Plant Cycle Connections

Trace five elements through a growing plant

BOT.1.9 "Communicate the importance of carbon, hydrogen, oxygen, phosphorus, and nitrogen cycles to plant physiology through graphics such as poster or computer presentations."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline one route into the plant for each of the five elements, and circle a plant job each element supports. Use your marks to plan clear labels and arrows for a poster.

What Keeps a Tomato Plant Growing?

1. At a school greenhouse, a tomato plant grows from materials that keep moving through its surroundings. Carbon enters its leaves as carbon dioxide, CO_2, from the air. In photosynthesis, the plant uses that carbon to build sugars, which supply material for new stems and fruit. Oxygen also cycles between air and living things. Leaves and roots take in oxygen gas for cellular respiration, which releases usable energy from sugars. Respiration sends carbon dioxide back into the air. Photosynthesis sends oxygen gas into the air. A poster could show arrows for gases entering and leaving a leaf.

2. Water makes another set of routes visible. A tomato plant's roots absorb water, H_2O, from soil, bringing hydrogen into the plant. Water helps cells stay firm, and its hydrogen helps make sugars during photosynthesis. Some water vapor leaves through tiny pores in leaves and later returns to Earth as rain. Nitrogen takes a different path: soil bacteria change nitrogen compounds into forms roots can absorb, such as nitrate. The plant uses this nitrogen to make proteins and chlorophyll, the pigment that captures light. Dead leaves and waste return nitrogen to soil as decomposers break them down.

3. Much of the phosphorus available in soil comes from rock. Weathering releases phosphate from rock into soil, where roots absorb it. The tomato plant needs phosphate to make DNA and ATP, a molecule that moves energy within cells. When fallen plant parts decay, phosphate can reenter soil and be taken up again. Harvested fruit can carry some phosphorus away from the garden. To explain these cycles in a presentation, connect each source to a plant part, name the job the element does there, and draw a return route. Those links show why growing plants depend on more than sunlight.

2 ANSWER WITH EVIDENCE

Use the passage

1. What two arrows would show carbon moving into the plant and back to the air? What plant job would you label beside the inward arrow?

2. How would you show oxygen moving into and out of the plant with arrows? What job would you label beside the inward arrow?

3. Which arrows would show hydrogen entering the plant and returning to the air? Add one plant job supported by the water that carries it.

4. For nitrogen and phosphorus, what source-to-root arrow, plant-job label, and soil-return arrow would you include for each?

3 YOUR TURN

Your own words

Create a two-panel poster for a school garden: one panel traces carbon, hydrogen, and oxygen through a plant, and the other traces nitrogen and phosphorus. Use arrows for an entry and a return route for each element, label one plant job for each, and write a caption explaining why composting fallen leaves could help the next crop.

ANSWER KEY

Plant Cycle Connections

PART 1 · READ AND MARK

Underline one route into the plant for each of the five elements, and circle a plant job each element supports. Use your marks to plan clear labels and arrows for a poster. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What two arrows would show carbon moving into the plant and back to the air? What plant job would you label beside the inward arrow?	**Air CO_2 → leaves; respiration → air CO_2. Label carbon's use in making sugars for new growth.**
2	How would you show oxygen moving into and out of the plant with arrows? What job would you label beside the inward arrow?	**Air oxygen gas → leaves and roots for cellular respiration; photosynthesis → oxygen gas in the air.**
3	Which arrows would show hydrogen entering the plant and returning to the air? Add one plant job supported by the water that carries it.	**Soil water → roots; leaves → water vapor in the air. Water helps cells stay firm or supplies hydrogen used to make sugars.**
4	For nitrogen and phosphorus, what source-to-root arrow, plant-job label, and soil-return arrow would you include for each?	**Nitrogen: soil nitrate → roots; proteins or chlorophyll; dead leaves and waste → soil through decomposition. Phosphorus: phosphate from weathered rock in soil → roots; DNA or ATP; decaying plant parts → soil.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: Air CO_2 → leaves → carbon in sugars for fruit; respiration → CO_2 in air. Soil H_2O → roots → hydrogen used to make sugars; leaves → water vapor in air. Air oxygen gas → leaves and roots → cellular respiration releases usable energy; photosynthesis → oxygen gas in air. Panel 2: Soil nitrate → roots → nitrogen in chlorophyll; fallen leaves → decomposers → nitrogen in soil. Weathered rock → soil phosphate → roots → phosphorus in ATP; fallen leaves → decomposers → phosphate in soil. Caption: Composting fallen leaves returns nitrogen and phosphate to soil, helping the next crop make chlorophyll and ATP.

Accept other accurate plant jobs named in the passage. For oxygen, the gas released during photosynthesis need not be shown as the same oxygen taken in for respiration.