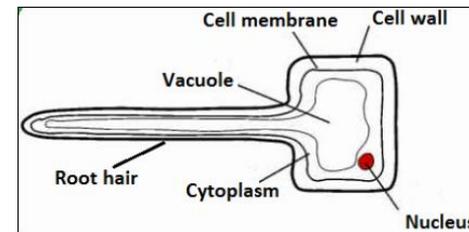
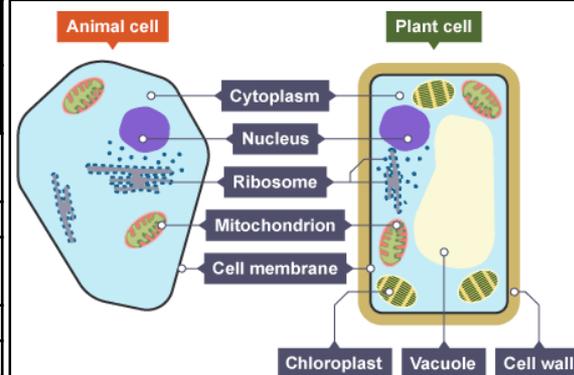




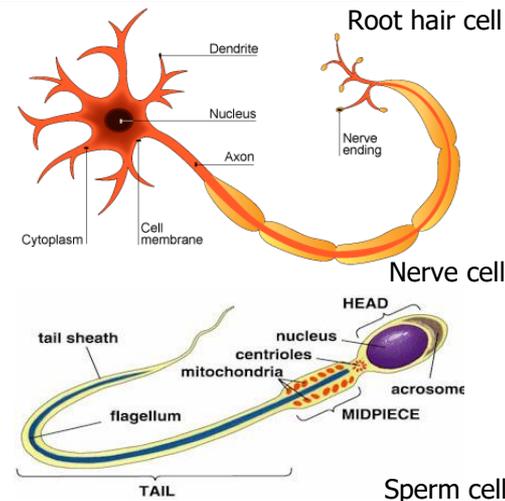
### Section 1: Cell Structure

Cell Structure	Function	Eukaryotic		Prokaryotic
		Animal Cells	Plant Cells	Bacterial Cells
Nucleus	Contains <b>genetic information</b> that <b>controls</b> the functions of the cell.	Y	Y	
Cell membrane	Controls what <b>enters</b> and <b>leaves</b> the cell.	Y	Y	Y
Cytoplasm	Where many <b>cell activities</b> and <b>chemical reactions</b> within the cell occur.	Y	Y	Y
Mitochondria	Provides <b>energy</b> from <b>aerobic respiration</b> .	Y	Y	
Ribosome	<b>Synthesises</b> (makes) <b>proteins</b> .	Y	Y	Y
Chloroplast	Where <b>photosynthesis</b> occurs.		Y	
Permanent vacuole	Used to <b>store</b> water and other chemicals as <b>cell sap</b> .		Y	
Cell wall	<b>Strengthens</b> and <b>supports</b> the cell. (Made of <b>cellulose</b> in plants.)		Y	Y
DNA loop	A loop of <b>DNA</b> , not enclosed within a nucleus.			Y
Plasmid	A <b>small circle of DNA</b> , may contain <b>genes</b> associated with antibiotic resistance.			Y



### Section 2: Specialised Cells

Specialised Cell	How structure relates to function
Sperm cell	<b>Acrosome</b> contains <b>enzyme</b> to break into egg; <b>tail</b> to swim; many <b>mitochondria</b> to provide <b>energy</b> to swim.
Nerve cell	<b>Long</b> to <b>transmit electrical impulses</b> over a distance.
Muscle cell	Contain <b>protein fibres</b> that can <b>contract</b> when energy is available, making the cells shorter.
Root hair cell	Long extension to <b>increase surface area</b> for water and mineral uptake; <b>thin cell wall</b> .
Xylem cell	<b>Waterproofed</b> cell wall; cells are <b>hollow</b> to allow water to move through.
Phloem cell	Some cells have lots of <b>mitochondria for active transport</b> ; some cells have very little cytoplasm for sugars to move through easily.



# KNOWLEDGE



# Biology Topic B1 Cell Structure and Transport

# ORGANISER

## Section 3: Microscopy

Magnification	The degree by which an object is <b>enlarged</b> . <b>Magnification = <math>\frac{\text{size of image}}{\text{size of real object}}</math></b>
Resolution	The ability of a microscope to <b>distinguish detail</b> .
Light microscope	Basic microscope with a maximum magnification of 1500x. <b>Low resolution.</b>
Electron microscope	Microscope with a much <b>higher magnification</b> (up to 500 000x) and resolving power than a light microscope. This means that it can be used to study cells in much finer detail.

