



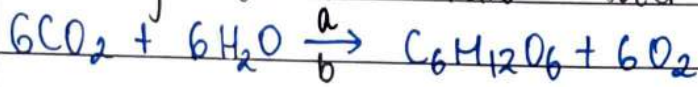
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PLANT NUTRITION: BT B5

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Plants are photoautotrophic (generate their own food).

Photosynthesis is the process by which plants manufacture carbohydrates from raw materials using energy from light



a: sunlight

b: Chlorophyll

Light energy is converted into chemical energy through photosynthesis.

Factors that affect the rate of photosynthesis:

CO_2

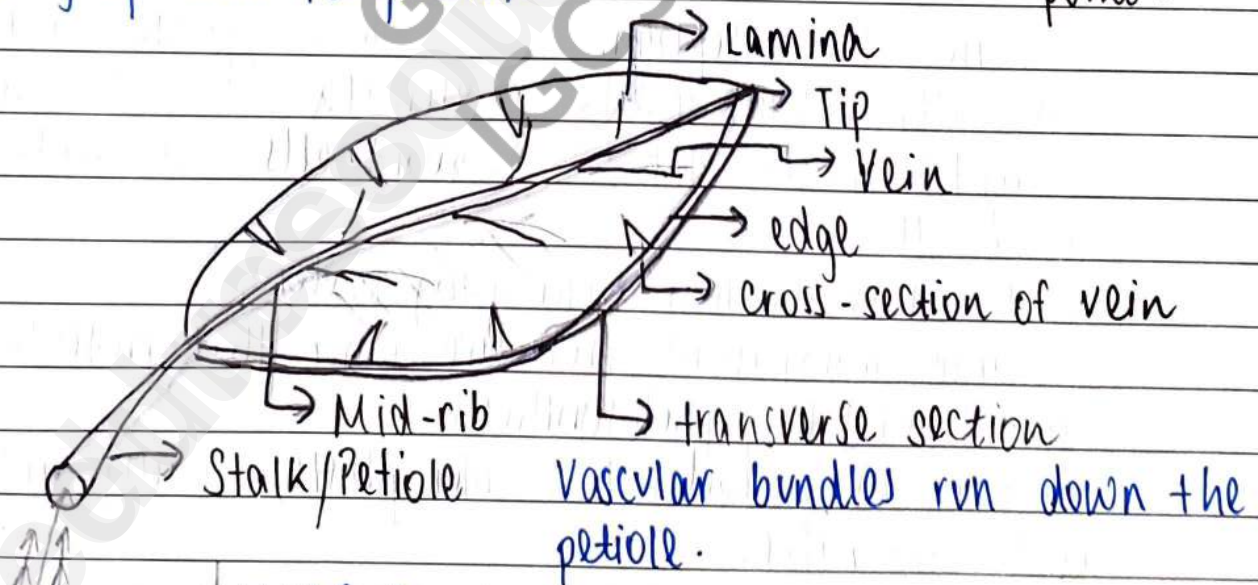
Water

Light

Giving optimum temperature

Light Intensity
Rate of Photosynthesis
= Rate of Respiration

This is the compensation point.



