** and **Breathing** (to take absorbed oxygen away-bring CO_2 to lungs / to replace the oxygen as its absorbed and remove CO_2)

Thin walls to increase rate of diffusion of O2 CO2 glucose and water



The heart has values to stop the blood flowing backwards

The blood coming **from the lungs** and going to the body is **oxygenated**.

When **ventricles contract** blood is force out of the heart

Veins go away from your heart

The blood **coming from the body** and going to the lungs is **deoxygenated.**

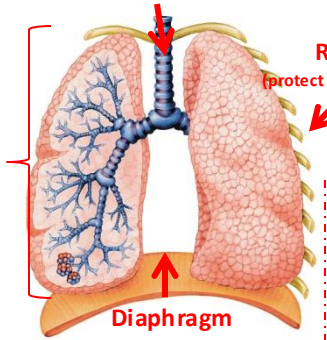
Arteries go toward your heart

Remember: You have a **double circulatory system**. Blood goes through your heart twice during one circuit.

Respiration

Aerobic	Anaerobic
Glucose + O_2 = CO_2 + H_2O + Energy	**Just Glucose** (No Oxygen) = **Lactic Acid+ Energy** (less energy)
Occurs in Mitochondria	Occurs in Cytoplasm

Breathing in (inhalation)
Diaphragm contracts flattens **Intercostal muscles** (Muscles around the ribs) **contract** – moving ribs up and out
Volume of lungs increases – air moves in
Breathing in (exhalation)
Diaphragm relaxes coming up **Intercostal muscles** (Muscles around the ribs) **relax** – moving ribs down and in
Volume of lungs decreases – air moves out

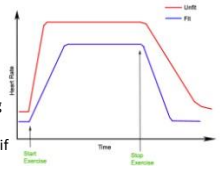


Why respire? Energy to build big molecules from small ones, move muscles and keep you warm.

As I exercise my heart and breathing rate will increase. Glycogen stores will be broken down into glucose. My blood will pump faster.

If you're using your muscle you'll need more glucose and oxygen, you'll produce more CO_2

Remember when describing graphs **compare** the **start, middle and end**. Use figures if you have them.



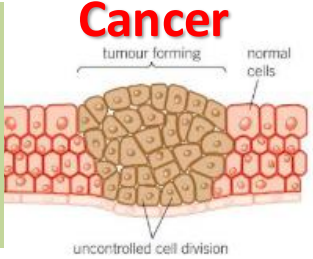
The Main Three Blood Vessels

er long periods of exercise muscles will tire. **Without** sufficient **oxygen** they will respire **anaerobically**. Once exercise is over the **oxygen debt** will have to be repaid to break down the **lactic acid** made.

Biology Paper 1

Malignant tumour – invasive cells, also called cancer. Can spread around the body and affect healthy tissues

Cancer



Benign tumour – abnormal growth of cells, non-invasive but can cause pressure to vital organs

Risk factor	Effects	Diseases
Obesity/poor diet	Sugar levels cannot correctly regulate	Type 2 diabetes
Alcohol	Liver forms scar tissue, affecting function of removing toxins	Liver cirrhosis
Smoking	Particulates cause cells to mutate within the lungs	Lung cancer

Non- Communicable diseases cannot be spread through pathogens. They develop within the body

Developing new drugs

New drugs have to be **tested and trailed** to make sure they are safe.
This means checking they're not toxic and have **no side effects**.

A **PLACEBO** is a pill that contains no drug. This helps doctors see the real effect of a medicine during trails.

Cancer treatments

Radiotherapy
targeted doses of radiation are directed towards the tumour. Prevention of mitosis being carried out.

Chemotherapy
chemicals enter the body to prevent cancerous cells from dividing or cause cells to 'self-destruct'.

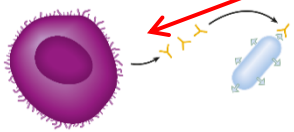
Causes of cancer:
- Genetics (breast and ovarian cancers)
- Mutations (changes in genetic material)
- Radiation exposure (UV & X-ray)
- Viral infections (e.g. HPV)
- Lifestyle (smoking etc)

They must be used with along with a healthy lifestyle to be effective.
Some people say they suffer side effect from taking them.

Statins
Lower the cholesterol in the blood and reduce the risk of cardiovascular disease

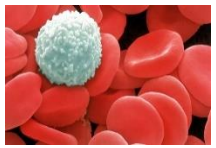
Immunity is when your body has learnt how to make the **antibodies** needed to kill a pathogen you've had before. ***This means you get better quickly the second time.***

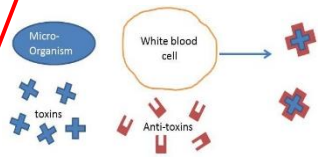
Prescribed and non-prescribed drugs can only be tested properly in **double-blind tests.**



White blood cell defence

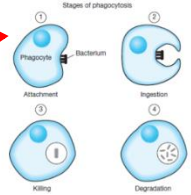
Producing antibodies – specific to certain pathogens, attach to pathogen antigens to prevent disease spread

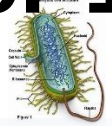




White blood cells produce antitoxins. These counteract any toxins released by pathogens

Phagocytosis – engulf and digest invading pathogens





Communicable diseases are transferable between organisms. Caused by pathogens

Beware! Some people cant be vaccinated and **media scares** can also be a problem.

Small amounts of dead or inactive pathogens can be used to create a **vaccine**. **Vaccinations** work against bacteria and viruses.

Painkillers only treat the symptoms – they can't kill the pathogen

Pathogen	EG in animals	EG in plants
Virus	HIV/AIDS	Tobacco mosaic
Bacteria	Salmonella	Agrobacterium
Fungi	Athletes foot	Rose black spot
Protists	Malaria	Downy mildew

Overuse of has lead to more bacteria becoming **resistant to antibiotics**

Antibiotics only work on Bacteria! Not viruses!

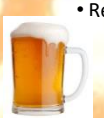
Antibiotics cant get into you cells!

First Lines of Defence

Pathogens = Infectious Disease

Both micro-organisms

Bacteria
- Reproduce rapidly
- Make toxins
- Very small



Useful for making cheese, beer and medicines

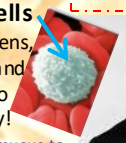
Viruses
- Reproduce inside your cells
- Damage your cells
- Very very small

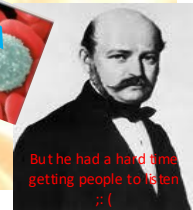
Mutations create new strains which are difficult to treat!
Epidemic = Disease spreading in **one country**
Pandemic = Disease spreading across **several countries**

Semmelweis knew that to stop disease spreading hand washing was important

White Blood Cells
Ingest (eat) pathogens, make antibodies and anti-toxins. All to define your body!

You also have skin and mucus to keep you safe. And your blood clots when you bleed.





But he had a hard time getting people to listen :(

Pathogens can spread by:
- Droplet infection
- Direct contact
- Break in skin
- Contaminated food or drink

Growing your own bacteria

You will need:
- Sterilised Petri Dishes
- Agar jelly (for food)
- An inoculating loop
- An oven at 25°C (higher could cause dangerous pathogens to grow)
- A few days to spare while they grow

Uncontaminated cultures let us investigate the effects of drugs and disinfectants.

Risk factors for communicable diseases:
- Lifestyle
- Environmental exposure

Casual mechanism – the explanation of how one factor influences another through biological processes.