2018 Standard Version

Cells and Living Things

Junior Science

All living things share the characteristics described in MRS C GREN

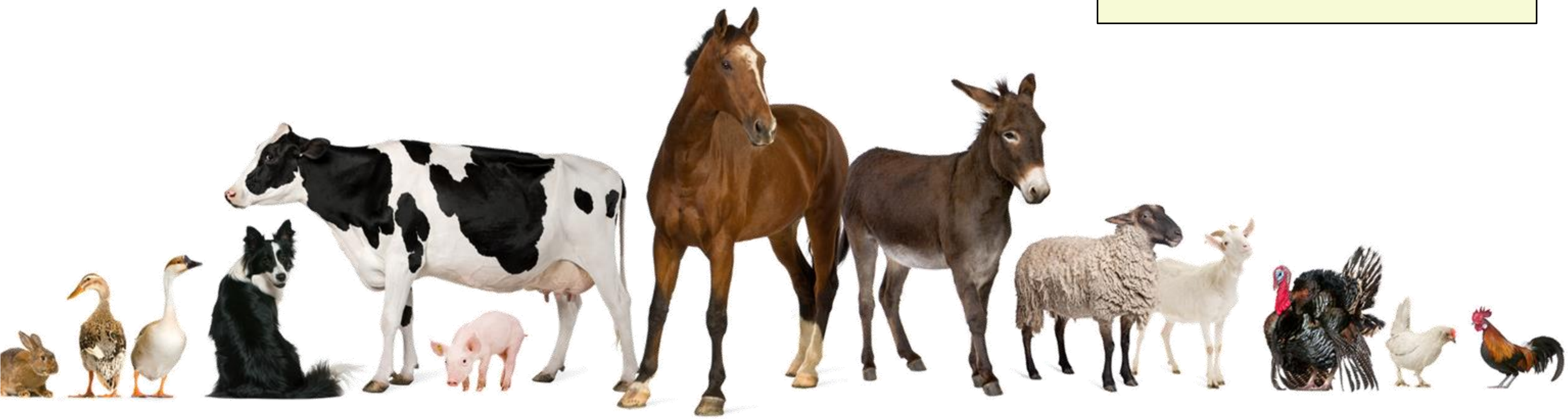
Biology is the study of living things

A **living object** is an object that carries out life functions

A **non-living object** is an object that has not been alive

A **dead object** is an object that was once alive

All living organisms are composed of one or more cells. A cell is a small, living unit that contains all the chemicals and molecules that help support an organism's life.



Classifying objects as living or non-living

How would we know if a **car** or **cow** is living? They both move and need “feeding” to keep them going. So why is only the cow living? We use the acronym MRS C GREN to remind us living objects show **ALL** of the life processes, not just some, and are made up of **CELLS.**

All living things share the characteristics described in MRS C GREN

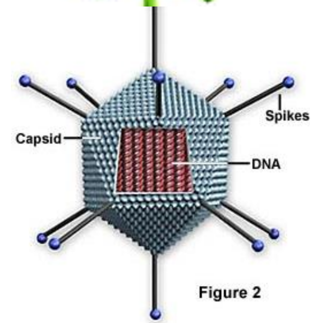
Life function	Gives us the ability to….
Movement	Move through space
Respiration	Obtain energy through reactions in cells
Sensitivity	Respond to the outside environment
Cells	Smallest unit of life – makes up the bodies of bigger organisms
Growth	Increase in size
Reproduction	Create more living things
Excretion	Dispose of waste chemicals
Nutrition	Extract useful chemicals from the environment

Which is Living and which is not? Use MRS C GREN

fire

fish

virus



algae

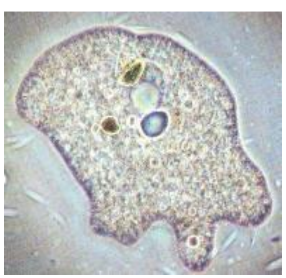
jellyfish

coral

mould

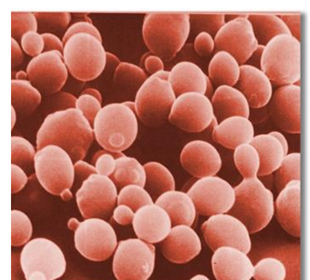
bacteria

amoeba



crystals

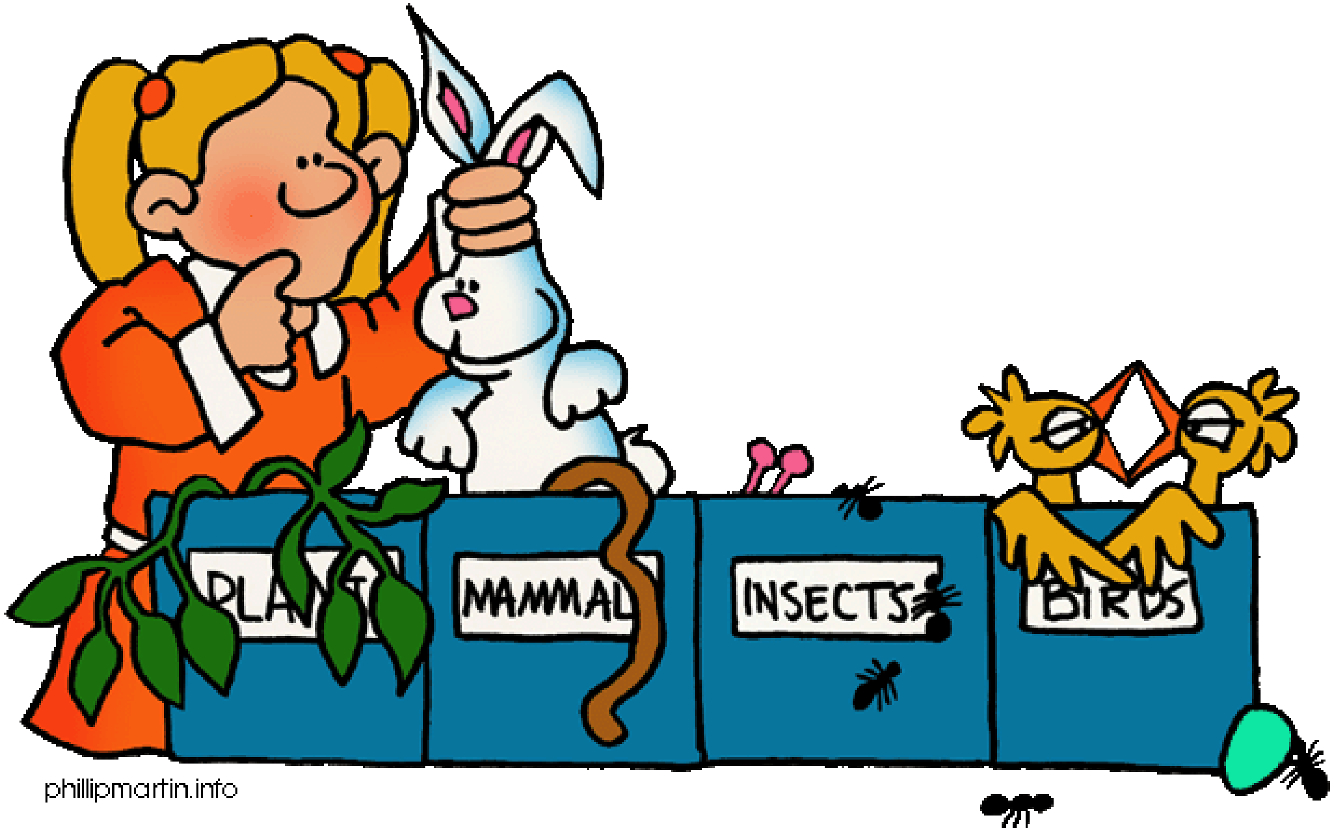
yeast



fungus

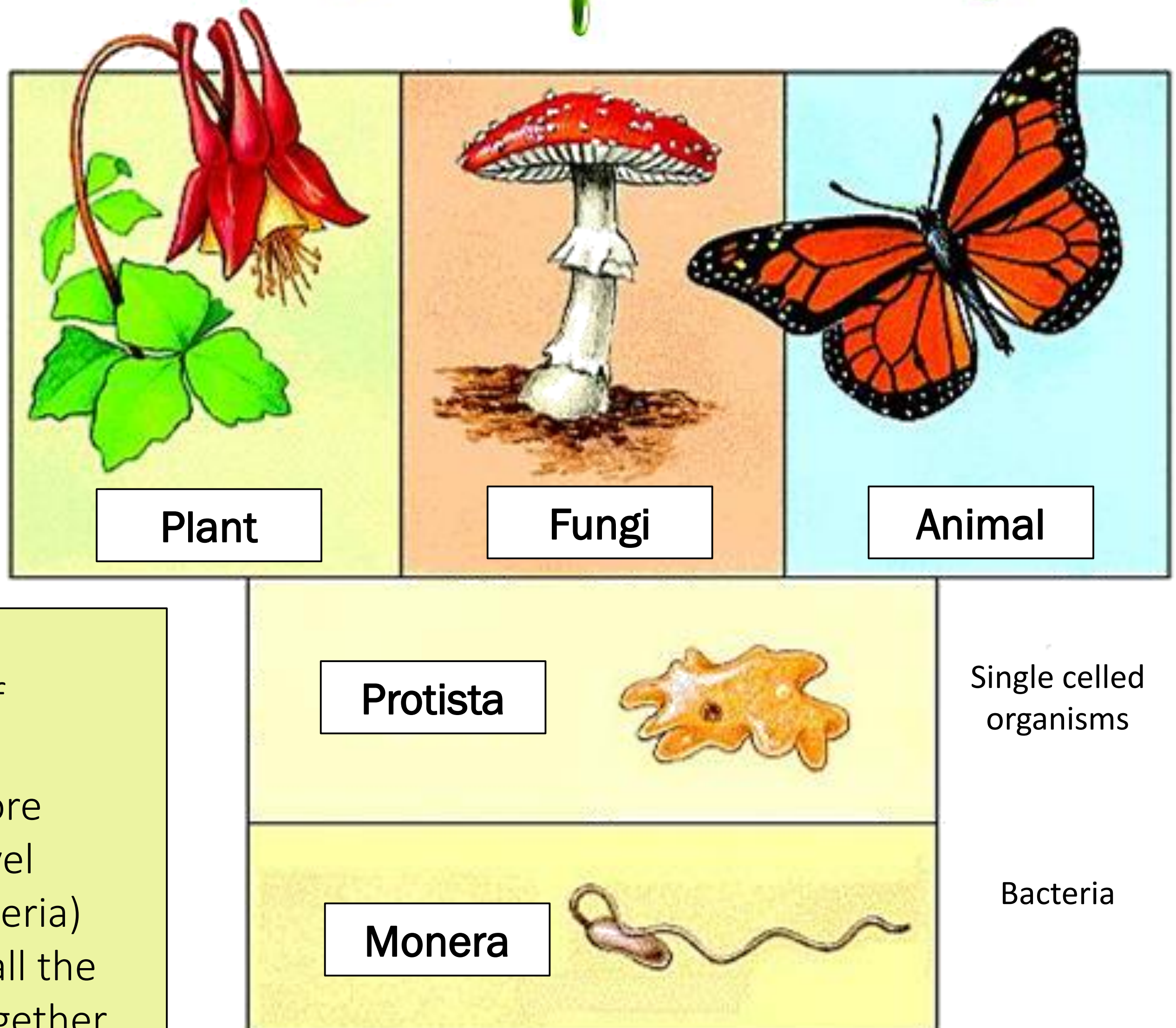
Living things are classified into groups based on similarities / features

Biologists classify all living things into overall groups, called **Kingdoms**. The members of each kingdom are alike in key ways, such as the nature of their cells, their body features or the way they obtain energy. Classification keys are used to identify living things (and other objects) in each group.



The main groups that living things are classified into; Bacteria (Monera), Protista, Animals, Plants, Fungi

Traditional classification of organisms into 5 kingdoms is based on differences in body structure



Single celled organisms

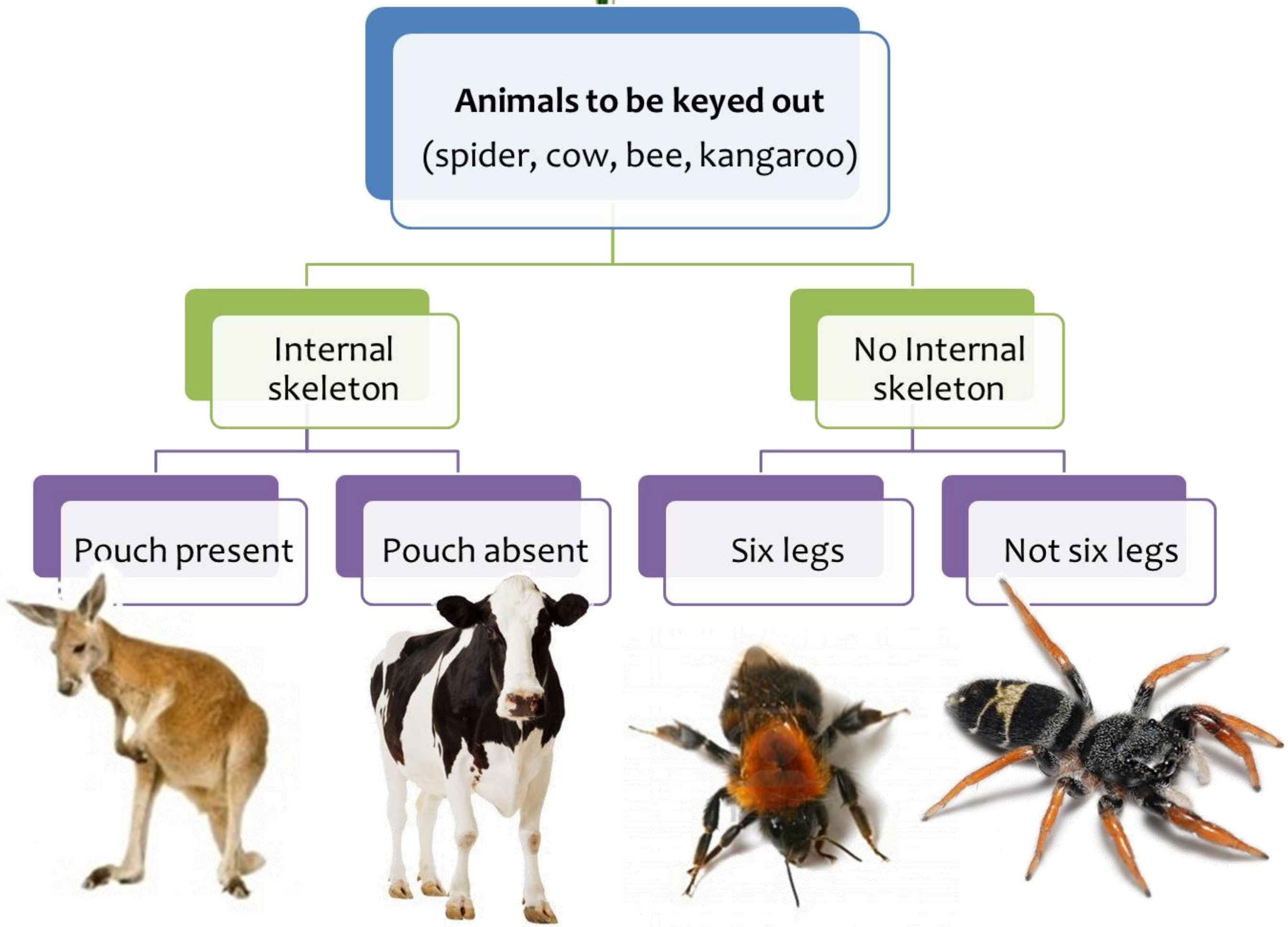
Bacteria

extra info

After the development of microscopes, scientists discovered there was more differences at cellular level within the **Monera** (Bacteria) Kingdom than between all the other 4 kingdoms put together.

What is a dichotomous identification key?

The Dichotomous keys are used as tools to help identify unknown organisms using careful observations and matching those observations in an organised manner against choices given at each step. Each two choices are known as a **couplet**. **Dichotomous** means branched.



Using a simple dichotomous identification key.

Rules for Using Dichotomous Keys:

1. Read both choices in a couplet (pair) carefully.
2. When reading a couplet, make sure you understand all of the terms used.
3. If you are unsure of which choice to make in a couplet, follow both forks (one at a time). After working through a couple of more couplets, it may become apparent that one fork does not fit your sample at all.
4. Work with more than one sample if possible. This will allow you to compare.
5. When a measurement is given make sure that you take the measurement and do not take a guess

Making a simple dichotomous identification key.

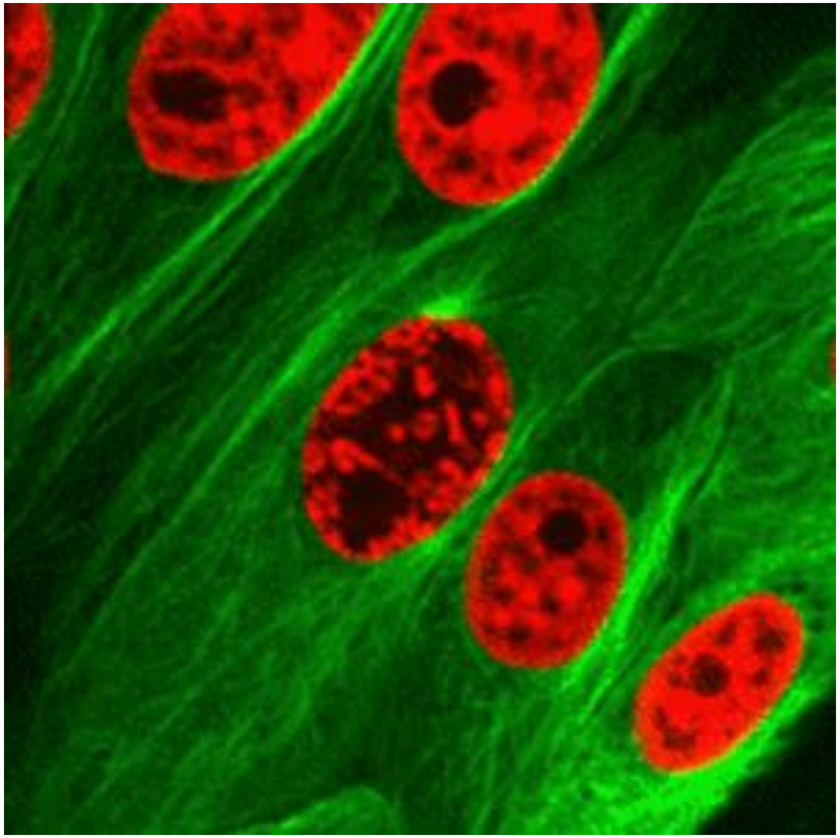
If we are making a key based on observations of physical features that we can see, the first step must be a feature that can divide all of the living organisms into two groups.
For example below, we could divide the birds into those that have tuffs of feathers on their heads (spotted shag and crested penguin) and those that do not (wax-eye, brown kiwi, paradise duck, kingfisher, yellow head, spotted dotterel)

https://www.stampcommunity.org/topic.asp?TOPIC_ID=5934&whichpage=23

Other features such as thickness of beak, tail or not, one colour or many colours – can be used to further divide each bird group.
The key is finished when each individual has its own path and the key leads to a name for each.

All living organisms are made up of cells.

All living organisms are made up of cells, the smallest structural (how it looks) and functional (How it works) unit.
Organisms can be **Unicellular** – consisting of one independent cell, or be **multicellular** – organised networks of cells with different functions and structures; humans have over 100 trillion cells.



The structure of a typical plant cell includes a cell membrane, cytoplasm, nucleus, cell wall, vacuole, and chloroplast.