Light factor
factor limiting

Rate of p/s

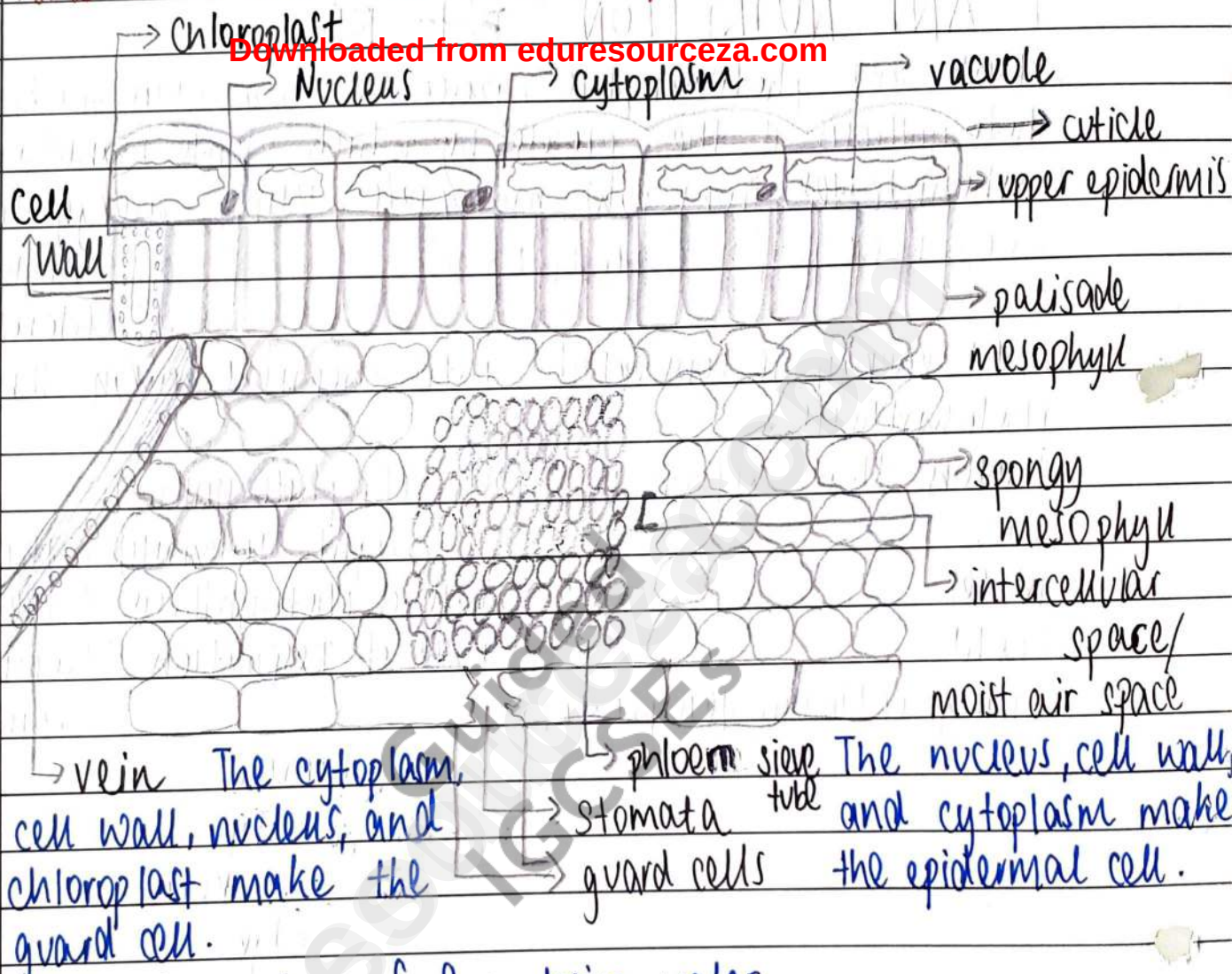
saturation point

* Chlorophyll is damaged at high light intensities.

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Light Intensity

Parts of a leaf and their adaptations.



Cuticle Stops the leaf from losing water

Epidermis Transparent protective layer that protects the leaf without inhibiting photosynthesis.

Palisade Cells Packed full of chloroplasts, are long and thin so light penetrates.

Intercellular air spaces Increase the surface area inside the leaf to maximize gas exchange across the surface of the spongy mesophyll cells.

Stoma Allows gas exchange of CO_2 and O_2 .

Guard Cells Allow the stoma to open and close to stop the leaf from losing too much water.

Vein (has xylem) Brings a steady supply of water to the leaf.

Specific minerals that plants require

Nitrate used to make amino acid for use in plant proteins.

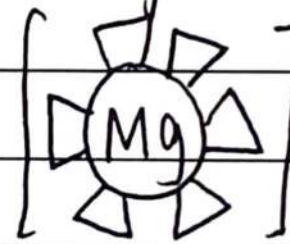
Magnesium forms part of the chlorophyll molecule.

Potassium vital for cell membranes.

Phosphate vital part of DNA and cell membranes.

Nitrogen deficiency can lead to weak growth of yellow leaves.

Magnesium deficiency can lead to yellowing of leaves between the leaves veins.



Magnesium ion in the middle with a protein ring around it.

Uses of glucose

- Respiration
- break down of glucose to give energy in the presence of oxygen
- energy released in the form of ATP (active transport).

