Photosynthesis Practice

Use this key to check answers and read the explanations.

1. Which part of a green leaf cell should you label as the main site of photosynthesis?
   A. Chloroplast
   B. Nucleus
   C. Mitochondrion
   D. Central vacuole
   Correct answer: A. Chloroplast
   Chloroplasts contain the pigments and other cell machinery that carry out photosynthesis.

2. A model of photosynthesis shows arrows for sunlight, water, and carbon dioxide. What does the sunlight arrow represent?
   A. A gas that leaves the leaf
   B. Atoms that become part of the sugar
   C. Energy that powers the process
   D. Water moving into the roots
   Correct answer: C. Energy that powers the process
   Light supplies energy. The atoms in the resulting sugar come from material inputs to the process.

3. What are the tiny openings in a leaf surface that can widen or narrow to regulate gas exchange?
   A. Veins
   B. Stomata
   C. Root hairs
   D. Guard cells
   Correct answer: B. Stomata
   Stomata are the openings. A pair of guard cells controls the width of each opening.

4. A diagram shows one gas leaving a leaf as a product of photosynthesis. Which gas belongs on that arrow?
   A. Water vapor
   B. Carbon dioxide
   C. Nitrogen
   D. Oxygen
   Correct answer: D. Oxygen
   The reactions of photosynthesis form oxygen gas. Some of that gas can leave the leaf through its stomata.

5. Water absorbed by a plant’s roots travels up through the stem. Which tissue carries this water to the leaves for processes such as photosynthesis?

A. Phloem
B. Xylem
C. Cuticle
D. Palisade mesophyll

Correct answer: B. Xylem
Xylem carries water from the roots up through the plant. The leaf veins contain xylem that delivers water to leaf tissues.

6. A healthy leaf looks green in white light. Which pattern of light reflection by chlorophyll helps explain that color?

A. It reflects more green light than red or blue light.
B. It reflects more red light than green or blue light.
C. It reflects more blue light than red or green light.
D. It reflects the same amount of red, blue, and green light.

Correct answer: A. It reflects more green light than red or blue light.
Chlorophyll absorbs red and blue light more strongly than green. Some green light reflects from the leaf and reaches your eyes.

7. A student sees water and carbon dioxide on the input side of a photosynthesis model. Which input supplies the oxygen atoms in the oxygen gas released?

A. Neither water nor carbon dioxide
B. Carbon dioxide only
C. Both water and carbon dioxide
D. Water only

Correct answer: D. Water only
During the light-dependent stage, water is split. Oxygen atoms from the water form the oxygen gas released in photosynthesis.

8. A mature leaf in the sun is making more sugar than it needs. A growing root tip below ground needs sugar. Which route can carry sugars to that root tip?

A. From the root tip to the mature leaf through phloem
B. From the mature leaf to the root tip through xylem
C. From the mature leaf to the root tip through phloem
D. From the root tip to the mature leaf through xylem

Correct answer: C. From the mature leaf to the root tip through phloem
The leaf supplies sugars to other parts of the plant. Phloem carries them from sources such as mature leaves to places using them, such as growing roots.

9. A seed forms on a parent plant and stores some of the sugars the parent made. In what form can a plant store those sugars for the seedling to use after germination?

A. Starch
B. Cellulose
C. Chlorophyll
D. Oxygen

Correct answer: A. Starch
A plant can link sugar units into starch. Stored starch supplies sugar for early seedling growth before its own leaves can meet its needs.

10. A leaf partly closes its stomata during a dry period. What two immediate effects would you expect through those openings?

A. More water vapor leaves, and more carbon dioxide can enter.
B. Less water vapor leaves, and more carbon dioxide can enter.
C. More water vapor leaves, and less carbon dioxide can enter.
D. Less water vapor leaves, and less carbon dioxide can enter.

Correct answer: D. Less water vapor leaves, and less carbon dioxide can enter.
Smaller openings slow both the escape of water vapor and the entry of carbon dioxide. That can conserve water while reducing the supply of carbon dioxide for photosynthesis.

11. In a fictional leaf model, photosynthesis makes 7 units of oxygen during one interval and respiration uses 7 units. No other process changes oxygen. What is the net change?

A. A loss of 7 units, with both processes active.
B. A gain of 7 units, with both processes active.
C. Zero units, with both processes active.
D. Zero units, with both processes stopped.

Correct answer: C. Zero units, with both processes active.
The model balances 7 units made against 7 used. A flat net oxygen reading can hide two active processes working in opposite directions.

12. During the same fictional time interval, a leaf with 3 cm^2 of area makes 12 oxygen units from photosynthesis. A leaf with 8 cm^2 makes 24 units. Which makes more per cm^2?

A. The larger leaf, at 4 units per cm^2 versus 3.
B. The smaller leaf, at 4 units per cm^2 versus 3.
C. The larger leaf, at 24 units per cm^2 versus 12.
D. Both make the same amount per cm^2.

Correct answer: B. The smaller leaf, at 4 units per cm^2 versus 3.
Divide each amount by its leaf area. The smaller leaf makes 12 ÷ 3 = 4 units per cm^2. The larger leaf makes 24 ÷ 8 = 3 units per cm^2.

13. In a chloroplast model, the light-dependent stage makes less ATP and NADPH while carbon dioxide stays available. Why could the sugar-building stage slow?

A. It captures sunlight directly and sends ATP and NADPH to the first stage.
B. It uses ATP and NADPH as its source of carbon atoms.
C. It needs to produce oxygen before ATP and NADPH can arrive.
D. It relies on ATP and NADPH from the light-dependent stage.

Correct answer: D. It relies on ATP and NADPH from the light-dependent stage.
The light-dependent reactions make the carriers. The Calvin cycle uses them to build a small sugar molecule from carbon dioxide.

14. In a fictional model with other conditions fixed, photosynthesis rates are 2, 5, 8, and 8 units at light levels 1, 2, 3, and 4. Which conclusion follows from these readings?

A. More light raises the rate at first, and the rate stays the same from level 3 to 4.
B. The rate increases by the same amount at every step in light level.
C. Photosynthesis stops at level 4 because the rate stops increasing.
D. The plateau identifies carbon dioxide as the specific cause of the limit.

Correct answer: A. More light raises the rate at first, and the rate stays the same from level 3 to 4.
The first two steps raise the measured rate. At levels 3 and 4, photosynthesis continues at 8 units. The readings alone do not identify what causes the plateau.

15. A fictional model lists photosynthesis rates with less and more carbon dioxide. In dim light they are 3 and 4. In bright light they are 5 and 11. Other settings match. Under which light setting does more carbon dioxide give a larger gain?

A. Bright light, by 8 units versus 2 in dim light.
B. Dim light, by 6 units versus 1 in bright light.
C. Bright light, by 6 units versus 1 in dim light.
D. Both light settings give an increase of 7 units.

Correct answer: C. Bright light, by 6 units versus 1 in dim light.
Compare readings at the same light level. More carbon dioxide raises the fictional rate by $4 - 3 = 1$ unit in dim light and $11 - 5 = 6$ units in bright light.