

FIGURE 1**How does a plant get energy?**

Have you ever observed a plant's growth over-time and wondered what is really happening? Your task is to use the information that scientists have gathered over several hundred years to determine how a plant gets energy.

Use the clues provided by other scientists to help you solve the mystery. Cut out the clues below and arrange them in groups that help you develop your answer. Use both words and scientific symbols when presenting your explanation.

The pigment (chlorophyll) is found in chloroplasts.

During the night, plants use ATP to assemble glucose ($C_6H_{12}O_6$) using CO_2 and H_2O .

Animal cells do not have chloroplasts.

Experiments in the 1950s using radioactive oxygen showed that O_2 from the CO_2 combines with other molecules to form $C_6H_{12}O_6$.

Experiments show that H from water is later found as part of the $C_6H_{12}O_6$ molecule.

Experiments show that light energy is used to split water into H and O.

If H is combined with CO_2 , glucose can be made.

In 1992, Marcus won a Nobel Prize for Physics describing the process of electron flow in plants.

Animal cells cannot make glucose ($C_6H_{12}O_6$).

Glucose produced by leaves can be used to build starch, cellulose, or other organic compounds.

In 1779, Ingenhousz found that aquatic plants produce O_2 in the light but not in the dark. He concluded that plants need sunlight to produce O_2 .

In 1643, van Helmont proved empirically that water, not soil, is needed by plants.

All cells need glucose ($C_6H_{12}O_6$) to carry on cellular activity.

Leaves from plants grown in the dark have a lower amount of starch than leaves from plants grown in light.

When water is split, the O_2 diffuses away, but the electrons flow through a transfer chain to help form ATP.

Glucose can be "stored" as a starch molecule in the leaves of plants.

Radiant energy from the Sun can be described in terms of its energy content.

Making glucose does not require light, but it does require ATP.

Growth and division of plant cells requires chemical energy and organic molecules.

Air is a combination of many gases, including CO_2 .

Green plants cannot live without water and air.

In 1771, Priestley proved that plants give off a gas (later called oxygen).

Pigments found in some cells are capable of absorbing various parts of the Sun's energy.

Experiments in 1941 showed that the oxygen (O_2) released from plants comes from water.

Energy is needed for chemical reactions to occur.

Glucose can come to a cell already made or can be made in some cells.

Chlorophyll absorbs light energy and uses it in chemical reactions in the chloroplasts.

Chloroplasts are the cellular organelles found in leaves.