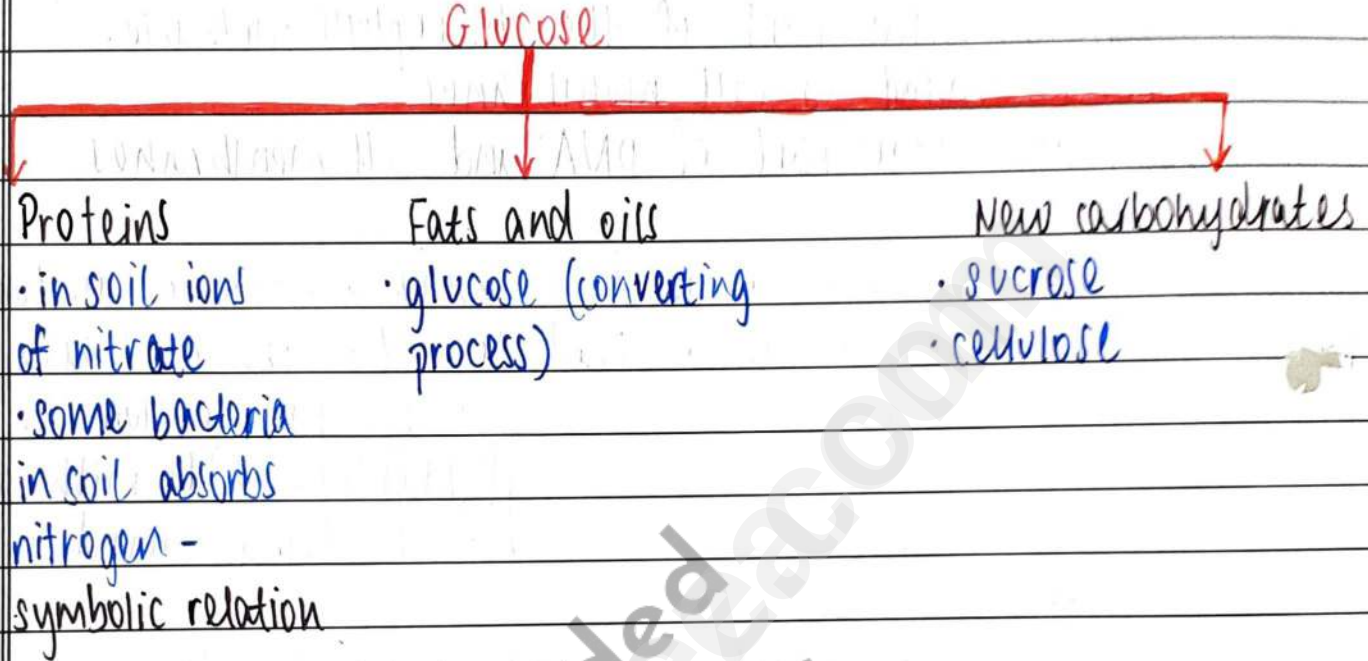
- Storage
- in the form of starch (insoluble in water) as glucose is soluble; this is for excess glucose.
- glucose is a simple sugar and quite reactive.
- starch is a polysaccharide and it is unreactive.
- excess of glucose can also be stored in the form of fats - glycogen.

Disadvantages of storing glucose

- reactive it may get involved in chemical reactions where it is unwanted.
- soluble it would dissolve in water and be lost.

- concentration it would increase affecting osmosis.

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- Nitrate ions combine with glucose to make amino acids.
- Amino acids strung together to form protein molecules.

Testing a leaf for starch

Procedure

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1. Take a leaf from a healthy plant, and drop it into boiling water in a water bath. Leave for 30 seconds. Turn out the bunsen flame.
2. Remove the leaf, which will be very soft, and drop it into a tube of alcohol in the water bath. Leave it until all chlorophyll has come out of the leaf.
3. The leaf will now be brittle. Remove it from the alcohol, and dip it into hot water again to soften it.
4. Spread the leaf out on a white tile, and cover it with iodine solution. A blue-black colour shows that the leaf contains starch.

To see if light is needed for photosynthesis

Procedure

1. Take a healthy plant, growing in a pot. Leave it in the dark for at least 48 hours to destarch it.
2. Test one of its leaves for starch to check it does not contain any.
3. Fasten the leaf with a piece of aluminium foil, make sure it does not cover the entire leaf.
4. Leave the plant in light for a few days.
5. Remove cover from leaf and test for starch.

Control: the part of the leaf is covered.

To see if chlorophyll is needed for photosynthesis

Procedure

1. Destarch a plant with variegated leaves.
2. Test one of the leaves for starch after leaving the plant in light.