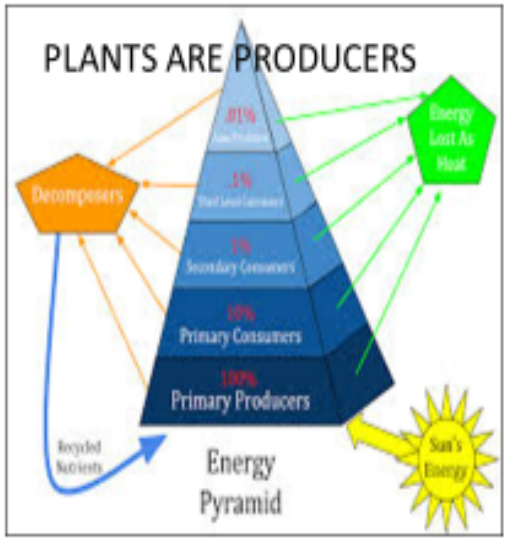
STUDENT TOPIC OVERVIEW Combined Science Year 10 Topic: Plants Structures and their Functions		Duration: 6 lessons	Composite: end of unit test
Key vocabulary: Chloroplasts Chlorophyll Chemosynthetic Biomass Palisade cell Guard cell Stoma Stomata Starch Sucrose Concentration Factor Temperature Intensity Proportion Diffusion Osmosis Translocation Active transport Root hair Xylem Phloem Transpiration Cohesion Capillary action Evaporation Potometer Inverse Proportional	**Core knowledge Components** Know that glucose made via photosynthesis is the basis for all other increases in biomass in organisms. Name and label the main structures in a leaf, and explain how they maximise photosynthesis and/or transpiration Recognise the structural components of stomata Explain from graphical data how limiting factors are affecting the rate of photosynthesis. Explain how rate of photosynthesis is directly proportional to light intensity Know how water enters a plant and is moved around. Describe the specialised structures and function of the root hair cells Explain how plants absorb minerals against a concentration gradient. Describe the route water molecules take to get from root to the leaf Explain what factors affect the rate of transpiration Describe how the products of photosynthesis move around the plant	**Powerful knowledge components crucial to commit to long term memory** **State the chemical equation for photosynthesis** **Identify the cells in the leaf where most photosynthesis occurs.** **State the function of stomata** **State how stomata are involved in transpiration** **Name 3 limiting factors that could reduce the rate of photosynthesis.** **Know that the rate of photosynthesis can be measured by pH change** **Name the processes which occur when water & minerals enter a root hair cell.** **Give one adaptation of a root hair cell.** **Know what is carried in the phloem** **Know that this process is called translocation** **Know 1 structural adaptation of phloem vessels** **Know what is carried in the xylem** **Know that this process is called transpiration** **Know that rate of transpiration can be measured using a potometer** **Know 1 structural adaptation of xylem vessels**	**Links to previous and future topics** **Yr7 Cells, Ecology** **Yr8 Plants** **Yr10 key concepts** **Yr9 Photosynthesis**

Impressive reading	Impressive speaking	Impressive writing	Resilience	Employability and Careers via:
• Culture capital articles	• Able to verbalise during questioning using key words.	• Writing clear conclusions and evaluations from practical.	Interpreting abstract concepts and evaluating data from graphs.	**Employability**: Collaboration, using data, following instructions. **Careers**: Gardener, farmer, agricultural scientist, florist. All need to know how to make plants grow well and survive.
Culture Capital: Uses of essential oils Resurrection plants				

SEND			
Communication & Interaction	**Cognition & Learning**	**SEMH**	**Physical/Sensory**
• Unambiguous terms and clear language used is presentations/handouts • Unambiguous terms and clear language used by teacher • ADHD pupils are given instructions directly by use of their names • Use of post-it plans to help pupils work through a task	• Chunking of activities into manageable portions, so as not to lead to cognitive overload • Use of low stakes/high gains activities for knowledge recall • Topics are mapped out visually for pupils to see • Links to previous learning established	• Consideration to seating positions • Awareness of specific pupil triggers • Communication channels kept open	• Consideration to seating positions • Clear access for physically compromised pupils • Opportunities for different sensory learning activities threaded into topics

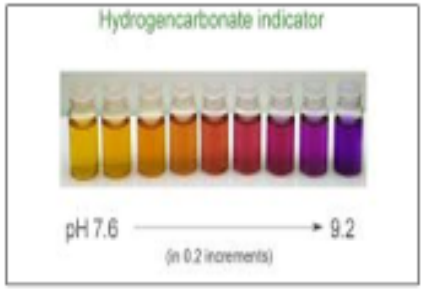
Yr10 Combined science
Plants Function Structure
KNOWLEDGE ORGANISER

PLANTS ARE PRODUCERS



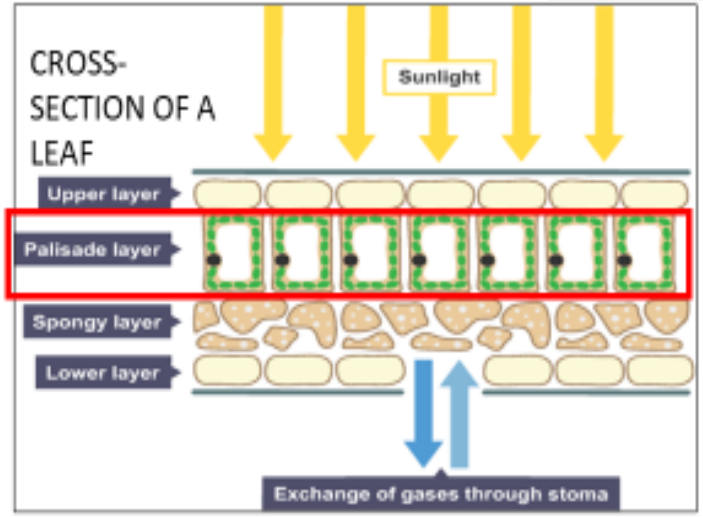
Plants, animals & selected other photosynthetic organisms are known as producers as they are ***autotrophic***. Making their own food using energy from the sun, they pass this energy on up the food chain's trophic levels.

Photosynthesis	*Plants make use of light energy from the environment (ENDOTHERMIC) to make food (glucose)*	Carbon dioxide + Water → Oxygen + Glucose $CO_2 + H_2O \rightarrow O_2 + C_6H_{12}O_6$



CORE PRACTICAL: algal balls are placed in hydrogen carbonate indicator, which indicates rate of photosynthesis due to a fall in pH (as CO2 is acidic in solution). The more photosynthesis that occurs, the lower the pH.

CROSS-SECTION OF A LEAF



Light intensity is varied with changing distance to a lamp.

The inverse square law

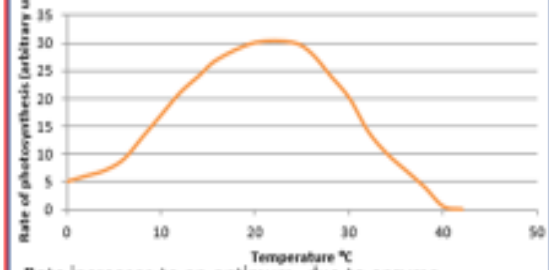
This is the 'proportional to' symbol.

$$\text{light intensity} \propto \frac{1}{\text{distance (d)}^2}$$

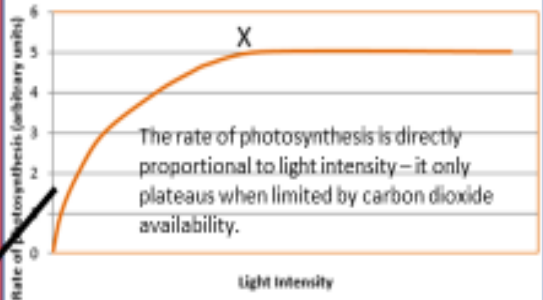
Putting one over the distance shows the inverse

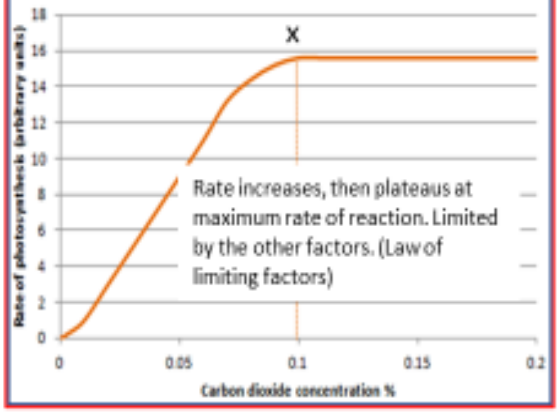
The distance is squared.

