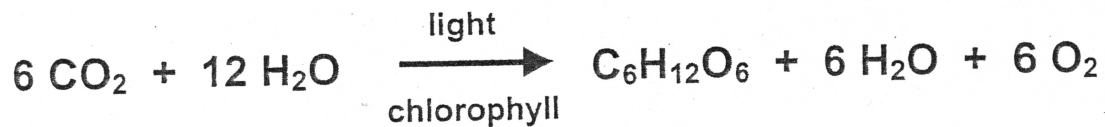


## Lab 7- Photosynthesis

### I. PHOTOSYNTHESIS OVERVIEW

- Summary Equation:



- Photosynthesis can be divided into two stages:

- (1) **Light-Dependent Phase (=Light Reaction)**- energy is captured from sunlight
- (2) **Light-Independent Phase (=Dark Reaction)**- energy captured during light reaction is used to fix  $\text{CO}_2$ , converting it into sugars and other compounds

Question:

Name four limiting factors that influence the rate of photosynthesis.

### II. PHOTOSYNTHETIC PIGMENTS

- Plants contain pigments (molecules that absorb specific wavelengths of light) to capture sunlight. These include . . .

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>(1) Chlorophyll a</li><li>(2) Chlorophyll b</li><li>(3) Carotenoids</li><li>(4) Xanthophylls</li></ul> | } Accessory Pigments (capture different wavelengths of light and pass energy on to chlorophyll a molecules) |
|--|---|

- In order to separate and visualize these pigments, one technique known as **paper chromatography** is used.
- In paper chromatography a solution containing several different chemicals with different molecular weights and varying degrees of polarity is absorbed by filter paper.
- The technique utilizes the polar properties of chromatography paper (cellulose) and the nonpolar properties of organic solvents (petroleum ether and acetone) to separate pigments. Each pigment migrates up the paper at different rates depending upon its solubility in the nonpolar solvent and its molecular weight. The smaller and more soluble the pigment, the faster it will migrate up the paper. Conversely, the larger and less soluble pigments will migrate at a slower rate.

## Photosynthetic Pigments Exercise

**Safety Note:** The solvents used in the lab today are extremely volatile and flammable!!! Do not light a flame in the lab today and avoid breathing fumes as much as possible.

### Procedure:

1. Obtain a test tube and rubber stopper. Cut a piece of chromatography paper so that it fits in the test tube and is  $\frac{1}{2}$  inch from the stopper inside the closed tube (see illustration below).  
[Caution: do not touch the surface of the chromatography paper, handle from the edges; oils from your fingers interfere with the process]
  2. Cut one end of the chromatography paper to make a point by making two  $45^\circ$  angle cuts.
  3. Draw a light pencil line across the chromatography paper 2.5 cm from the pointed end. Next, use the blunt end of a forcep to rub a leaf along the pencil line to transfer the plant extract. Repeat rubbing plant extract onto the chromatography paper 14 more times.
  4. After you have applied the plant extract, pour a small amount of chromatography solvent (90% petroleum ether, 10% acetone) into your test tube. There should be enough solvent to just submerge the pointed end of the chromatography paper.
  5. Insert the chromatography paper into the test tube containing solvent pointed end down and replace the stopper tightly. Place the test tube upright in a jar, beaker or test tube rack
  6. When the solvent front has almost reached the top of the filter paper remove the strip and let it dry. Mark the four pigment fronts and the solvent front.
- **Analysis of Chromatogram-** Identify the positions of the different pigments based upon the information below:

Pigment	Color	Solubility
Chlorophyll a	blue-green	more than Chlorophyll b
Chlorophyll b	pale or olive green	low
Carotenes	yellow	high
Xanthophylls	pale yellow-brown	less than Carotenes

1. Indicate the relative positions of each pigment on the illustrated chromatography paper:

