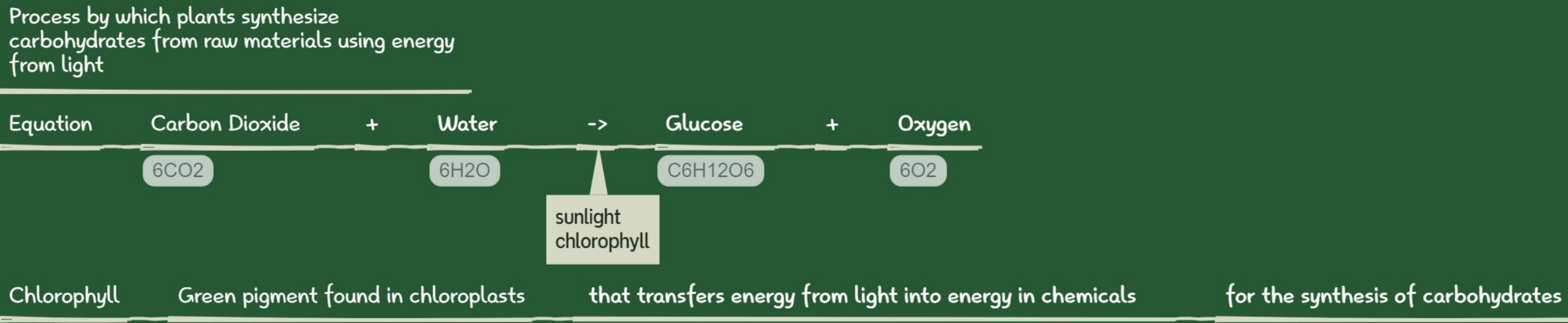


B6.1 - Photosynthesis



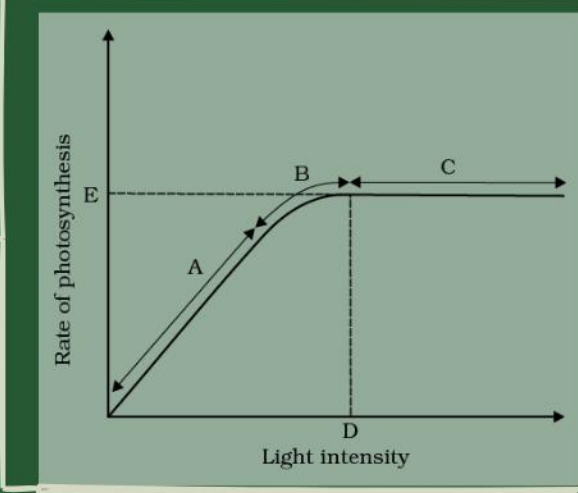
Photosynthesis

Uses

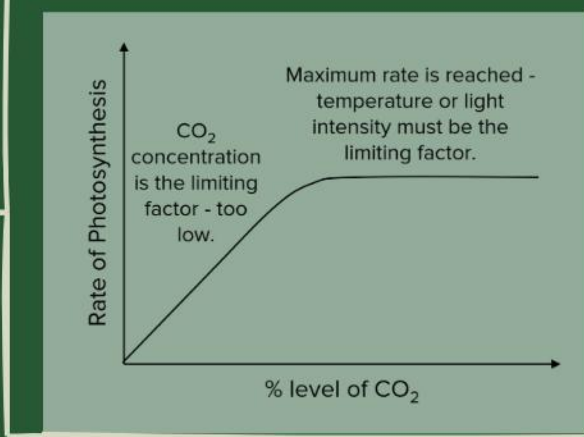
Uses of glucose in plants	
Substance	Uses
Remain as glucose	Respiration to provide energy
Starch	To store energy since it is insoluble
Sucrose	Transport in the phloem
Cellulose	Building cell walls
Nectar	Attracting pollinators
Amino acids	Building blocks of protein for growth and repair

Uses of minerals in plants		
Mineral	Function	Signs of deficiency
Nitrates	Needed for synthesising amino acids -> which make long chains to make proteins	Stunted growth; weak stem, yellow, dying, low leaves; upper leaves pale green
Magnesium	Making chlorophyll (forms part of chlorophyll molecules) -> chlorophyll needed to trap light to provide energy for photosynthesis	Chlorosis (leaves turn yellow); lack of photosynthesis limits plant growth
+ Phosphates, potassium		

