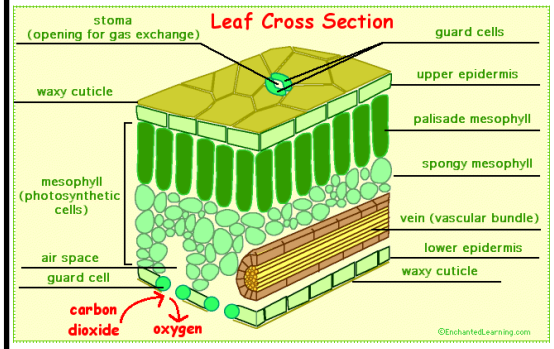
SCIENCE

Year 8: Environment

1) Leaf structure and function

Leaves are adapted to allow photosynthesis to take place.

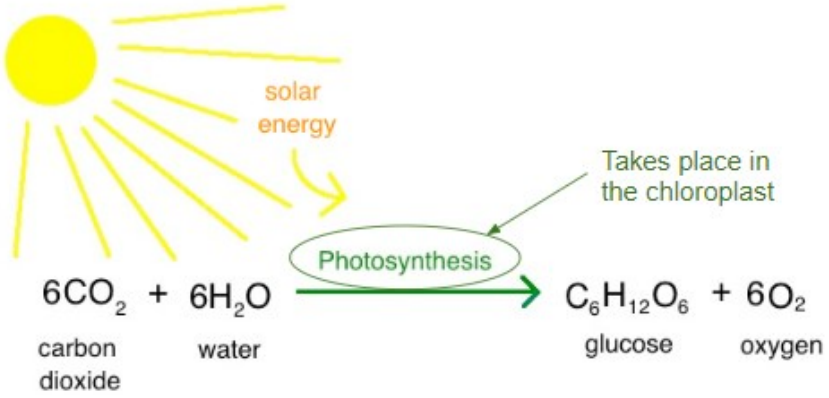


Carbon dioxide enters though the stomata

Oxygen and water leave through the stomata

Part	Function
Stomata	Gaps in the surface of the leaf to allow gas exchange
Waxy layer	Prevents water loss from the leaf
Chloroplasts	Contain chlorophyll that absorb energy from the sun
Veins	Transport water to the leaf and glucose away from the leaf

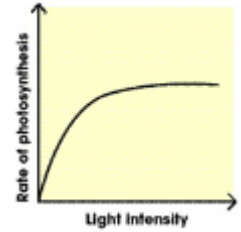
• 2) Photosynthesis (process, reactants and products)



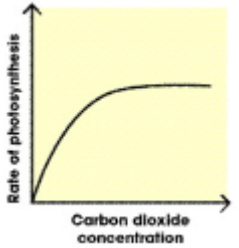
- Photosynthesis takes place within the chloroplasts of the leaf.
- The reactants for photosynthesis are carbon dioxide and water.
- The plant also requires energy from sunlight for photosynthesis to take place.
- The products are glucose and oxygen

Keyword	Meaning	Keyword	Meaning
Chloroplasts	Contain chlorophyll that absorb energy	**Denature**	The changing shape of proteins or enzymes responsible for chemical reactions
Producer	An organism that makes it's own food	**Trophic level**	The levels in a pyramid of numbers & biomass showing different organisms
Pyramid of numbers	A pyramid shaped food chain showing the number of organisms at each trophic level	**Starch**	A chain of glucose molecules stored in a plant
Pyramid of biomass	A pyramid shaped food chain showing the biomass of each organism at each trophic level	**Iodine**	A chemical element used to identify the presence of starch
Photosynthesis	A process by which plants make their own food (glucose)	**Limiting factor**	A factor that limits a process
Glucose	A type of sugar	**Efficiency**	The amount of useful energy transfer

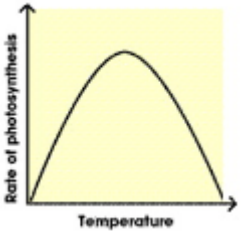
3) Limiting factors of photosynthesis



Light Intensity: Light provides energy for photosynthesis. As light levels increase the rate of photosynthesis increases until the graph levels off. Beyond this point either carbon dioxide concentration or temperature is the limiting factor.



CO2 Concentration: CO2 is a reactant needed for photosynthesis. As carbon dioxide concentration increases increase the rate of photosynthesis increases until the graph levels off. Beyond this point either light or temperature is the limiting factor.



