Knowledge Organiser Key Stage 3

Subject: Science Year: 9 Topic Title: Plants & Photosynthesis

Key Facts

What is photosynthesis?

1. Plants make their own food (for energy) in a process called photosynthesis.
2. Photosynthesis helps keep:
    a. levels of oxygen high;
    b. levels of carbon dioxide low.
3. Photosynthesis takes place in chloroplasts in the cells.
4. Chloroplasts contain chlorophyll. Chlorophyll absorbs the light energy for photosynthesis
5. The equation for photosynthesis is: carbon dioxide + water → glucose + oxygen

These are the things that plants need for photosynthesis:

6. carbon dioxide – absorbed through their leaves;
7. Water - from the ground through their roots;
8. light (a source of energy) - from the Sun.

These are the things that plants make by photosynthesis:

9. Oxygen - released into the air from the leaves;
10. Glucose: turned into starch and plant oils, used as an energy store; This energy is released by respiration; Used to make cellulose for cell walls.
11. **Water** is absorbed into the roots by a process called **osmosis**, which does not use energy.
12. **Minerals** are absorbed into the roots by a process called **active transport,** which uses energy.

Water

13. Water is absorbed through the roots, by **osmosis**;
14. It is transported through tubes (**xylem**) to the leaf;
15. The roots contain cells called **root hair cells**.
    a. They increase the **surface area**;
    b. They have **thin walls**. This lets water pass into them easily.
16. Root cells do not contain chloroplasts.

Carbon dioxide

17. Enters leaf by **diffusion** through the **stomata**.
18. **Guard cells** control the size of the stomata
19. Stomata closes in **hot**, **windy** or **dry** conditions.
20. Spongy layer has gaps between cells;
    a. Allows carbon dioxide to **diffuse** to other cells in the leaf; Allows oxygen produced in photosynthesis diffuse out of the leaf.

Food security and pollination

21. **Pollination** is the transfer of pollen from one plant to another;
22. Pollen can be transferred by **insects** or by **wind**;
23. Insects that pollinate plants help us produce our food.
24. Our food supply depends on plants:
    a. Our food made of, and from plants;
    b. The animals we eat feed on plants.

Respiration v photosynthesis

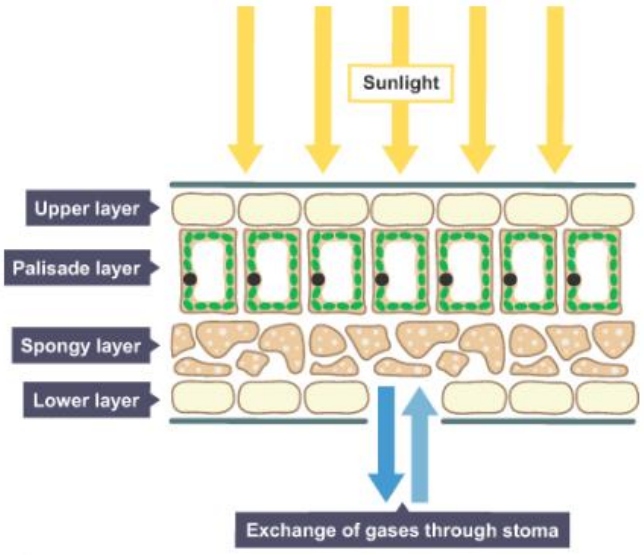
25. Photosynthesis: **carbon dioxide + water → glucose + oxygen**
26. Aerobic respiration is: **glucose + oxygen → carbon dioxide + water**
27. The equation for photosynthesis is the **opposite** of the equation for aerobic respiration.
28. **Photosynthesis**: **produces** glucose and oxygen; **uses** carbon dioxide and water;
29. **Respiration**: **produces** carbon dioxide and water; **uses** glucose and oxygen;

Key words

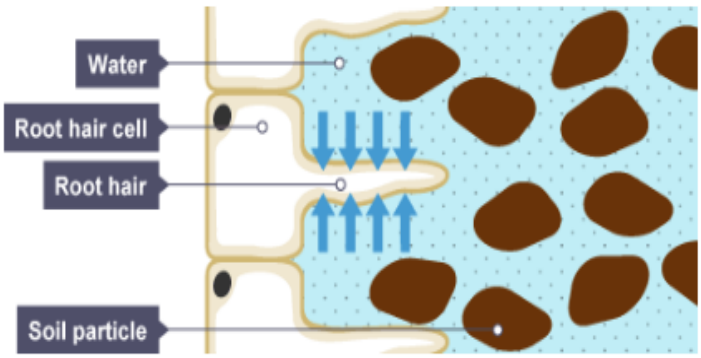
1. Osmosis - is the diffusion of water across a partially permeable membrane from a dilute solution (high concentration of water) to a concentrated solution (low concentration of water).
2. Diffusion - is the movement of a substance from an area of high concentration to an area of low concentration.
3. Active transport - is the movement of dissolved molecules into or out of a cell through the cell membrane, from a region of lower concentration to a region of higher concentration. The particles move against the concentration gradient , using energy released during respiration .
4. Respiration - is a chemical reaction that happens in all living cells, including plant cells and animal cells. It is the way that energy is released from glucose so that all the other chemical processes needed for life can happen. Do not confuse **respiration** with breathing (which is properly called ventilation).
5. Photosynthesis - is a chemical reaction that takes place inside the leaves of a plant, producing food for the plant to survive. Carbon dioxide, water and light are all needed for **photosynthesis** to take place.

Diagrams

Adaptation	Function
Thin	Short distance for carbon dioxide to diffuse into the leaf
Waxy Layer	Prevents water loss by **evaporation**
Palisade cells	Contain a lot of **chloroplasts** to absorb light
Chloroplasts contain chlorophyll	Absorbs light
Stomata	Allows carbon dioxide to diffuse into the leaf (and oxygen to diffuse out)
Guard cells	Open/close stomata depending on conditions
Network of tubes (xylem & phloem)	Transports water (xylem) and food (phloem)



A cross-section through a leaf showing its main parts



Water is absorbed from the soil by root hair cells

Potential misconceptions to avoid / errors students often make

1. Do not use the word 'food' for minerals
2. That putting a thermometer in the water will control the temperature – this will only monitor it.
3. That water enters the leaves through the stomata when it rains
4. That oxygen levels may fall with deforestation and combustion of fossil fuels – oxygen levels are much higher than carbon dioxide, so are not as vulnerable to change.
5. That deforestation leads to an increase in carbon dioxide because the trees release CO_2 when cut down.