

## **Photosynthesis Test**

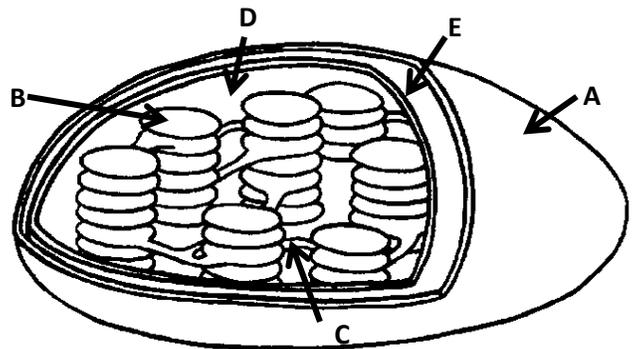
### Definitions (2 pts each):

- \_\_\_\_\_ are small discs found within the chloroplast that contains components important for photosynthesis.
  - Carotenoid
  - Lamella
  - Thylakoid
  - Stroma
- The red, orange, and yellow pigments found in plants, that are often visible in the fall are:
  - Carotenoids
  - Stroma
  - Chlorophyll
  - Chloroplast
- An organic molecule that acts as the main energy source for cell processes.
  - The Calvin cycle
  - Chlorophyll
  - Glucose.
  - ATP.
- A biochemical pathway of photosynthesis in which carbon dioxide is converted into glucose using ATP and NADPH is called:
  - the light-dependent reactions.
  - the Calvin cycle.
  - glycolysis.
  - None of the above.
- The \_\_\_\_\_ is a gel-like material within the chloroplast that corresponds to the cytoplasm of the original bacterium.
  - Stroma
  - Lamella
  - Grana
  - Thylakoid
- \_\_\_\_\_ is a protein attached to the thylakoid membrane that helps synthesize ATP each time a  $H^+$  exits the thylakoid.
  - ATP synthase
  - Proton pump
  - NADPH
  - ADP

### Labeling (2 pts each):

Using the labeled diagram of a chloroplast, indicate the following structures:

- The thylakoid is labeled as \_\_\_\_ in the illustration.
  - A
  - B
  - C
  - D
  - E
- The outer membrane is labeled as \_\_\_\_ in the illustration.
  - A
  - B
  - C
  - D
  - E
- The lamella is labeled as \_\_\_\_ in the illustration.
  - A
  - B
  - C
  - D
  - E



- The inner membrane is labeled as \_\_\_\_ in the illustration.
  - A
  - B
  - C
  - D
  - E
- The stroma is labeled as \_\_\_\_ in the illustration.
  - A
  - B
  - C
  - D
  - E

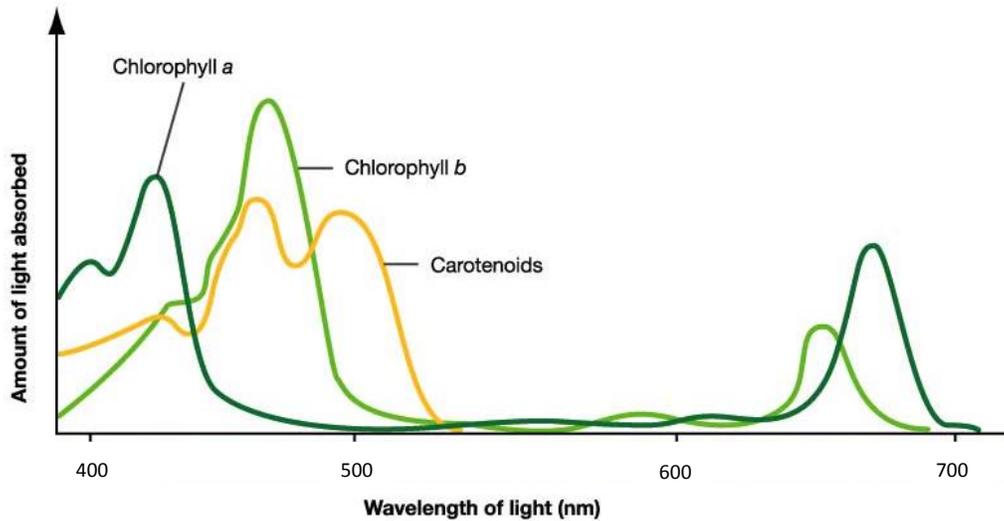
Multiple Choice (2 pts each):