## Section 4: Orders of Magnitude

Unit Prefix	Size in metres	Standard Form
Centimetre (cm)	0.01m	$10^{-2}\text{m}$
Millimetre (mm)	0.001m	$10^{-3}\text{m}$
Micrometre ( $\mu\text{m}$ )	0.000001m	$10^{-6}\text{m}$
Nanometre (nm)	0.000000001m	$10^{-9}\text{m}$

## Section 7: Transport Across Membranes

Cell Structure	Definition	Uses
Diffusion	<b>Spreading</b> out of the particles (gas/ solution) resulting in a <b>net movement</b> from an area of <b>higher concentration</b> to an area of <b>lower concentration</b> .	<b>Oxygen</b> and <b>carbon dioxide</b> in <b>gas exchange</b> (leaves and alveoli). <b>Urea</b> from <b>cells</b> into the <b>blood plasma</b> for excretion in the kidney.
Osmosis	The diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane.	Movement of water into and out of cells.
Active Transport	The movement of substances from a more dilute solution to a more concentrated solution (against a concentration gradient). Requires energy from respiration.	<b>Absorption</b> of <b>mineral ions</b> (low concentration) from soil into <b>plant roots</b> . <b>Absorption</b> of <b>sugar molecules</b> from lower concentrations in the <b>gut</b> into the <b>blood</b> which has a higher sugar concentration.

## Section 8: Factors Affecting Diffusion

Factor	Explanation
Difference in concentrations ( <b>concentration gradient</b> )	The greater the difference in concentrations, the faster the rate of diffusion.
<b>Temperature</b>	Particles move more quickly at higher temperatures, so rate of diffusion increases.
<b>Surface area</b> of membrane	The greater the surface area the quicker the rate of diffusion.

## Section 9: Adaptations of Exchange Surfaces

<b>Large surface area</b>
<b>Thin membrane</b> to provide a <b>short diffusion path</b>
<b>Ventilation</b> (in animals for gas exchange – maintains a concentration gradient)
<b>Efficient blood supply</b> (in animals – maintains a concentration gradient)



**Section 3: Microscopy**

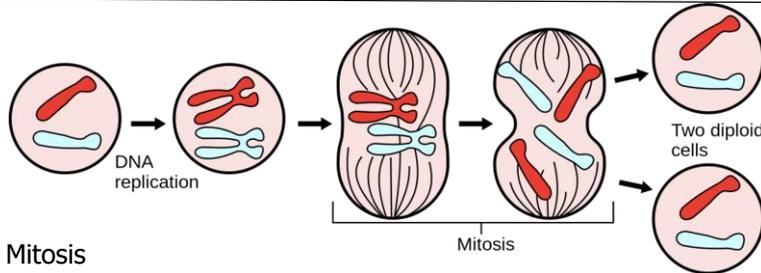
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**Section 5: Mitosis and the Cell Cycle**

- Number of **sub-cellular structures** (e.g. **ribosomes** and **mitochondria**) **increase**.
- Number of **chromosomes double**.
- One set of **chromosomes** is **pulled** to each end of the cell.
- The **nucleus divides**.
- Cytoplasm** and **cell membranes divide** to form two **identical** cells

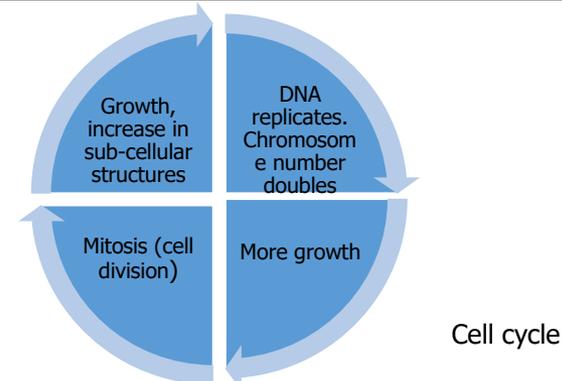


**Section 6: Stem Cells**

Stem Cell	Properties	Uses
Embryonic stem cell	Can divide into <b>most types</b> of cell.	<b>Therapeutic cloning</b> – embryonic stem cells produced with same genes as patient. <b>No rejection.</b>
Adult stem cell	Can divide into a <b>limited number of cells</b> e.g. bone marrow stem cells can form various blood cells.	
Meristem	Found in plants. Can differentiate (divide) into <b>any type</b> of plant cell.	<b>Clone</b> rare species to <b>prevent extinction</b> . <b>Crops</b> with <b>special features</b> can be clones

**Pros and Cons of Using Stem Cells**

Pros	<b>Treatment of diseases</b> such as diabetes, dementia and paralysis.
Cons	<b>Ethical</b> and <b>religious</b> objections. Can <b>transfer viruses</b> held within cells.





