Name _____ Date _____

Photosynthesis Unit Review: How Light Reactions and the Calvin Cycle Store Light Energy in Sugar

Directions: Answer the questions on photosynthesis; the questions in one group use a table of pondweed results.

1. Use the word bank to complete these sentences about what photosynthesis takes in and gives off.

Word bank
glucose • chlorophyll • water • carbon dioxide • oxygen

For photosynthesis, a plant takes in _____ from the air through its leaves and _____ from the soil through its roots. Using light energy, it builds sugar and gives off _____.

2. Match each part of a leaf or chloroplast to its role in photosynthesis.

Write the letter of the matching answer on each line.

1. _____ Stroma
2. _____ Chlorophyll
3. _____ Stoma (a pore in the leaf)
4. _____ Thylakoid membrane

A. Fluid where the Calvin cycle builds sugar
B. Pigment that captures light energy
C. Organelle that releases the energy stored in sugar
D. Opening that lets carbon dioxide into the leaf
E. Site of the light-dependent reactions

3. Which cells in a typical plant carry out photosynthesis?

A. Only cells that contain chloroplasts, such as many cells inside leaves
B. Only cells on the outer surface of the plant, where light hits first
C. Every living plant cell, including the cells of the roots
D. Only root cells, because they take in the water photosynthesis needs

4. Why do the leaves of most plants look green to our eyes?

A. Leaves absorb no light at all and simply reflect sunlight back.
B. Chlorophyll absorbs mostly red and blue light and reflects much of the green.
C. Green light is the only color of sunlight that reaches a leaf.
D. Chlorophyll absorbs green light more strongly than any other color.

5. A leaf makes sugar, and some of that sugar travels to a root underground. How does the root receive energy from the light that the leaf absorbed?

A. As chemical energy carried by the sugar that reaches the root.

B. As light carried by water flowing to the root.

C. As light produced by carbon dioxide entering the root.

D. As heat released by sugar that stays in the leaf.

6. In a classic experiment, algae were given water with extra heavy oxygen atoms, while their carbon dioxide had the usual mix of oxygen atoms. The oxygen gas the algae released had the same share of heavy oxygen as the water. What does this result show?

A. The oxygen released in photosynthesis comes from the air around the algae.

B. The oxygen released in photosynthesis comes from carbon dioxide.

C. The oxygen released in photosynthesis comes from the sugar.

D. The oxygen released in photosynthesis comes from water.

7. Which two of these are made by the light-dependent reactions?

☐ A. Carbon dioxide ☐ B. Starch ☐ C. NADPH

☐ D. ATP ☐ E. Glucose

8. Why does the Calvin cycle of a plant moved from bright light into darkness soon slow down and stop, even though the cycle does not capture light itself?

A. It runs out of the energy carriers that the light-dependent reactions supply.

B. Its cells stop needing any sugar as soon as the light is gone.

C. Its chloroplasts begin making oxygen instead of sugar once it is dark.

D. Its stroma needs light to shine on it directly to bond carbon dioxide into sugar.

9. At night, a plant takes in oxygen and gives off carbon dioxide. Which statement explains this?

A. Its chloroplasts switch to making carbon dioxide once the sun goes down.

B. It breathes in oxygen only at night and never uses oxygen during the day.

C. It runs photosynthesis in reverse at night, turning sugar back into light.

D. Its cells carry out cellular respiration day and night, but photosynthesis stops in the dark.

10. A tree grows from a small seed into a plant with hundreds of kilograms of dry wood, while the soil around it loses very little mass. Where does the tree get the carbon that makes up a large share of its dry wood?

A. Water taken up by the roots B. Carbon dioxide taken in from the air

C. Sunlight absorbed by the leaves D. Minerals taken up from the soil

Pondweed Under a Lamp

In an investigation, a sprig of pondweed was placed in a tube of water with baking soda added to supply carbon dioxide, and a beaker of water stood between the lamp and the tube. The same sprig and water were used throughout as the lamp was set at five distances from the plant. At each distance, the bubbles rising from the cut stem were counted for 1 minute, 3 times. The bubbles are mostly oxygen.

Mean number of bubbles counted per minute from a pondweed sprig at five lamp distances (3 trials at each distance)

Distance from lamp (cm)	Mean number of bubbles counted per minute
10	36
20	30
30	19
40	11
50	6

11. In this investigation, which variable was changed on purpose?

A. The distance between the lamp and the plant
B. The amount of baking soda in the water
C. The kind of plant used in the tube
D. The number of bubbles counted per minute

12. What do the results show about this pondweed?

A. In this test, the plant gave off bubbles faster when the lamp was closer.
B. Light is the only factor that affects how fast photosynthesis happens.
C. Every water plant gives off 36 bubbles per minute at 10 cm from a lamp.
D. The plant stopped carrying out photosynthesis when the lamp was 50 cm away.

13. Why was a beaker of water placed between the lamp and the plant?

A. To make the light reaching the plant brighter
B. To add carbon dioxide to the water around the plant
C. To give the plant more water to use in photosynthesis
D. To absorb heat from the lamp so that the temperature stayed about the same

14. Suppose the test at 10 cm were repeated with no baking soda in the water, so the plant had less carbon dioxide. What is the most likely result?

A. The same number of bubbles, because the bubbles are carbon dioxide, not oxygen
B. Fewer bubbles per minute, because carbon dioxide is one of the inputs of photosynthesis
C. More bubbles per minute, because less carbon dioxide leaves more room for oxygen
D. The same number of bubbles, because light is the only input that matters