Temperature: As temperature increases so does the rate of photosynthesis until it reaches the optimum, then it starts to decrease. This is because enzymes are involved in photosynthesis. Too cold and they move too slowly. Too hot and they denature

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4) Uses of glucose and testing for starch

Plants use glucose produced in photosynthesis for:

- Respiration (to release energy for growth)
- Converting into insoluble substances for storage. Such as:

Oils

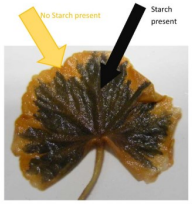
Fats

Starch

- Used to make cellulose for cell walls
- Used to make proteins for growth and repair

Plants store glucose as starch. Starch is stored in the cells and broken down into glucose when the plant cannot photosynthesise.

Iodine is used to test for starch in plants (and food) and if starch is present the iodine will turn blue/black.

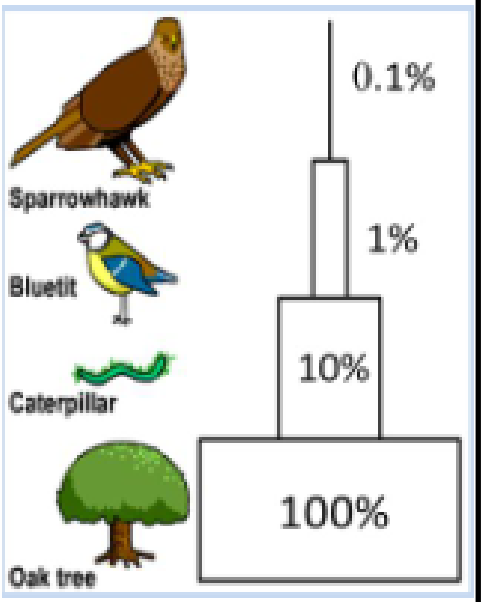


5) Energy loss in a food chain

- Energy moves from one trophic level to the next up the pyramid.

- At each trophic level organisms use the energy for life processes and some is lost as heat to the environment or as waste in faeces.

- Only around 10% of the available energy or biomass within a trophic level is transferred to the next higher trophic level.



6) Pyramids of number and biomass

- Food chains show energy flow through an ecosystem
- Each level of the food chain is known as a trophic level
- Pyramids of number show the number of organisms at each trophic level. The unit for this is number of organisms
- Pyramids of biomass show the mass of living material at each trophic level. The unit for this is g/m².
- When drawing ecological pyramids the height of the bars should be the same at each level.

E.g.

1 Sparrowhawk

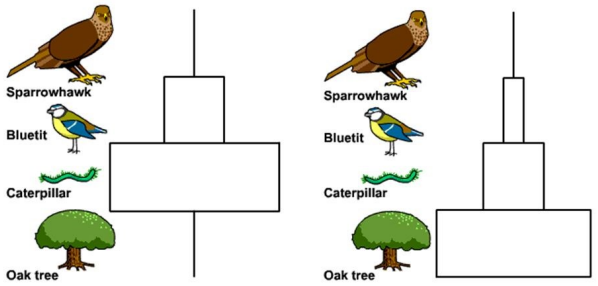
15 Bluetits

45 Caterpillar

1 Oak Tree

Pyramid of number

Pyramid of biomass



7) Calculating efficiency up trophic levels

Energy is lost at each level in the food chain (about 90% at each level). This is because most energy is used up or lost in the following ways:

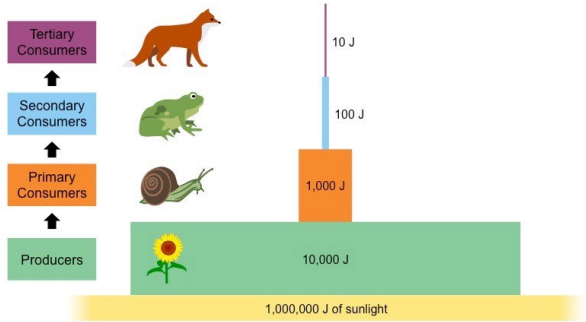
Respiration (lost as heat)

Used up in movement

Maintaining constant body temperature

Faeces and urine (lost as heat)

Some material not being eaten by the consumer



To calculate the amount of energy passed from one trophic level to the next you must multiply the energy by 0.1 (to lose 90%) e.g. Sunflower to Snail: 10,000J x 0.1 = 1,000J