Matter Has a Path

Use evidence to trace matter and energy through living systems.

SC.8.L.18.4 "Cite evidence that living systems follow the Laws of Conservation of Mass and Energy."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline details that show where matter comes from or goes, and circle details that show energy changes form or moves.

Following Matter and Energy

1. At a school greenhouse, students place a bean plant in a clear chamber. They measure the plant's mass, the water added, and the carbon dioxide in the air. After several sunny days, the plant has gained mass while carbon dioxide in the chamber has decreased. During photosynthesis, the plant uses carbon dioxide and water to build sugars and other materials. The atoms in the new plant tissue did not appear from nowhere. They came mainly from carbon dioxide, while water supplied hydrogen.

2. Photosynthesis changes energy as well as matter. Chlorophyll absorbs light energy, and the plant stores part of that energy in the chemical bonds of sugar. Later, plant cells break down sugar during cellular respiration. The stored chemical energy is transformed into energy for cell work, such as building roots and moving materials. Some energy is also transferred to the surroundings as heat. Energy is not created when the plant grows, and it does not disappear when the cells use sugar. It changes form and moves between the plant and its surroundings.

3. Evidence from a leaf-eating caterpillar extends the same idea. As the caterpillar eats leaves, some leaf matter becomes caterpillar tissue. Other matter leaves its body as carbon dioxide, water vapor, and solid waste. If scientists accounted for the mass of the eaten leaves, the caterpillar's gain, and all materials leaving, the matter would be accounted for even though it changed locations and forms. The caterpillar receives chemical energy from leaf molecules. It transforms some into movement and growth, while some energy transfers to the environment as heat.

2 ANSWER WITH EVIDENCE

Use the passage

1. Cite two details from paragraph 1 that show why the bean plant's increased mass does not mean new matter was created.

2. Cite two details from paragraph 2 that show energy is conserved as the plant uses sugar.

3. What mass would scientists need to account for in the caterpillar investigation? Cite evidence from paragraph 3.

4. Explain why a caterpillar gaining body mass does not violate conservation of mass. Use two details from the passage as evidence.

3 YOUR TURN

Your own words

Choose a living system that is not the bean plant or caterpillar. In 3 or 4 sentences, make a claim that it follows conservation of mass and energy. Include one matter evidence and one energy evidence, and tell where some energy goes.

ANSWER KEY

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GRADE 8 · SC.8.L.18.4

PART 1 · READ AND MARK

Underline details that show where matter comes from or goes, and circle details that show energy changes form or moves. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Cite two details from paragraph 1 that show why the bean plant's increased mass does not mean new matter was created.	**The plant gained mass while carbon dioxide decreased, and it used carbon dioxide and water to build sugars and other materials. The atoms in its new tissue came mainly from carbon dioxide, with water supplying hydrogen.**
2	Cite two details from paragraph 2 that show energy is conserved as the plant uses sugar.	**Light energy is stored as chemical energy in sugar. When cells break down sugar, chemical energy is transformed into energy for cell work and some is transferred as heat.**
3	What mass would scientists need to account for in the caterpillar investigation? Cite evidence from paragraph 3.	**They would account for the mass of eaten leaves, the caterpillar's mass gain, and materials leaving as carbon dioxide, water vapor, and solid waste.**
4	Explain why a caterpillar gaining body mass does not violate conservation of mass. Use two details from the passage as evidence.	**Some matter from eaten leaves becomes caterpillar tissue. Other leaf matter leaves the caterpillar as carbon dioxide, water vapor, and solid waste, so the matter changes form or location rather than being created.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

A tomato plant follows conservation of mass because carbon dioxide and water provide atoms for its growing stems and fruit. It also follows conservation of energy because light energy is stored as chemical energy in sugars. When the plant uses sugars, energy powers cell work and some energy transfers to the surroundings as heat.

Accept equivalent evidence that matter enters, leaves, or changes form without being created or destroyed. Accept energy evidence that correctly describes energy changing form or transferring, including transfer to the surroundings as heat.