# Biology Topic B3

## Organisation and the digestive system

### KNOWLEDGE

### ORGANISER

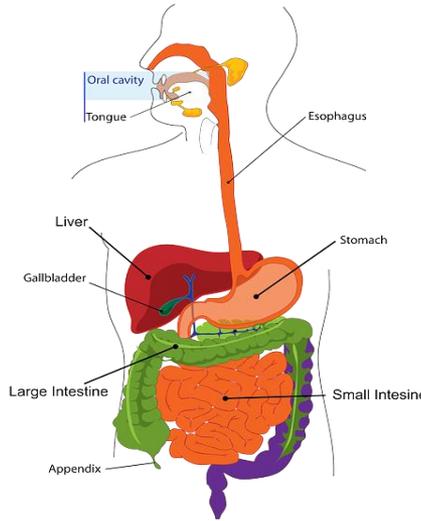
#### Section 1: Organisation

Tissue	A <b>group of cells</b> with a <b>similar structure and function</b> e.g. muscle tissue
Organ	A <b>group of tissues</b> performing a specific <b>function</b> e.g. heart, leaf
Organ System	A <b>group of organs</b> that perform a specific <b>function</b> e.g. digestive system.

#### Section 2: Human Digestive System

4 Order of movement of food through the digestive system:

<b>Mouth</b>	<b>Many</b>
<b>Oesophagus</b>	<b>Ordinary</b>
<b>Stomach</b>	<b>Students</b>
<b>Small intestine</b>	<b>Struggle</b>
<b>Large intestine</b>	<b>Learning and</b>
<b>Rectum</b>	<b>Remembering</b>
<b>Anus</b>	<b>Answers</b>



#### Section 3: Enzymes Key Terms

Enzyme	A <b>biological catalyst</b> that can <b>speed up the rate of reaction</b> without being used itself. Made of a large <b>protein molecule</b> .
Substrate	The <b>chemical that fits into</b> the <b>active site</b> of an enzyme.
Lock and Key Model	Only <b>one type of substrate</b> can <b>fit into the active site</b> of an enzyme, like a key fits into a lock.
Denatured	When the <b>active site of an enzyme changes shape</b> and the <b>substrate can no longer fit in</b> . Can be caused by <b>pH</b> or <b>temperature</b> .

#### Section 5b: Other Chemicals

Hydrochloric Acid	Acid with pH of 2 produced by the stomach. <b>Unravels proteins</b> .
Bile	<b>Emulsifies fats</b> (turns them into droplets to give a greater surface area). It is <b>alkaline</b> so <b>neutralises acid from the stomach</b> . <b>Produced in liver, stored in gall bladder</b> and is <b>released into the small intestine</b> .

#### Section 4: Testing for Biological Molecules

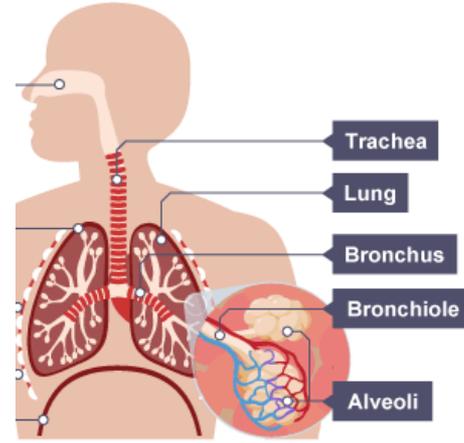
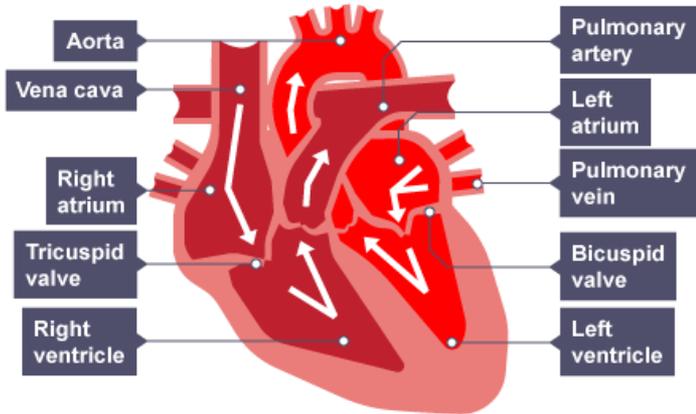
Molecule	Chemical Test	Positive Result
Starch	Add orange/brown <b>iodine solution</b> .	Colour turns to <b>blue/black</b> .
Sugar	Add blue <b>Benedict's solution</b> . Place in a <b>boiling water bath for 5 minutes</b> .	Colour turns <b>green/ yellow/ orange/ brick red</b> .
Protein	Add blue <b>Biuret solution</b> .	Colour turns to <b>lilac/ purple</b> .
Lipid	Add <b>ethanol</b> and decant into <b>water</b> .	<b>Cloudy white emulsion</b> .

