Plants are *autotrophs* that use visible light from the sun as an energy source for their food making process, which is known as *photosynthesis*. In order to provide enough nutrition for their large, multicellular bodies they require a number of specialized organs designed specifically for the process of photosynthesis. These organs are the *leaves* of the plant body, and they contain cells with *organelles* called *chloroplasts*, which perform the light-trapping and food-making reactions. Leaves have other specializations besides the presence of numerous chloroplasts to ensure that all requisite photosynthetic materials will be provided. These other specializations include:

- **Guard cells**, which create *stomata* (pores; small openings) that allow gas exchange with the environment.

- **Vascular tissues** for transportation of materials (*xylem* tissue moves water upward in the body of the plant, and *phloem* tissue carries food dissolved in water downward in the body of the plant).

- A *waxy cuticle* on the outer surface (epidermis) of most leaves helps prevent water loss.

Inside the chloroplasts are many different kinds of *protein pigments* (such as *chlorophylls*, *carotenes* and *xanthophylls*) that can trap the sun’s energy. This energy is needed to power the food making reactions.

The *glucose* sugar produced from photosynthesis is often stored as *starch*, and you can test for its presence with *iodine (IKI) solution*.

**PART I**

Examine the prepared microscope slides of leaves and identify the waxy cuticle, stomata, guard cells, xylem, phloem, epidermal cells and chloroplasts.

Use your textbook (check the chapter that discusses plant leaves) and Photo Atlas as references to identify these structures.

**PART II**

- Take two small beakers and fill them each with 100 ml of dilute *phenol red* solution. (Phenol red is red when in an *alkaline* solution, but turns yellow in an *acidic* solution).

- Use a drinking straw to bubble CO₂ into each beaker from your breath. Bubble in just enough gas to change the color. Too much will make the reaction time very long.

- Continue breathing through the straw until each beaker's phenol red turns yellow. This means that CO₂ and water have combined to form a weak acid called *carbonic acid*.

- As soon as the liquid turns yellow stop blowing into the beaker.
• Place a several large sprigs of water-dwelling plants into one of the two beakers and place both beakers in front of a lamp with a bright (150 watt) bulb. Lamps are set up for you along the back lab counter.

• Check the appearance of the beakers' contents in 20, 40 and 60 minutes.

OBSERVATIONS:


PART III

• Recall from previous lab work that iodine (IKI) solution is a test for the presence of starch and turns black when starch is present.

• Take a Coleus leaf that was exposed to sunlight for at least 5 days and place it in boiling water for 1 minute.

• Remove the leaf from boiling water and place it in the double-boiler bath of methanol provided for you under the hood. Boil the leaf in methanol for 3 minutes.

• Place the boiled leaf in a petri dish and add IKI solution to the surface of the leaf.

• Repeat this process with a leaf that was covered with foil for at least 5 days.

• Record your observations of the two samples in the space provided below.

OBSERVATIONS:

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<th>SUN EXPOSED LEAF:</th>
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