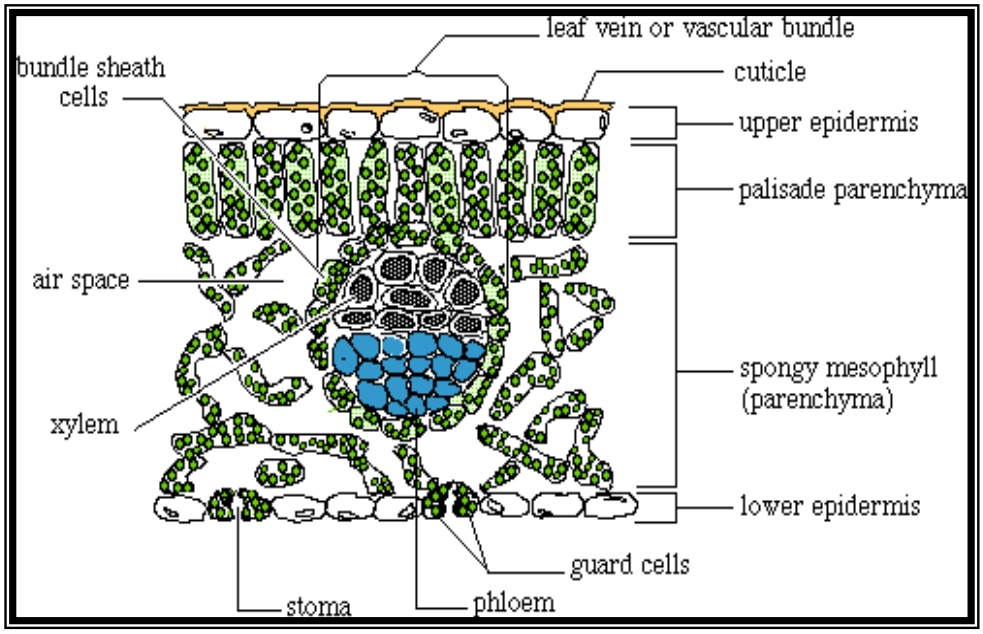
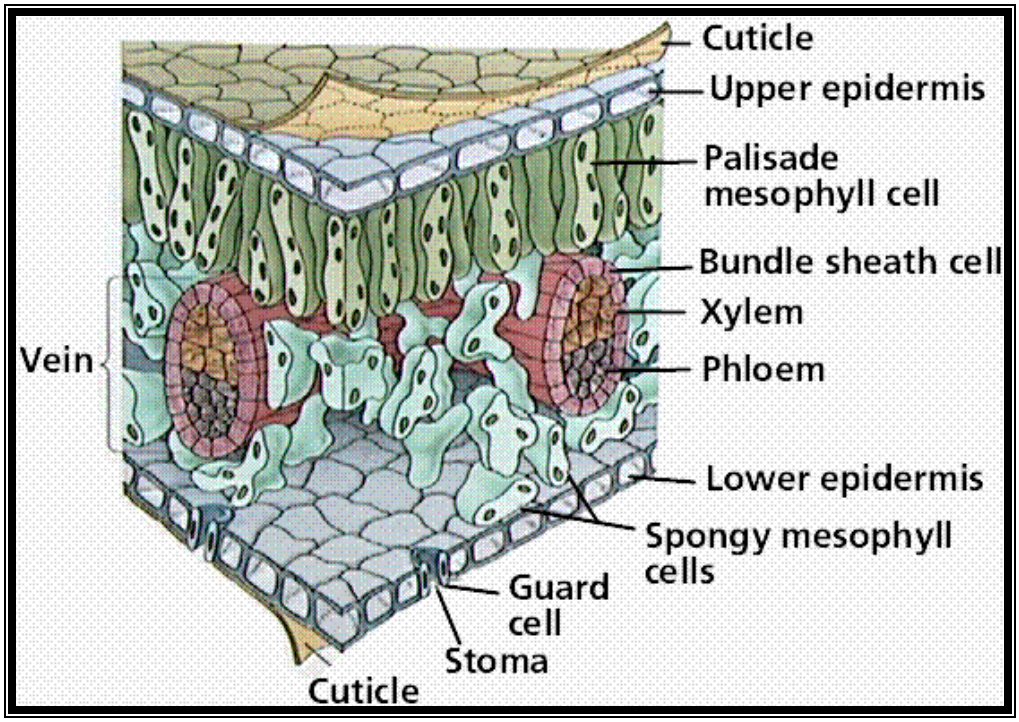
Structure of the Leaf