#### Section 5a: Human Digestive Enzymes

Enzyme	Function	Sites of production	Sites of action
Amylase	Breaks <b>starch</b> into <b>sugars</b> .	Salivary glands Pancreas Small intestine	Mouth Small intestine
Protease	Breaks <b>proteins</b> into <b>amino acids</b> .	Stomach Pancreas Small intestine	Stomach Small intestine
Lipase	Breaks <b>lipids (fats)</b> into <b>fatty acids and glycerol</b> .	Pancreas Small intestine	Small intestine



Section 6: Heart and Lungs



Section 6a: Structures in the Heart

Pacemaker	Group of cells in the <b>right atrium</b> that controls <b>resting heart rate</b> .
Right ventricle	Pumps <b>deoxygenated blood</b> to the <b>lungs</b> for <b>gas exchange</b> .
Left ventricle	Pumps <b>oxygenated blood</b> to the <b>body</b> . <b>Thick, muscular wall</b> .
Valve	Stops blood flowing the <b>wrong way</b> / leaking.

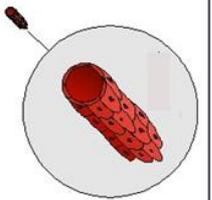
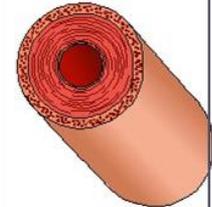
Section 6b: Structures in the Lungs

Alveoli	Small sacs where <b>gas exchange</b> occurs. <b>Surrounded by capillaries</b> . <b>Oxygen moves from the alveoli into the capillaries</b> , carbon dioxide moves from the capillaries into the alveoli
Trachea and Bronchi	Tubes through which gases move. <b>Lined with cartilage</b> so they don't collapse.

Section 8: Components of the Blood

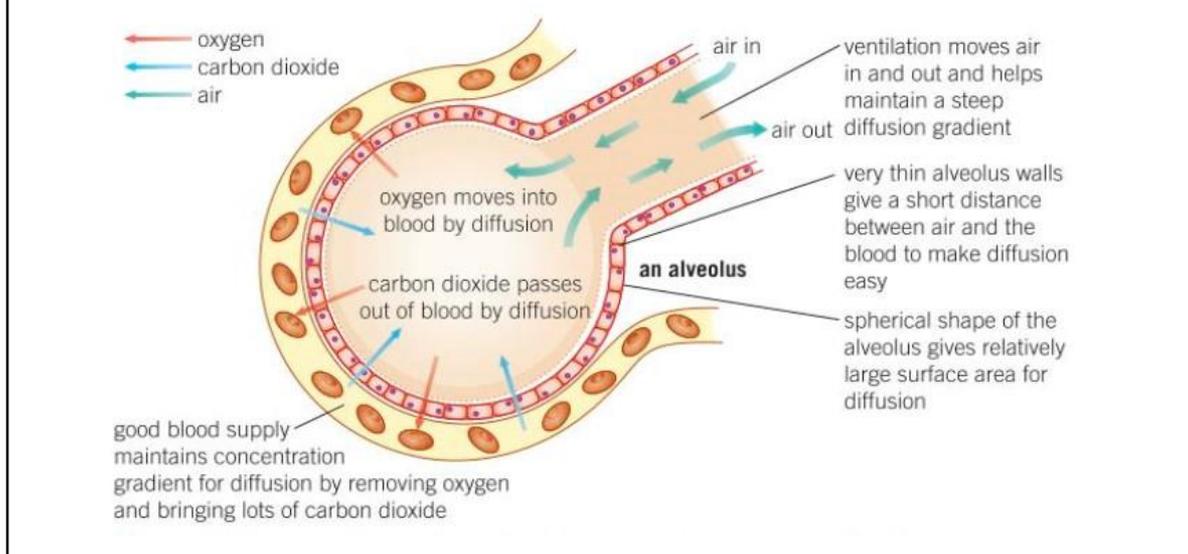
Plasma	<b>Liquid</b> part of the blood. Transports blood cells as well as <b>carbon dioxide, proteins, glucose, hormones</b> and <b>urea</b> .
Red Blood Cells	<b>Carries oxygen</b> . Packed with <b>haemoglobin</b> , a protein that binds to oxygen. <b>No nucleus</b> to create extra space for haemoglobin. <b>Biconcave shape</b> to give a <b>large surface area</b> .
White Blood Cells	<b>Destroy pathogens</b> . Some can produce <b>antibodies</b> .
Platelets	Cell fragments that help to <b>clot wounds</b> .

Adaptations	<b>Thick wall to withstand high pressure</b>	<b>Thin wall. Valves to prevent backflow of blood.</b>	<b>Wall is one cell thick to allow quick diffusion of substances.</b>
Purpose	<b>Takes blood away from the heart.</b>	<b>Takes blood back to the heart.</b>	<b>Exchange of substances between blood and cells.</b>
	<b>Artery</b>	<b>Vein</b>	<b>Capillary</b>

