

## Assignment 6

1. Matching (3 points-0.2 point per blank)

Fill in the terms required to complete the [relationships diagram](#). Choose terms from the list provided on the right side of the diagram. Note that two of the terms must be used twice.

A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	
M	
N	
O	

When you have completed the table, use it to answer the matching question in WebAssign,

2. File upload (2 points)

View this [transmission electron micrograph of a plant cell](#), locate a chloroplast and capture the image for labeling. The micrograph is displayed as if using a "virtual electron microscope", so you will need to magnify the image and move to a region that contains the clearest view of chloroplast internal structures. Perform a screen capture of the chloroplast, then label the following structures:

a thylakoid

a granum (use brackets or similar means to indicate the entire structure)

stroma

outer chloroplast membrane

Submit your labeled image to WebAssign.

**Note:** for full credit you will need to choose the best (highest resolution) chloroplast in the cell and capture it under high enough magnification to clearly show the internal structures.

3. Multiple-choice (1 point)

What is the role of chlorophyll *a* in photosynthesis?

It absorbs light energy from the red portion of the spectrum and passes it to chlorophyll *b*.

It absorbs light energy both directly and from accessory pigments, then converts it into a form of chemical energy.

It absorbs light energy from the green part of the spectrum to energize electrons.

It absorbs light energy and immediately uses it to synthesize glucose.

It plays only a minor role in the light reactions of photosynthesis.

4. Multiple-choice (1 point)

What is the role of carotenoids in photosynthesis?

They absorb light energy from the blue-green portion of the spectrum and pass it to chlorophyll *a*.

They absorb light energy both directly and from accessory pigments, then convert it into a form of chemical energy.

They absorb light energy from the yellow-green part of the spectrum to energize electrons.

They absorb light energy and immediately use it to synthesize glucose.

They absorb light energy from the purple part of the spectrum and convert it to a form of chemical energy.

5. Fill-in-the-blank (2 points)

Based on the [chromatogram in activity 2](#), identify the pigments resolved for Magnolia leaves.

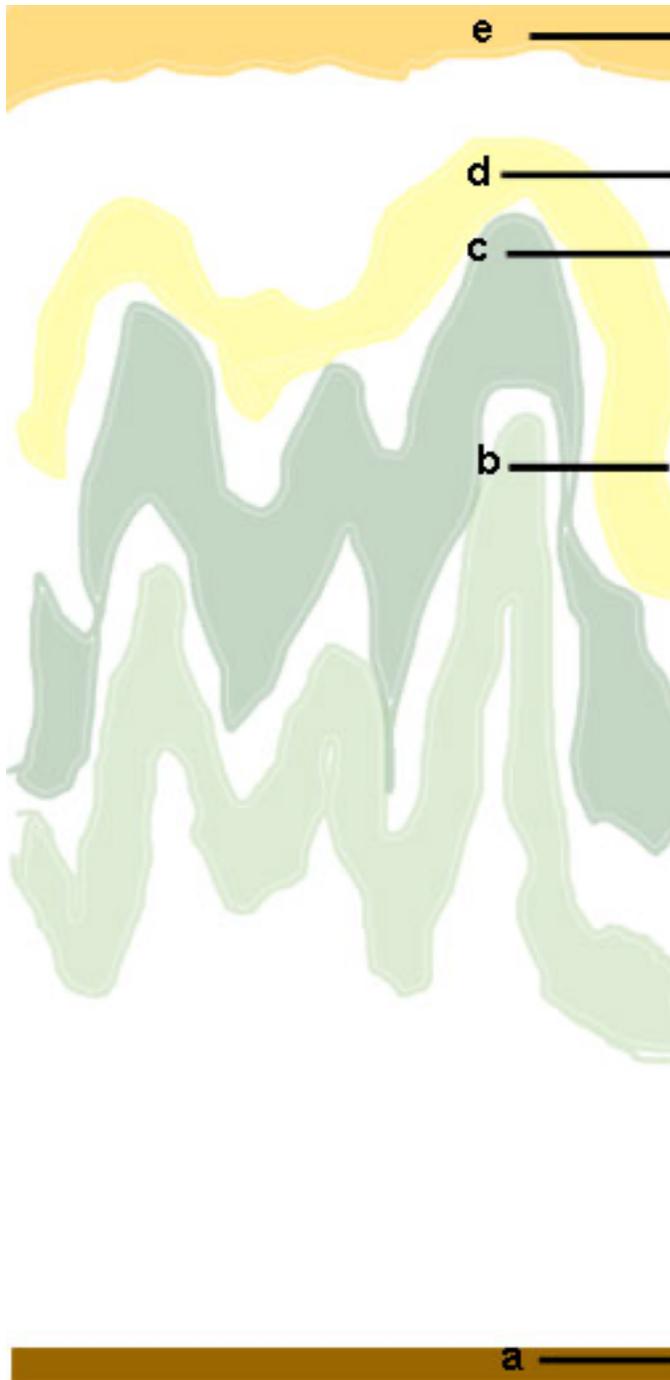
The pigment with the least affinity for paper is \_\_\_\_\_. The pigment that moved the slowest during chromatography is \_\_\_\_\_.

**Note:** you must spell the pigments correctly to receive credit.

6. Essay (2 points)

The chromatogram shown below is a stylized version of the one in question 5. Identify the location of chlorophyll *a* and xanthophyll by letter and determine the Rf values for each. Use the short black lines b-e, as your points for the distance traveled by a compound. (Line a is the application line.)

Pigment	letter	Rf value
Chlorophyll <i>a</i>		
Xanthophyll		



To answer this WebAssign question, give the letter of the lines that indicate the locations of chlorophyll a and xanthophyll. Then indicate the Rf value for each of these pigments. Briefly describe how you calculated the Rf values.

7. True/false (2 points—0.5 points each)

Study the illustration of [2-dimensional chromatography](#) in activity 2 (bottom of the page), then answer the following questions by writing true or false in each blank.

\_\_\_\_\_ More compounds can usually be identified by 2-dimensional chromatography than by 1-dimensional chromatography.

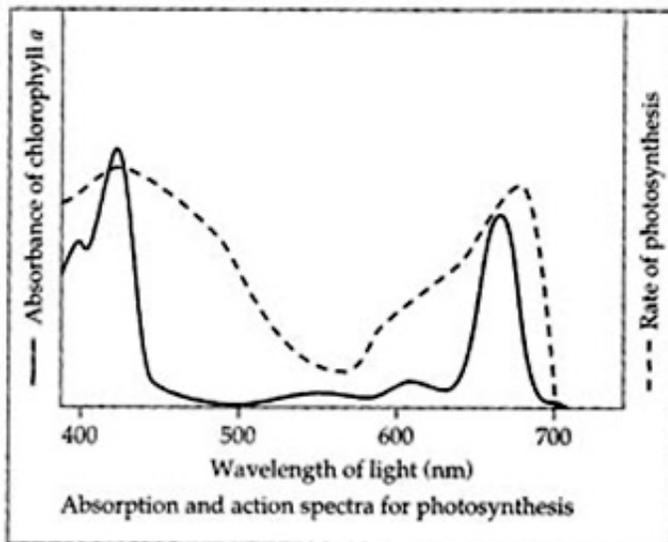
\_\_\_\_\_ Compounds move farther up the paper in 1-dimensional chromatography than in the initial solvent of 2-dimensional chromatography.

\_\_\_\_\_ 1-dimensional chromatography should always be used to separate plant pigments because it gives a clearer separation of compounds.

\_\_\_\_\_ In 2-dimensional chromatography, the paper is turned 90° before applying the second solvent.

8. Multiple-choice (1 point)

The illustration below shows both the action spectrum and the absorption spectrum of an Elodea leaf on the same graph. The action spectrum (rate of photosynthesis) is shown by the dotted line and the absorption spectrum is shown by the solid line. Think about why these two lines do not exactly match, then answer the following question.



Which of the following statements best explains why the action spectrum does not match the absorption spectrum?

