Name: _____ Date: _____ Period: ____

The Success of Photosynthesis in Geranium Leaves Using Visible Light Wavelengths Week #____

Directions: Read, annotate, and complete each section.

Photosynthesis is the process that plants use to make food. Green plants use pigments called chlorophyll, located in chloroplasts, to absorb the incoming light for use in the photosynthetic process. There are two different types of chlorophyll: chlorophyll a and chlorophyll b, that collectively capture almost all of the visible light spectrum.

Light is an important factor in photosynthesis and the correlation between color and wavelength must be understood. When sunlight is put through a prism, it will separate into a spectrum of different colors. The spectrum is divided into wavelengths measured in nanometers and each color corresponds to a range of nanometers. The colors seen by humans are the wavelengths that are not absorbed by an object but are instead reflected back at our eyes.

In finding which wavelengths affect the rate of photosynthesis, this experiment involved placing black, red, blue, and green filters over portions of four separate leaves from the same plant that were similar in size. The filters were attached to the leaves by sandwiching the leaves in between the two sides of the filter paper, and then loosely paper clipping it to the leaf. After the treatments were placed, the leaves were returned to bright light for one week. The results of the control areas, where light was not filtered, were be compared to the results of the covered areas.

Draw and label the experimental set up of the four leaves.

After one week, the leaves were removed from the plant, cut into experimental and control groups, and placed into eight separate petri dishes. Water was added to each dish, until the bottom of the dish was covered and the leaves were allowed to soak. Drops of indicator solution were added to all of the petri dishes. A result of photosynthesis is glucose, and glucose turns orange in the presence of indicator solution, this is how it will be determined how much glucose is present in the leaves.

Draw and label the experimental set up of the eight petri dishes.

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1. (SIN 402) What is the independent variable in this experiment?
    a. type of leaf
    b. amount of glucose
    c. size of the color filters
    d. color of light

2. (SIN 402) What is the dependent variable in this experiment?
    a. amount of glucose
    b. color of light
    c. size of leaf
    d. amount of time exposed to light

3. (SIN 403) What was the control group in the experiment?
    a. the leaves without filters
    b. the leaves with filters
    c. the portion of leaves without filters
    d. the portion of leaves with filters

Figure 1 identifies color of light correlated to wavelengths. The results of the experiment were used to generate Figure 2.

4. (IOD 501) According to Figures 1 and 2, which color of light resulted in the highest rates of photosynthesis?
    a. red light
    b. green light
    c. blue light
    d. cyan light

5. (IOD 501) Which of the following correctly places the colors of light from the experiment in order from most amount of photosynthesis to the least amount of photosynthesis?
    a. green, red, blue
    b. red, green, blue
    c. blue, red, green
    d. blue, green, red

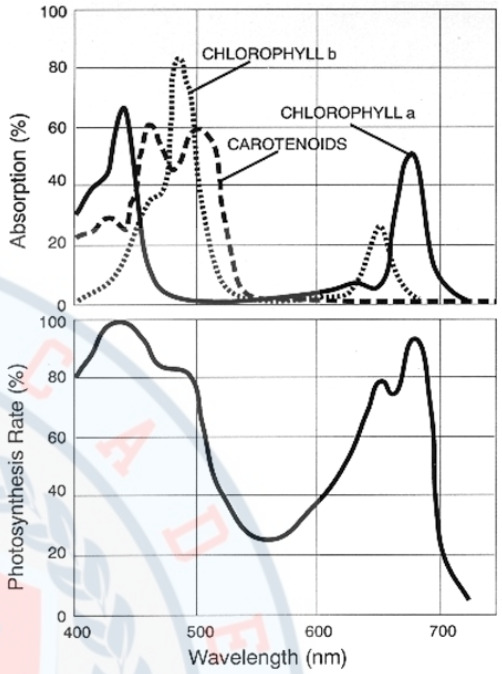

Figure 1

Color	Wavelength (nm)
Red	625-740
Orange	590-625
Yellow	565-590
Green	520-565
Cyan	500-520
Blue	435-500
Violet	380-435

Figure 2

6. (EMI 501) Which of the following conclusions is supported by Figures 1 and 2?
    a. Chlorophyll a, chlorophyll b, and carotenoids absorb the most red light which results in the highest rate of photosynthesis.
    b. Chlorophyll a, chlorophyll b, and carotenoids reflect the most green light which results in the highest rate of photosynthesis.
    c. Chlorophyll a, chlorophyll b, and carotenoids reflect the most green light which results in the lowest rate of photosynthesis.
    d. Chlorophyll a, chlorophyll b, and carotenoids absorb the most blue light which results in the lowest rate of photosynthesis.