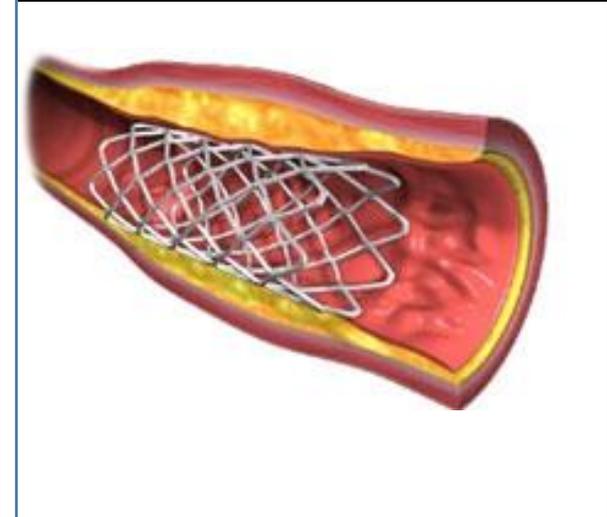




**Section 9: How gases get exchanged in the alveoli.**



**Section 11: How a stent is positioned in an artery**



**Section 10: Heart Disease**

Coronary Heart Disease	Build up of <b>fatty material in coronary arteries</b> . Can lead to a <b>blood clot</b> and a <b>heart attack</b> .		
Treatment	What it is	Advantage	Disadvantage
Stent	<b>Wire mesh that opens up a blocked artery.</b>	Keeps artery open. Low-risk surgery.	Fatty material can rebuild.
Statin	Drug that <b>reduces cholesterol</b> .	Reduces fat being deposited in arteries.	Side effects e.g. liver damage.
Heart transplant	<b>Replacement heart</b> from a donor.	Long-term.	Major surgery. Could be rejected.
Artificial heart	<b>Man-made heart</b> used while <b>waiting for a transplant</b> .	Not rejected. Keeps patient alive.	Short life-time. Battery has to be transported. Limited activity.
Mechanical heart valve	Mechanical replacement of faulty heart valve.	Can last a life-time.	Can damage red blood cells.
Biological heart valve	Biological replacement of faulty heart valve.	Don't damage red blood cells.	Valve hardens and may need replacing.

# KNOWLEDGE



## Biology Topic B4 Organising in Plants and Animals

# ORGANISER

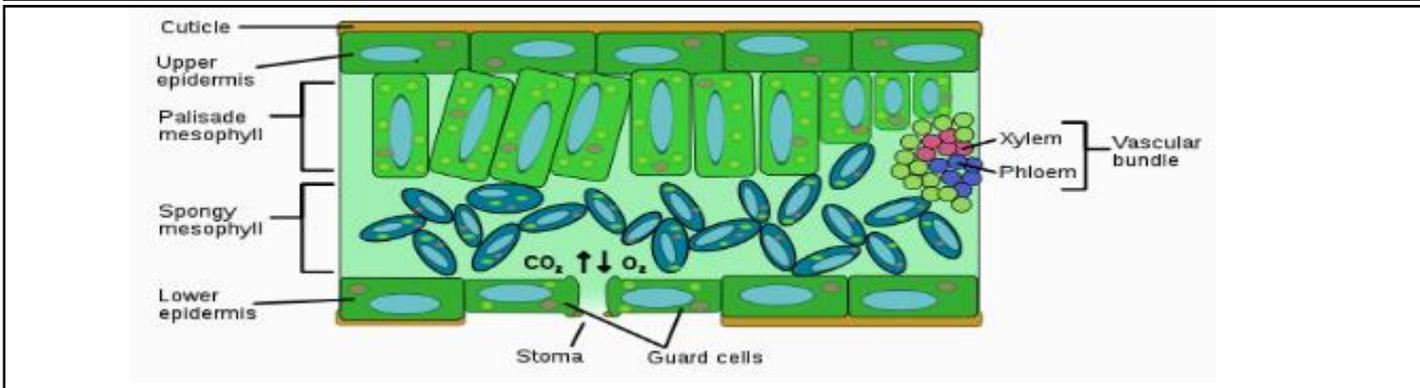
### Section 10a: Movement within Plants

Transpiration	The <b>loss of water vapour</b> from the leaves by <b>evaporation from cells</b> and then out through the <b>stomata</b> .
Transpiration Stream	The <b>movement of water</b> from the <b>roots</b> , up the stem to the <b>leaves</b> .
Translocation	The <b>movement of dissolved sugars</b> around the plant.

### Section 10b: Factors Affecting Transpiration

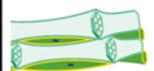
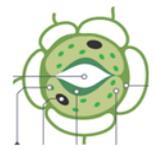
Temperature	Increasing temperature <b>increases the transpiration rate</b> as water evaporates quickly.
Humidity	Increasing humidity <b>decreases the rate of transpiration</b> as water evaporates slowly.
Wind speed	Increasing wind speed <b>increases the transpiration rate</b> as water evaporates quickly.
Light	Increasing light <b>increases the rate of transpiration</b> as <b>stomata open</b> .

