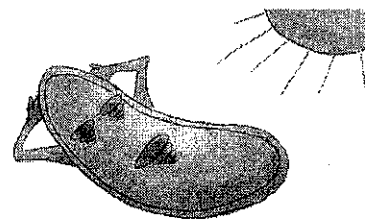


Chloroplasts and Photosynthesis

Name: _____ Date: _____ Hour: _____

Review Plant Organelles

Plant cells have three kinds of structures that are not found in animal cells and that are extremely important to plant survival, plastids, central vacuoles, and cell walls. **Plastids** are organelles that, like mitochondria, are surrounded by a double membrane and contain their own DNA. There are several types of plastids, including chloroplasts, chromoplasts, and leucoplasts. Chloroplasts use light energy to make carbohydrates from carbon dioxide and water through the process of photosynthesis. Each chloroplast contains a system of flattened, membranous sacs called **thylakoids**. Thylakoids contain the green pigment chlorophyll, the main molecule that absorbs light and captures light energy for the cell. The thylakoids are connected and layered to form stacks called **grana**. Surrounding the grana is a solution called the **stroma**.



1. What are the three structures found in plant cells that are not in animal cells?

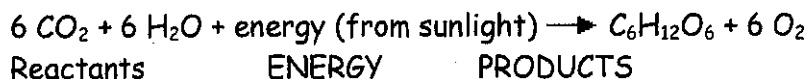
2. What is a plastid? _____

3. Give three examples of plastids. _____

4. What organelle is involved in photosynthesis? _____

Chloroplasts

Plant cells and some Algae contain an organelle called the chloroplast. The chloroplast allows autotrophs like plants to harvest **energy** from **sunlight** to carry on a process known as **Photosynthesis** that is used to make their food. Specialized pigments in the chloroplast (including the common green pigment **chlorophyll**) absorb sunlight and use this energy to combine **carbon dioxide** and **water** and make **GLUCOSE** (simple sugar) and **OXYGEN**. The complete the chemical reaction for Photosynthesis is:



In this way, plant cells manufacture glucose (simple sugar) and other carbohydrates that they can store for later use. Photosynthetic cells found mainly in the leaves may have thousands of chloroplasts.

5. What type of cells contains chloroplasts? _____

6. What is the energy autotrophs use to make their own food? _____

7. The food making process is called _____.

8. What are the reactants for photosynthesis? _____

9. What simple sugar is produced by photosynthesis? _____

10. What gas is USED? _____ RELEASED? _____

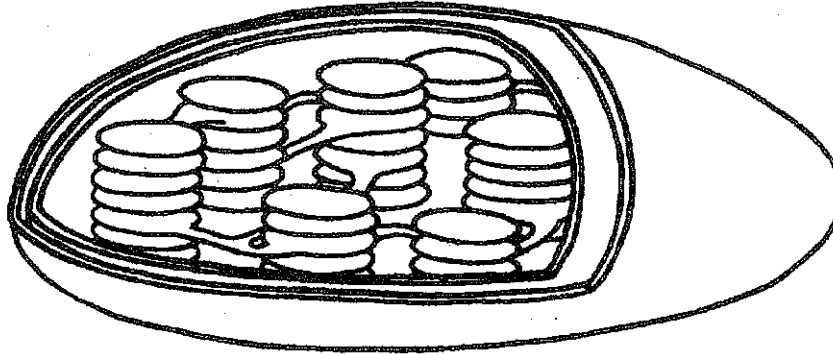
11. Where are most photosynthetic cells in plants found? _____

12. About how many chloroplasts can be found in photosynthetic cells? _____

Chloroplasts are double membrane organelles with a smooth outer membrane and an inner membrane folded into disc-shaped sacs called thylakoids. *Color and label* the outer membrane of a single thylakoid light green. Thylakoids, mainly contain chlorophyll, the green pigment, but there are other accessory pigments also (red, orange, yellow, brown). Thylakoids are in stacks (like pancakes) called granum (grana, plural). *Color and label* one granum (STACKS) dark green in Figure 1.

Grana are connected to each other by structures called lamellae, and they are surrounded by a gel-like material called stroma. *Color and label* the lamellae brown in figure 1. *Color and label* the stroma light blue in Figure 1.

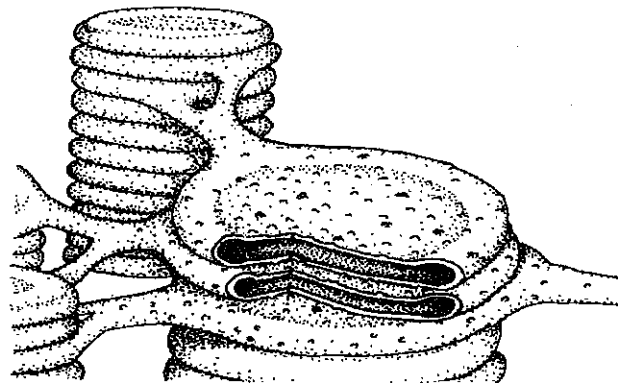
FIGURE 1-CHLOROPLAST



13. How many membranes surround a chloroplast? _____
14. The outer membrane is S _____.
15. The INDIVIDUAL SACS formed by the inner membrane are called _____ and are arranged in _____ like pancakes.
16. What main pigment is found inside a thylakoid? _____
17. What color will it be? _____
18. Other pigments that trap sunlight are called A _____ pigments. What colors are these pigments? _____
19. STACKS of thylakoids are called G _____ (plural) or GRANUM (singular).
20. Stacks of grana are connected to each other by _____.

Light-capturing pigments in the grana are organized into photosystems. On Figure 2, *color and label* a single thylakoid (SINGLE DISK) dark green. In figure 2, *color and label* a granum (STACK) red.

FIGURE 2-THYLAKOID

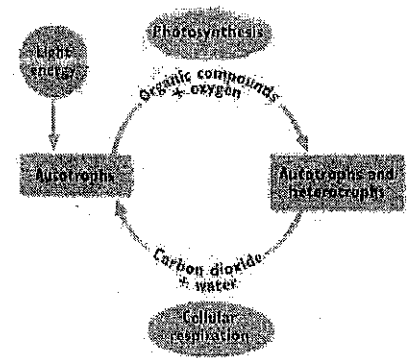


Overview of Photosynthesis

The figure to the right shows how **autotrophs** use **photosynthesis** to produce organic compounds from carbon dioxide and water. Remember that an **autotroph** is an organism that uses sunlight energy to make their own food. The oxygen and some of the organic compounds produced are then used by cells in a process called **cellular respiration**. During **cellular respiration**, **carbon dioxide** and **water** are produced. Thus, the products of **photosynthesis** are reactants in cellular respiration. Conversely, the products of cellular respiration are reactants in photosynthesis.

Photosynthesis can be divided into two stages:

- Light Reactions-Light energy (absorbed from the sun) is converted to chemical energy, which is temporarily stored in ATP and the energy carrier molecule, NADPH.
- Calvin Cycle-Organic compounds are formed using carbon dioxide and the chemical energy stored in ATP and NADPH.



It is helpful to examine the two stages separately in order to better understand the overall process of photosynthesis.

21. What is an autotroph? _____

22. What is USED in cellular respiration? _____
23. What is PRODUCED in cellular respiration? _____
24. How are cellular respiration and photosynthesis related? _____

25. What are the two stages of photosynthesis? _____
26. In the light reactions, _____ energy is converted to _____ energy.
27. The chemical energy is temporarily stored in _____ and NADPH.
28. What is NADPH? _____
29. What is formed during the Calvin Cycle? _____
30. What is used to form the organic compounds? _____
