Light Without Sunbeams

How plants make sugars where direct sunlight cannot reach

L.5.3A.2 "Analyze environments that do not receive direct sunlight and devise explanations as to how photosynthesis occurs, either naturally or artificially."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline three ways plants receive light without direct sunlight. Circle three details that show light is blocked or reduced.

Where Does the Light Come From?

1. On a winter day, snow covers the ice of a shallow pond. No sunbeam strikes the plants below. Still, some daylight passes through the snow and ice and spreads through the water. Tiny algae near the surface can use that light, along with water and carbon dioxide, to make sugars by photosynthesis. If the snow grows very thick, much less light reaches them.

2. Inside a limestone cave, green moss grows near the opening, even on a wall that never faces the sun. Daylight enters the opening and bounces off pale rock onto the moss. Farther inside, a twisting tunnel blocks all daylight. Water drips from its ceiling, but no green plants grow in that totally dark tunnel. Water alone cannot supply the light energy that photosynthesis needs.

3. A school grows lettuce in a room below ground. The room has no windows, so students hang electric LED lamps above the leaves. The lamps provide light energy that lettuce can use for photosynthesis, just as it can use daylight. Roots take in water, and leaves take in carbon dioxide from the air. When the lamps are off for a long time, the lettuce cannot keep making sugars by photosynthesis.

2 ANSWER WITH EVIDENCE

Use the passage

1. How can algae photosynthesize beneath the pond ice if no sunbeam strikes them?

2. Why can moss photosynthesize on the cave wall even though the wall never faces the sun?

3. Why is the dripping water in the deep cave tunnel not enough for green plants to photosynthesize there?

4. A student says the lettuce can keep making sugars if the lamps stay off because it still has water and air. What is wrong with that idea?

3 YOUR TURN

Your own words

You want to grow herbs in a bed beneath a wide bridge where direct sunlight never reaches them. In three sentences, describe where the herbs might get light, explain how that light would help them photosynthesize, and suggest what to do if the daylight is too weak.

ANSWER KEY

Light Without Sunbeams

GRADE 5 · L.5.3A.2

PART 1 · READ AND MARK

Underline three ways plants receive light without direct sunlight. Circle three details that show light is blocked or reduced. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How can algae photosynthesize beneath the pond ice if no sunbeam strikes them?	**Daylight passes through the snow and ice and reaches the algae in the water.**
2	Why can moss photosynthesize on the cave wall even though the wall never faces the sun?	**Daylight enters the cave opening and bounces off pale rock onto the moss.**
3	Why is the dripping water in the deep cave tunnel not enough for green plants to photosynthesize there?	**The twisting tunnel blocks all daylight, and photosynthesis needs light energy as well as water.**
4	A student says the lettuce can keep making sugars if the lamps stay off because it still has water and air. What is wrong with that idea?	**Without light from the lamps, the lettuce cannot keep making sugars by photosynthesis, even if it has water and carbon dioxide.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Daylight could reach the herbs from the sides of the bridge and bounce off the ground onto their leaves. The herbs could use that light, water, and carbon dioxide to make sugars by photosynthesis. If too little daylight reaches the bed, I would add LED lamps above the herbs.

Accept explanations that identify indirect daylight or an electric lamp as a light source and connect that light to photosynthesis. For the marking job, students should identify light passing through snow and ice, light bouncing off rock, and light from LED lamps, plus thick snow, the blocked tunnel, and lamps being off.