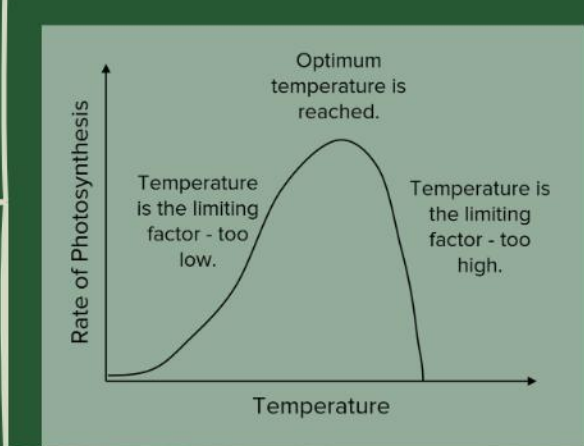
As light intensity increases, so does the rate of photosynthesis until a point where another factor becomes limiting



As CO2 concentration increases, so does the rate of photosynthesis until a point where another factor becomes limiting



Temperature affects the enzymes that control the rates of the chemical reactions of photosynthesis



If the temperature is too low, molecules move slowly causing a slow rate of photosynthesis
If temperature is too high, enzymes denature

Method:

- To kill the cells of the leaf, which allows the ethanol in by disrupting the leaf's cell membrane
- To soften the leaf
- To remove green pigment chlorophyll from the leaf
- To wash away the ethanol and any trace of it
- To soften it

① Boil the leaf in water for about 5 minutes ② Dip the leaf in hot alcohol for a few minutes ③ Wash leaf in hot water ④ Finally, place the leaf on a white tile and add a few drops of iodine solution on it

Observation: If the leaf turns blue-black, starch is present

Investigating need of chlorophyll, light and CO2 for photosynthesis

Chlorophyll

Procedure: Get a plant with variegated leaves (leaves have both green and white patches) Destarch it by keeping it in complete darkness for around 48 hours Place it in sunlight for a few days so it can form some new starch Perform iodine starch test

Result: Green parts (containing chlorophyll) will turn blue-black White parts will be orange-brown

This shows that starch is only formed when chlorophyll is present Hence, photosynthesis can only occur in the presence of chlorophyll

Light

Procedure: Destarch a plant Cut out a strip of opaque black paper and clip it to a section of one of the leaves Leave the plant in sunlight for a few days Perform the starch test and observe

Result: The areas that turn blue-black (and hence contain starch) are the areas exposed to sunlight And the orange-brown area is the section that was covered by the paper

This shows that light is necessary for photosynthesis

CO2

Procedure: Destarch two potted plants Cover both in transparent plastic bags Place sodium hydrogencarbonate in one Place a petri dish of soda lime in the other Leave the two plants in sunlight for at least 6 hours and perform the iodine starch test on a leaf of each plant

Result: Leaf from the plant with sodium hydrogencarbonate turns blue-black Leaf from plant with soda lime turns orange-brown

Sodium hydrogencarbonate gives off carbon dioxide Soda lime absorbs carbon dioxide from the air

Shows how CO2 is essential for photosynthesis

Hydrogencarbonate indicator				
Can be used to assess changes in CO2 concentration due to gas exchange in plants and animals				
Under low CO2 concentration atmospheric conditions, it turns PURPLE				
Under normal atmospheric conditions (0.04% CO2), it is RED				
In highly concentrated CO2 conditions, it turns YELLOW				
Results				
	Conditions	Initial colour of indicator	Final colour of indicator	Conclusions
A	No cover (full light)	Red	Purple	Leaf does photosynthesis using up CO2
B	Gauze (some light)	Red	Red	Leaf does photosynthesis and respiration
C	Aluminium foil (no light)	Red	Yellow	Leaf does respiration increasing CO2
D	Control (no leaf)	Red	Red	No leaf so no photosynthesis or respiration