The leaf contains an accessory pigment that absorbs light in the red part of the spectrum.

The leaf contains accessory pigments that absorb light in both the purple and green parts of the spectrum.

The leaf contains accessory pigments that absorb light in the both blue and orange parts of the spectrum.

Chlorophyll *a* in this leaf can absorb light in the green and yellow parts of the spectrum.

Chlorophyll *a* in this leaf can absorb light in all regions of the spectrum.

9. Multiple-choice (1 point)

In the experiment on photosynthetic rate (activity 3), what was the function of DPIP?

It produced NADPH.

It produced ATP.

It energized electrons during photosynthesis.

It absorbed light energy.

It accepted electrons.

10. Multiple-choice (1 point)

In the experiment on photosynthetic rate (activity 3), what was measured by the spectrophotometer?

The increase in absorption of the samples with time.

The decrease in absorption of the samples with time.

The change in color from clear to blue with time.

The change in color of chlorophyll with time.

The formation of orange color with time.

11. File upload (2 points)

Data from the photosynthesis experiment is recorded in this table.

Time (min)	No light	White light	White light Boiled thylakoids	Green light	Blue light
0	0.565	0.565	0.570	0.570	0.568
1	0.557	0.522	0.569	0.565	0.549
2	0.556	0.468	0.565	0.540	0.505
3	0.555	0.420	0.570	0.522	0.456
4	0.553	0.377	0.568	0.509	0.423
5	0.553	0.336	0.565	0.486	0.39
6	0.553	0.301	0.565	0.462	0.357
7	0.549	0.267	0.568	0.444	0.328
8	0.551	0.248	0.568	0.429	0.300
9	0.553	0.201	0.570	0.409	0.275
10	0.550	0.165	0.570	0.393	0.247

Graph 1 – Use the [on-line plotter](#) to plot time vs. absorption for no light, white light, and boiled thylakoids. You will need three Y columns. Use lines to connect the points so that the three lines can be compared. Label all Y-column headings to receive full credit. Capture an image of the graph and submit it to WebAssign.

12. File upload (2 points)

Refer to the data in the above table and make the following graph:

Graph 2 - Use the [on-line plotter](#) to plot time vs. absorption for white light, green light, and blue light. You will need three Y columns. Use lines to connect the points so that the three lines can be compared. Label all Y-column headings to receive full credit. Capture an image of the graph and submit it to WebAssign.

13. Essay (3 points)

Write a short essay about the results of the photosynthesis experiment that includes the following:

- Compare the rate of photosynthesis in the samples with white light/boiled thylakoids vs. white light/normal thylakoids vs. no light/normal thylakoids. Explain the differences in photosynthetic rate.
- Compare the rate of photosynthesis in the samples with normal thylakoids but exposed to white light vs. green light vs. blue light. Explain why the color of light had these effects on photosynthetic rate.

14. Fill-in-the-blank (2 points)

Study the [last photograph](#) in activity 3 (bottom of the page), which depicts the cuvettes used in the experiment at the end of 10 minutes of incubation.

If cuvette "a" is the zero-time cuvette, and "f" contains the white light/normal thylakoids sample, then:

the cuvette that contains the boiled sample is \_\_\_\_ (b, d or e) and the cuvette that was incubated under green light is \_\_\_\_ (b, d or e).

15. File upload (2 points)

View this [stained leaf section](#), which is displayed as if using a "virtual light microscope". Magnify the image and move to a region that contains the clearest view of internal structure, including a stoma. Perform a screen capture of the magnified leaf section, then label the following parts:

stoma  
mesophyll  
epidermis  
vein

Submit your labeled image to WebAssign.

**Note:** you must magnify the image enough to see all structures clearly, but all 4 labeled structures must be within the field of view.

16. Multiple-choice (1 point)

Using what you have learned about plant cells in general and guard cells in particular, answer the following question:

The mechanism by which guard cells move to open a stoma is related most closely to

contraction of muscle fibers  
elongation of microtubules  
cytoplasmic streaming  
turgor pressure  
beating of flagella