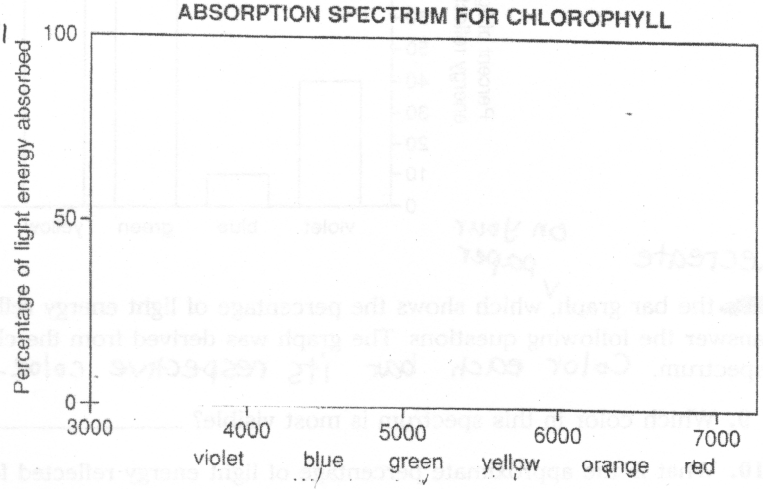
The Absorption of Chlorophyll

A pigment is a substance that absorbs and reflects light of particular wavelengths. For example, the yellow-green color of a leaf is due to a pigment in the leaf called chlorophyll. When white light (which contains all of the colors of the spectrum) shines on chlorophyll, the chlorophyll absorbs most of the red, orange, blue, and violet and reflects most of the green and yellow. That is why you see a yellow-green color. Think of a pigment as a sponge that soaks up all of the other colors of the spectrum except the one you see.

A spectrophotometer is an instrument that is used to measure the amount of light absorbed by a pigment. Below is a graph showing the percentage of light energy reflected for the absorption spectrum for chlorophyll. The highest peaks represent colors that chlorophyll absorbs the most. Therefore, they are the least visible.

Wvlngth	chlorophyll A %	chlorophyll B %
4000	30	0
4500	65	40
5000	0	85
5500	0	0
6000	10	10
6500	45	25
7000	10	10



Use the data to make a graph on your paper like the one shown. Label two lines 'A' and 'B'.

1. Which of the colors absorbed by chlorophyll is least visible? _____
2. What is its approximate wavelength? _____
3. What percentage of light energy absorbed does this peak represent? _____
4. How much of this color is being reflected? _____
5. What percentage of light energy absorbed by chlorophyll does the orange spectrum peak represent? _____

6. Why would you say there are no peaks in the range between 5000 angstroms and 6100 angstroms? _____

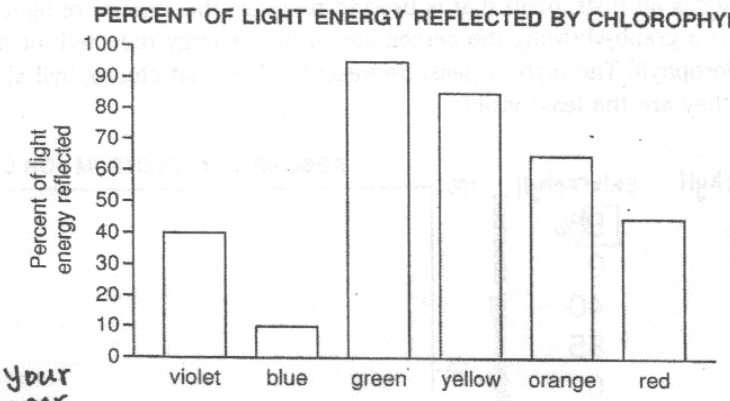
_____

7. Are you able to see the light in the yellow-green part of the spectrum? Explain why. _____

_____

8. Arrange the colors in the absorption spectrum of chlorophyll in order of their visibility. Place the most visible color first. _____

_____



Recreate on your paper the bar graph, which shows the percentage of light energy reflected by chlorophyll, to answer the following questions. The graph was derived from the chlorophyll absorption spectrum. Color each bar its respective color – Red = red, blue = blue, etc.

9. Which color in this spectrum is most visible? _____

10. What is the approximate percentage of light energy reflected for this color? _____

11. What percentage of light energy absorbed does this represent? _____

12. If everything above 50 percent of light energy reflected is visible to the human eye, is red light part of the mixture of colors seen in light reflected by chlorophyll? _____

"Absorption of Chlorophyll" Companion Sheet

Class set: please do not write on this sheet!

1. What is a pigment?
2. What pigment gives plants their green color?
3. What colors of the spectrum does white light contain?
4. What can you compare a pigment to?
5. In this first graph, what do high peaks represent? What does that mean about the colors with high peaks?
6. Now use the data points shown to make a graph. The graph should have one colored line for chlorophyll A and a second different-colored line for chlorophyll B.
7. Now, answer questions 1-5 on the front page.
8. Next, answer questions 6-7 on the back page.
9. For Question 8, make 2-inch high, 1 inch wide COLOR BARS to answer the question.
10. Next, create and label the bar graph shown.
11. Color each bar in this graph with the color that matches its name.
12. Answer questions 9 – 12.
13. A meter is about one yard (3 feet) long. A centimeter is $1/100^{th}$ if that distance. A millimeter is $1/1{,}000^{th}$ of a meter. A micrometer is $1/1{,}000{,}000^{th}$ of a meter. And a nanometer is $1/1{,}000{,}000{,}000^{th}$ of a meter. Now, make a data table that looks like this:

Color	Starts at ___ nm	Ends at ___ nm
Violet		
Blue		
Green		
Yellow		
Orange		
Red		

14. Use the information on the front page to fill in the range of wavelength nanometer amounts.
15. What two nanometer ranges of light do plants use *most*?
16. What nanometer range of light do plants use *least*?