Functions

Cell Wall

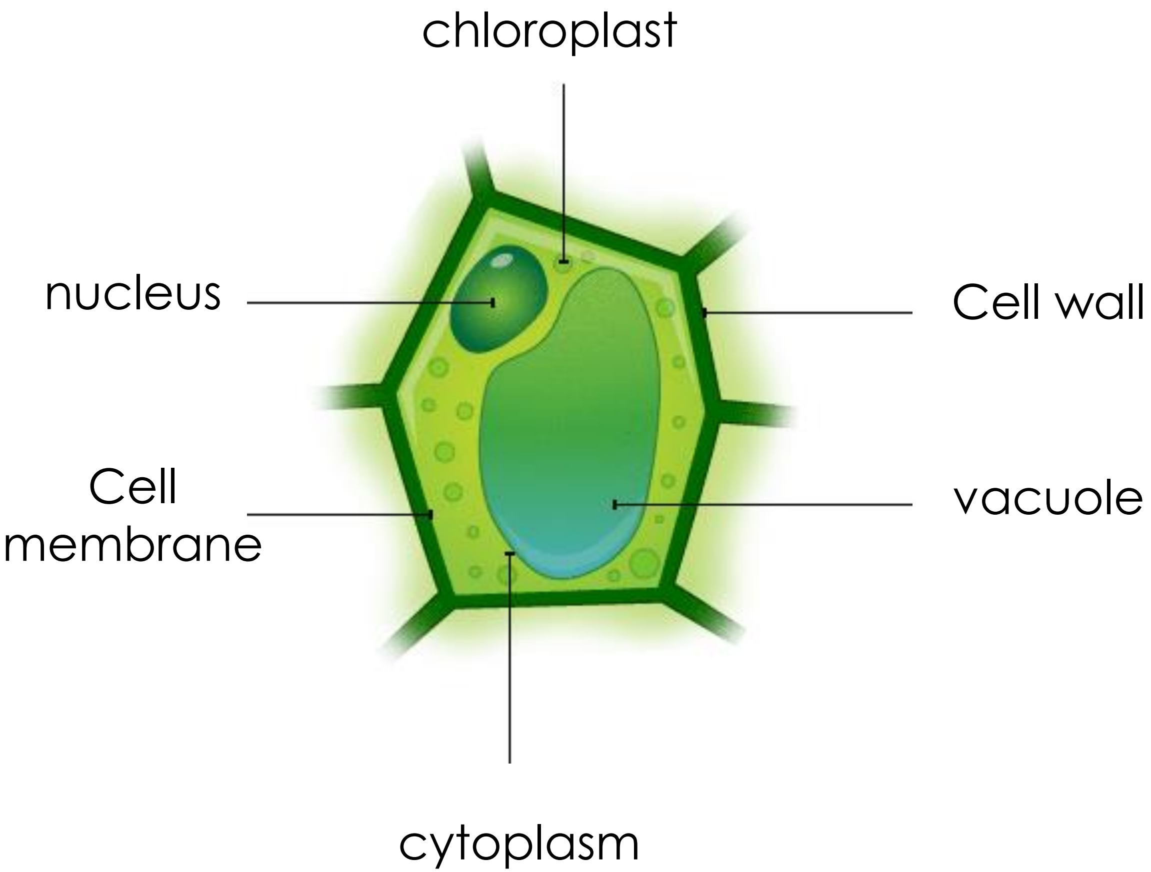
Gives the cell rigidity and a more angular appearance.

Chloroplasts

The site of photosynthesis, gives the cell its characteristic green colour

Vacuole

Assists with storage and structure



http://www.bbc.co.uk/bitesize/standard/biology/investigating_cells/cells_and_diffusion/revision/5/

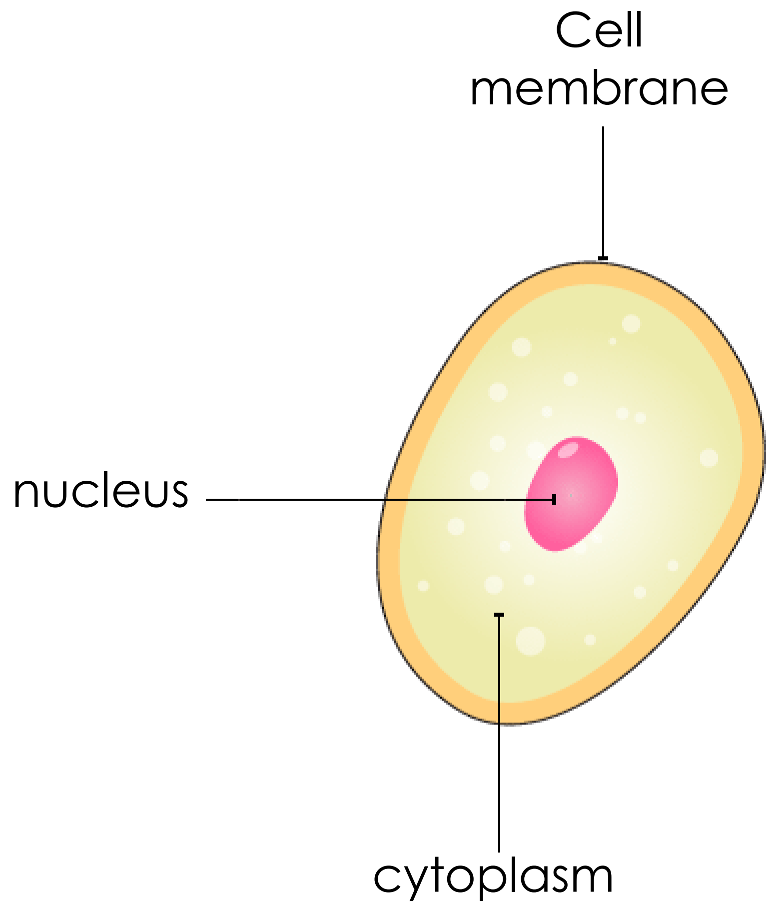
The structure of a typical animal cell includes a cell membrane, cytoplasm and nucleus

Functions

Cell membrane
Surrounds cell and controls passage of nutrients and chemicals. Flexible and allows cell to change shape.

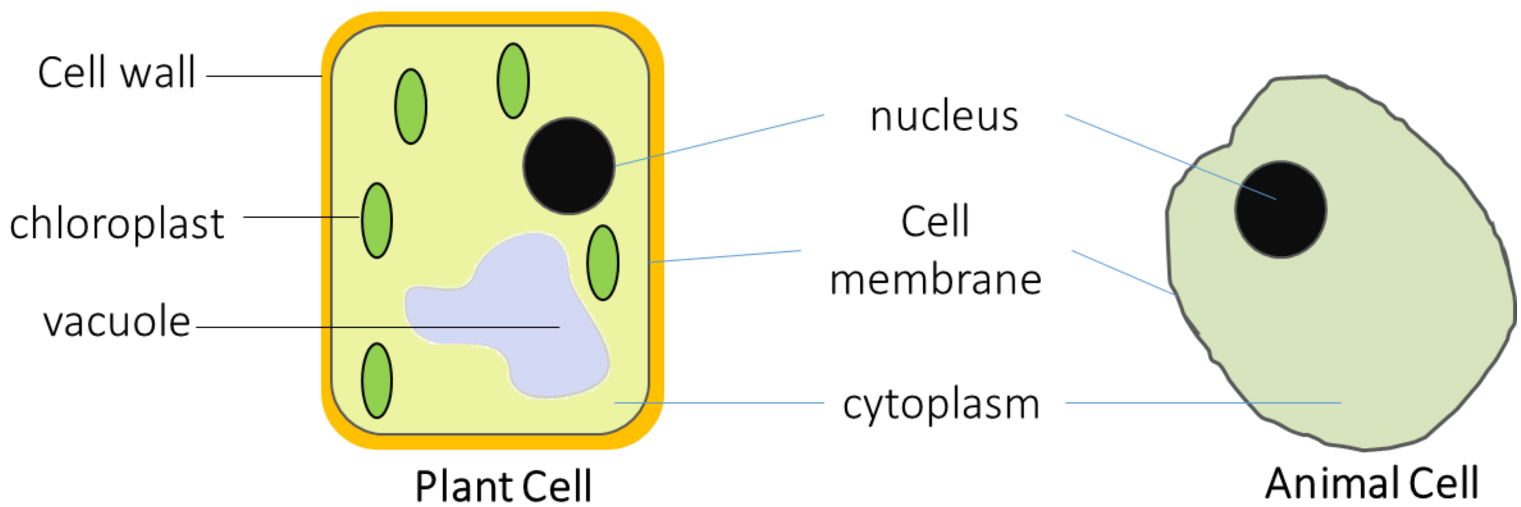
Cytoplasm

A liquid filling the cell and containing all the chemicals the cell needs to function

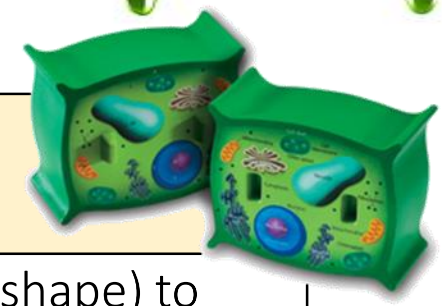


Plant and animal cells similarities and differences.

Similarities	Differences
1.BOTH cells have a 'skin', called the membrane, protecting it from the outside environment. 2. BOTH cells have a nucleus. The 'information storage' of the cell. 3. BOTH cells have Cytoplasm, a fluid that protects the inside of the cell and carries nutrients	1. ONLY Plants have a cell wall that help define the shape and give structure to the plant. 2. ONLY plant cells contains chloroplasts that helps in the plants photosynthesis. 3. Plant cells are generally larger than animal cells. 4. Plants have a larger Vacuole.



The summary of the differences in structure between animal and plant cells.



	Animal Cell	Plant Cell
Shape:	Round (irregular shape)	Rectangular (fixed shape) to interlock for support.
Chloroplast:	Animal cells don't have chloroplasts	Plant cells have chloroplasts because they make their own food
Vacuole:	One or more small vacuoles (much smaller than plant cells).	One, large central vacuole taking up 90% of cell volume which is required for storage
Cell wall:	Absent	Present for a plant’s support.
Plasma Membrane:	only cell membrane	cell wall and a cell membrane

Using a Microscope

Most cells are to small to be clearly seen by eye and require a microscope to view.

Definitions:

Magnification: the number of times the image is enlarged

Resolution: the clarity (how clear) and ability to see detail in the image

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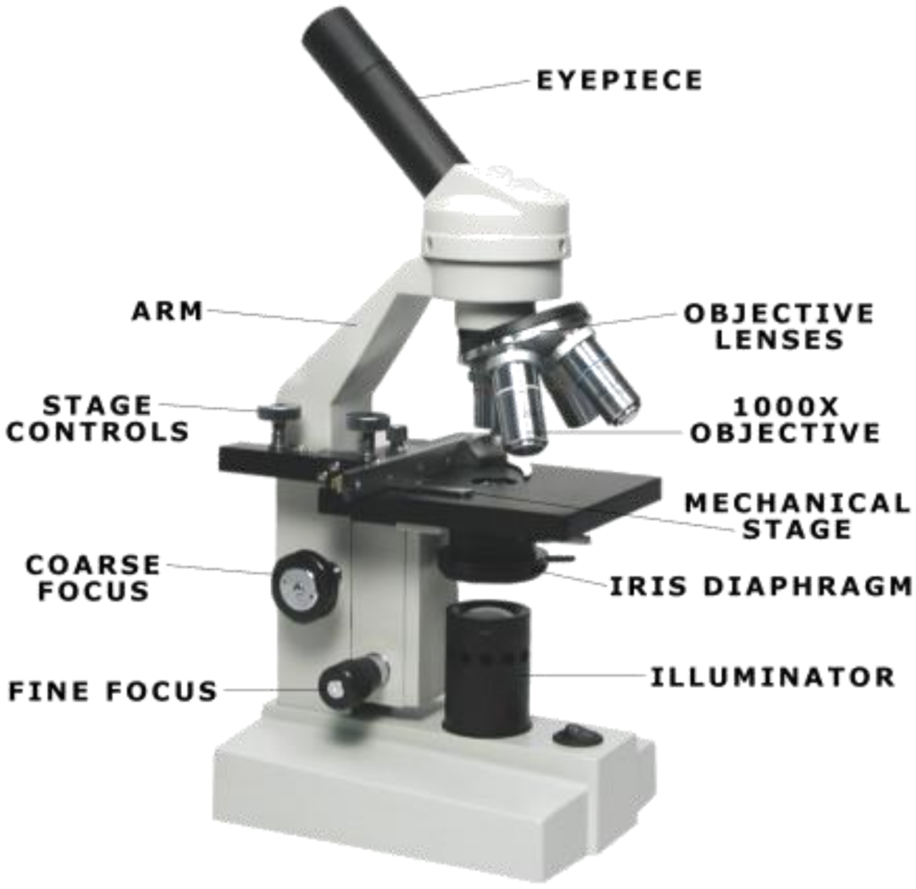
Microscope parts and function

arm - this attaches the eyepiece and body tube to the base.
base - this supports the microscope.
coarse focus adjustment - a knob that makes large adjustments to the focus.
eyepiece - where you place your eye.
fine focus adjustment - a knob that makes small adjustments to the focus (it is often smaller than the coarse focus knob).
high-power objective - a large lens with high magnifying power.
low-power objective - a small lens with low magnifying power.
mirror (or illuminator) - this directs light upwards onto the slide.
stage - the platform on which a slide is placed.



Using a microscope safely

1. Make sure the lowest power objective lens (e.g. 4x) is clicked into position.

2. Place the microscope slide on the stage and fasten it with the stage clips.

3. Look at the objective lens and the stage **from the side** and turn the **course focus knob** so the stage moves upward. Move it up as far as it will go without letting the objective touch the coverslip.

4. Look through the eyepiece and move the **course focus knob down** until the image comes into focus. Adjust the mirror for the greatest amount of light. Use the **fine focus knob** for the clearest image

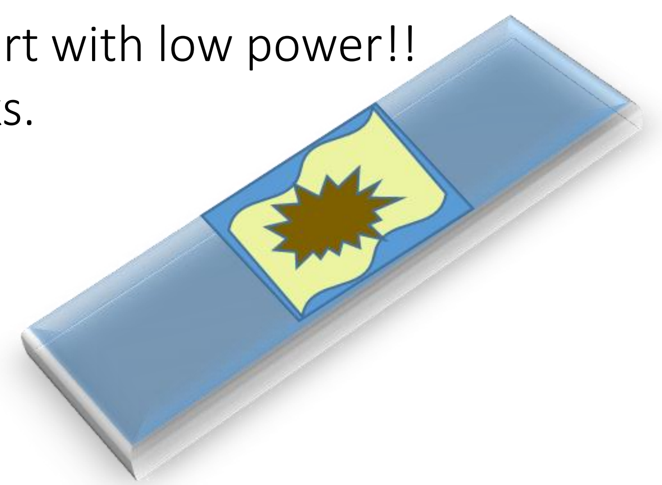
6. When you have a clear image of your sample with the lowest power objective, you can change to the next objective lenses. You might need to readjust the sample into focus

7. When finished, lower the stage, click the low power lens into position and remove the slide

Making a Microscope Slide

Onion Cell Slides

1. Collect onion, slide and cover slip, lamp and microscope.
2. Peel the epidermal cells (skin between layers) from the onion tissue.
3. Place the cell sample on your slide – spread it out and make sure it is not folded.
4. Add 2 drops of iodine (or other stain) to the onion slide.
5. Lower cover slip onto the slide one side at a time so there are no bubbles
6. Focus under the microscope – remember to start with low power!!
7. Draw 2-3 cells about 10 lines big into your books.
8. Return used slides and slips to the ice cream container with disinfectant.

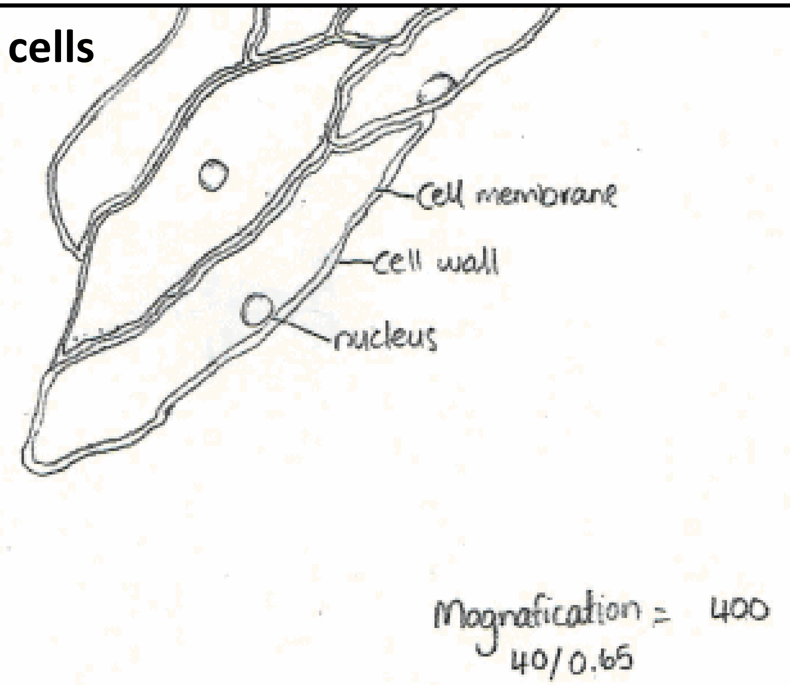


Biological drawings are a useful way of recording information from your observations.

Rules for drawing a cell

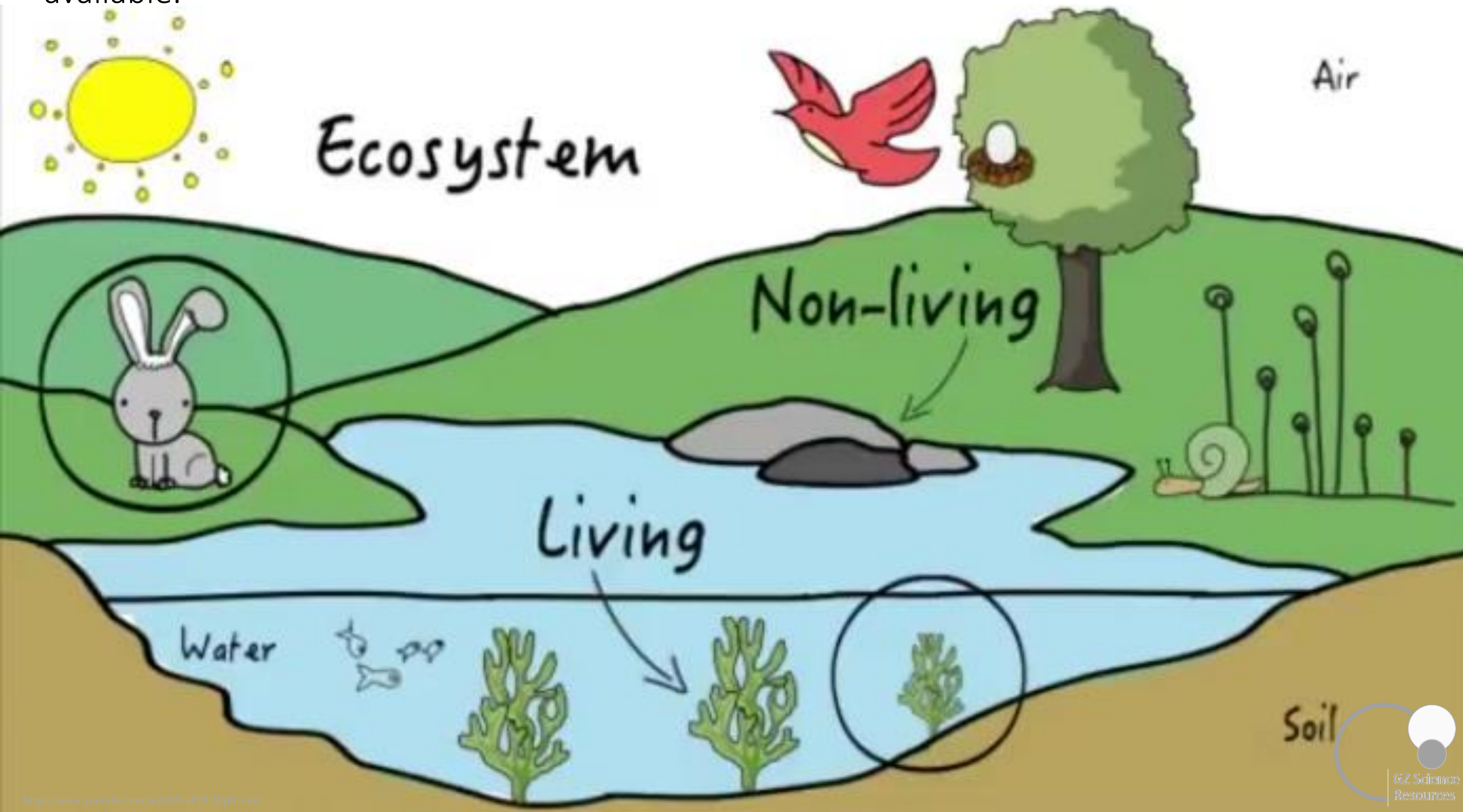
1. Use unlined paper.
2. Draw in pencil.
3. Always print.
4. Give the drawing a title
5. Use a large area of the paper
6. Label all visible parts and never cross lines.
7. Name the specimen
8. Print your name and other Information such as scale or magnification used on the microscope

Onion cells



An ecosystem is the habitat and the community considered together.

An **ecosystem** includes all of the living organisms in a specific area. These systems consist of a living part called the **community** made up of all the plants and animals, which interact with their non-living environments (weather, Earth, Sun, soil, atmosphere) which determine the **habitats** available.



The niche is the way in which an organism interacts with its environment including its feeding role, type of activity and habitat

The **niche** of a species describes how members "make a living" in the environment in which they are found.

