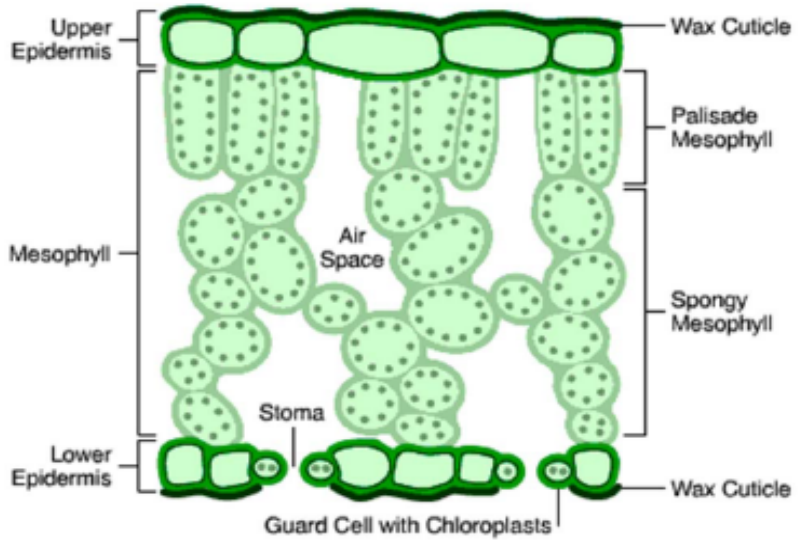
The Thomas Alleyne Academy | Ofsted Good Provider

Knowledge Organiser - Ecological relationships and classification

Science Department

Sc Yr9 B1 Understand the structure of leaves and the role minerals play in plant development



The layers are different *tissues* within a leaf – each has a particular role in this organ (the leaf)

- Upper epidermis: has a waxy cuticle for protection and to prevent water loss.
- Palisade mesophyll: carries out photosynthesis so cells are packed with chloroplasts and cells are arranged upright to use space efficiently.
- Spongy mesophyll: has a large surface area for gas exchange.
- Lower epidermis: has holes called stomata to allow gases to enter and exit the leaf

You need to know what mineral ions a plant needs and what it uses these for:

Mineral	Use	Deficiency symptoms
Nitrate ions (NO_3)	Building proteins and growth	Poor growth and yellow leaves
Phosphate ions (PO_4)	Respiration and growth	Poor root growth and discoloured leaves
Potassium ions (K^+)	Respiration and photosynthesis	Poor flower and fruit growth, discoloured leaves
Magnesium ions (Mg^{2+})	Used to make chlorophyll	Yellow leaves

Proteins are used to make cells

Respiration releases energy used to grow

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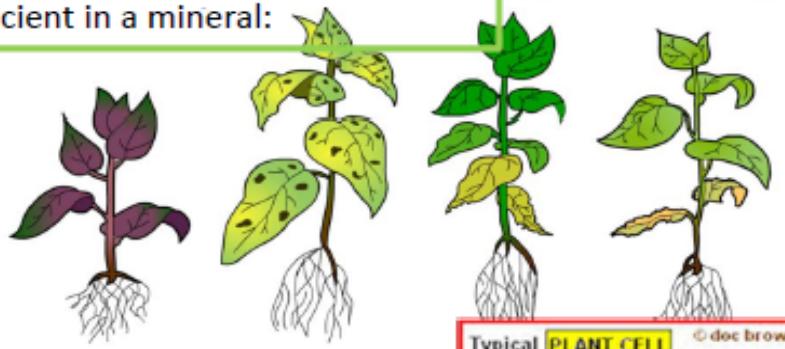
Chlorophyll is the green pigment in leaves

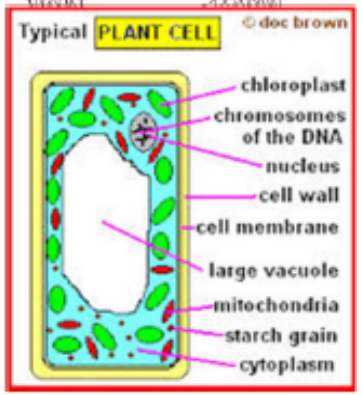
You can see here what plants might look like if they are deficient in a mineral:



Equation for photosynthesis:

Carbon Dioxide + Water → Glucose + Oxygen

This process takes place in the chloroplasts of plant cells. Light intensity, carbon dioxide concentration and temperature all affect how fast a plant will do photosynthesis.



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Sc Yr9 B2 Understand the process of respiration

In the mitochondria **aerobic respiration** occurs. This is a reaction that uses oxygen to break down glucose into carbon dioxide and water (which we exhale). This releases energy.