### Section 11: Leaf Structure and Plant Tissues



Epidermis	<b>Cover</b> the <b>surfaces</b> of the leaf; lets <b>light penetrate</b> . 59
Xylem	<b>Carries water</b> and <b>minerals</b> from the roots around the plant.
Phloem	<b>Carries dissolved sugars</b> made through photosynthesis around the plant. 6
Palisade mesophyll	Where <b>most photosynthesis</b> takes place. Cells contain <b>many chloroplasts</b> . <b>Absorbs light</b> .
Spongy mesophyll	<b>Some photosynthesis</b> . Has <b>air spaces</b> for <b>diffusion</b> of CO <sub>2</sub> and O <sub>2</sub> .
Guard cells	Cells that <b>open</b> and <b>close stomata</b> .
Stoma	<b>Opening</b> that allows <b>CO<sub>2</sub> and O<sub>2</sub></b> to <b>diffuse</b> in and out of the leaf.

### Section 12: Cell Adaptations for Movement Within Plants

Root hair cell	
Extension gives a large surface area to absorb water and minerals.	
Xylem	
Vessels are strengthened by lignin to withstand pressure.	
Cell walls are waterproof.	
Phloem	
End of cells contain pores to allow dissolved sugars to move between cells.	
Guard Cells and Stoma	
Guard cells can open the stoma to allow gas exchange or close to prevent water loss.	

# KNOWLEDGE



# Biology Topic B5 + B6 Communicable Diseases

# ORGANISER

## Section 1: Pathogens and Diseases

Disease	Pathogen	How it is spread	Effect	Prevention/Control
Measles	Virus	Droplets from sneezes and coughs	Can be fatal	Vaccination of children
HIV	Virus	Sexual contact, needle exchange	Damages some white blood cells	Antiretroviral drugs when infected
Tobacco Mosaic Virus	Virus	Direct contact	Mottling of leaves, reduces photosynthesis	
Salmonella	Bacteria	Infected food	Fever, abdominal cramps, diarrhoea, vomiting	Vaccination of poultry (chickens).
Gonorrhoea	Bacteria	Sexual contact	Discharge from penis/ vagina, pain when urinating	Controlled by antibiotics. Spread prevented by condoms.
Rose Black Spot	Fungus	Spores carried by water or wind	Leaves turn yellow, fall early. Photosynthesis reduced.	Treated by fungicides or destroying affected leaves.
Malaria	Protist	By a vector – mosquito	Fever, can be fatal.	Preventing mosquitos from breeding, using mosquito nets.

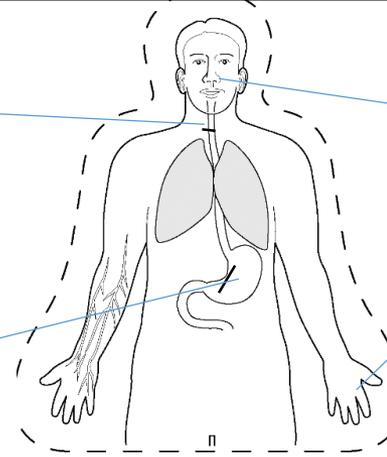
## Section 2: Non-Specific Defences

### Trachea and Bronchi

Produces **mucus** to **trap pathogens**. Contains **cilia** to **move mucus** for swallowing

### Stomach

Contains **hydrochloric acid** to destroy pathogens.



### Nose

Contains **hairs** and **mucus** to **trap pathogens**

### Skin

A **physical barrier** to pathogens.

## Section 3: Key terms

Pathogen	A <b>microorganism</b> that <b>causes disease</b> .
Bacteria	A type of <b>pathogen</b> that <b>produces toxins</b> that <b>damage tissues</b> .
Viruses	A type of <b>pathogen</b> that <b>lives and replicates within cells</b> and causes <b>cell damage</b> . It is <b>difficult to kill viruses without damaging cells</b> .
Antibodies	Some white blood cells (lymphocytes) produce antibodies. These <b>bind to pathogens</b> and <b>destroy them</b> or <b>stick them together</b> .
Antitoxins	Some white blood cells (lymphocytes) produce antitoxins. Antitoxins <b>neutralise toxins</b> .
Antibiotics	Antibiotics <b>kill bacteria</b> . <b>Specific antibiotics</b> should be used for <b>specific bacteria</b> . <b>Some bacteria are resistant</b> to antibiotics. <b>Do not kill viruses</b> .
Painkillers	Painkillers <b>relieve symptoms</b> but <b>don't kill pathogens</b> .
Phagocytosis	Some white blood cells (phagocytes) <b>engulf pathogens</b> .



**Section 4: Preventing Infections**

Hygiene	Hand washing, disinfectants on work surfaces, keeping raw meat away from food
Isolation of infected individuals	Infected individuals kept separate from healthy individuals
Destroying and controlling vectors	By killing or controlling vectors e.g. mosquitos, aphids, rodents etc the spread of disease is reduced
Vaccination	Body is injected with a small amount of inactive pathogen. If you are infected your body has developed immunity to the pathogen.