Describing the niche of a species would include:

- ❑ The **habitat**, which means where the species lives, feeds and reproduces.
- ❑ When the organism is **active** (day or night)
- ❑ The **feeding role** that the species has in the community. (producer, consumer or decomposer)
- ❑ The **adaptations** the organism has to best survive.

The New Zealand kiwi is a flightless bird that lives in a NZ bush habitat that has a temperate climate. The kiwi is an omnivore and is nocturnal.

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Habitat examples

All birds form a separate group of animals that evolved from the same ancestor. Bird species are found all across the world in many different habitats. Diversity in a bird adaptations help each type of species survive in different habitats.

A NZ Keas habitat is in South Island alpine regions

Emperor penguins found only in the Antarctic polar region

Adaptations assist an organism to survive in an ecosystem

An adaptation is a **feature** of an organism that aids the **survival** and reproduction of individuals of that species in its environment.

Whio (Blue Duck) live in rivers or streams that are:
- *fast-flowing*
- *surrounded by trees*
- *rocky-bottomed and clean and clear (not polluted!!)*

https://www.nzgeo.com/wp-content/uploads/2016/12/10_BACK_v18_flat_300dpi-600x291.jpg

http://roomwhio.blogspot.co.nz/p/class-items.html

Whio adaptations to its environment: The whio has large, webbed feet to give it power in fast-flowing water, and well-developed claws for rough terrain to hold on tight to rocks.
The whio has a tough rubbery tip to its beak to push between rocks and find aquatic invertebrates (water insects)

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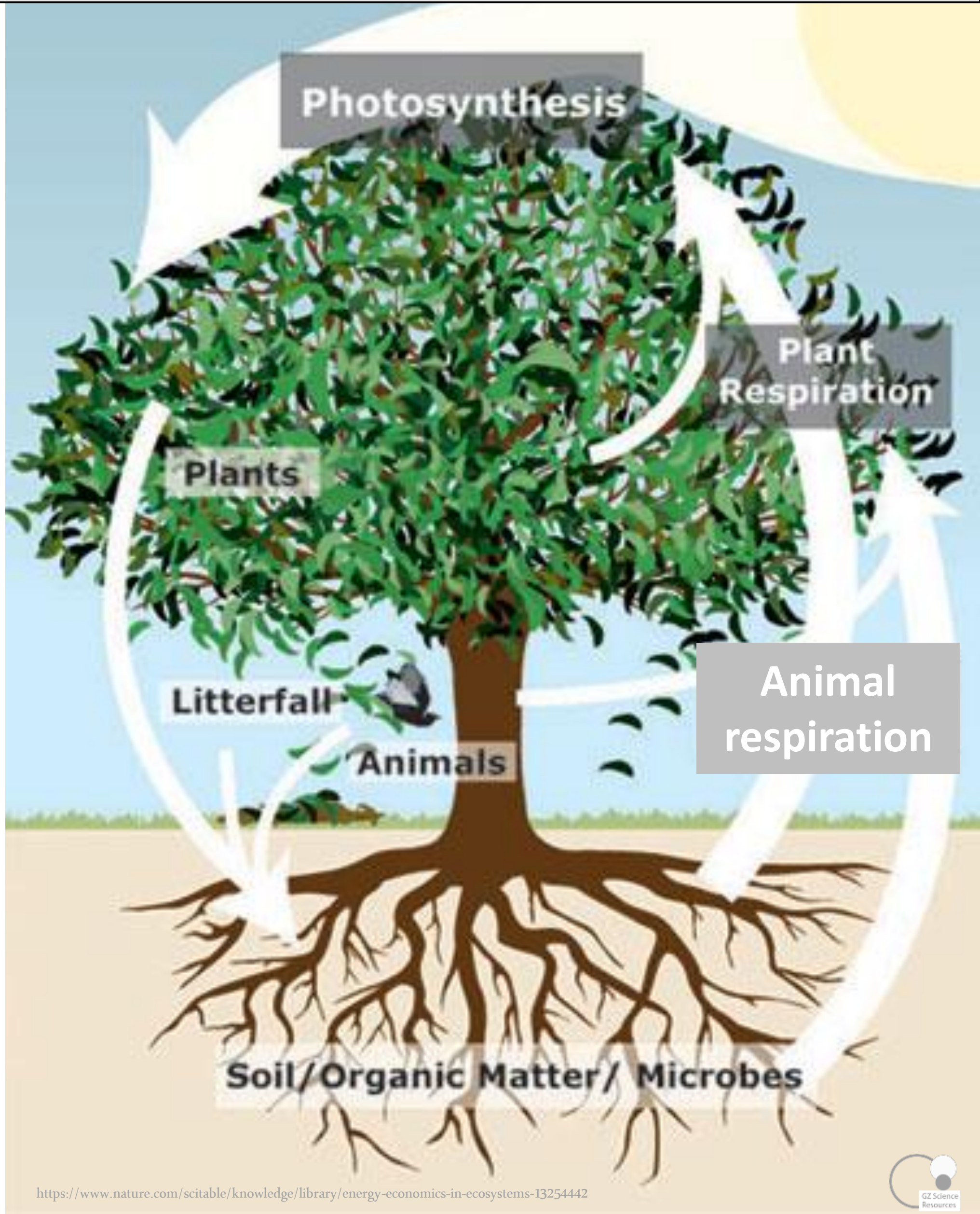
Plants fill the role of Producers in a community

Plants are special because they have leaves and are able to produce their own food by the process of **photosynthesis** from sunlight using raw materials that they get from the air and soil.

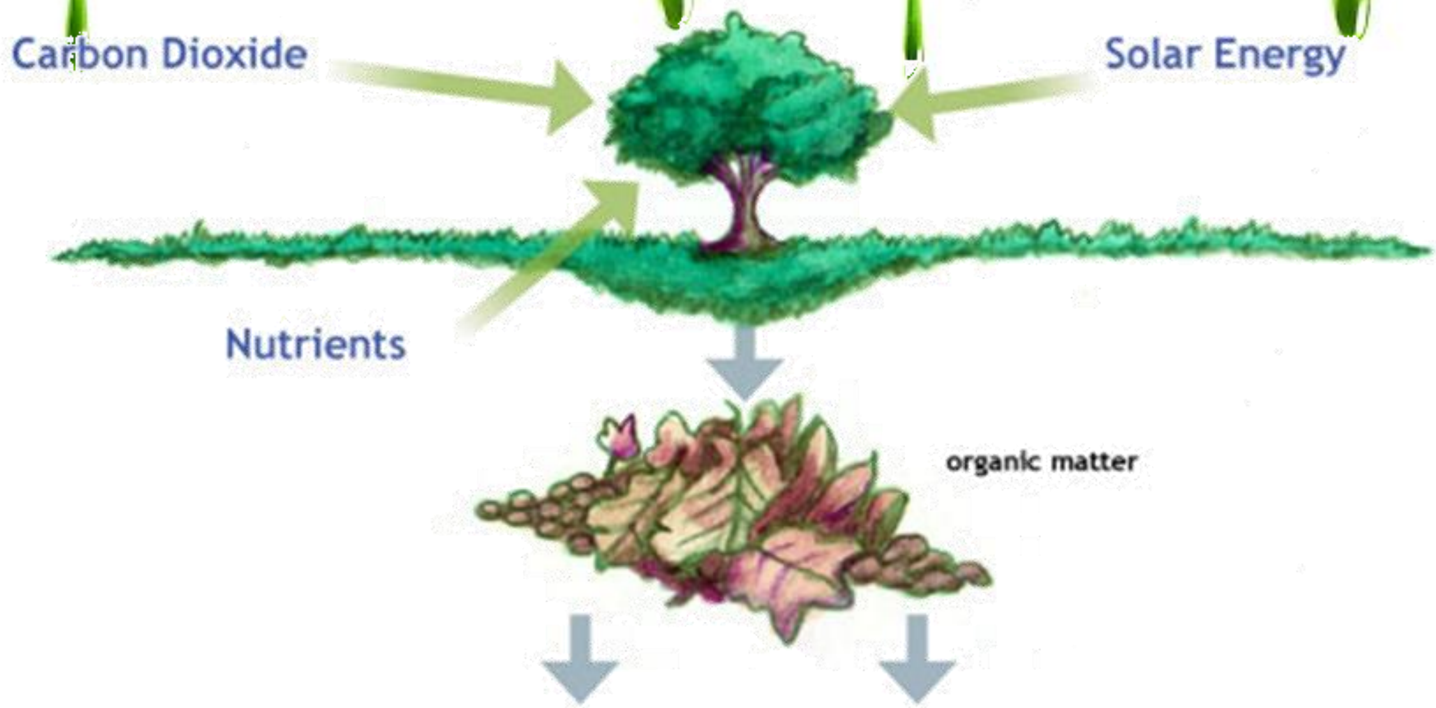
Plants can be thought of as 'food factories' which provide most living organisms on Earth with a source of energy and food.

They produce the energy that is at the start of any food chain and therefore the group of plants are known as **Producers**.

Community – a group of different species living together and interacting



The importance of plants as producers.



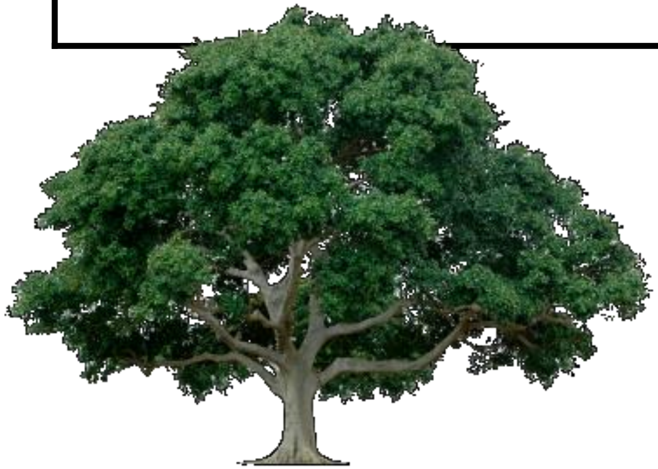
Food entering the food chain

Producers are at the beginning of a food chain. On land, Producers are plants. Plants are at the beginning of every food chain that involves the Sun. All energy comes from the Sun and plants make food with that energy using the process of **photosynthesis**. Energy in the form of nutrients and food are passed onto other organisms when they eat (consume) the plants.

The role of producers, consumers and decomposers in food chains and webs.

The two main groups that organisms can be divided into as feeding groups are either producers or consumers. Consumers can then be further dived into decomposers, herbivore, carnivores, omnivores and scavengers.

Producers	Consumers
Organisms that make their own food through photosynthesis, such as plants	Organisms that need to eat other organisms for food, such as animals

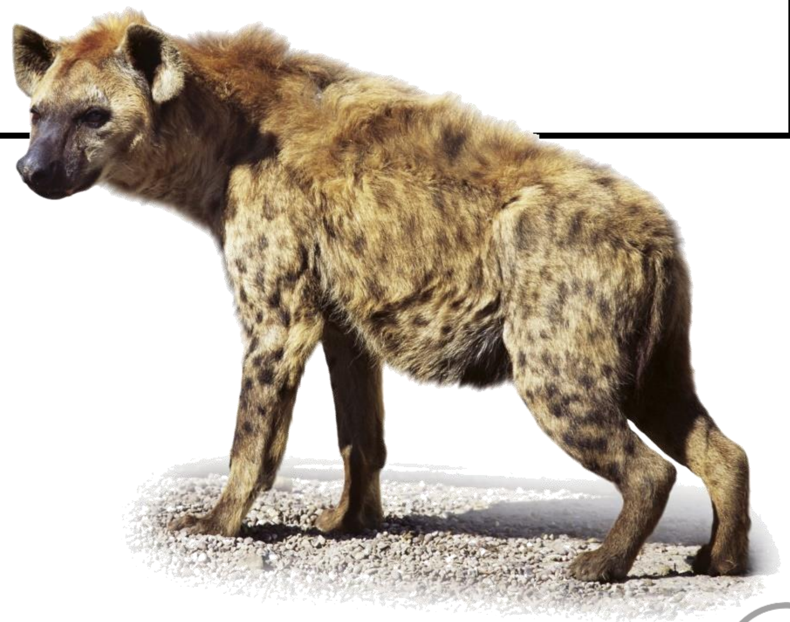


The definition of consumers (Part 1)

Herbivores	Omnivores	Carnivores
Herbivores are animals that eat plants only. (plant eaters) In a food web they are directly above the producers	Omnivores eat both plants and other consumers. They obtain their food from more than one source.	Carnivores eat only other living consumers (meat eaters). This also includes birds that eat only insects.

The definition of consumers (Part 2)

Decomposer	Scavenger
Fungi and bacteria that break down the bodies of dead plants and animals	Consumers that eat dead animals



https://www.dkfindout.com/uk/animals-and-nature/hyenas/

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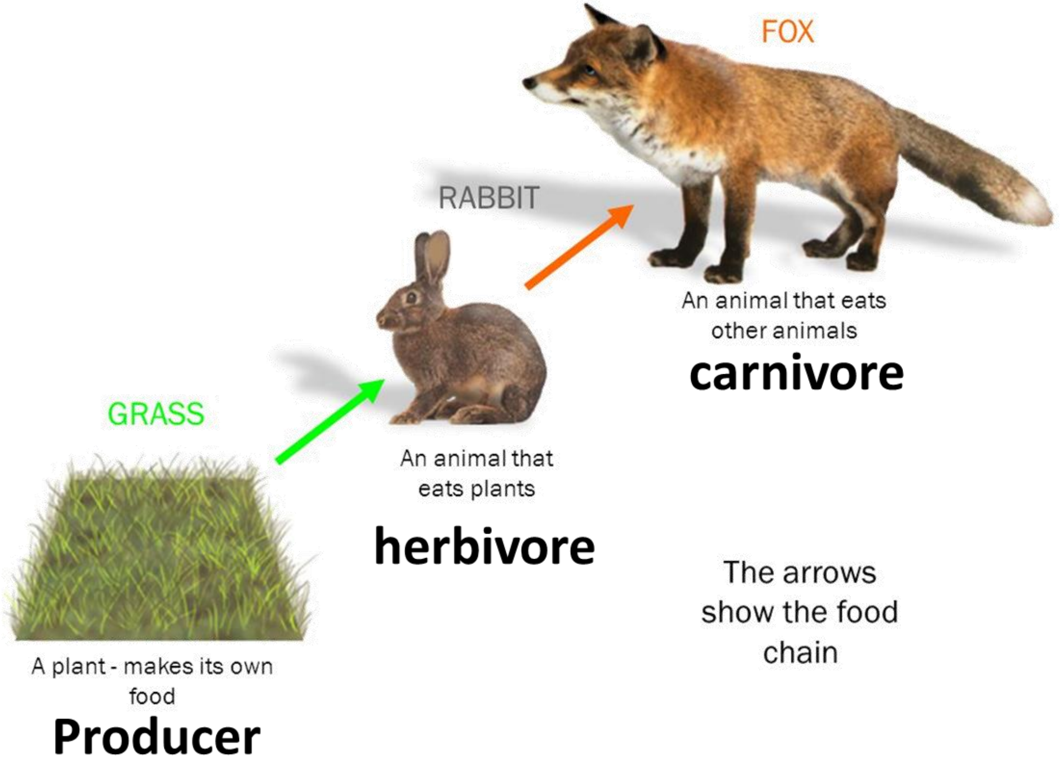
The role of producers in food chains.



A food chain is a series of organisms through which energy flows; first link is always a producer, such as a plant. The producer stores energy from the Sun through the process of photosynthesis. Each organism above the producer eats the one below it in the chain. Energy flows in one direction only.

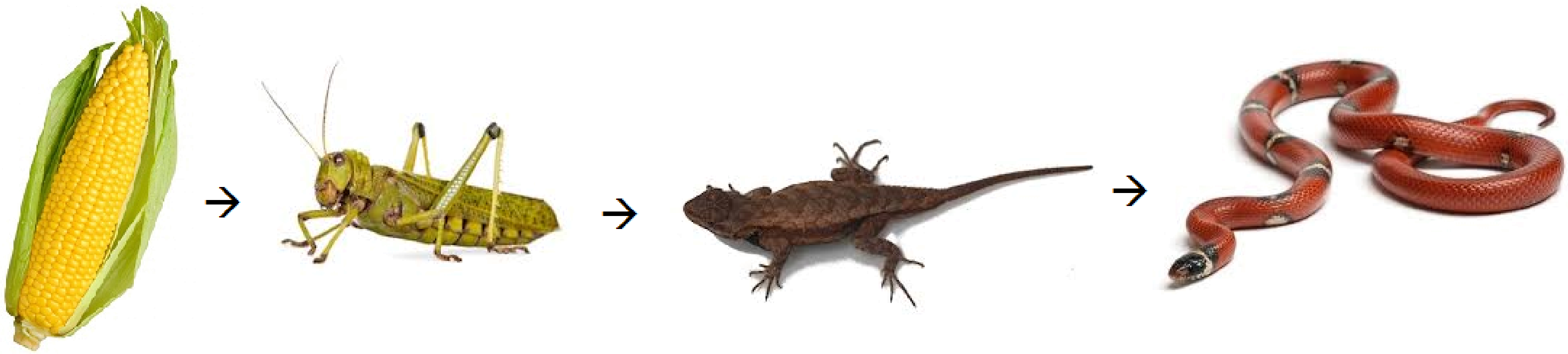
The role of producers, consumers and decomposers in food chains and webs.

Food Chains

The feeding of one organism upon another in a sequence of food transfers is known as a food chain.

Arrows go from the organism being eaten to the organism eating it showing the direction of flow of energy

Food chain



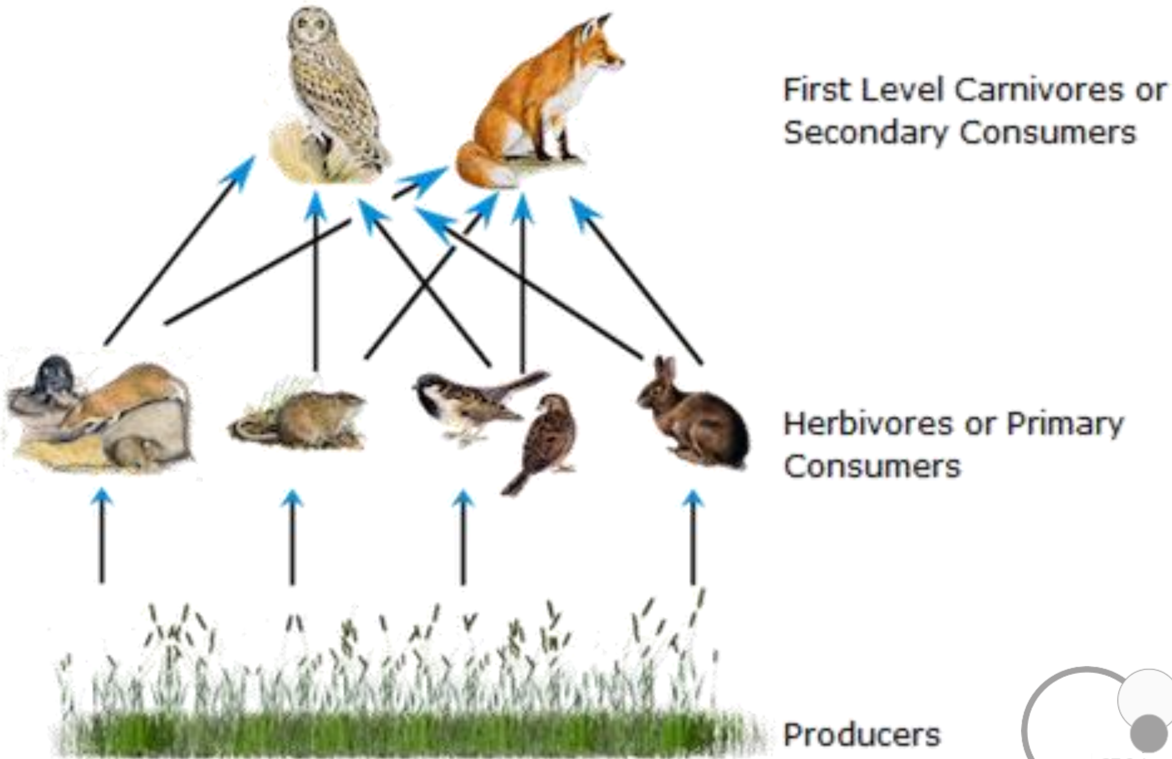
maize	locust	lizard	snake
producer	primary consumer	secondary consumer	tertiary consumer

Food Webs

In an ecosystem there are many different food chains and many of these are cross-linked to form a food web. Ultimately, all plants and animals in an ecosystem are part of this complex food web.

If one species in the food web changes in numbers, it will affect all other species in the food web.

For example, if all the rabbits were removed the predators would need to start eating more of the birds, mice and rats. The grass that the rabbits ate would increase and feed more of the other herbivores.



