

Name: _____

Plant Transport: Option 1

Plants are incredible organisms! They can make all their own food from the simple inputs of sunlight, carbon dioxide, and water. This biological wizardry is accomplished through the magic of photosynthesis. This process can be summarized by the equation below.



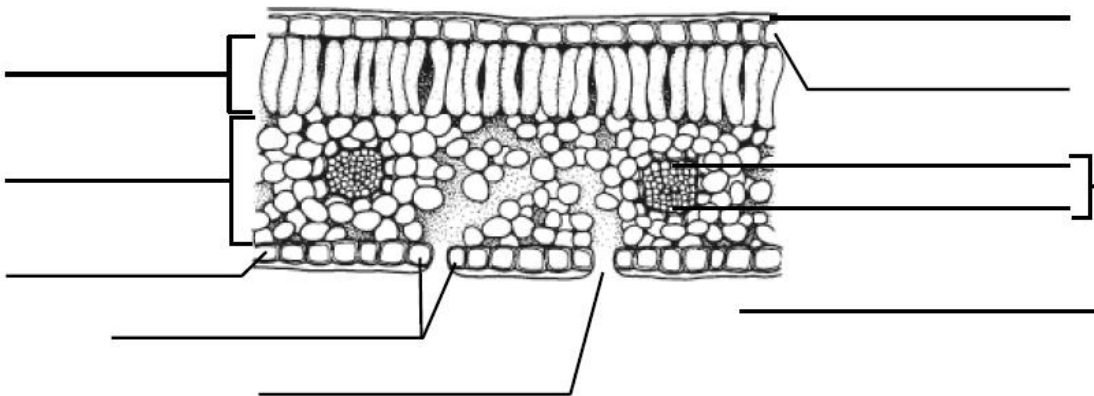
This means that plants are able to harness the energy of the sun to turn CO₂ from the air into the carbon-based molecules of life — carbohydrates, proteins, lipids, and nucleic acids.

Plants capture the sun's light within their green leaves. Inside a leaf's cells are green organelles — chloroplasts — which do all this hard work of producing the food that feeds the plant... and, in fact, the whole rest of the world, too! To do this job best, leaves have evolved a specific structure — 3 types of tissue arranged in layers:

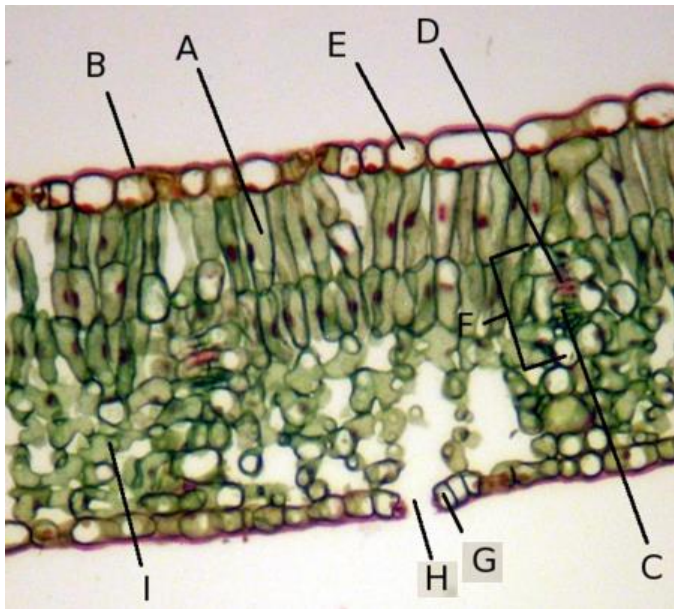
- epidermis
- mesophyll
- vascular tissue

The **epidermis** is the outer layer of cells that acts like a protective “skin” for the leaf. Covering the epidermis is a waxy coating, called the **cuticle**, which stops evaporation of water from the leaves thereby helping plants conserve water. In the lower epidermis are openings called **stomata** surrounded by two cells called **guard cells**. The stomata act like the lungs of the plant in that they allow gas exchange — letting CO₂ into the inner plant tissues for photosynthesis and then allowing O₂ out as a waste product of photosynthesis. The mesophyll is the main inner leaf tissue making up the blade of the leaf. Most of the photosynthesis of the plant takes place in the mesophyll. The mesophyll in the upper part of the leaf is made up of tightly packed cells, full of chloroplasts, and is called the **palisade layer**. The mesophyll in the lower part of the leaves is made up of loosely packed cells and is called the **spongy layer**. The **vascular tissue** functions like the circulatory system of the plant. The **xylem** carries water from the roots to the leaves and to the other upper parts of the plant. The **phloem** carries the sugars produced during photosynthesis in the chloroplasts of the leaves to any place else in the plant that needs the food. Xylem and phloem are found in vascular bundles in the veins of the leaf.

1. Below is a diagram of a cross section through a leaf. LABEL the **bolded** structures discussed above.



2. Below is a cross section of a Lilac leaf under a micro scope. Identify the structures.



- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____
- G. _____
- H. _____
- I. _____

3. *What are the 3 functions of stomata?*
4. *Why are most of the stomates on the bottom of the leaf?*
5. *Why are the epidermis layers of the leaf coated in a waxy cuticle?*
6. *Why are the cells of the palisades layer packed so tightly together?*
7. *Why are the cells of the spongy layer packed so loosely together?*
8. *What is the function of the xylem?*
9. *What is the function of the phloem?*
10. *Describe how the functions of the xylem and phloem specifically relate to photosynthesis.*
 - A. **xylem**
 - B. **phloem**
11. *Why would the cells of the palisades layer have more chloroplasts in them?*
12. *What is the function of guard cells?*
13. *Why do stomata need to be open?*
14. *Under what conditions would guard cells close the stomates?*
15. *Why do plants need to take in CO₂?*