

Capturing the Sun's Energy: Mastery Check

Learning target: I can show that I know how producers capture light energy and build matter from carbon dioxide and water, trace atoms and energy through the photosynthesis equation, and explain with evidence where a plant's mass and energy come from.

Retrieval and mastery check

About 35 min

Individual

MS-LS1-6 · assesses

MS-ETS1-2 · supports

independent practice

writing

Name _____

Date _____

Period _____

Directions

Part A has twelve mixed items; answer every one, and show your work on any item with numbers. Part B is one paragraph. Work alone and without notes. If you are unsure of an item, write your best reasoning rather than leaving it blank.

You will need: This worksheet, Pencil, Calculator (optional)

Part A: Retrieval (12 items)

1. Which of these is the **energy** input of photosynthesis?

- ☐ A. Carbon dioxide
- ☐ B. Water
- ☐ C. Sunlight
- ☐ D. Oxygen

2. Which pair names the **products** of photosynthesis?

- ☐ A. Carbon dioxide and water
- ☐ B. Sugar and oxygen
- ☐ C. Sugar and carbon dioxide
- ☐ D. Water and oxygen

3. True or false: a plant's cells use sugar for energy only at night, when photosynthesis has stopped.

- ☐ True ☐ False Explain your thinking:

4. Most of the dry mass of a tree comes from which source?

- ☐ A. Minerals absorbed from the soil
- ☐ B. Water absorbed by the roots
- ☐ C. Carbon dioxide taken from the air
- ☐ D. Sunlight absorbed by the leaves

5. In the equation $6 \text{CO}_2 + 6 \text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2$, count the oxygen atoms on the reactant side and on the product side. Show the multiplication for each side.

6. Explain why leaves look green, using the words 'absorbs' and 'less'.

7. Producers link many sugar units into chains. The chain called _____ is stored in roots, seeds and fruits for later use; the chain called _____ forms the stiff walls of plant cells.

8. What happens to the light energy a leaf absorbs during photosynthesis?

- ☐ A. It becomes atoms in the sugar molecule.
- ☐ B. It is stored as chemical energy in the sugar and released when the sugar reacts with oxygen.
- ☐ C. It is destroyed once the sugar is made.
- ☐ D. It leaves the plant along with the oxygen.

9. A green leaf held under water in bright light gives off a stream of bubbles; the same leaf in the dark gives off none. State two conclusions this evidence supports and one thing it does **not** tell you.

10. A sealed jar with a plant in the light drops from 900 ppm to 600 ppm of carbon dioxide in 20 minutes. An identical jar in the dark rises from 900 ppm to 1000 ppm in the same 20 minutes. Calculate the rate of change for each jar in ppm per minute. Then estimate how fast photosynthesis in the lit jar was actually removing carbon dioxide, assuming the plant releases carbon dioxide at the dark-jar rate at all times.

11. A town choosing a biofuel for its buses writes two statements: 'The fuel must not be made from food crops' and 'The fuel should store as much energy per kilogram as possible.' Label each as a criterion or a constraint and explain the difference in one sentence.

12. Draw a simple leaf. Show the three inputs and two outputs of photosynthesis as labeled arrows, using solid arrows for matter and a dashed arrow for energy. Mark where the reaction happens inside the leaf cell.



Part B: Synthesis

13. Write a paragraph of 5 to 7 sentences answering: **Where does a giant sequoia's enormous mass come from, and where does the energy to build it come from?** Your paragraph must name the matter inputs and the energy input, use at least one piece of evidence from this chapter (an experiment, a dataset or a ledger), explain why light cannot be the source of the tree's mass, and say what happens to the energy once it is in the tree.

Paragraph frame for Part B

Sentence 1: A sequoia builds its mass from ___ and ___, not from ___. Sentence 2: The energy comes from ___, which is absorbed by ___ inside the ___. Sentence 3: Evidence: ___ (name an experiment, dataset or ledger and one number). Sentence 4: Light cannot be the source of mass because ___. Sentence 5: Once captured, the energy is ___ in the sugar, and the tree ___. Sentence 6 (optional): The tree builds the sugar into ___ and ___, which is where most of the wood comes from.

Two-way check

Write one multiple-choice item of your own that a classmate who still believes 'plants eat soil' would get wrong, with four options and the correct answer marked. Then write one numeric item that uses the photosynthesis equation and requires at least two steps to solve. Provide a full key for both, including the calculation, and explain in one sentence what each item is really testing.