The structure and functions of the plant

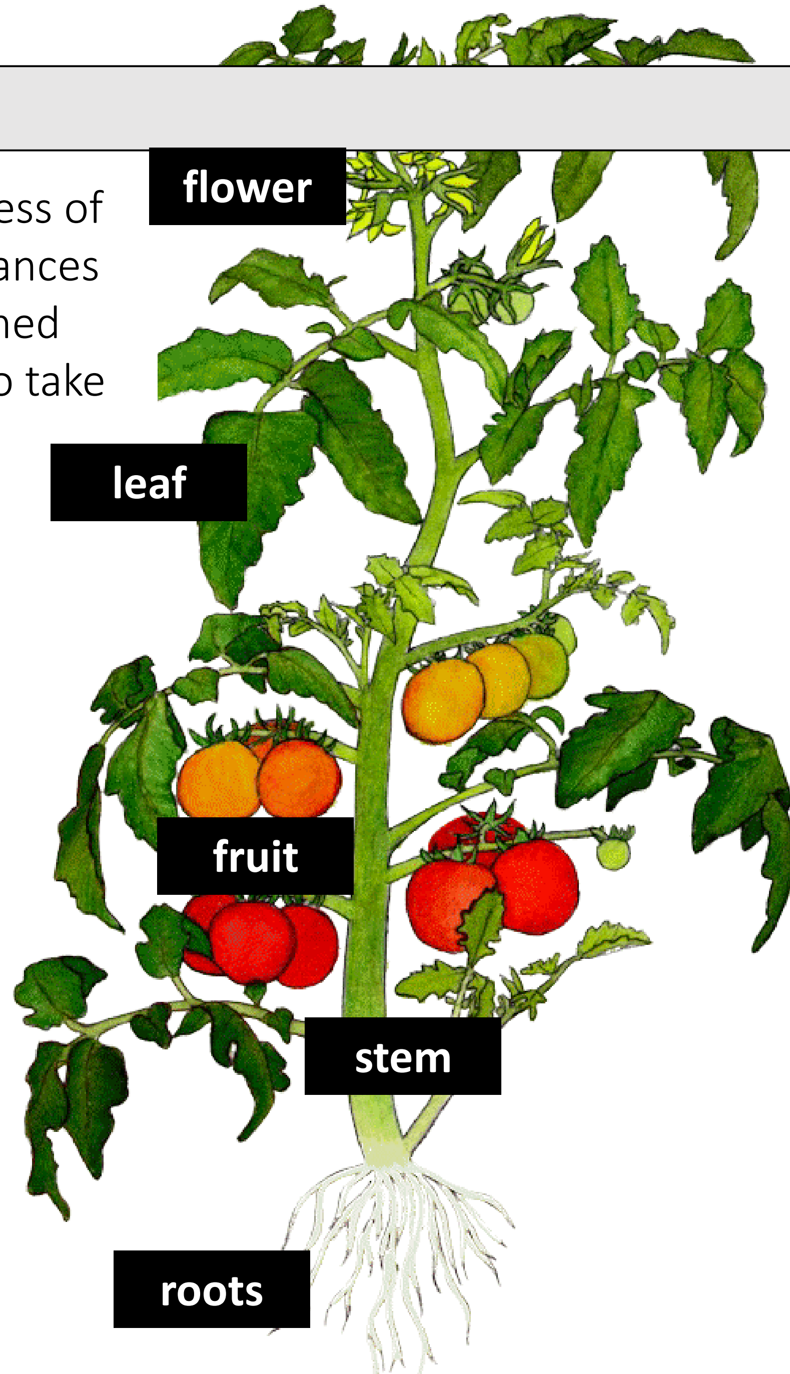
Many parts of the plant are involved with the process of photosynthesis, either by helping collect the substances needed (roots, stem, leaves), storing products formed (roots, stem) or providing a place for the process to take place (leaf cells).

The Shoot System - Above ground (usually)
Lifts the plant above the soil. Main functions include:

- **Leaves** - photosynthesis
- **Flowers** - reproduction
- **Fruit** – seed dispersal
- **Stem** - food and water transport

The Root System - Underground (usually)
Anchor the plant in the soil. Main functions include:

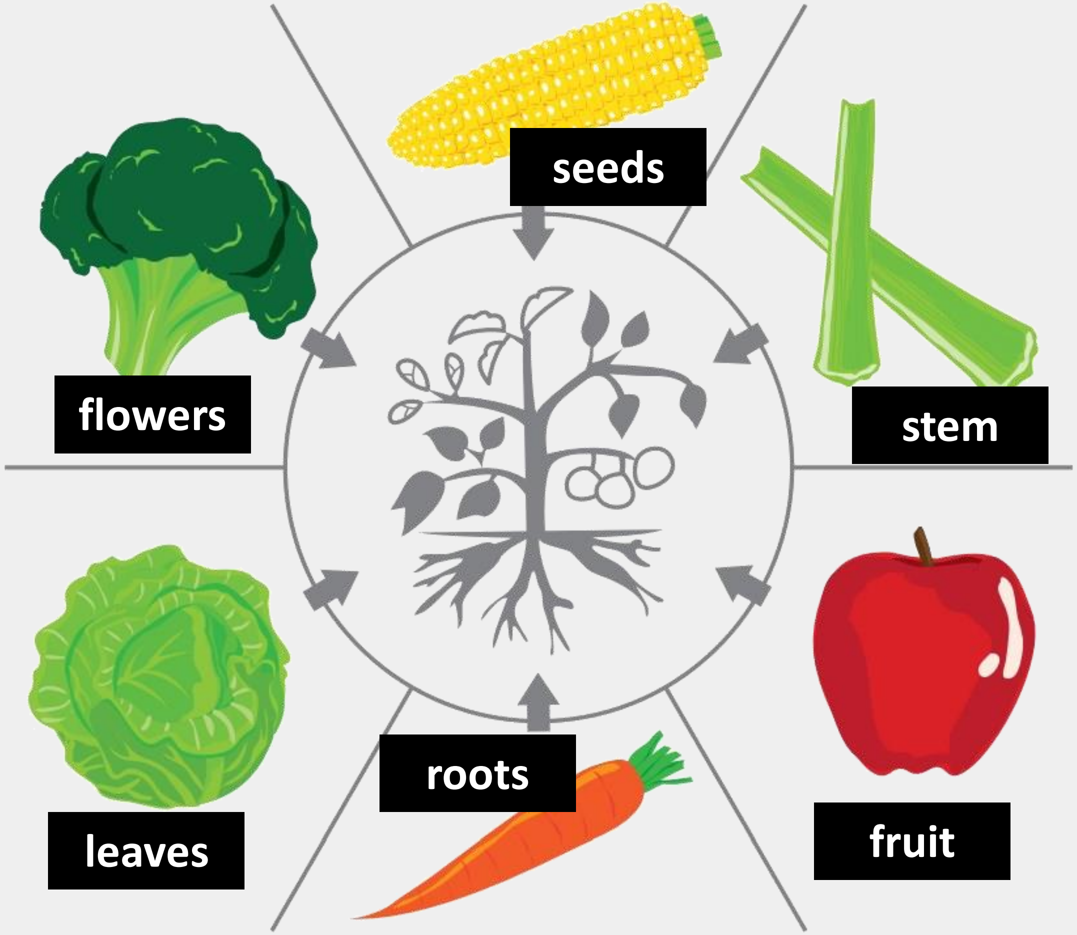
- **Absorb** water and nutrients
- **Transport** water and nutrients
- Food **Storage**



http://moziru.com/explore/Roots%20clipart%20tomato%20plant/

Background Knowledge

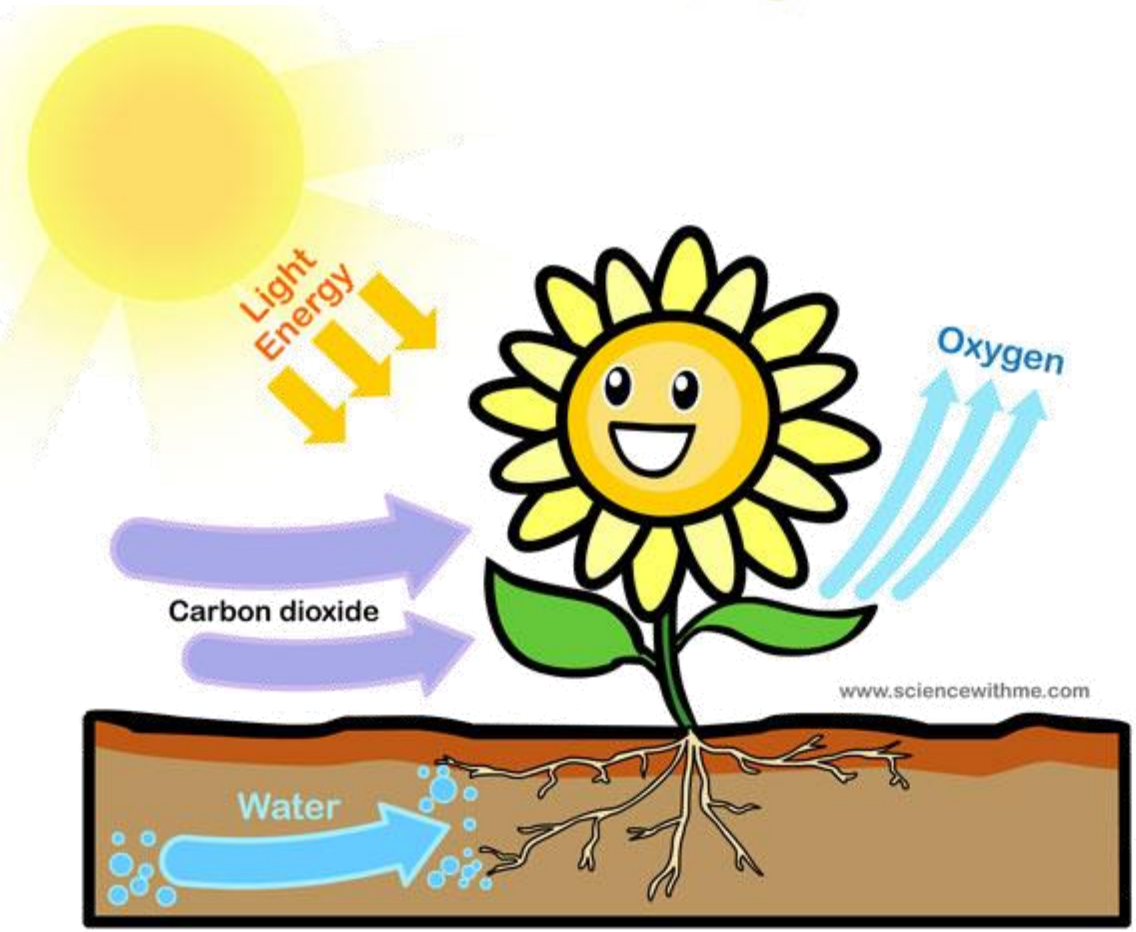
Parts of a plant we eat



We use many types of plants for food. The fruit and vegetables that we eat, and grow for eating, come from various parts of the plant. We often breed types of plant for food by **exaggerating** a part of a plant, such as flowers of the plant to grow broccoli, to make better use of them.

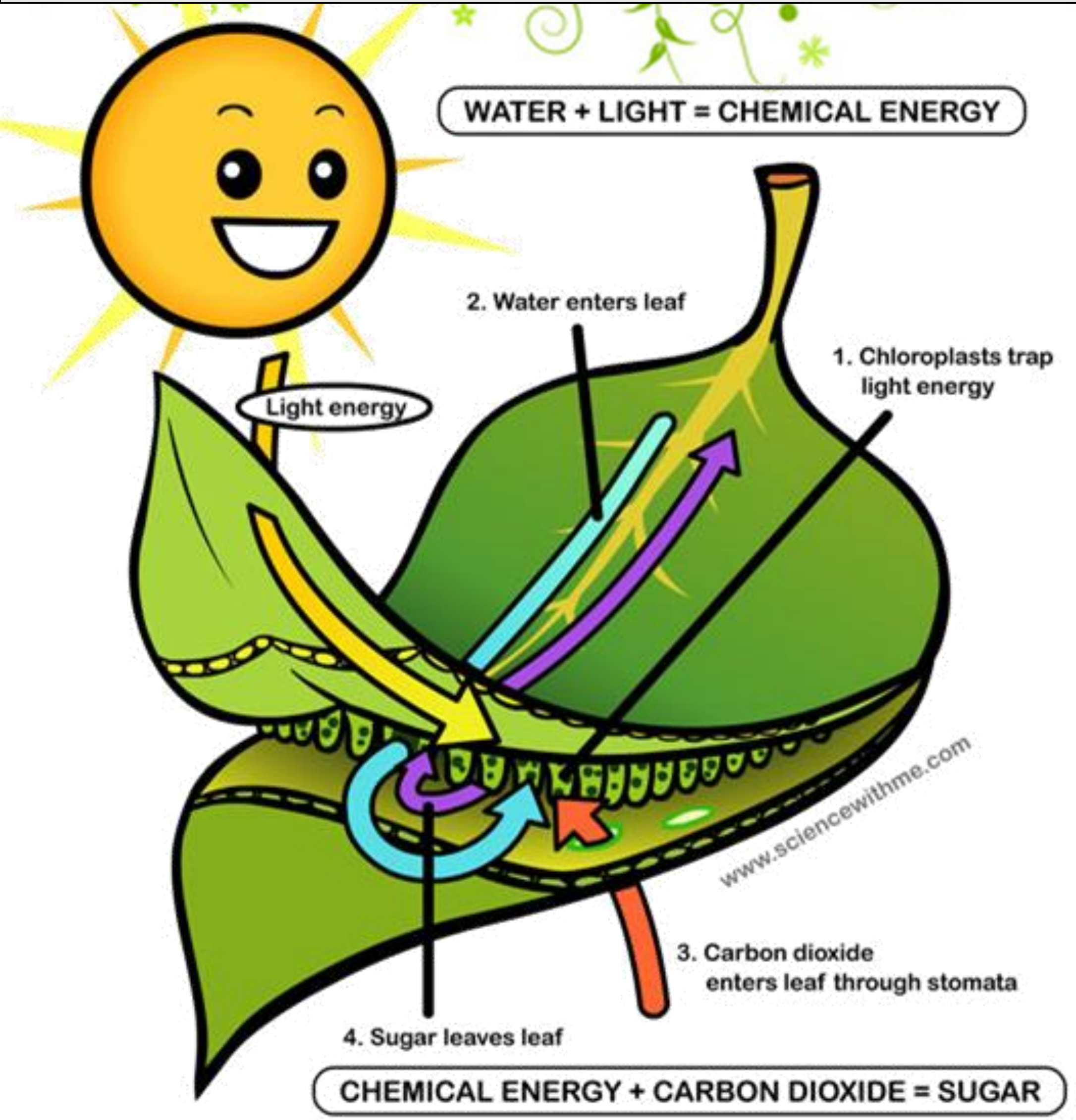
https://www.scienceworld.ca/resources/units/plants-we-eat

The significance of photosynthesis in making food



Most living organisms depend on plants to survive. Plants convert (change) energy from sunlight into food stored as carbohydrates through **photosynthesis**. Because animals cannot make their own food, they must eat plants (producers) to gain nutrition. Plants produce oxygen, which is released during photosynthesis, which all organisms need for **respiration**.

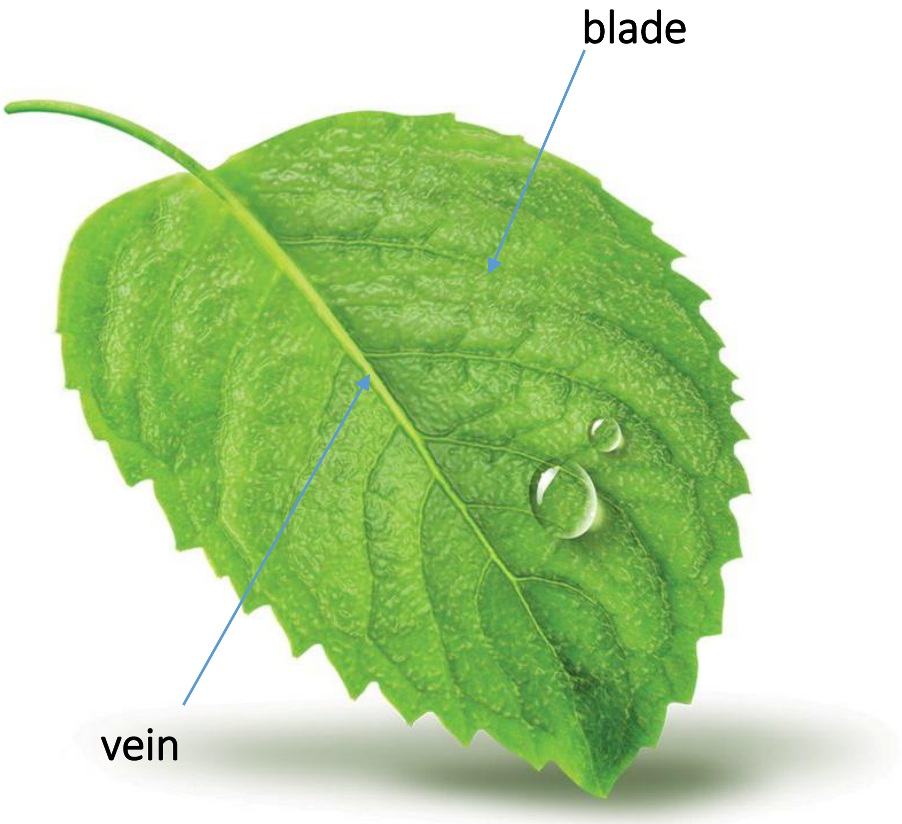
Photosynthesis transfers energy from sunlight into energy in chemicals such as glucose and starch.



Light enters the leaf and is trapped by a green substance called chlorophyll contained within structures called the chloroplasts in the cells.
Water is transported via water tube cells, called **xylem**, to the leaf cell and the **carbon dioxide** enters through the stomata and diffuses (spreads) to the leaf cells. These substances react chemically within the chloroplasts; powered by the light then **glucose** (a sugar) is produced along with **oxygen,** which diffuses out. The sugar leaves the leaf via sugar/food tube cells.

The leaf is the location of most photosynthesis

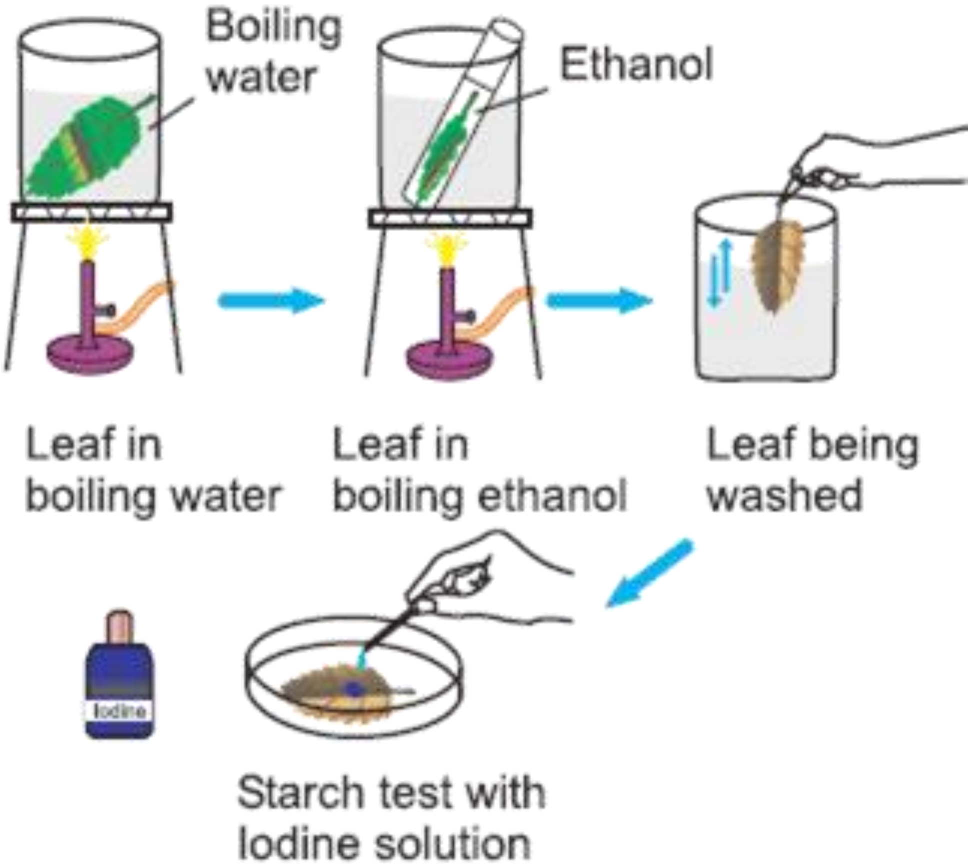
Extension



The **flat surface** of the leaf called the blade helps capture maximum sunlight for **photosynthesis**.
The leaf is attached by a stem to the plant which branch out into veins.
The **large surface area** of the leaf helps capture as much sunlight as possible.
The **green colour** is due to chlorophyll in the leaf cells that captures the light, and where photosynthesis takes place.
The **leaf is thin** to allow light (and carbon dioxide gas from the air) to circulate to every cell in the leaf.