12. Trees start as a little seed. What provided most of the mass that made a tree grow so large?
- Nutrients in the soil
  - Molecules in the air
  - The sun
  - Water taken up by the roots
13. An organic compound formed in the dark reactions of photosynthesis is
- glucose
  - chlorophyll
  - oxygen
  - water
14. The availability of which atmospheric gas most directly influences the rate of photosynthesis
- carbon dioxide
  - nitrogen
  - oxygen
  - hydrogen
15. One bean plant is illuminated with green light and another bean plant of similar size and leaf area is illuminated with blue light. If all other conditions are identical, how will the photosynthetic rates of the plants most probably compare?
- Neither plant will carry on photosynthesis
  - The plant under the blue light will carry on photosynthesis at a greater rate than the one under the green light.
  - Photosynthesis will occur at the same rate in both plants.
  - The plant under the green light will carry on photosynthesis at a greater rate than the one under the blue light.
16. The light reactions of photosynthesis occur in the \_\_\_\_\_, and the dark reactions occur in the \_\_\_\_\_ of the chloroplast.
- cytochromes, stroma
  - thylakoid membranes, stroma
  - reaction centers, cytochromes
  - stroma, cytochromes
17. The overall source of energy for photosynthesis is:
- energy from NADPH
  - energy released when water is split and oxygen is produced
  - energy from ATP
  - light energy from the sun
18. Which of the following does NOT happen during the light-dependent reactions of photosynthesis?
- ATP is produced
  - Oxygen is produced
  - Glucose is produced
  - NADPH is produced
19. Thylakoid membranes within chloroplasts contain chlorophyll. The Calvin cycle occurs in the stroma of the chloroplasts. How are these processes occurring within the Calvin cycle and the thylakoid membrane connected?
- The Calvin cycle uses high-energy molecules formed within the thylakoid membrane to convert CO<sub>2</sub> into sugar molecules
  - The Calvin cycle uses sugar molecules formed within the thylakoid membrane to generate high-energy molecules
  - The processes in the thylakoid membrane use high-energy molecules formed during the Calvin cycle to convert CO<sub>2</sub> into sugar molecules
  - The processes in the thylakoid membrane use sugar molecules formed during the Calvin cycle to generate high-energy molecules
20. An overall result of photosynthesis in plants is the use of sunlight to create ATP & NADPH that powers the conversion of \_\_\_\_\_ to glucose.
- glucose
  - carbon dioxide
  - oxygen
  - NADPH
21. Which of the following are used in the overall reactions for photosynthesis?
- carbon dioxide
  - water
  - light
  - all of the above
22. During photosynthesis, carbon dioxide (CO<sub>2</sub>), and water (H<sub>2</sub>O) combine to yield glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) and oxygen (O<sub>2</sub>). What is the **balanced** chemical equation for this reaction?
- $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6$
  - $6 \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2$
  - $6 \text{CO}_2 + 6 \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$
  - $6 \text{H}_2\text{O} + 6 \text{CO}_2 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2$

23. The light-dependent reactions supply the Calvin cycle with
- ATP and CO<sub>2</sub>
  - NADPH and H<sub>2</sub>O
  - NADPH and ATP
  - CO<sub>2</sub> and H<sub>2</sub>O
24. Photosynthesis uses sunlight to convert water and carbon dioxide into
- oxygen.
  - glucose.
  - ATP and oxygen.
  - oxygen and glucose.
25. Plants gather the sun's energy with light-absorbing molecules called
- pigments.
  - thylakoids.
  - chloroplasts.
  - glucose.
26. Renaldo grew algae in the presence of a poison that stops the light-independent reactions of photosynthesis. As a result, which molecules will the **light-dependent** reactions stop producing?
- ADP and NADP<sup>+</sup>
  - ADP and NADPH
  - ATP and NADP<sup>+</sup>
  - ATP and NADPH
27. The equation for photosynthesis can be written as...  $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ . How many oxygen **atoms** are present in the **products** of photosynthesis?
- 6
  - 18
  - 14
  - 12
28. How does the Calvin cycle differ from the light-dependent reactions?
- It takes place in the stroma.
  - It takes place in chloroplasts.
  - It requires light.
  - It takes place in the thylakoid.
29. If carbon dioxide is removed from a plant's environment, what would you expect to happen to the plant's production of glucose?
- More glucose molecules will be produced.
  - Fewer glucose molecules will be produced.
  - The same number of glucose molecules will be produced but without carbon dioxide.
  - Carbon dioxide does not affect the production of glucose molecules in plants.
30. Which of the following is not a product of the light-dependent reactions of photosynthesis?
- O<sub>2</sub>
  - ATP
  - NADPH
  - Sugar
31. Which of the following is the source of the carbon in sugar produced during photo synthesis?
- CO<sub>2</sub>
  - H<sub>2</sub>O
  - ATP
  - NADPH
32. Which of the following is the source of the oxygen released during photosynthesis?
- CO<sub>2</sub>
  - H<sub>2</sub>O
  - ATP
  - NADPH

Interpreting Graphs (2 pts each):

Using the graph of light absorbance by photosynthetic pigments found in plants, answer the following questions:



33. If all light from our sun shined at a wavelength of 425 nm, what plant pigment would work the best?
- Chlorophyll a
  - Chlorophyll b
  - Carotenoids
  - No pigments work well at this wavelength of light.
34. If light was between \_\_\_\_\_ wavelengths, chlorophyll a, chlorophyll b, and the carotenoids would **NOT** function well.
- 415 nm – 490 nm
  - 550 nm - 700 nm
  - 450 nm – 550 nm
  - 530 nm - 630 nm
35. How efficient would photosynthesis be if sunlight was only green (between 495 – 570 nm)?
- Only one pigment works well at some of these wavelengths of light, so photosynthesis would not be as efficient in green light as in white light.
  - Since all three pigments work in green light, there would be a lot of oxygen and glucose produced.
  - Photosynthesis would be just as efficient in green light as in white light.
  - None of the above.

Open Response (15 possible points) –

Use the **back of your bubble sheet** to answer your open-response question.

Trevor determines the rate of photosynthesis of an aquatic plant by counting the number of oxygen bubbles produced per minute. Assume each bubble contains the same volume of gas. He places a light source 40 cm above the aquatic plant and uses four different colors of light, one at a time. The table to the right summarizes Trevor's data:

Using your understanding of photosynthesis, analyze this experiment. As a part of your answer, be sure to:

- (4 points)** Graph your data, using a bar graph. Include a **title**, **both** axis labels, and **bar** labels.
- (4 points)** Explain why counting the number of oxygen bubbles produced per minute is an **acceptable method** to determine the rate of photosynthesis.
- (4 points)** Explain why white and green light colors cause **different** rates of photosynthesis.
- (3 points)** Predict the results of Trevor's experiment if he moves the light source to **100** cm away from the plant. Explain your reasoning.