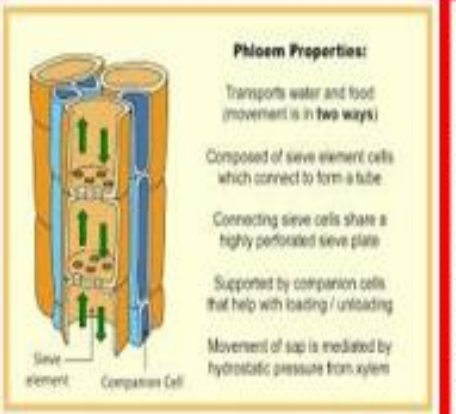
THE 3 LIMITING FACTORS OF PHOTOSYNTHESIS



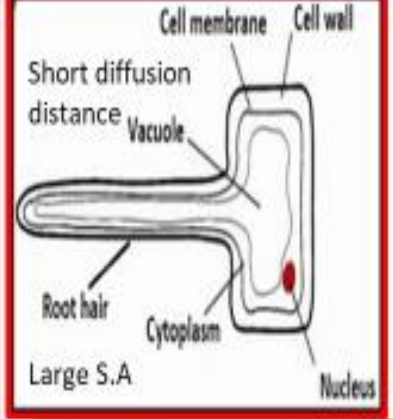
Rate increases to an optimum, due to enzyme reactions. Decreases if temperature is too high, due to denaturation.



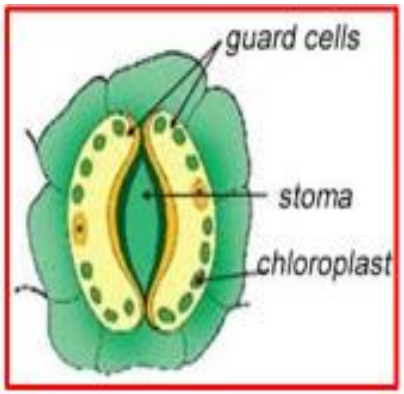




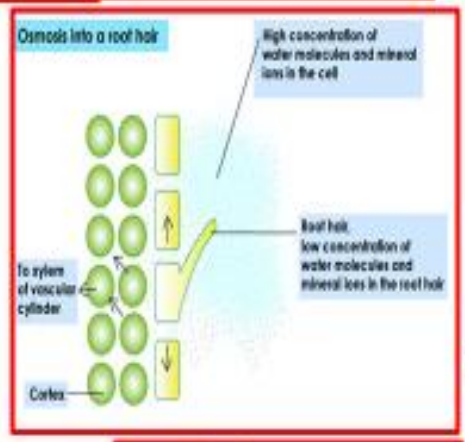
GETTING WATER IN AT THE ROOT:
The specially adapted root hair cells actively transport mineral ions in, which causes water to follow by osmosis. The water molecules move across the root and enter the xylem.

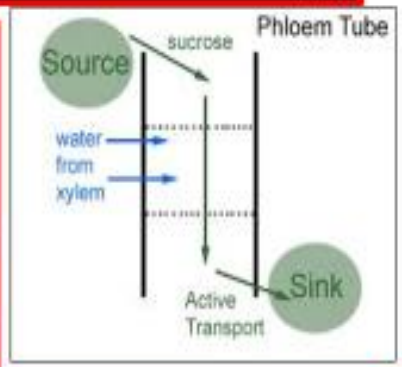


Stomata open to allow gas exchange (CO_2 in, O_2 out) for photosynthesis. Also water vapour to exit to mobilise the transpiration stream. Guard cells swell and open the pore.

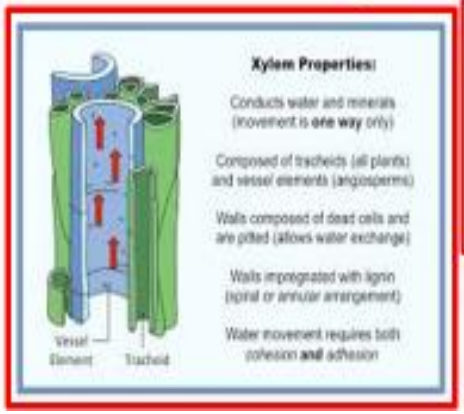


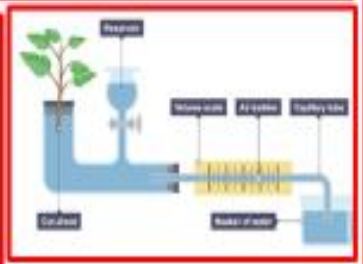
TRANSPORT IN PLANTS:
Plants have 2 separate systems of tubes inside for transport. Xylem is used to transport water & minerals in the direction from roots → leaves. Phloem is a separate system, used to transport sugars made in photosynthesis all around the plant.





The cohesive properties of water allow for the transpiration stream to be pulled through the plant by evaporation from the stomata, and osmosis through the leaves. It is pushed in to the bottom by root pressure. Factors affecting transpiration include wind, humidity and temperature.