Starch test

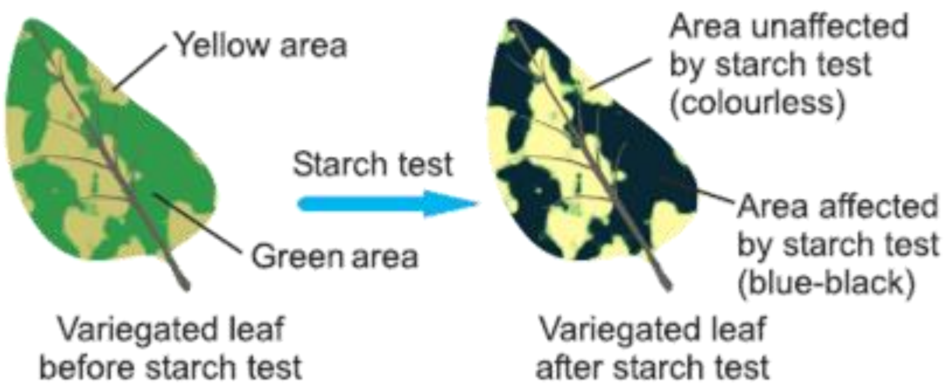
A positive test for starch is the **leaf turning blue- black** when iodine is added. The starch is the storage product of the plant when it produces photosynthesis. A positive test means photosynthesis has occurred.



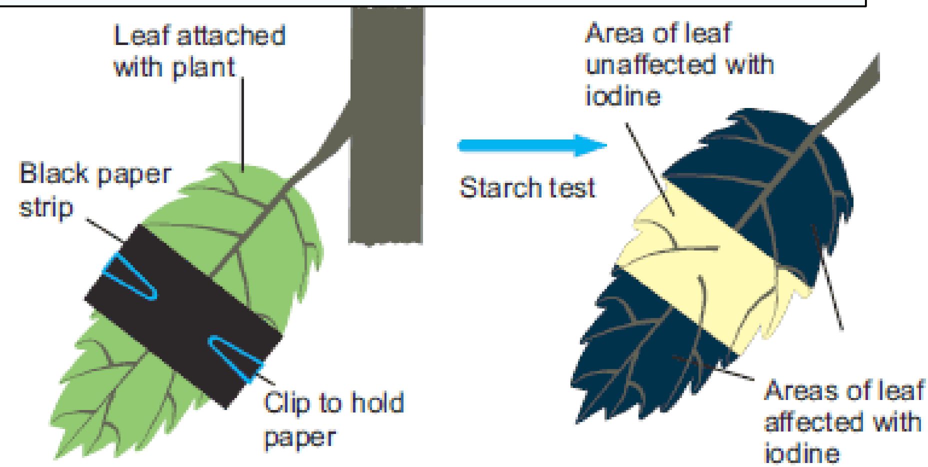
Step 1. The leaf is boiled in water to soften it.
Step 2. The leaf is then placed into a boiling tube of ethanol, which is placed in a beaker of water and heated gently. This will remove the green chlorophyll.
Step 3. The leaf is washed in water to remove all of the ethanol.
Step 4. Iodine added to the leaf. It will turn blue-black in the presence of starch. The starch indicates photosynthesis and the production of glucose has occurred.

Investigations into photosynthesis requirements

We can investigate that photosynthesis happens in the chloroplasts/chlorophyll in the leaf cells and use the starch test as evidence. When a plant undergoes photosynthesis, it produces glucose, which is converted into starch for storage. If we want to **investigate** what **factors** are required for **photosynthesis** we use the starch test to enable us to reach a conclusion. Factors include chlorophyll, water, carbon dioxide and light present.



Investigating if Chlorophyll is required for photosynthesis:
Select a leaf that is variegated leaf. The green parts contain chlorophyll and the white parts do not. To show chlorophyll is required for photosynthesis only the previous green areas will turn **blue - black.**



Investigating if light is required for photosynthesis:
Place a piece of black paper over a leaf and leave for a few days still on the plant. To show light is required for photosynthesis only the uncovered areas will turn **blue - black**.

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Background Knowledge

Water movement through a plant

Water is required for photosynthesis and it moves through the plant in **one direction only**.

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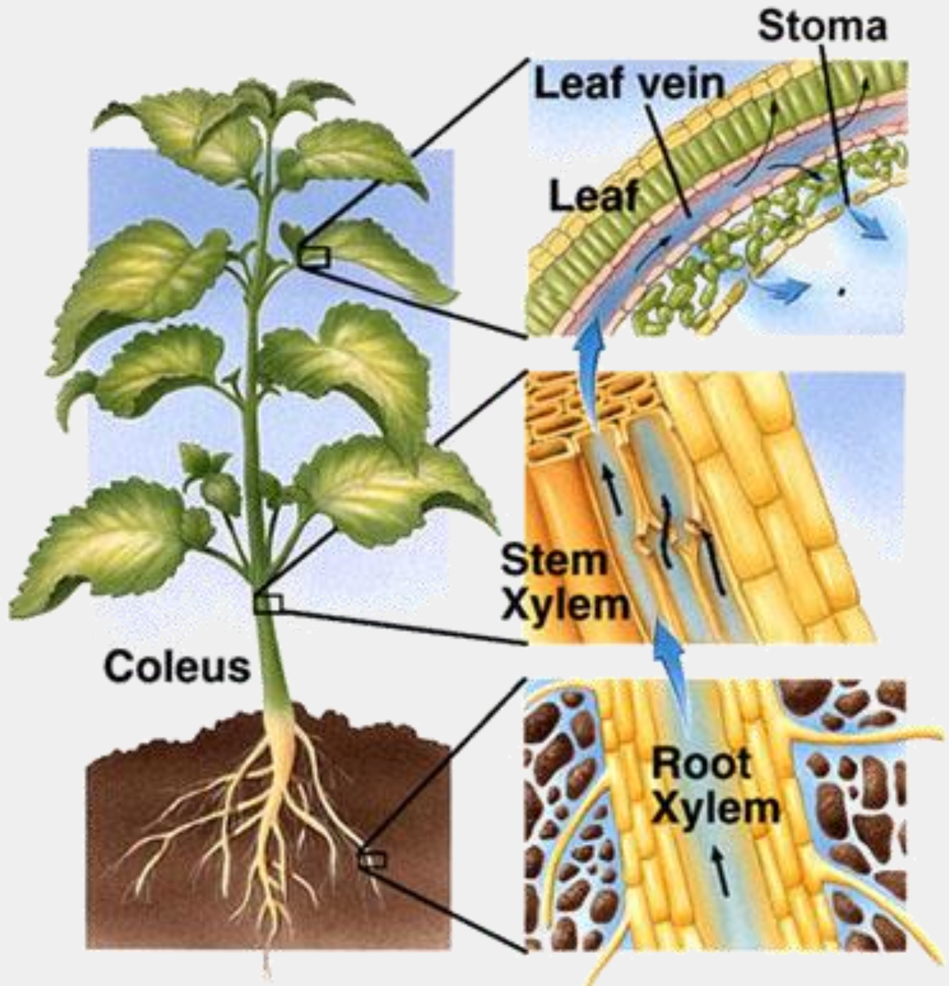
Step three: water moves out of the plant by transpiration through the stomata on the underside of the leaf

Step two: water moves up through the xylem by molecules "sticking" together and being pulled upwards

Step one: Water uptake by the process of osmosis into the root hairs

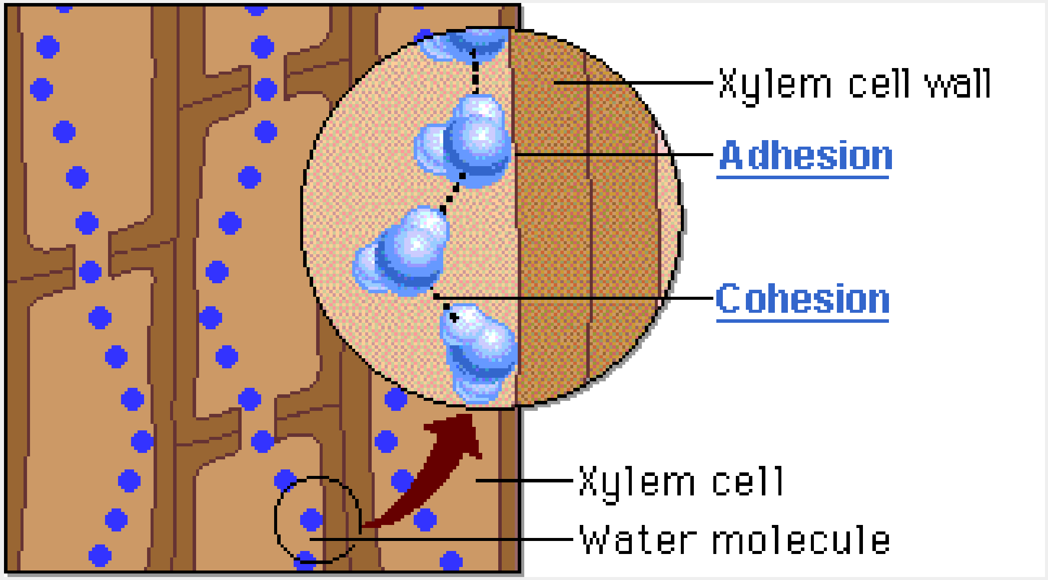


Background Knowledge

The xylem transports water in plants

Water is pulled up the xylem as each water particle sticks to each other. The xylem is probably the longest part of the pathway that water takes on its way to the leaves of a plant. Transpiration of water in the leaf pulls the water up.

Xylem cells have cell walls containing cellulose and lignin making them extremely strong. Xylem cells contain no membranes and are considered dead. These cells overlap to create a series of pathways that water can take as it heads to the leaves.

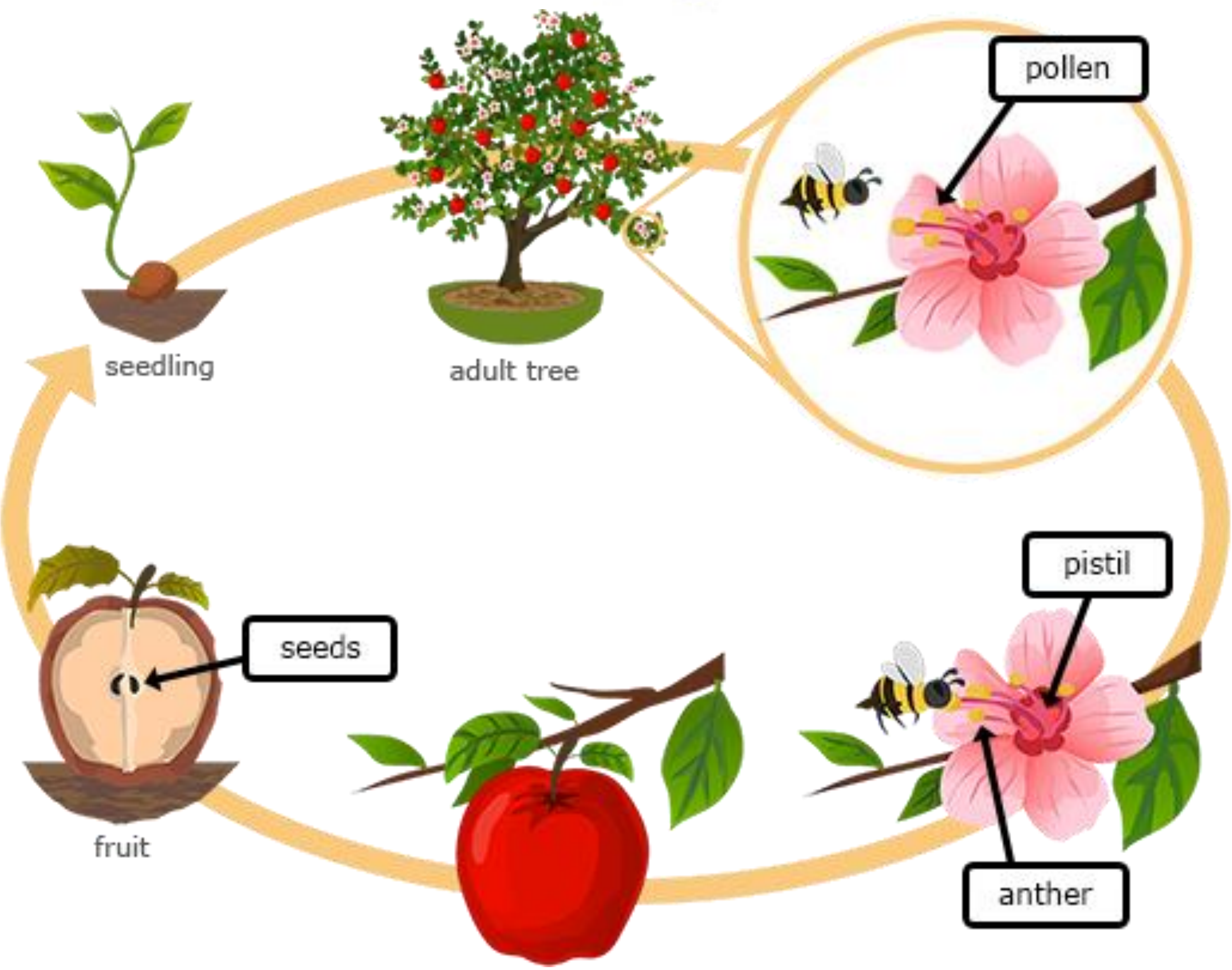


Flowering Plants

Plants that produce flowers are known as **Flowering Plants** (angiosperms).
The flowers are the **reproductive structures** where fertilisation occurs and seeds are produced.
Flowering plants include many of our common New Zealand such as kōwhai, harakeke (flax) and pōhutakawa, as well as flowering grasses like toetoe.

Many of our New Zealand Flowering plants have been discovered by Māori to be useful for medicine, food, clothing and housing.

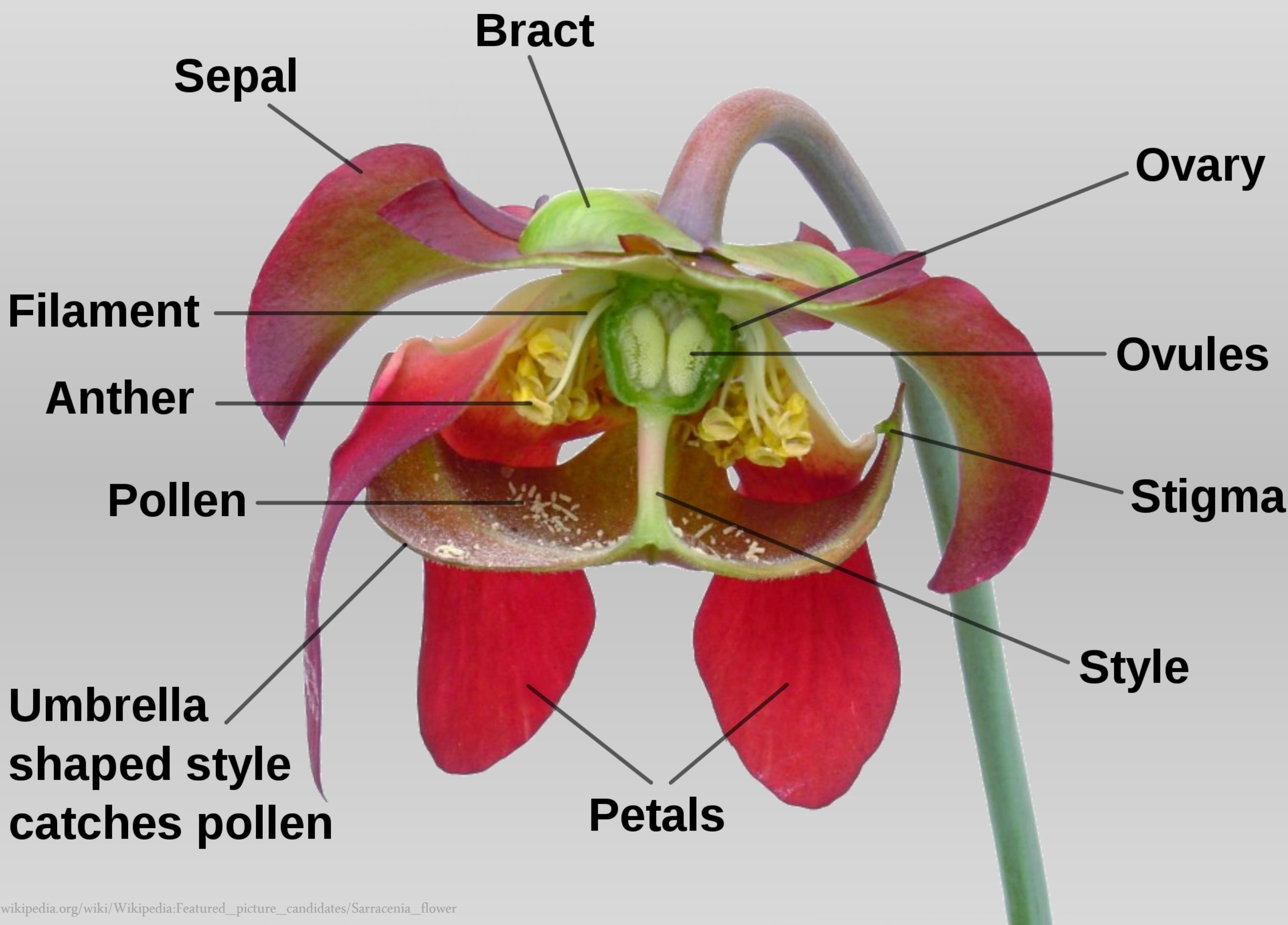
Flowering Plant life cycle



All flowering plants develop flowers that produce male pollen and female eggs. The number and structure of these depend on the species of plant.