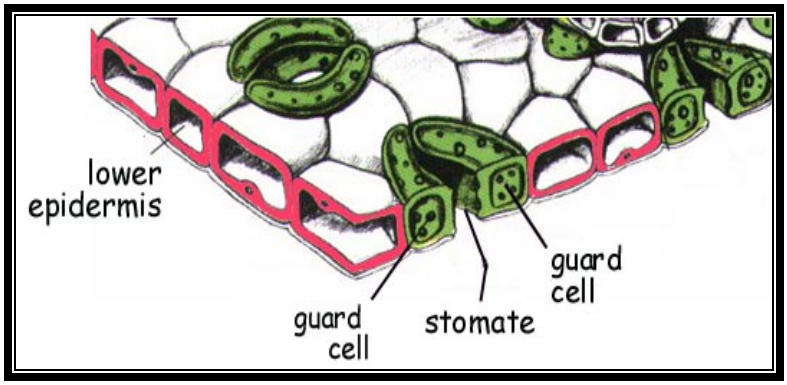


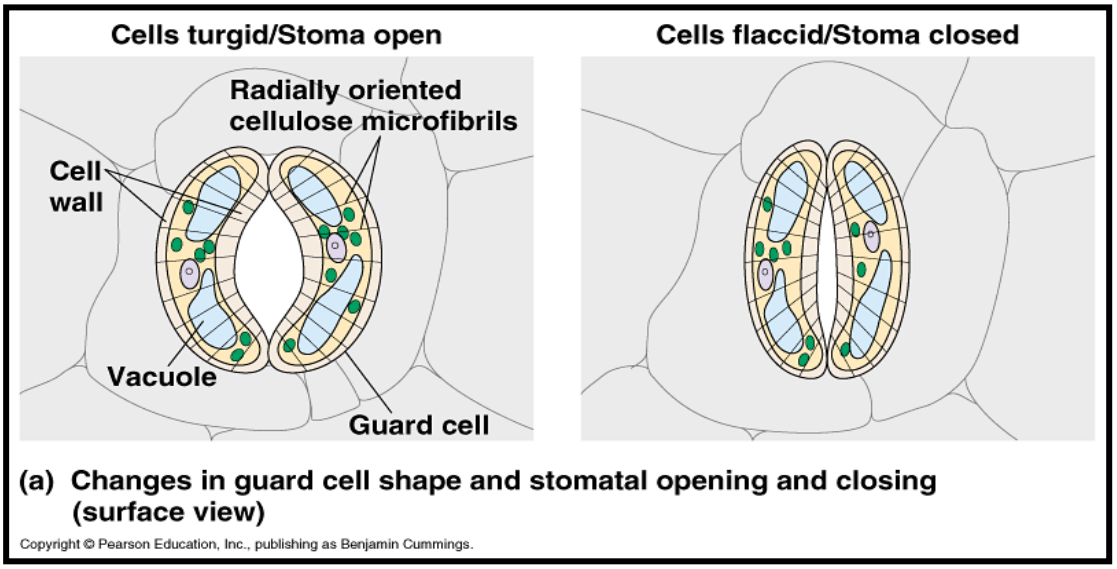


Structure of the Leaf:

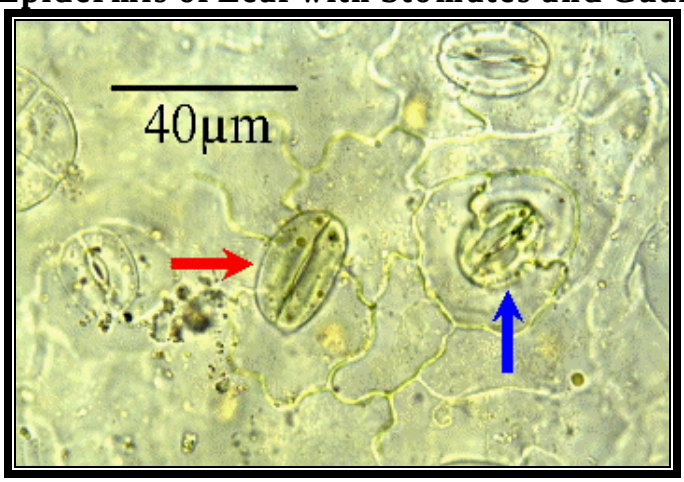
1. Large surface area permits maximum absorption of light energy
2. **Cuticle:** protective waxy covering of the leaf.
3. **Epidermis:** outer single layer of cells that lies beneath the cuticle.
    a. Generally contain little to no pigment in order to allow light to reach the photosynthetic layer below.
    b. The cuticle and epidermis together function to:
        - ✓ protect the inner tissues of the leaf from water loss
        - ✓ increase the leaf's ability to resist invasion of inner tissues by fungi
        - ✓ protect the leaf from mechanical injury

4. **Palisades Layer:** made up of elongated cells filled with many chloroplasts.
    a. Located directly below the upper epidermis.
    b. Most photosynthesis takes place in this layer
5. **Spongy Layer:** has many interconnected air spaces with cells that have moist cell surfaces to encourage the circulation and exchange of gases including oxygen, carbon dioxide, and water vapor.
    a. found directly beneath the palisades layer
    b. has some chloroplasts
6. **Stomates:** openings typically found in the lower cuticle and epidermis.
    a. generally continuous with the intercellular spaces of the spongy layer
    b. permit the exchange of gases between the leaf and the environment
7. **Guard Cells:** regulate the opening size of the stomate
    a. there is a pair of guard cells around each stomate
    b. these cells are kidney shaped and contain chloroplasts
    c. when guard cells LOSE water, the stomates **CLOSE**, stomates **OPEN** when guard cells gain water & swell.
    d. Stomates are **CLOSED** during the **HOTTEST** parts of the day to prevent water loss from leaves.





Lower Epidermis of Leaf with Stomates and Guard Cells



8. **Conducting Tissue:** veins in the leaf contain xylem and phloem
    a. xylem carries water and soluble minerals from the roots to the leaves
    b. phloem carries food and other dissolved materials to all parts of the plant.

Gas Exchange in Plants

Leaves:

- gas exchange takes place in the spongy layer of the leaf where interior air spaces connect with the environment through the stomates.

Stems:

- **Lenticels** – stems of **woody plants** contain small areas of loosely exposed cells that permit gas exchanges with the environment.

Roots:

- Gas exchange occurs in the moist membranes of the root hairs and other epidermal cells.

Check Your Understanding:

1. Describe the functions of the cuticle.
2. Why is the epidermis clear (has no pigmentation)?
3. Where does most photosynthesis take place in a leaf? How do you know?
4. Relate the structure of the spongy layer to its function.
5. How do guard cells regulate the stomata openings?
6. Why do you think most plants have stomates on the underside of their leaves?
7. Differentiate between xylem and phloem.
8. What are the function of lenticels and where are they found?