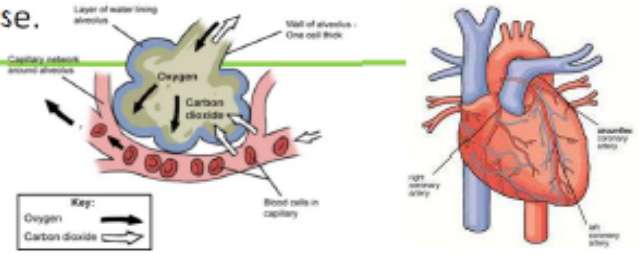
Oxygen (we inhale) + Glucose (from food) → Carbon Dioxide + Water (we exhale) [+ energy]

$$O_2 + C_6H_{12}O_6 \rightarrow CO_2 + H_2O$$

We use this energy constantly to keep our bodies warm and to build larger molecules from smaller ones (e.g. building amino acids up into proteins)

When we exercise we require more energy to allow our muscles to contact.
This means that:

- We have to breath more quickly and more deeply to supply our cells with more oxygen.
- Our heart beats quicker to pump blood to the working muscles. Remember, that our blood carries the oxygen and glucose (the reactants for respiration)
- These changes result in a faster rate of respiration and more energy release.



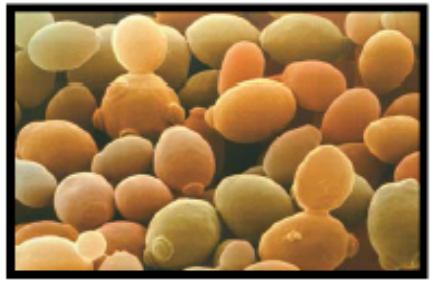
During strenuous exercise or a rapid burst of activity the body may not be able to supply the cells with enough oxygen. The cells continue to do respiration but will switch to doing **Anaerobic Respiration** (shown in blue below)

If lactic acid builds up in our muscles this causes cramp.

Glucose → Lactic Acid + Smaller amount of energy

Glucose → Ethanol + Carbon Dioxide + Smaller amount of energy

When a micro-organism called yeast carries out **Anaerobic Respiration** (shown in purple above) different products are made. These products are useful in the manufacture of bread and alcohol.



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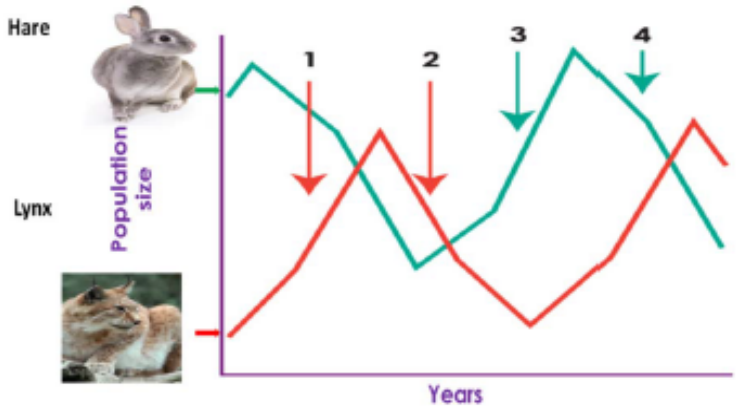
Sc Yr9 B3 Understand how to investigate an ecosystem and its processes

A food chain can be represented more accurately in a pyramid of biomass. This shows how much organic material (and energy) is in each level of the food chain.

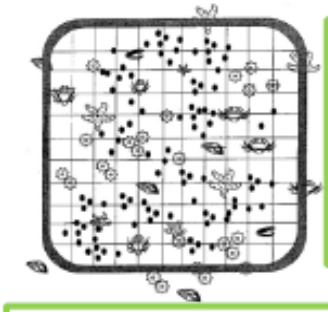
There can only be a few top predators in a food chain (and food chains are rarely longer than 5 steps) because energy is lost at every level of the food chain e.g. when the prey animal moves around before it is consumed by its predator.



Any change to a food chain will have knock-on effects e.g. if the numbers of a predator species (like the lynx) increase then the prey population (the hare) will decrease.

If we want to take measurements of how many or which species live in an ecosystem we have to measure a small sample (measuring the whole ecosystem would take far too long!)

When we measure a sample we have to try and make sure the sample is representative (i.e. it gives a good idea about what is happening in the *whole* ecosystem).
We have to make sure our sample is **big enough** and is generated in a **random** way **without bias**.



1. A quadrat (wooden frame) of a known size (e.g. 1m^2) is placed several times.
2. Where to put the quadrat should be chosen randomly (by generating co-ordinates using a calculator)
3. Count what is in each quadrat
4. Work out an average number from all of the quadrats
5. Work out the average of the whole ecosystem e.g. on average there are 20 flowers in 1m^2 so in the whole field (1500m) there will be 20 x 1500 = 30,000 flowers

If you want to see how the distribution of a species change (e.g. is there more flowers nearer the lake?) then you would use a transect (a line created using a measuring tape). Quadrats are put down every 2m and the number of flower are counted.
The transect is then repeated 5m to the left/right of the original.