# "the light begins…the light ends"

Science, Chemistry

" The light begins...the light ends" Dulce Maldonado Abstract: In this lab the students did two labs in which they learned the process of photosynthesis, which involves the use of light energy to convert carbon dioxide and water into sugar, oxygen, and other organic compounds. Oxygen is released as a product. This process is often summarized by the following reaction: 6CO2 + 12H2O ------> C6H12O6 + 6H2O + 6O2 The energy of photosynthesis comes from absorbed photons found in light and involves a reducing agent, in this case water. The second lab is about the spectrophotometer where they learned that it’s an instrument that measures the amount of light of a specific wavelength that passes though the medium. Introduction: The purpose of this lab experiment is to separate plant pigments using paper chromatography, and to measure the rate of photosynthesis in isolated chloroplasts. Because of capillary action the solvent moves up the paper causing the pigments to become visible at certain distances. The substances visible on the paper are called pigments. Chlorophyll a is the main pigment that makes up about 75% of the pigmentation in plants. Chlorophyll b makes up about 25% of the pigmentation. And carotenes and xanthophyll’s are accessory pigments that make up the rest of the pigmentation. Carotene is the most soluble of the pigments and as a result will be carried the farthest by the solvent. Chlorophylls absorb blue and red light while carotenoids absorb blue-green light, but green and yellow light are not effectively absorbed by phosynthetic pigments in plants therefore light of these colors is either reflected by leaves or passes through the leaves. This explains why plants are green. Photosynthesis is important to our environment because nearly all-living things depend on the energy produced from photosynthesis

for their nourishment. It is a cycle because animals need from the plants to feed on as well as oxygen. The paper will display a spectrum of the pigments found in the spinach leaves. Using the formula Rf one can determine the relationship between the distances the solvent traveled to the distance the pigment traveled Materials and Methods for LAB 1: Materials: In the first lab they used filter paper and had to cut it out and shape it so it could fit into the Pasteur pipet they had to handle the paper with care because the oil on their skins could stain the paper and with the tongs they held the paper down and with a dollar quarter they pressed down the spinach on the end of the arrow shaped paper they rolled it for about three times and after they hooked the paper on the cap of the Pasteur pipet and put it into the pipet and just the tip of the arrow shaped paper touched the solvent. Then the strip of paper was placed into the tube with the point down in the bottom. When the pigment reached the point it was left in there for 20 minutes. From the distance the pigment traveled and the distance the solvent traveled the Rf value was calculated Figure 1 Questions: 1. Why does chlorophyll appear green? It cannot absorb green wavelengths of light but it reflects the green wavelengths. 2. Is starch produced when a leaf is kept in the dark? Why or why not? It is not produced, as sunlight or light energy is needed for the energy in photosynthesis. Starch is used for respiration such as oxygen 3. What causes leaves to turn from green to yellow and red in autumn? During summer months, leaves are green due to a pigment called chlorophyll. When fall starts the chlorophyll starts to breaks down and other pigments become dominant. 4. Of what value to plants is starch? It is a way for plants to store excess glucose 5. What is the significance of electron transport in the

photochemical (i. e., light-dependent) reactions of photosynthesis? Electron transport chain is used to create ATP and NADPH that is then used in the Calvin cycle to convert CO2 and H20 in organic substances. Materials and Methods for LAB 2: First the tubes were labeled and cleaned with lens paper because even the oil from your hands can affect the transmittance of light through the tube. They used a spectrophotometer to measure the amount of light absorbed and transmitted by a dissolved chemical. One tube was labeled as acetone and another tube was green that represented the boiled chloroplast. They would have to set the wavelength to a certain number and record the absorbance number. Table 1 Graph 1 Questions: 1. What is the difference between an absorption spectrum and a standard curve? A standard curve is just a plot of two different parameters and the curve tells the scientist the relationship between the two parameters. Absorption spectrum the relationship of absorbance versus wavelength for a pigment molecule, this indicates which wavelengths are absorbed maximally by a pigment 2. Can spectrophotometry be used to determine the concentration of " colorless" solutes such as salt or sugar? Explain Yes it can because a spectrophotometer separates white light into a spectrum of colors, such as wavelengths, the light is either absorbed by the dissolved substance or transmitted through the solution and exits the sample tube. Conclusion: From lab 1 we discovered that the many pigments found in chloroplasts are all involved in gathering energy from sunlight. The spectrum of color displayed on the filter paper showed the pigments and the solubility of each. In lab 2 the spectrophotometer measured the light transmittance through the various tubes and the chloroplast solutions in each. In the

spectrophotometry you could see how the absorbance would increase or decrease by the wavelength. This indicated that photosynthesis was occurring and at what rate it was occurring. The class group now understands the purpose of photosynthesis and what it is capable of and they are very satisfied to have photosynthesis on earth. Works Cited Sinclair Tom, National Association of Biology Teachers (NABT), American Society of Plants Biologists http://www. aspb. org/education/lab_photosyn. cfm Jefferson State Community College, Spectrophotometry Chapter 8, Identifying Solutes and Determining their Concentration, pages 81-89 Jefferson State Community College, Photosynthesis Chapter 13, Pigment Separation, Starch Production, and CO2 Uptake, pages 137-147