**Section 6: Clinical Trials**

Trial Stage	Purpose
Preclinical – cells, animals	Test for <b>toxicity</b> and <b>efficacy</b> before testing humans
Healthy volunteers	<b>Very low doses</b> to test for <b>toxicity</b> .
Patients	Larger groups. Test for <b>toxicity, efficacy</b> and <b>dose</b> . <b>Placebos</b> may be used in a <b>double-blind trial</b> .

**Clinical Trial Key Terms**

Placebo	A drug with <b>no active ingredients</b> , designed to <b>mimic a real drug</b> . Used to test if the effects of a drug on a patient are just <b>psychological</b> .
Double-blind trial	The volunteers do not know which group they are in, and neither do the researchers, until the end of the trial
Toxicity	How <b>harmful</b> the drug is. May have dangerous <b>side effects</b> .
Efficacy	How <b>effective</b> the drug is.
Dose	The <b>amount</b> of the drug given to the patient.

**Section 5: Ways in which white blood cells destroy pathogens**

Role of white blood cell	How it protects you against disease
<p><b>Ingesting microorganisms</b></p>	Some white blood cells ingest (take in) pathogens, digesting and destroying them so they cannot make you ill.
<p><b>Producing antibodies</b></p>	Some white blood cells produce special chemicals called antibodies. These target particular bacteria or viruses and destroy them. You need a unique antibody for each type of pathogen. When your white blood cells have produced antibodies once against a particular pathogen, they can be made very quickly if that pathogen gets into the body again. This stops you getting the disease twice.
<p><b>Producing antitoxins</b></p>	Some white blood cells produce antitoxins. These counteract (cancel out) the toxins released by pathogens.

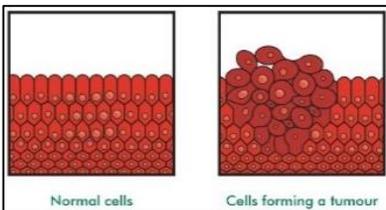
**Section 7:**

Drugs from plants	Traditionally drugs were extracted from plants
Penicillin	Discovered from penicillium mould



**Section 1: Key Definitions**

<b>Non-communicable disease</b>	Long term or slow progressing disease not caused by infectious pathogens.
<b>Risk factor</b>	Characteristic or exposure that increases the likelihood of developing a disease.
<b>Correlation</b>	When one thing changes when the other one does. e.g more tomatoes eaten, less heart disease.
<b>Casual Link/Cause:</b>	When one factor changes, the other one changes as well and there is evidence to show that the change of one factor actually causes the other to change
<b>Cancer</b>	Non-communicable disease caused by uncontrolled cell division.
<b>Causes of cancer</b>	Ionizing radiation e.g Gamma Rays, Viral infection, Chemicals in food or cigarette, Inherited mutations in the gene.
<b>Casual Link/Cause:</b>	When one factor changes, the other one changes as well and there is evidence to show that the change of one factor actually causes the other to change
<b>Causes of cancer</b>	Ionizing radiation e.g Gamma Rays, Viral infection, Chemicals in food or cigarette, Inherited mutations in the gene.
<b>Benign tumours</b>	Form in one place and do not spread to other tissues
<b>Malignant tumours</b>	May spread to different tissues and form secondary tumours
<b>Lifestyle risk factors for cancer</b>	Smoking, obesity, common viruses and UV light. Genetic factors are also risks for some cancers.
<b>Carcinogens</b>	Agents that cause cancer or increase the risk of causing cancer
<b>Ionizing radiation</b>	Radiation that penetrates the cells and damages chromosomes, causing mutations in the DNA.
<b>Treating cancer</b>	Radiotherapy – cancer cells are destroyed by targeted doses of radiation Chemotherapy – chemicals are used to stop cancer cells dividing or causing the cancer cells to 'self destruct'.
<b>Smoking</b>	Can cause heart disease and lung cancer Fetus exposed to smoke has restricted oxygen, which can lead to premature birth, low birthweight, and stillbirth Tobacco smoke contains carbon monoxide (a poisonous gas) and nicotine (addictive chemical)
<b>Diet</b>	Affects risk of developing cardiovascular diseases through cholesterol levels and through obesity. Obesity is a risk factor for type 2 diabetes Lack of exercise is a risk factor for type 2 diabetes
<b>Alcohol</b>	Can damage the liver and cause cirrhosis and liver cancer Can cause brain damage and death Alcohol taken by pregnant women can affect the development of the unborn baby



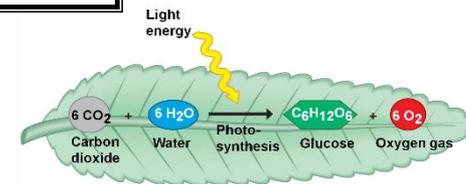
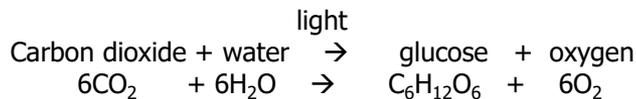
# KNOWLEDGE



# Biology Topic B8 Photosynthesis

# ORGANISER

## Section 1: Photosynthesis Equation



## Section 2: Key terms

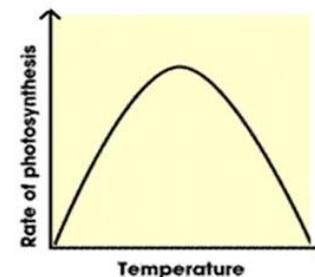
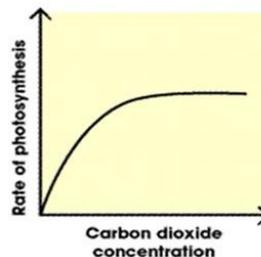
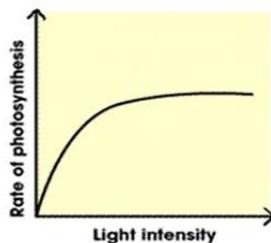
Chloroplast	The plant <b>organelle</b> where <b>photosynthesis</b> takes place.
Chlorophyll	The <b>green pigment</b> that <b>absorbs energy from light</b> .
Endothermic	Photosynthesis <b>takes energy</b> in (in the form of <b>light</b> ). It is an endothermic reaction.
Diffusion	<b>The spreading out of particles by random motion from where they are in high concentration to a low concentration. Occurs in gases and liquids.</b>

## Section 3: Uses of Glucose

- Used in **respiration** to release **energy**.
- Converted into **starch** for **storage**.
- Converted into **fats** and **oils** for **storage**.
- Produce **cellulose** to **strengthen** the **cell wall**.
- Produce **amino acids** to **make proteins** (also needs nitrate ions from the soil)

## Section 4: Limiting Factors

Limiting Factor	The factor that stops the rate of photosynthesis from increasing; could be light intensity, CO <sub>2</sub> concentration, temperature or amount of chlorophyll.
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### Light Intensity

Initially light is the limiting factor. When the graph plateaus something else (e.g. CO<sub>2</sub> concentration, temperature) is limiting the rate.

### CO<sub>2</sub> concentration

Initially CO<sub>2</sub> concentration is the limiting factor. When the graph plateaus something else (e.g. light intensity, temperature) is limiting the rate.

### Temperature

As temperature increases, the rate of photosynthesis increases. Above the optimum there is a decrease in photosynthesis. Enzymes needed for photosynthesis become denatured.



**Section 5: Respiration**

Energy	Energy in organisms is needed for <b>chemical reactions to build larger molecules, movement and keeping warm.</b>
Aerobic Respiration	Aerobic respiration <b>provides energy.</b> It requires <b>oxygen.</b> It is an <b>exothermic</b> reaction (produces heat). In <b>mitochondria.</b>  <b>Glucose + oxygen → carbon dioxide + water (+energy)</b> <b>C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> + 6O<sub>2</sub> → 6CO<sub>2</sub> + 6H<sub>2</sub>O (+energy)</b>
Anaerobic Respiration (muscles)	<b>No oxygen</b> needed. Provides <b>less energy</b> than aerobic respiration as glucose <b>not fully oxidised.</b> Occurs during <b>intensive exercise.</b> In <b>cytoplasm.</b> <b>Glucose → lactic acid</b>
Lactic Acid	Produced in <b>anaerobic respiration in muscles.</b> <b>Build up</b> of lactic acid <b>causes fatigue.</b> Lactic acid must be <b>taken to the liver by the blood</b> so that it can be <b>oxidised back to glucose.</b>
Oxygen Debt	The <b>amount of extra oxygen</b> the body needs <b>after exercise</b> to <b>react with the lactic acid</b> and remove it.
Anaerobic Respiration (plant and yeast cells)	<b>No oxygen</b> needed. In yeast cells it is called <b>fermentation</b> – economically important for manufacture of <b>bread</b> and <b>alcoholic drinks.</b> In <b>cytoplasm.</b> <b>Glucose → ethanol + carbon dioxide</b>

**Section 5: Response to Exercise**

Increase in breathing rate	Increases rate at which <b>oxygen</b> is taken into the lungs.
Increase in heart rate	Oxygenated blood is pumped around the body at a faster rate. Carbon dioxide is removed at a faster rate.
Increase in breath volume	A <b>greater volume</b> of oxygen is taken in with each breath.

**Section 6a: Metabolism**

Metabolism	The <b>sum of all the reactions</b> in a <b>cell</b> or <b>body.</b> Some of these reactions <b>require the energy released from respiration.</b>
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**Section 6b: Metabolic Reactions**

Conversion of glucose to starch, cellulose or glycogen.
Formation of lipids from glycerol and fatty acids
Use of glucose and nitrates to make amino acids (plants only)
Respiration
Breakdown of proteins to urea

**Section 6a: Metabolism in the liver (Higher)**

Liver	Detoxifies poisonous substances such as ethanol; passes broken down products in the blood so they can be excreted in the urine via the kidneys; converts lactic acid back into glucose.
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