Two Energy Routes

Trace how ocean producers turn energy into food.

MAQ.5.5 "Paraphrase energy conversion processes (e.g., photosynthesis and chemosynthesis)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the starting energy source for each process, circle where the energy is stored, and draw an arrow from each producer to an animal that receives food energy from it.

Sunlight Above, Chemicals Below

1. On a calm morning, sunlight reaches the upper ocean, where tiny drifting algae called phytoplankton begin photosynthesis. Their cells capture light energy and use it to build sugars from dissolved carbon dioxide and water. The energy that arrived as light is now stored in chemical bonds in the sugars. Oxygen is released during this process. The algae use some sugar to power their own activities. Grazing animals can also eat the algae and obtain some of that energy. When a copepod eats an alga, it receives chemical energy that began as sunlight, even though the copepod never captured that light itself.

2. Far below the sunlit water, hot fluid rich in dissolved minerals rises from cracks in the seafloor. At some hydrothermal vents, bacteria use chemical energy released when hydrogen sulfide from vent fluid reacts with oxygen in seawater. They use that energy to build sugars from carbon dioxide. This process, chemosynthesis, stores energy in organic molecules without using sunlight. Vent mussels can host these bacteria inside their tissues. The bacteria supply food to the mussels, while the mussels provide access to dissolved chemicals. Unlike a surface alga, a vent bacterium begins with energy from a chemical reaction, not from incoming light.

3. Imagine following energy through each community. Near the surface, light becomes chemical energy in algal sugars, which can then move to a grazer. At a vent, energy from the reaction of hydrogen sulfide and oxygen becomes chemical energy in bacterial sugars, which can move to a mussel. Both processes turn carbon dioxide into energy-rich organic matter, but carbon dioxide is not itself the energy source. The starting energy source differs: sunlight for photosynthesis and a chemical reaction for chemosynthesis. In either case, making food inside a producer supports animals that cannot make food that way.

2 ANSWER WITH EVIDENCE

Use the passage

1. In your own words, explain how sunlight becomes energy a copepod can use.

2. Paraphrase how a chemical reaction at a vent can lead to food for a mussel.

3. Explain in your own words why carbon dioxide is used in both processes but is not the starting energy source for either one.

4. A visitor says, "All ocean food begins with sunlight, even at vents." Rewrite the claim so it accurately describes the two energy routes in the passage.

3 YOUR TURN

Your own words

Write a short explanation for aquarium visitors about how a surface community and a vent community each gain food energy. Use an original analogy for each energy conversion, describe how an animal gets food energy in each place, and explain one important difference between the routes.

ANSWER KEY

Two Energy Routes

HIGH SCHOOL · MAQ.5.5

PART 1 · READ AND MARK

Underline the starting energy source for each process, circle where the energy is stored, and draw an arrow from each producer to an animal that receives food energy from it. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In your own words, explain how sunlight becomes energy a copepod can use.	**Phytoplankton capture sunlight and store its energy in sugars. A copepod gets some of that chemical energy by eating an alga.**
2	Paraphrase how a chemical reaction at a vent can lead to food for a mussel.	**Bacteria use energy released by a reaction between hydrogen sulfide and oxygen to make sugars from carbon dioxide. The bacteria then supply food to the mussel.**
3	Explain in your own words why carbon dioxide is used in both processes but is not the starting energy source for either one.	**Both producers use carbon dioxide to build organic matter. Photosynthesis gets energy from sunlight, while chemosynthesis gets energy from a chemical reaction.**
4	A visitor says, "All ocean food begins with sunlight, even at vents." Rewrite the claim so it accurately describes the two energy routes in the passage.	**Surface algae use sunlight to make food, but vent bacteria can make food using energy from a chemical reaction without sunlight.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Surface algae act like solar chargers, turning incoming light into chemical energy stored in sugar. A copepod gets some of that energy when it eats algae. Vent bacteria act like devices powered by a chemical battery: a reaction between hydrogen sulfide and oxygen supplies energy to build sugar. A mussel receives food from the bacteria living inside it. Both routes store energy in food, but the surface route starts with sunlight and the vent route starts with a chemical reaction.

Accept accurate paraphrases that distinguish the energy source from carbon dioxide, which supplies carbon for food molecules. Analogies may vary, but they must preserve the difference between light energy and energy from a chemical reaction.