The reproductive cycle involves the transfer of pollen to the egg in the flower (**pollination**), the joining of the pollen and egg to make a seed (**fertilisation**) and the spreading of seeds to grow a new plant (**seed dispersal**)

The structure of a flower

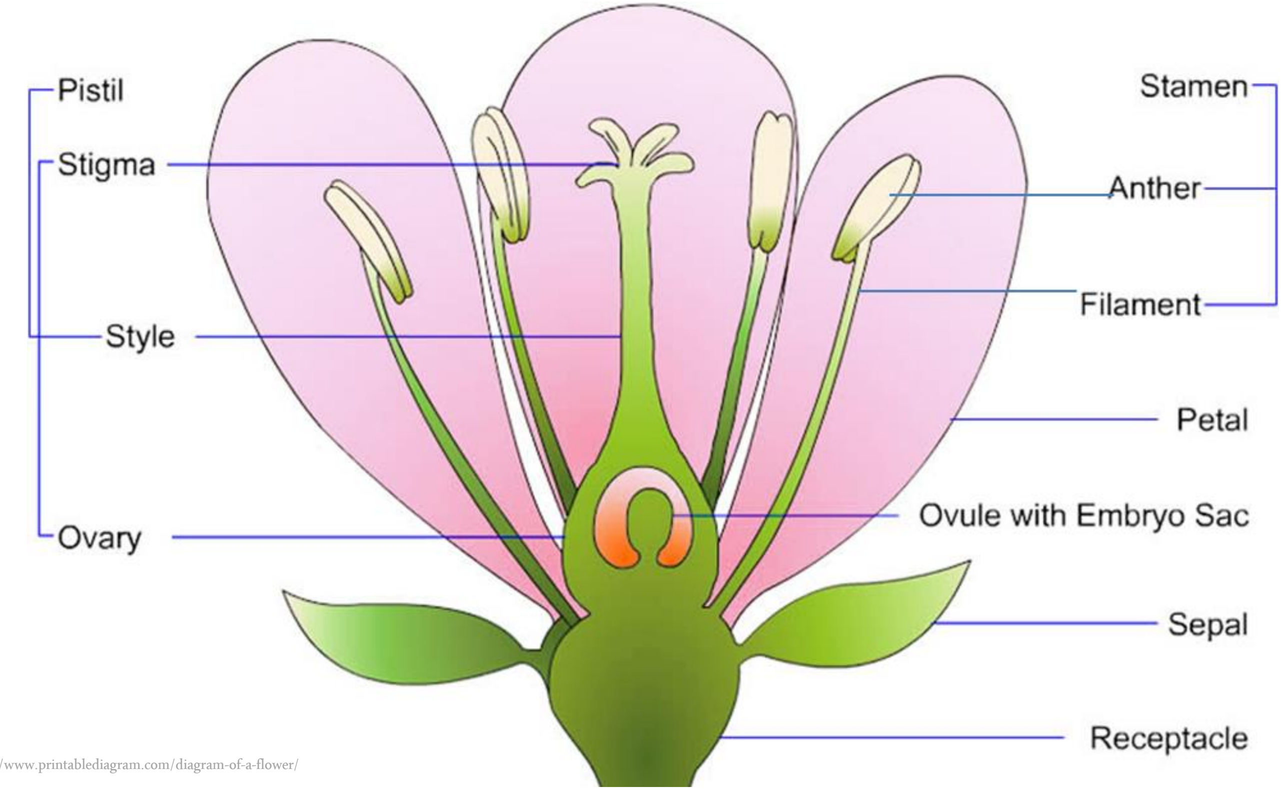


Insect / bird - pollinated flowers have visible, often colourful petals that surround the flower's sexual reproduction parts. The petals can "advertise" for specific **pollinators** through their shape, size, colour and sometimes smell. The flowers are surrounded by sepals, which are small and usually green structures that protect the flower as its developing.

https://en.wikipedia.org/wiki/Wikipedia:Featured_picture_candidates/Sarracenia_flower

Drawing and labelling a flower

The main parts of a typical flower that are pollinated by an animal such as a bird or insect, is shown below in a cross-section drawing. Many flowers often have many anther/filaments surrounding one central stigma/style. When labelling, one of each is required.



http://www.printablediagram.com/diagram-of-a-flower/

Reminders for Biological drawing:

- ❑ Clean single lines
- ❑ Label all parts
- ❑ Do not cross over lines

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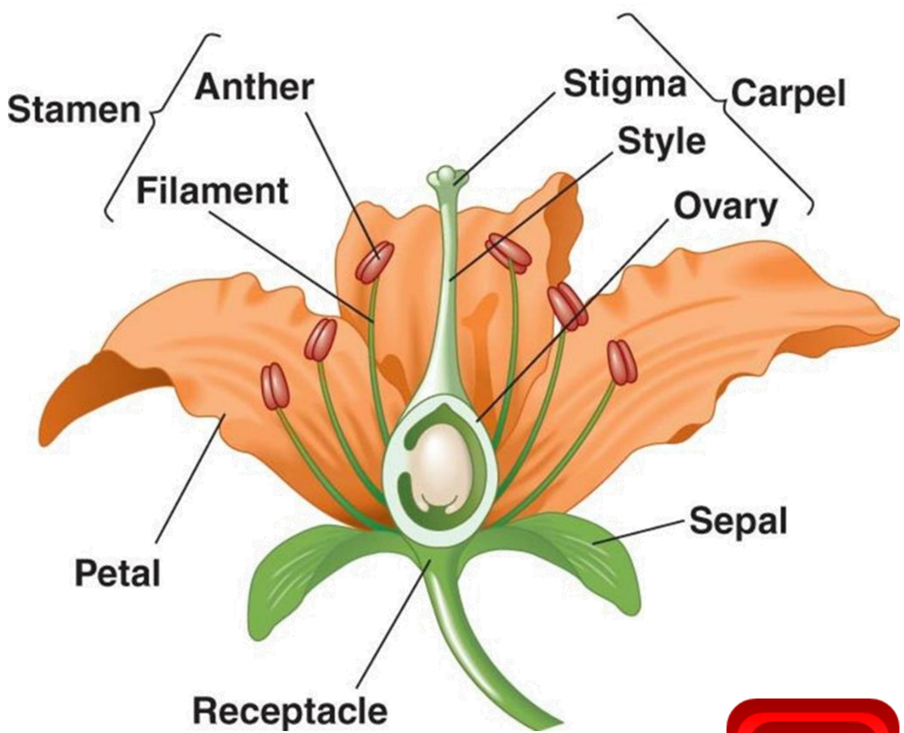
The reproductive parts of an insect-pollinated flower

<u>The male part</u> of a flower is called the **stamen**. The pollen is produced in the **anther** which is held up by the **filament**. The pollen is collected by a pollinator. (or spread by wind) The pollen contains male sex cells (**gametes**) which will later join with the female gametes in the ovule during fertilisation.



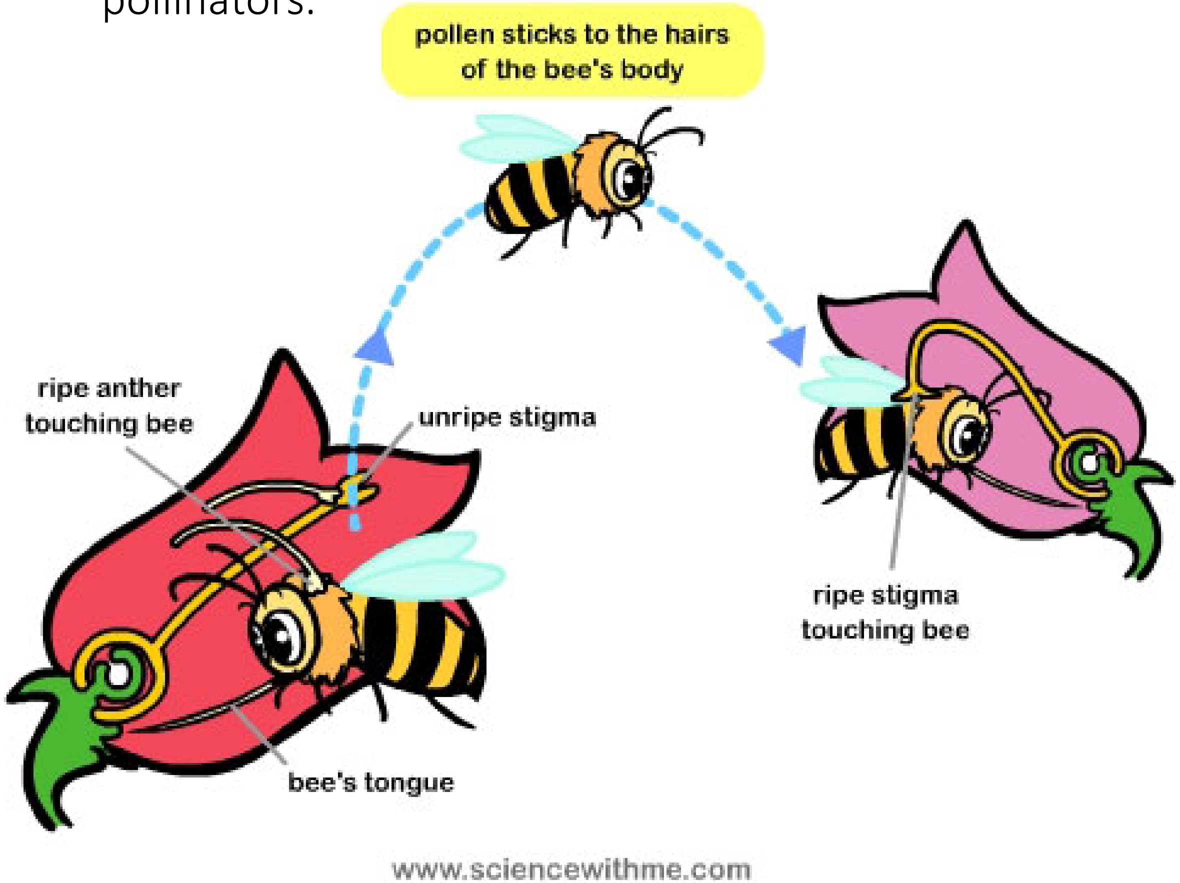
https://humananatomyly.com/flower-diagram-without-labels/

Extension

<u>The female part</u> of the flower is called the **pistil (or carpel)**. The pollen from a male part of a flower is brought to the stigma by a pollinator. This process is called **pollination**. The pollen travels down the **style** into the **ovary** to join with an egg cell inside the ovules in a process called **fertilisation**.

Pollination

Pollination is the transfer of pollen from the male part of the flower to the female (stigma) part of another flower. Flowers can be wind-pollinated or animal-pollinated. Animals that assist in pollinating a flower are known as pollinators.



Insect-pollinated flowers often contain **nectar**, a sweet sugar produced by the plant, to attract an insect. As the insect reaches into the flower for the nectar it may be brushed with pollen from the anther. If the insect moves to another flower it may brush the pollen against the stigma and therefore pollinate the flower.

Flowers ripen their male and female parts of the flower at different times to prevent **self pollination**.

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Summary of pollination in plants

1. The male parts of the flower are the **anther** and **filament**
2. The female parts of the flower are the **stigma**, **style** and **ovary**
3. Male gametes are found in **Pollen** Produced in the **Anther**
4. Pollen needs to be moved to the female part called the **Stigma** of the same species of plant to reproduce
5. This process is called **Pollination**
6. Pollination can be helped by **Wind** Or **Animal**
7. An example of wind pollination is **grass plants**
8. A wind pollinated flower is most likely to look like - **small, green, unscented**
9. An example of animal pollination is a **rose plant pollinated by insects**
10. An animal pollinated flower is most likely to look like – **colourful, with large petals, perhaps with a scent**

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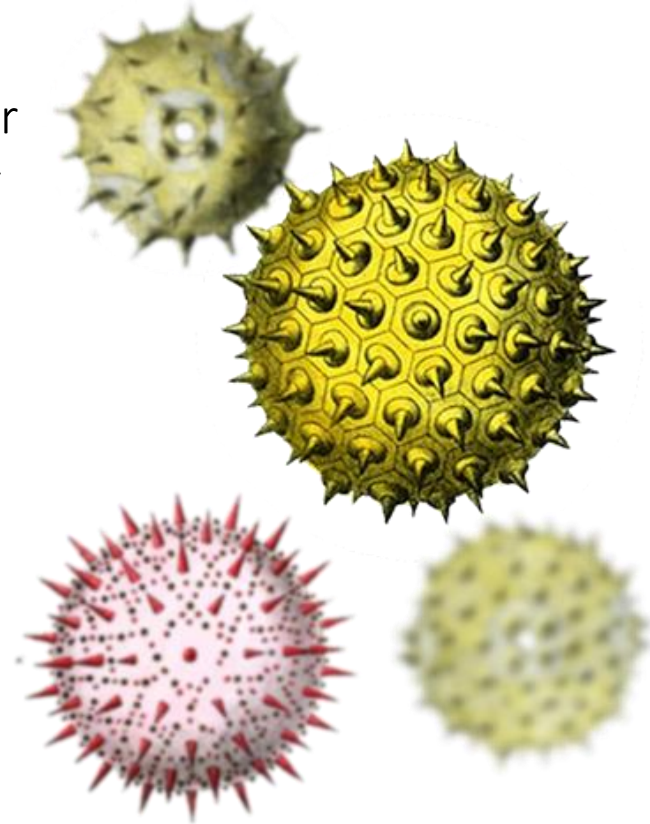
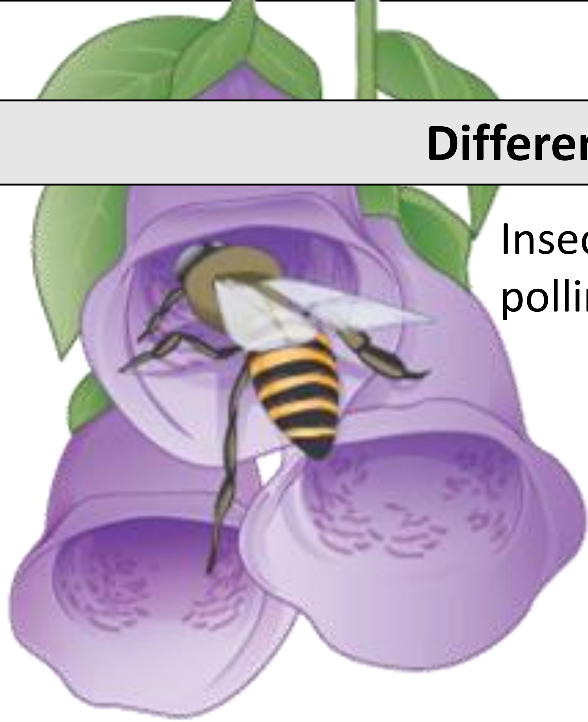
Different ways **pollen** may be transferred.

Pollen grains are tiny and they are light enough to be carried by the wind or on the bodies of flying and crawling animals.

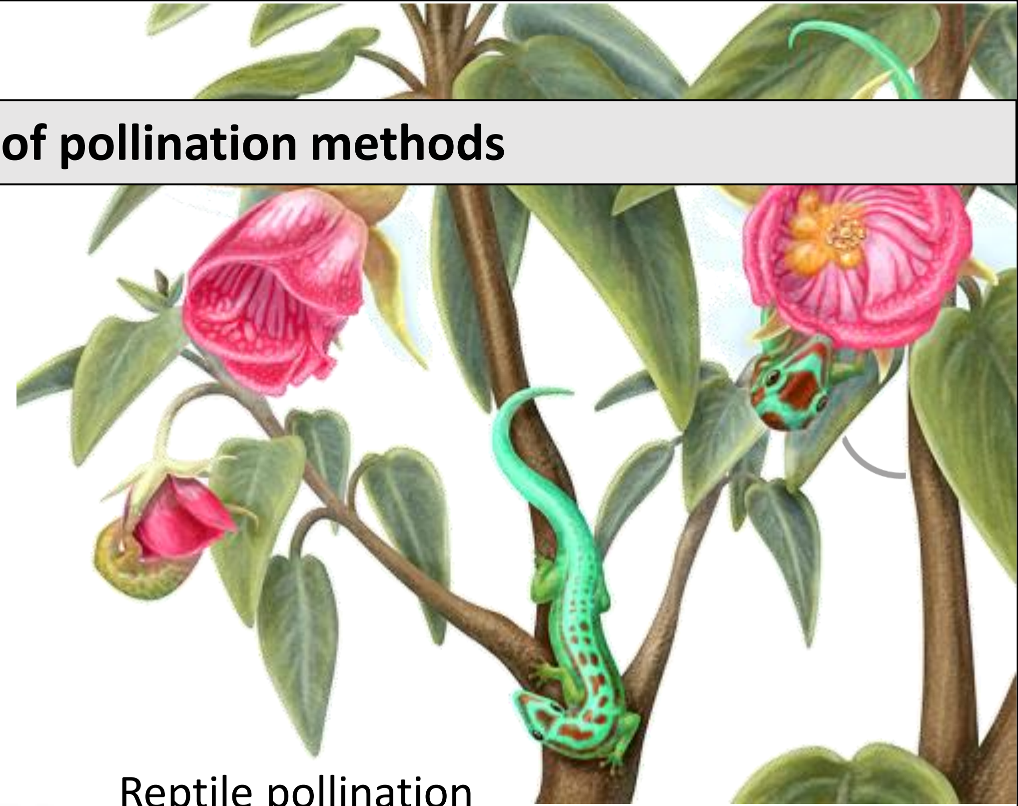
Plants and their flowers have adapted to transfer their pollen from one flower to another in many different ways that include using wind, insects, birds, mammals and reptiles.



Different types of pollination methods

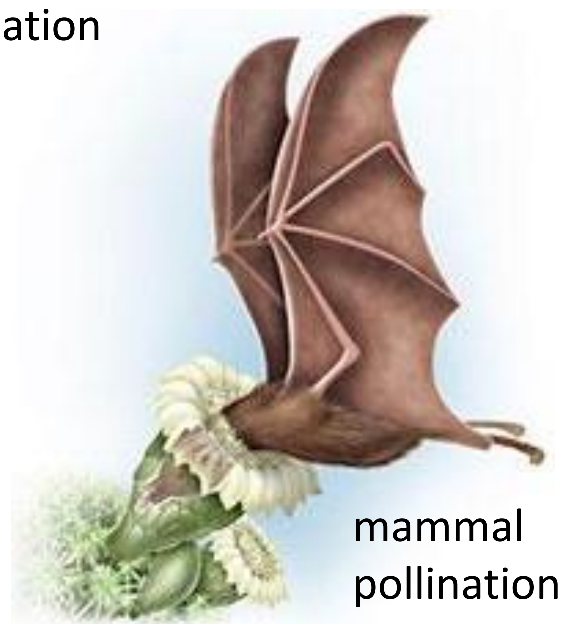


Insect pollination



Reptile pollination

wind pollination

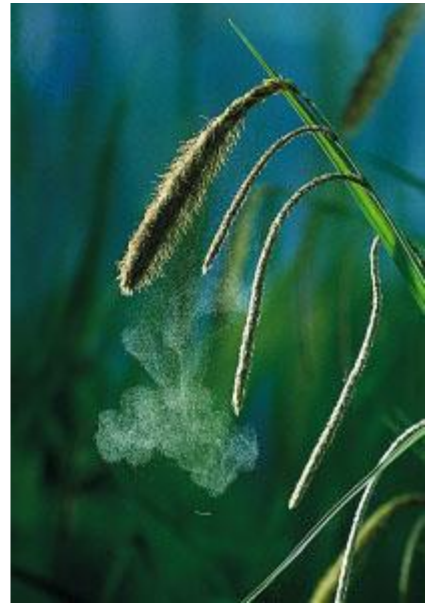


mammal pollination

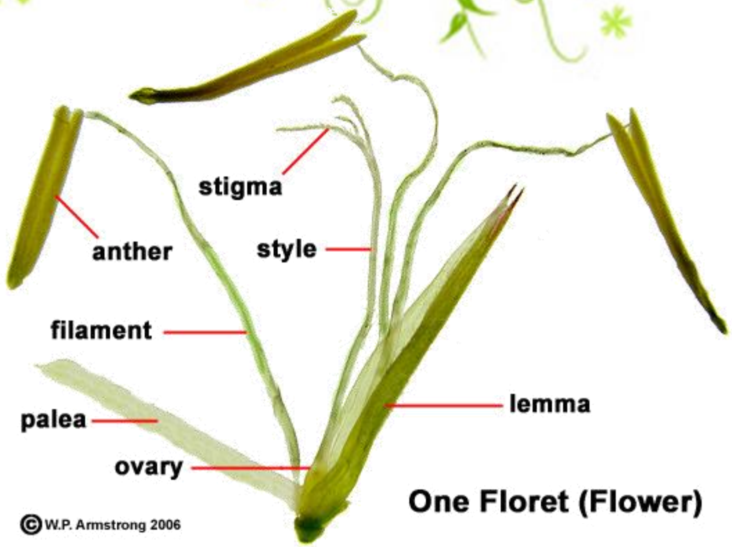
Bird pollination

Examples of insect-pollinated flowers

Examples of wind-pollinated flowers

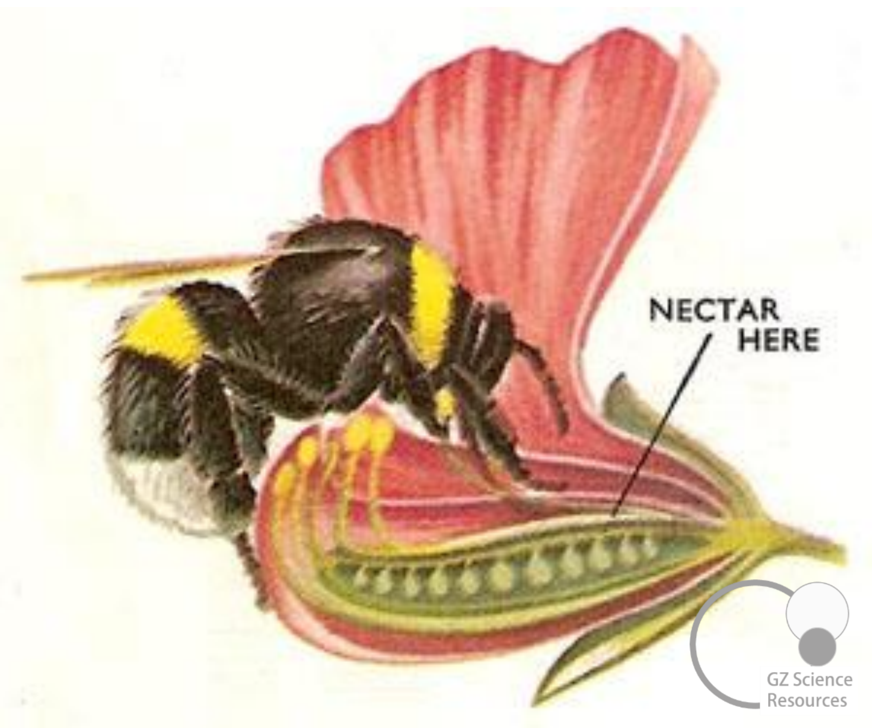


The differences in structure between insect-and wind-pollinated flowers



Insect pollinated flowers are easily seen and often contain scent and nectar to attract the insects. The male parts are adapted so they make contact with the insect as it feeds from the flower.

Wind pollinated flowers are often small and green with no scent. Male anthers protrude out from the flower to allow the wind to pick up the pollen and disperse it away from the plant. Male and female parts develop at different times.



