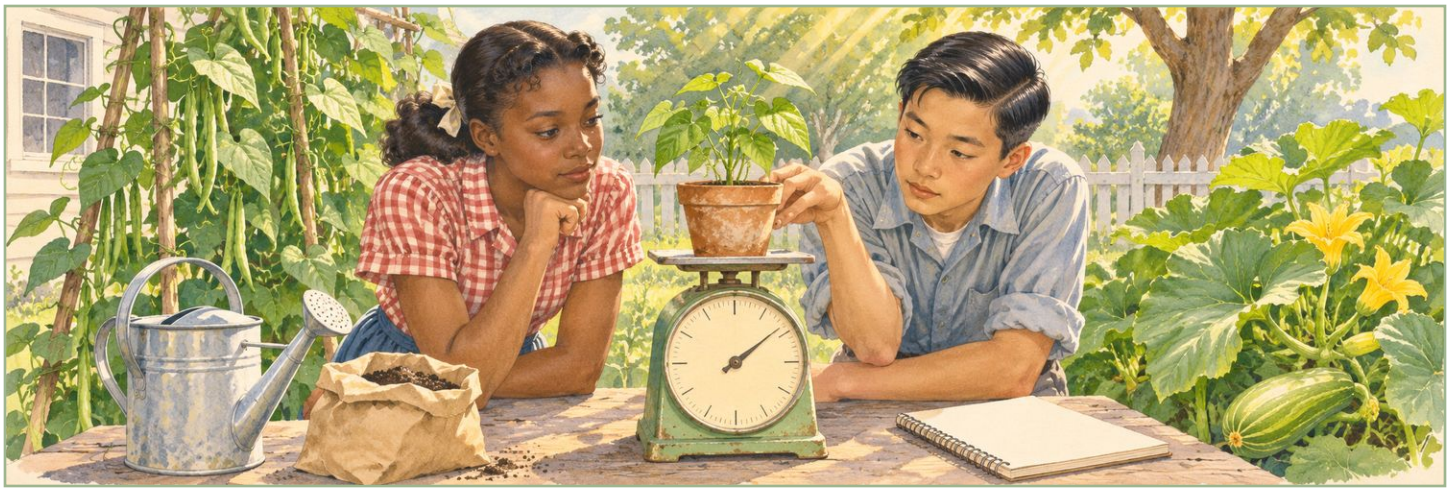

Photosynthesis Worksheet

Where does a plant's weight come from? Grades 6 to 8

Name _____ Class _____ Date _____

Background. Plants make their own food. Inside the green **chloroplasts** in their leaves, a green pigment called **chlorophyll** captures energy from sunlight. The plant uses that energy to turn carbon dioxide from the air and water from the soil into a sugar called **glucose**, and it gives off oxygen. This process is called **photosynthesis**.

carbon dioxide + water → glucose + oxygen (with light energy and chlorophyll)

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$$

Part 1. Match each word to its meaning

Word	Letter	Meaning
1. chlorophyll		A. tiny openings on a leaf that let gases in and out
2. stomata		B. tubes that carry water up from the roots
3. glucose		C. the green pigment that captures light energy
4. xylem		D. tubes that carry sugar from the leaves to the rest of the plant
5. phloem		E. the sugar a plant makes for food and energy
6. chloroplast		F. the part of a leaf cell where photosynthesis happens

Part 2. Follow the ingredients

Fill in where each part comes from or where it goes.

Ingredient or product	Where it comes from or goes	How it travels
Water		
Carbon dioxide		
Light energy		
Glucose (sugar)		
Oxygen		

Part 3. Use the equation

1. Count the atoms. How many carbon (C), hydrogen (H), and oxygen (O) atoms are on each side of the equation? Are they equal?

2. A plant is kept in a dark closet for two weeks. What happens to photosynthesis, and why?

Part 4. The willow tree mystery

In the 1600s, a scientist named Jan van Helmont planted a 5-pound willow tree in a pot holding 200 pounds of dried soil. For five years he gave it only rainwater. Then he weighed everything again. The tree weighed about 169 pounds, but the soil had lost only about 2 ounces.

3. How many pounds did the tree gain?

4. Van Helmont decided the extra weight came from the water. Was he partly right? What did he miss?

Part 5. Try it: weigh the soil

Fill a cup with garden soil, let it dry for a few days, and weigh it. Plant 3 bean seeds, water them, and grow them in a sunny window for 4 weeks. Then pull the plants out, shake and rinse the soil off the roots back into the cup, let the soil dry again, and weigh it.

	Weight (grams)
Dry soil at the start	
Dry soil at the end	
Change in soil weight	
Weight of the bean plants (fresh)	

5. The plants gained much more weight than the soil lost. Where did most of the plants' new weight come from?

6. Gardener's question: why do vegetable gardens need a spot with 6 to 8 hours of sun a day?

Photosynthesis Worksheet: Teacher Page and Answer Key

Standard: NGSS MS-LS1-6: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

Part 1: 1-C, 2-A, 3-E, 4-B, 5-D, 6-F.

Part 2: Water comes from the soil, through the roots, and up the xylem. Carbon dioxide comes from the air, through the stomata. Light energy comes from the sun and is captured by chlorophyll. Glucose is made in the leaves and travels through the phloem to roots, stems, fruits, and seeds, where it is used for energy or stored (as starch in a potato, for example). Oxygen leaves through the stomata into the air.

1. Each side has 6 carbon, 12 hydrogen, and 18 oxygen atoms. They are equal, because atoms are rearranged, not created or destroyed.

2. Photosynthesis stops, because there is no light energy. The plant uses up its stored sugar, turns pale, and weakens, and it will die if left too long.

3. About 164 pounds.

4. Partly right. Water does add some of the weight, and the hydrogen in the sugar comes from water. But most of the weight of wood and leaves is carbon, which came from carbon dioxide in the air. Van Helmont did not know that air could add weight.

5. Mostly from carbon dioxide in the air, plus water. The soil supplies only small amounts of minerals, like nitrogen and potassium, so its weight barely changes. Expect the soil to lose less than a gram or two.

6. More light means more photosynthesis, which means more sugar for growing leaves, roots, flowers, and fruit. Fruiting crops like tomatoes, peppers, and squash need the most sun.