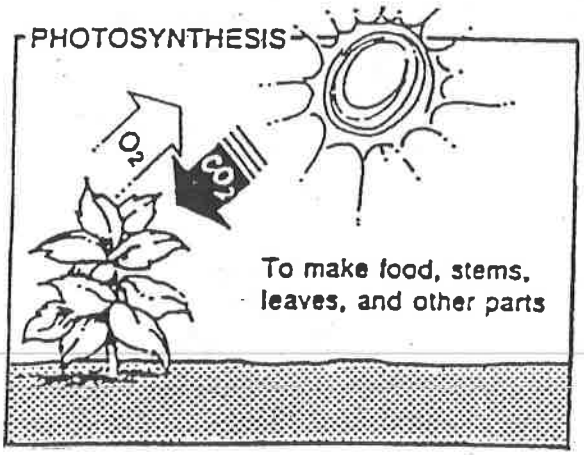
Photosynthesis And Respiration

Photosynthesis:

Green plants containing chlorophyll are able to use the energy of the sun to manufacture glucose from carbon dioxide and water. This process is called photosynthesis (photo - light; synthesis - to put together). It may be summed up by saying that the green plant changes solar energy from the sun into chemical energy which is then stored in the glucose.

This process may be compared to the charging and discharging of a battery. A battery may be charged using electrical energy. This electrical energy is then stored in the battery or chemical energy which, at a later date, may be changed both to electrical energy to light a flashlight, run a toy, or various other things.

Glucose will dissolve in water and so it cannot be stored in any particular part of the plant such as the root or stem. It flows along with the plant sap through the phloem of the vascular bundles. For glucose to be stored, it has to be changed into starch which is not soluble in water. Starch is a long chain of glucose molecules. Starch is often stored in stems, roots, fruits and seeds. A good example where this occurs is in the potato plant. The leaves absorb carbon dioxide through the stomates. The roots absorb water from the soil. The water is then transported upward to the leaves through the xylem of the vascular bundles. The chlorophyll in the chloroplast will use the carbon dioxide and water to produce glucose. Remember that this happens only during the daytime. The glucose cannot be stored in the leaves since it is dissolved in the water of the sap. It is carried through the phloem of the vascular bundles to the tubers in the soil. Here the glucose is changed to starch and stored. As more and more glucose arrives in the tuber throughout the summer and is continually changed to starch, the tuber increases in size.



Cellular Respiration:

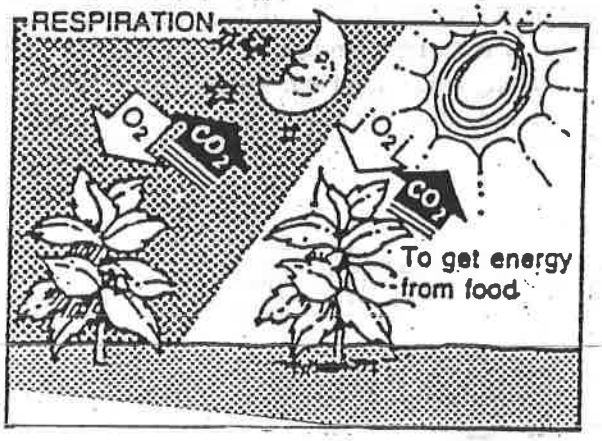
Not all the glucose is stored as starch. The potato plant needs energy to grow and to produce flowers, fruits, and seeds. The plant cannot directly use the sun's energy for these processes. It can only use it to produce glucose. Remember that the glucose contains the sun's stored energy. This energy must now be released. This is done in a process called cellular respiration.

In cellular respiration, oxygen combines with the glucose. When this happens, the glucose molecule is broken down into carbon dioxide and water and the stored energy is released. This energy can now be used for any of the activities the plant has to perform. Cellular respiration takes place in very small organelles called mitochondria which are suspended within the cell's cytoplasm. They are often referred to as the power plants or furnaces of the cell.

Cellular respiration is similar to burning. When fuels such as wood, coal, or natural gas burn, oxygen joins with them and releases energy in the form of heat and light along with the waste products of carbon dioxide and water. This chemical change is called oxidation. Cellular respiration, of course, happens at a much slower rate than burning. However, the energy released as heat is responsible for keeping our body temperature at 37.5°C. If an organism dies, cellular respiration stops and no more heat energy is released. As a result, the body temperature drops.

Cellular respiration occurs in the cells of all organisms, both plants and animals, and it takes place 24 hours a day.

In humans, the oxygen needed for cellular respiration is provided by breathing. This puts oxygen into the lungs. From here, it is carried by the blood to all cells of the body. The carbon dioxide and water, produced during cellular respiration, moves into the blood stream. The carbon dioxide is carried to the lungs and exhaled. The water is carried to the kidneys and excreted.



Relationship Between Photosynthesis And Cellular Respiration:

In a green plant, the processes of photosynthesis and cellular respiration occur simultaneously during the day. At night, photosynthesis stops but cellular respiration continues. During the day, all of the carbon dioxide produced in cellular respiration is used in photosynthesis. This is not enough so more carbon dioxide is absorbed from the air. Also, during the day, some of the oxygen produced in photosynthesis is used for cellular respiration. Photosynthesis produces so much oxygen, however, that most of it is not needed and is released into the atmosphere.

At night, when photosynthesis stops, but cellular respiration continues, the plant has to release all its produced carbon dioxide and absorb all its oxygen from the air.

Photosynthesis & Respiration

1. Define photosynthesis.

2. Write the word equation for photosynthesis.

3. How is glucose stored in a plant?

4. Why do cells need energy?

5. How do cells get the energy they need?

6. Write the word equation for respiration.

7. Compare respiration to burning.

8. How do animals get the glucose they need for respiration?

9. How do green organisms get the glucose they need for respiration?

10. How are photosynthesis and respiration related?