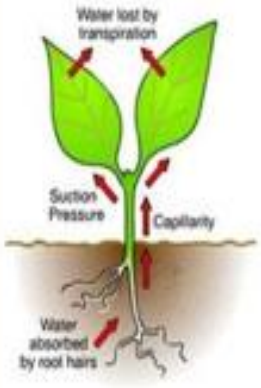




Rate of transpiration is measured using a potometer

Sugars are transported around the plant in the phloem, in any direction, via a process known as translocation. We talk about them being transported from where they are made (SOURCE) to where they are needed (SINK). Glucose is the product of photosynthesis, but it is stored as starch, and transported as sucrose.

Transpiration



2. Water is constantly lost through evaporation from the leaves through tiny holes in the bottom of the leaf called stomata.

Topic: Health and Disease

Duration: Combined 7 lessons

Composite: Unit test

Key vocabulary:

Health
Disease
Communicable
Non-communicable
Pathogen
Virus
Bacteria
Fungi
Protists
Immune system
Antigens
Antibodies
Lymphocytes
Immunisation
Cardiovascular

Core knowledge Components
Powerful knowledge components crucial to commit to long term memory (IN RED BOX)

Links to previous and future topics

KS3 – Cells, Moving and Breathing, Microorganisms, plants

HEALTH AND DISEASE - Part 1

The World Health Organisation (WHO) describes health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

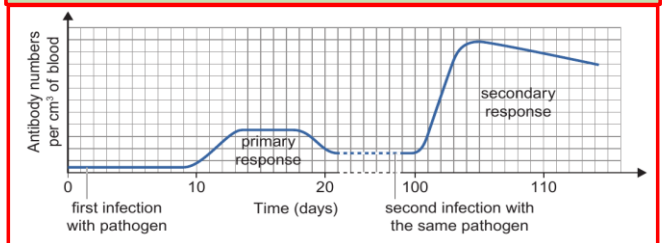
The presence of one disease can lead to a higher susceptibility to other diseases.

Damage to immune system	Makes it easier for other pathogens to cause disease.
Damage to body defences	Barriers and defences are damages. Pathogens can enter the body.
Damage to organ systems	Organ systems do not work as effectively leading to other diseases.

Communicable and non communicable diseases

Communicable	***Non-communicable***
Caused by pathogens. They can be passed from person to person.	Caused by a fault in genes or by the way we live (lifestyle)

Primary and secondary response to a pathogen



The immune responses to the first and second infection by a pathogen are different.

Pathogens are microorganisms that cause infectious disease

Viruses	Bacteria (prokaryotes)	Protists (eukaryotes)	Fungi (eukaryotes)
e.g. cold, influenza, measles, HIV, tobacco mosaic virus	***e.g. tuberculosis (TB), Salmonella, Gonorrhoea***	***e.g. dysentery, sleeping sickness, malaria***	***e.g. athlete's foot, thrush, rose black spot***

Pathogens may infect plants or animals and can be spread by direct contact, water, air, unhygienic food preparation or vector

Communicable diseases

Pathogen	***Disease***	Symptoms	Method of transmission	Control of spread
Bacteria	***cholera***	Causes diarrhoea.	Contaminated water	Vaccination, water treatment to remove bacteria.
Bacteria	***tuberculosis***	Causes lung damage.	Air borne water droplets from couching.	Isolation of infected person, vaccination.
Fungi	***Chalara ash dieback***	Leaf loss and bark lesions.	Spores in the air.	Remove/destroy infected trees.
Protists	***Malaria***	Recurrent fever. Damage to blood and liver.	By an animal vector (mosquitoes).	Prevent breeding of mosquitoes. Use of nets to prevent bites.
Virus	***HIV***	Initially flu like systems, serious damage to immune system.	Sexual contact and exchange of body fluids.	Anti-retroviral drugs and use of condoms.
Bacteria	***Chlamydia***	Unusual discharge from genitals or anus, pain when urinating.	Unprotected sex.	Using condoms during sex.

Antibiotics

E.g. Penicillin Used to treat bacterial infection by inhibiting cells processes in the bacterium but not the host organism (human) cells**. They do not work on viruses.**

HEALTH AND DISEASE - Part 2

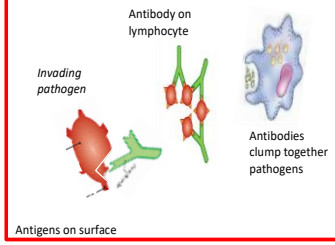
Vaccines are used to immunise a large proportion of the population (herd immunity) to prevent the spread of a pathogen

Small amount of dead or inactive form of the pathogen	***1st infection by pathogen***	White blood cells detect pathogens in the vaccine. Antibodies are released into the blood.
	Re-infection by the same pathogen	White blood cells detect pathogens. Antibodies are made much faster and in larger amounts.

