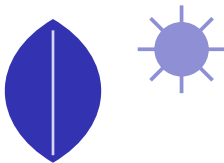


Plant Nutrition

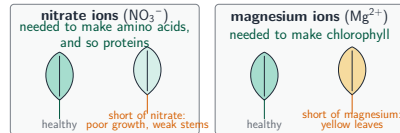
IGCSE Biology ■ Topic 6

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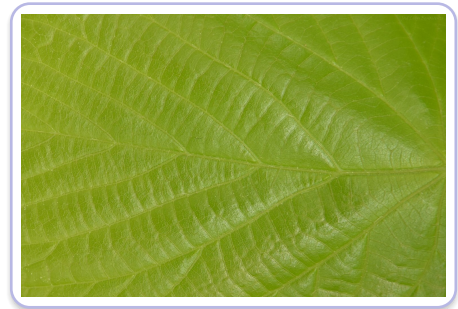
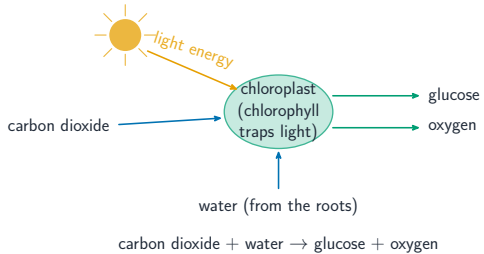
What we will cover

- 1 Photosynthesis
- 2 Uses of glucose
- 3 Minerals from the soil
- 4 Rate & limiting factors
- 5 Leaf structure



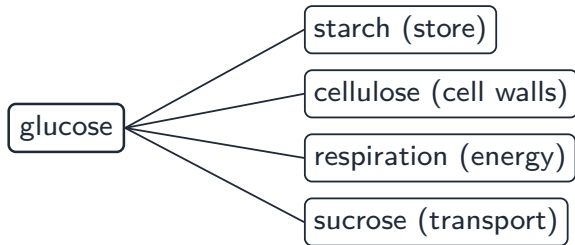
minerals from the soil

Photosynthesis



Leaves capture light for photosynthesis

Uses of glucose



The glucose is used to:

- store as **starch** 淀粉
- build **cellulose** 纤维素 cell walls
- release energy in **respiration** 呼吸作用
- move as **sucrose** 蔗糖 in the **phloem** 韧皮部

Minerals from the soil

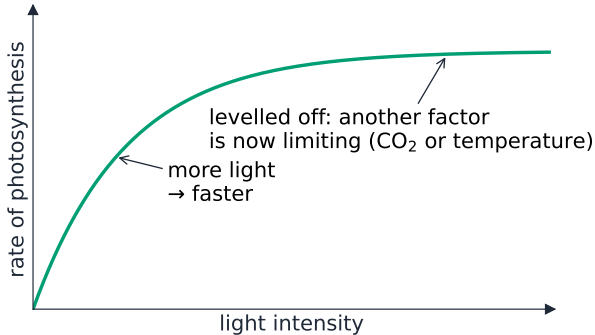
nitrate ions 硝酸根离子

make **amino acids** 氨基酸
(proteins); shortage
→ poor, weak growth

magnesium ions 镁离子

make chlorophyll; short-
age → **yellow** leaves

Rate and limiting factors

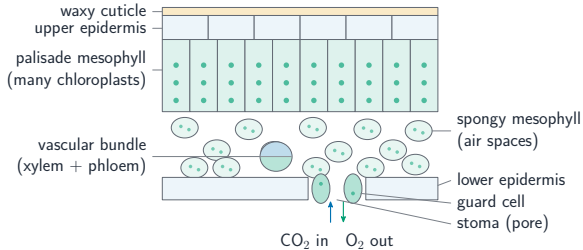


Three factors raise the rate:

- **light intensity** 光照强度
- CO₂ concentration
- temperature (until enzymes denature)

The one in shortest supply is the **limiting factor** 限制因素.

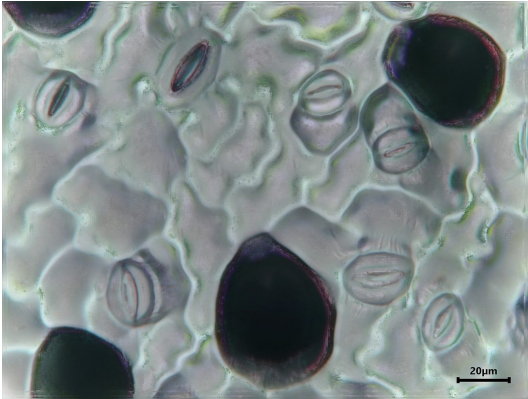
Leaf structure



A leaf is **adapted** 适应 – broad & thin to catch light.

- **palisade** 栅栏叶肉 cells: packed with chloroplasts
- **spongy** 海绵叶肉 layer: air spaces for gas
- **xylem** 木质部 brings water; phloem takes sugar

Stomata and guard cells



Stomata 气孔 are tiny pores (mostly on the lower surface) that let CO_2 in & O_2 out.

A pair of **guard cells** 保卫细胞 opens & closes each stoma.

Worked example – limiting factors

A graph of photosynthesis against light intensity rises then levels off. Explain both parts.

- Rising part: light is the **limiting factor** 限制因素 – more light, more photosynthesis.
- Levelling off: adding light changes nothing, so **something else** now limits it.
- That will be **carbon dioxide concentration** or **temperature**.
- To prove it, raise one of them: if the plateau **rises**, that was the limiting factor.

The limiting factor is whichever is **in shortest supply**. On a graph: the **slope** shows the factor is limiting; the **plateau** shows it no longer is.

Topic 6 – key takeaways

1

Equation

$\text{CO}_2 + \text{water} \rightarrow \text{glucose} + \text{O}_2$
(light)

2

Glucose

starch, cellulose, respiration,
transport

3

Minerals

nitrate $\rightarrow$ proteins; magnesium $\rightarrow$
chlorophyll

4

Leaf

palisade for light; stomata for gas
exchange

Check yourself

- 1 What two raw materials does photosynthesis use?
- 2 What ion does a plant need to make chlorophyll?
- 3 Which leaf cells do most photosynthesis?
- 4 What opens and closes a stoma?



Answers 1. carbon dioxide & water 2. magnesium 3. palisade mesophyll 4. the guard cells