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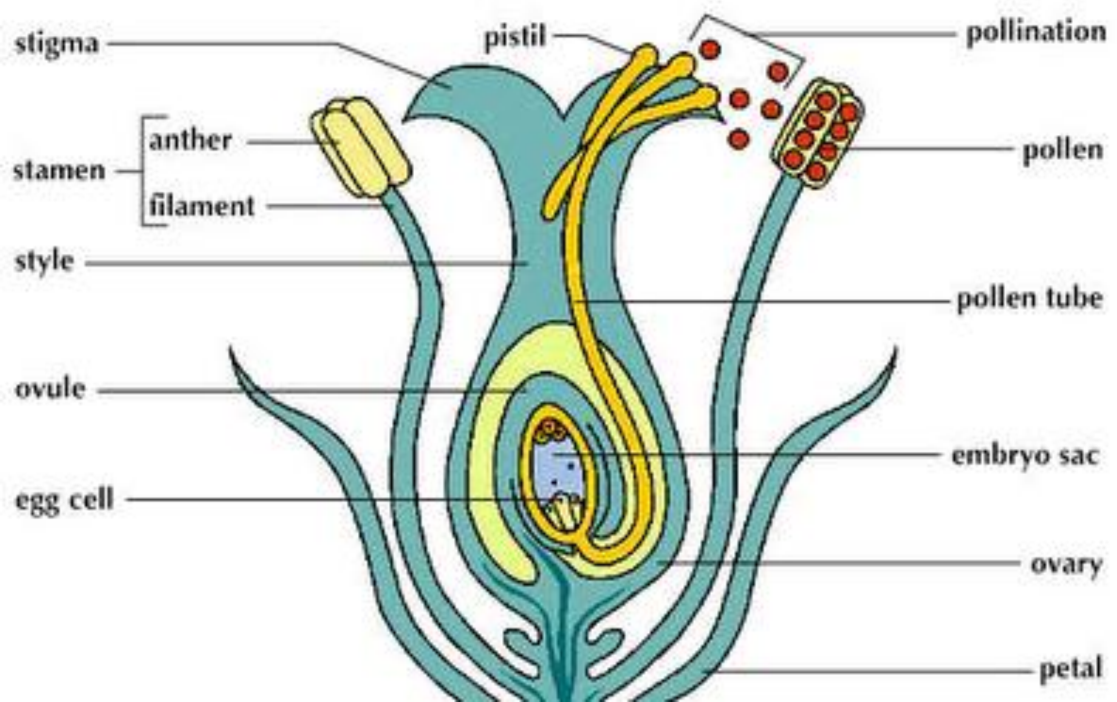
The differences in structure between insect-and wind-pollinated flowers
Summary

Feature	**Wind pollinated**	**Insect pollinated**
petals	Small dull coloured petals	Large brightly coloured flowers
scent	Flowers do not have any scent	Flowers have scent to attract insects
stamen	Stamen is thin and hangs outside flower	Stamen is strong and inside the flower
pollen	Pollen grains are light and numerous	Pollen grains are sticky or hairy and are few in amount
stigma	Stigma is feathery to catch pollen and hangs outside the flower	Stigma is also hairy and sticky and is inside the flower
nectar	No nectar or nectary	Many have sweet nectar in a nectary to attract insects

Fertilisation in flowering plants

1. Pollen from either the same plant (self-pollination) or another plant (cross-pollination) needs to arrive on the flowers stigma
2. The pollen sends a tube down the style to reach the ovule, and the male gametes (there are two in every pollen grain) enter the ovule to fertilise the egg (female gamete)
3. One male gamete joins with one female gamete to form a **zygote** and the plant is fertilised. (The fertilised ovule develops into a seed)



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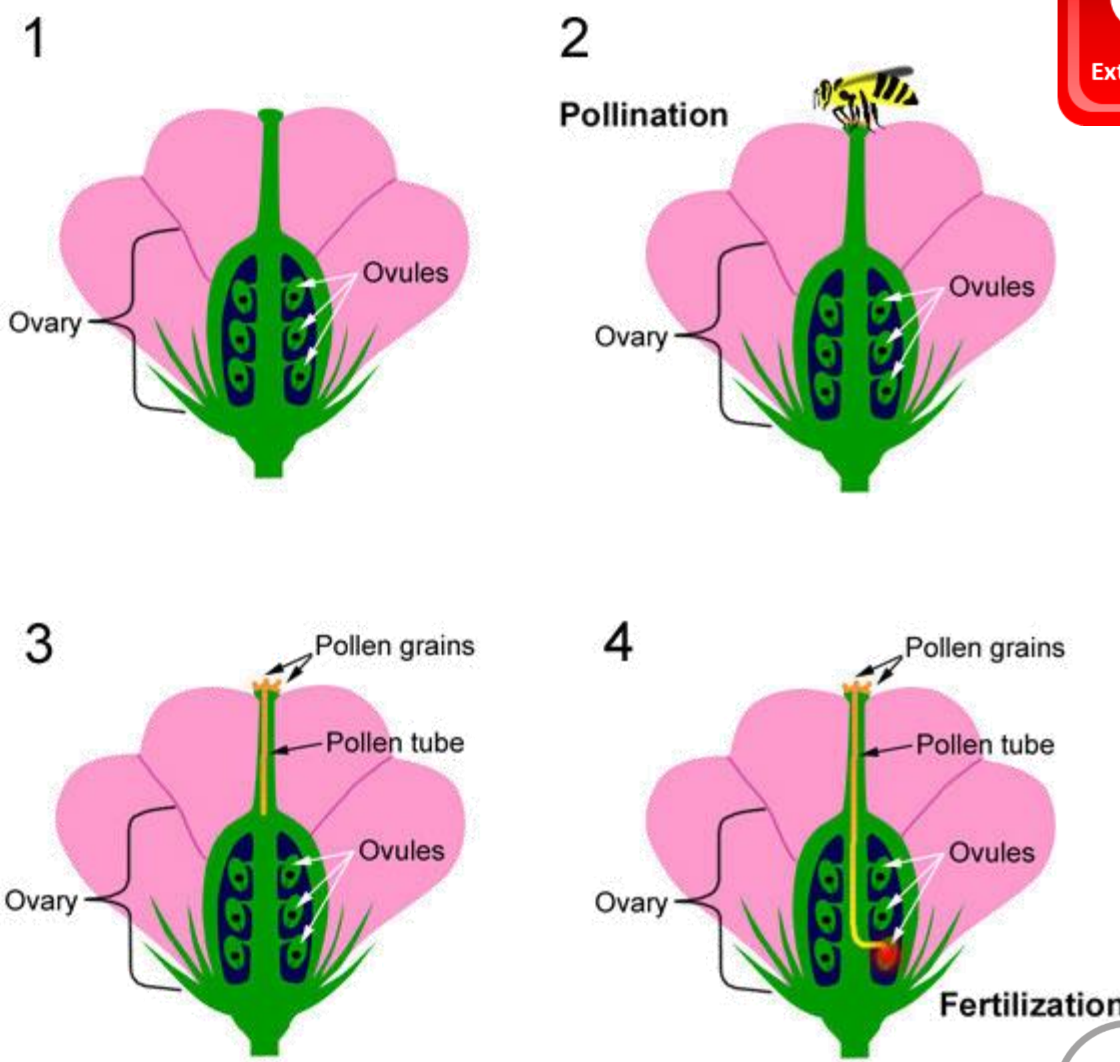
The differences between pollination and fertilisation in flowering plants

Extension

Pollination just refers to pollen landing on the female stigma of the plant. This can either be with a pollinator or wind.

Fertilisation refers to the sperm cell (that was in the pollen grain) joining with the egg cell to form a single cell (zygote).

Pollination does not always lead to fertilisation

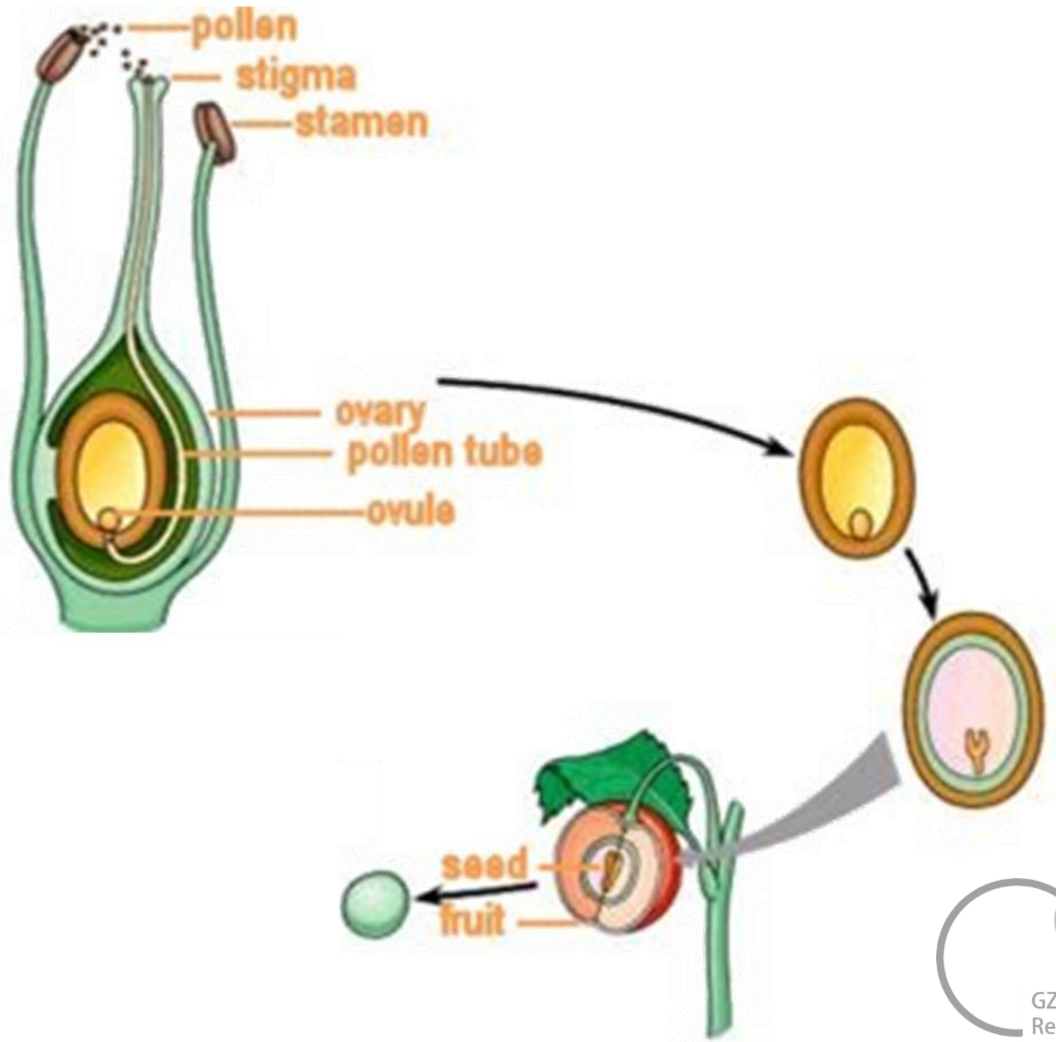


The formation of seed and fruit from ovule and ovary

extra info

Once the flower has been fertilised by pollen the **ovary** grows to form the **fruit**.
The **ovules** become the **seeds**.
The outer part of the ovule grows into the seed coat.
The **zygote** grows into the young plant – or embryo.

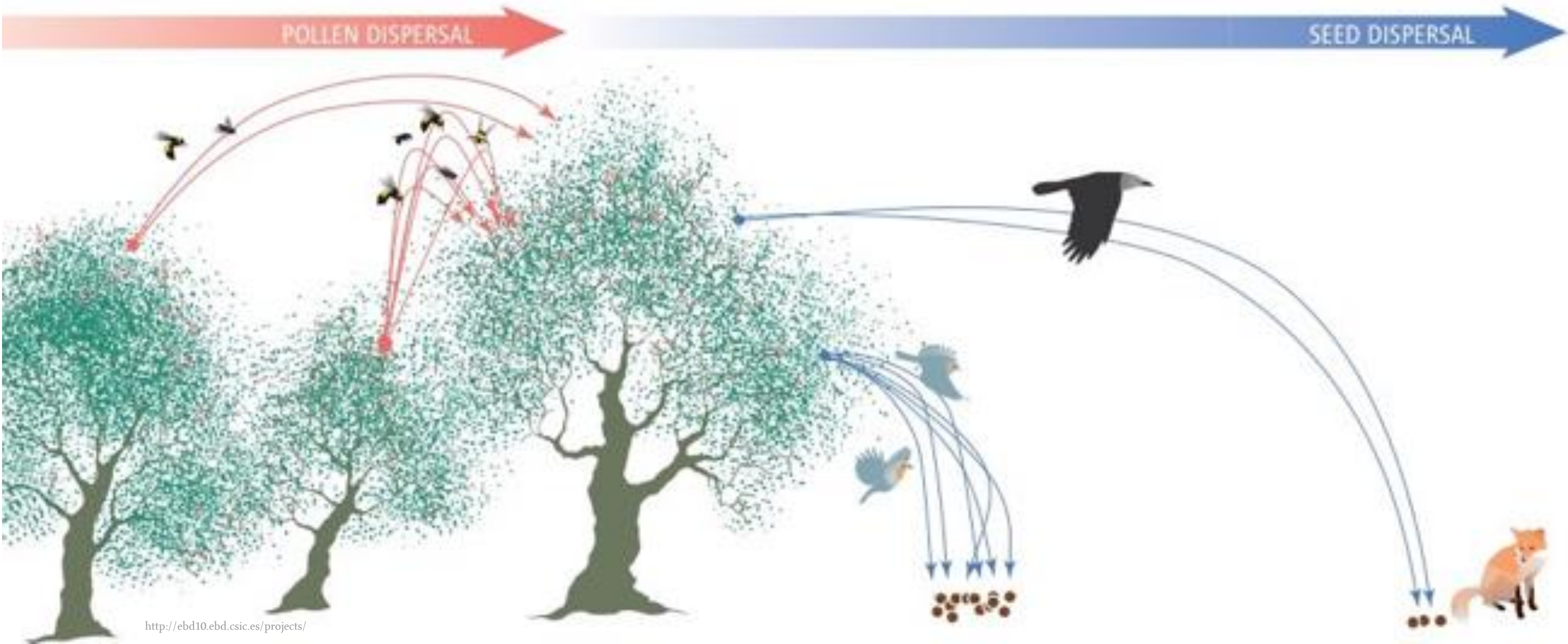
A fruit may have one or more seeds.
The petals, sepals and other parts of the flower start to die and fall off.



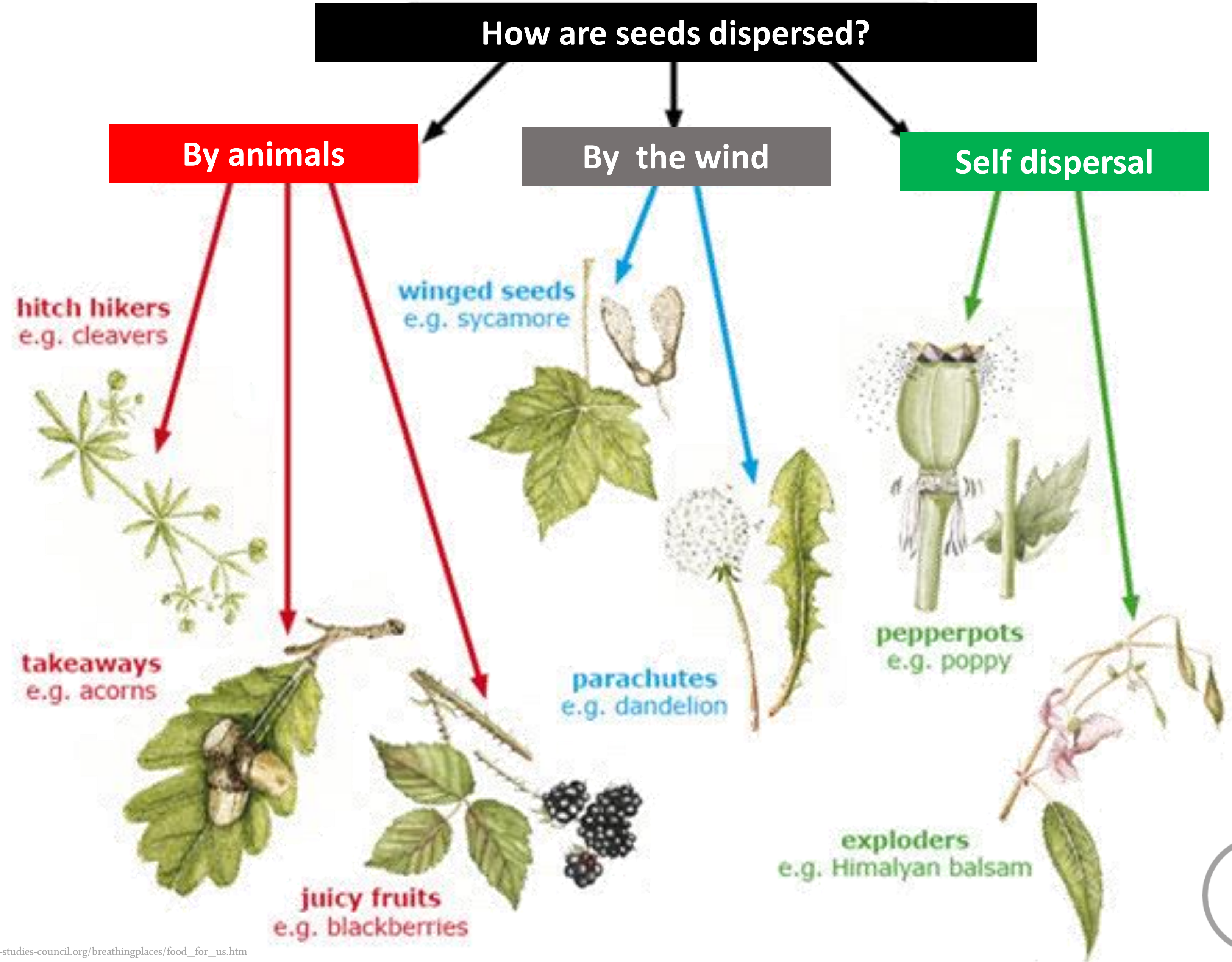
NOT ASSESSED

Seed dispersal

Pollen is dispersed (or spread) from plant to plant so the flowers can be pollinated and fertilised seeds produced. Once the seeds are mature they then also need to be dispersed so they are not competing with the parent plant for space, light, water and nutrients. There are various ways that plants have evolved to disperse their seeds; forming inside fruit that animals will eat and spread, forming structures on the seed so the wind will carry them away, can float away, be forced away or tangle in the coat of an animal to be carried away.



Seed dispersal



http://www.field-studies-council.org/breathingplaces/food_for_us.htm

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Seed structure is linked to Seed dispersal

Extension

Animals

These fall into two main groups: fruits to attract animals to eat them or seed pods that are sticky or have hooks to attached to animals coats and be carried away

Wind

Most of these seeds are light and either have wings or plumes

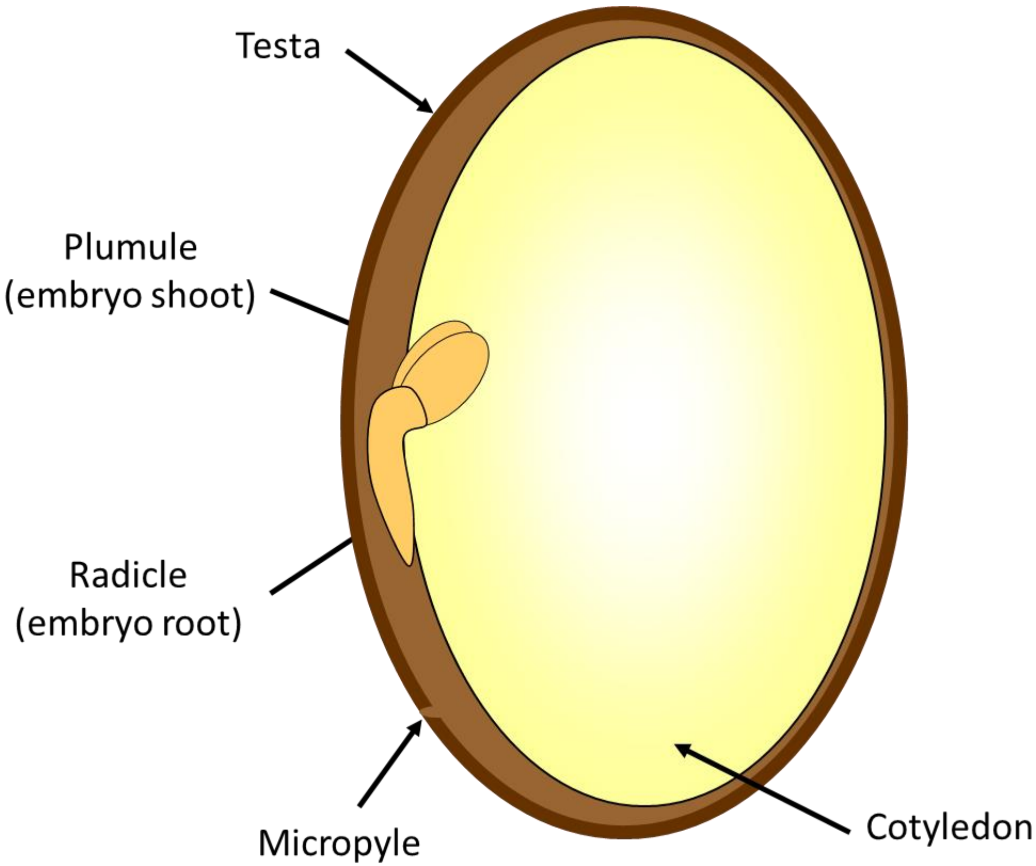
Water

Most of these plants have fruits which float. They become buoyant by trapping air.