Chemical and physical barriers against pathogens entering the body

	***Nose***	Nasal hairs and sticky mucus prevent pathogens entering through the nostrils.
	***Trachea and bronchus***	Lined with mucus to trap dust and pathogens. Cilia move the mucus upwards to be swallowed.
	***Stomach acid***	The stomach produces hydrochloric acid. This kills most ingested pathogens.
	***Skin***	Hard to penetrate waterproof barrier. If damaged, blood clots quickly to seal cuts.
	***Lysozymes in tears***	Kills bacteria on the surface of the eye.

Immune systems response to a pathogen



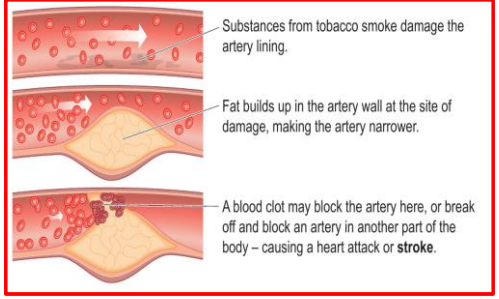
Lifestyle factors and their effects on non-communicable disease

Disease	**lifestyle factors**
Obesity and malnutrition	Lack of exercise and consuming too many/too few calories through an unbalanced diet.
Liver disease	Large amounts of alcohol taken over a long period of time can lead to liver disease e.g. cirrhosis.
Cardiovascular disease	Smoking leads to damage and blocking of arteries supplying the heart with oxygenated blood.

$$BMI = \frac{mass\ (kg)}{(height\ (m))^2}$$

Drugs (including antibiotics) have to be tested and trialled before to check they are safe and effective

Cardiovascular Disease



Evaluating different treatments for cardiovascular disease (CVD)

Lifestyle changes	***Surgical procedures***	***Life long medication***
Giving up smoking, drinking excess alcohol and taking more exercise can reduce the risk of CVD. Some patients may not stick to lifestyle changes.	A stent can be surgically inserted into blocked blood vessel. Blocked blood vessels can be bypassed with inserted blood vessels. This treatment requires life long medication.	Medicines to reduce blood pressure and cholesterol. Statins for lowering cholesterol carry a small risk of developing diabetes.

A placebo can look identical to the new drug but contain no active ingredients

Discovery of new drugs

Preclinical testing	***Clinical testing (A drug that has passed the preclinical testing)***
1) Drugs are tested on human cells and tissues. 2) Drugs are tested on live animals	1) Drug is tested on human volunteers, known as a clinical trial. The drug is tested on healthy volunteers to ensure that it does not have any harmful side effects. 2) Next the drugs are tested on someone who is suffering with the illness. Trails continue to find the optimum dose the most effective with the least side effects). 3) Patients are put into random groups. One group in given the new drug, the other is given a placebo. Clinical trials are blind, the patient does not know if they are receiving the new drug or the placebo.

Non-communicable diseases are caused by the interaction of a number of factors

Disease	**Interacting factors**
Cardiovascular disease	Diet, obesity, smoking, drinking alcohol, lack of exercise, genetics.
Cancer	
Lung disease	
Liver disease	
Malnutrition	

Impressive reading	Impressive speaking	Impressive writing	Resilience	Graph/Numeracy skills:	Employability via:
Read with purpose: spot the error activity Research task on cardiovascular disease	Present your research on cardiovascular disease and prevention methods	Task on the differences between a virus, bacteria, protists and fungi	• Use of transferable mathematical skills. • Scientific investigation skills in using fiddly equipment.	• The response to vaccinations	Nurse, doctor, physiotherapist, health visitor, Dietitians
Culture capital: • Edward Jenner and the discovery of smallpox vaccination					

SEND

Communication & Interaction	Cognition & Learning	SEMH	Physical/Sensory
• Unambiguous terms and clear language used is presentations/handouts • Unambiguous terms and clear language used by teacher • ADHD pupils are given instructions directly by use of their names Use of post-it plans to help pupils work through a task	• Chunking of activities into manageable portions, so as not to lead to cognitive overload • Use of low stakes/high gains activities for knowledge recall • Topics are mapped out visually for pupils to see Links to previous learning established	• Consideration to seating positions • Awareness of specific pupil triggers Communication channels kept open	• Consideration to seating positions • Clear access for physically compromised pupils Opportunities for different sensory learning activities threaded into topics