Expulsion

Fruits explode or burst and seeds are flicked away

The Structure of seeds



A seed is a fertilised ovum (egg) containing a small embryonic plant and a supply of food to help it germinate and grow before it can start to photosynthesis and make its own food. The embryo plant is made up of the plumule and radicle and cotyledons contain the starch/food stores.
Water enters the seed through the micropyle and starts the seed germinating. The water also softens the testa to allow it to split.

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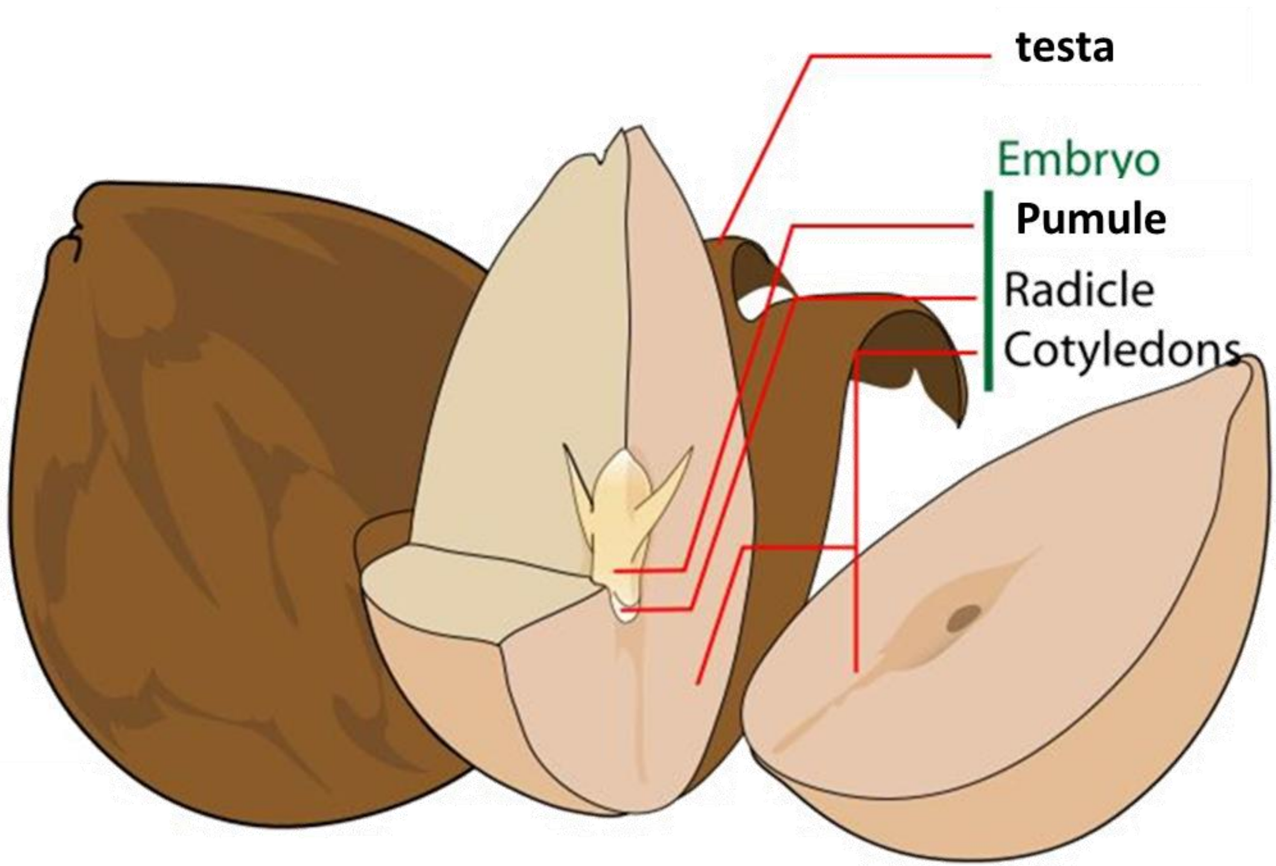
The functions of parts of a seed



The seed consists of the seed coat or the **testa,** which surrounds the **cotyledons** or the food storage area. The embryo consists of the **radicle** which is the embryonic root and the **pumule,** which forms the first shoots and leaves of the plant. A small pore in the seed may be seen called the **micropyle**. This is where the pollen originally entered the ovule.

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The conditions needed for germination of seeds

Seeds will remain **dormant** until they receive (WOW)

Water

Oxygen

Warmth

Then they will **germinate.**

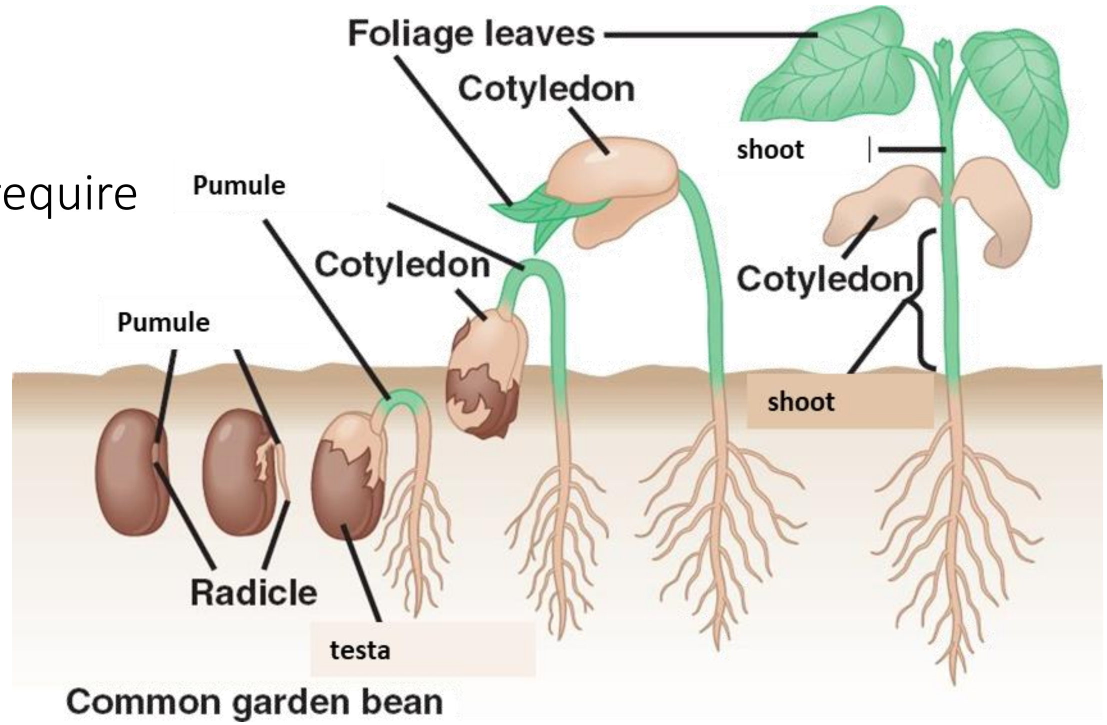
Other types of seeds may also require

>fire to burn seed coat

>light

>soaking in water
>scratched seed coat
>being digested by animals

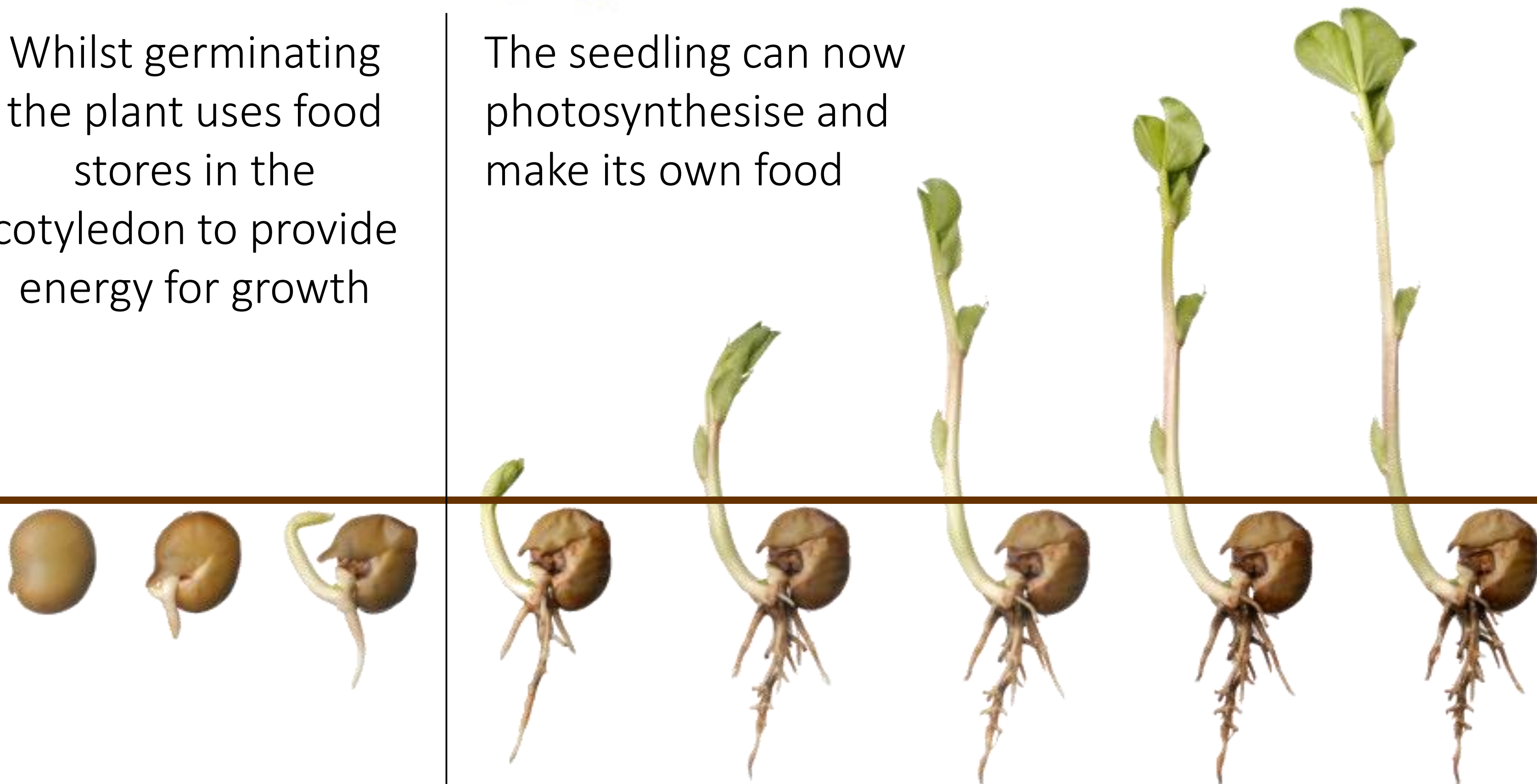
Before they germinate



Stages of germination of seeds

Whilst germinating the plant uses food stores in the cotyledon to provide energy for growth

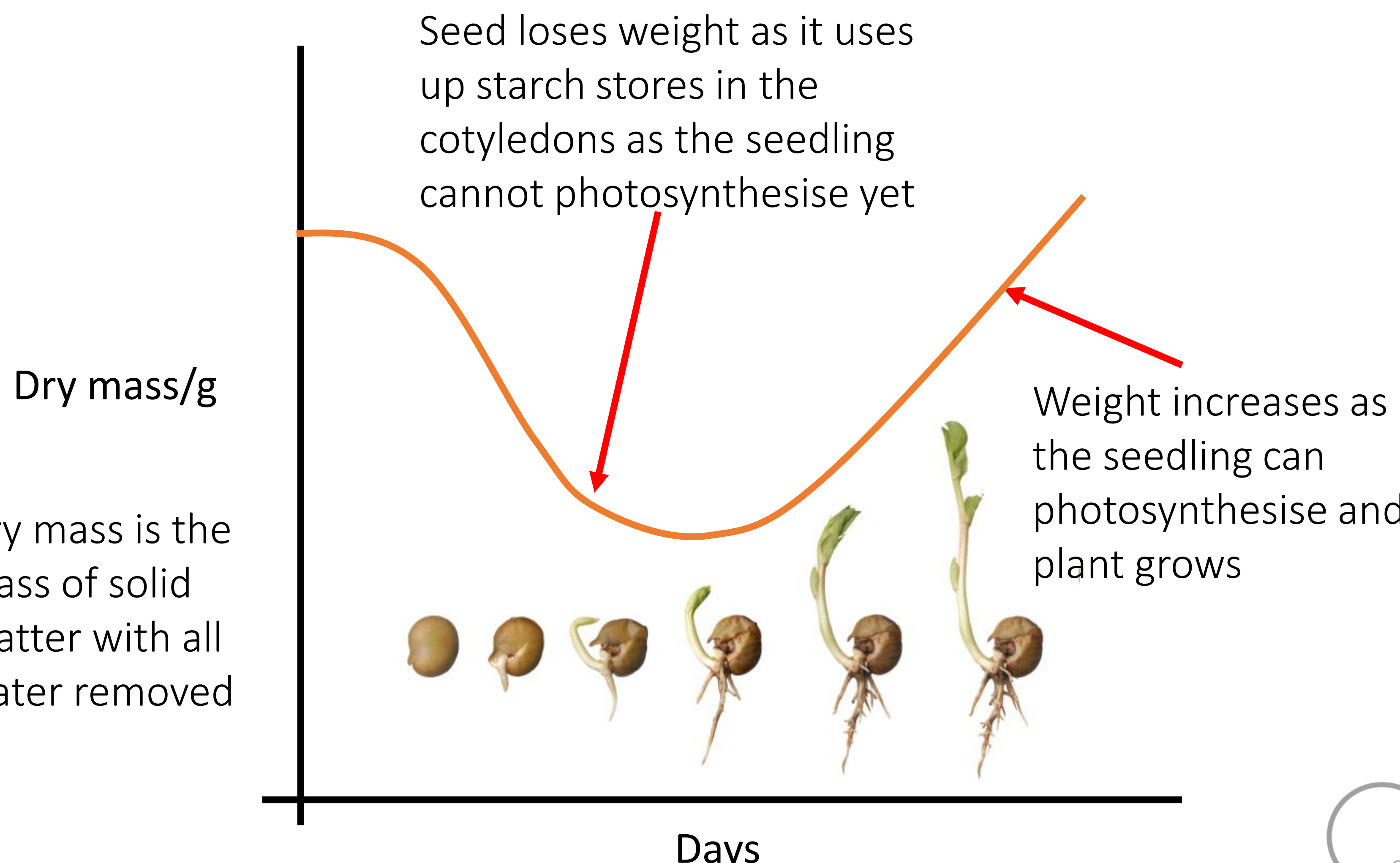
The seedling can now photosynthesise and make its own food



germination

Plant growth and development

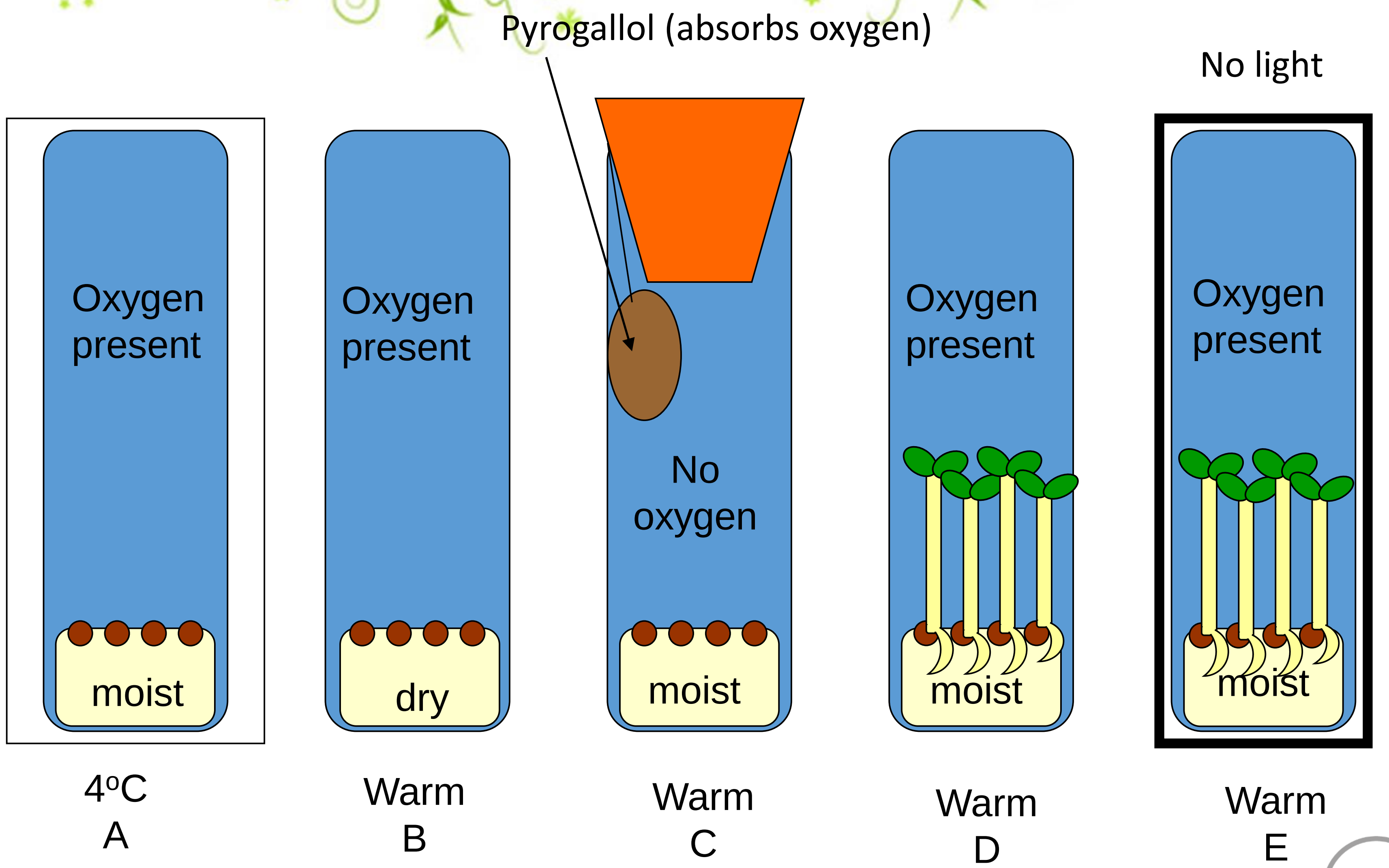
The conditions needed for germination of seeds



Dry mass is the mass of solid matter with all water removed

Germination Investigation

:



Māori scientific knowledge and understanding of their use of plants - Tawa

Over a long period of time Māori have built up their scientific knowledge and understanding of their use of plants for medicine (Rongoa), food, clothing and housing.
Many of these uses are still practiced today.

Tutu. Photographer: Michael Hall. © Te Papa & Ngati Toa. Tutu ointment being applied to arthritic wrist.

Māori scientific knowledge and understanding of their use of plants - Rata

The rātā tree bark can be made into a lotion or poultice, and the flower nectar can used for sore throats.

White and Red Rata from Maungatautari

Māori scientific knowledge and understanding of their use of plants - Kawakawa

Kawakawa can be made into a tea, poultice or chewed for tooth ache, sore stomach, and pains

Te Ara - The Encyclopedia of New Zealand
Photograph by Emily Tutaki

Kawakawa from Maungatautari


The root can be boiled and then smeared it on as an ointment.
The flax root and leaf can be used for boils, bruises and bleeding, burns, toothache, worms, indigestion, measles.
Harakeke also has many uses as kete (baskets) and food carriers. The tough fibre in the plant can be used for fishing nets and traps, footwear, cords and ropes.
Various types (cultivars) of flax were seen as having specific uses by different iwi. ‘Māeneene’ - Ngāi Tūhoe -fine patterned mats. Ngāti Porou -‘Tākirikau’ - piupiu (kilts). ‘Kōhunga’ - Ngāti Maniapoto - finest cloaks.