THE STANDARD

Photosynthesis & Matter/Energy Cycling

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.

ANCHORING PHENOMENON

The Willow Tree That Didn't Eat the Soil

In the 1600s, a scientist named Jan van Helmont planted a young willow tree in a pot. He weighed the tree (5 pounds) and weighed the soil (200 pounds). For 5 years he only added rainwater. At the end he weighed everything again. The tree was 169 pounds. The soil was still 199 pounds, 14 ounces. The tree had gained 164 pounds while the soil had barely lost 2 ounces. Where did all that tree come from? Students will keep circling back to this all week.

> DRIVING QUESTION
> *"If the soil barely changed, where did 164 pounds of tree come from?"*

INVESTIGATIVE 1

Bubbles on a Water Plant in Sunlight

A sprig of elodea sits in a beaker of water under a bright lamp. Within minutes, tiny bubbles start streaming off the cut end of the stem and from the leaves. Move the beaker into the dark. The bubbles stop. Put it back under the light. The bubbles come back. Same plant, same water. The only thing changing is the light. Use this one to sharpen the energy-input lens the anchor is pushing on.

> DRIVING QUESTION
> *"What gas is in those bubbles, and why does the plant only make them in the light?"*

INVESTIGATIVE 2

The Variegated Leaf and the Iodine Test

A variegated leaf (one with both green and white patches) gets covered for a day, then sits in bright sunlight for several hours. The teacher boils it briefly, soaks it in alcohol to pull the green out, and drops it in iodine. The leaf comes out with dark blue-black patches only where the green chlorophyll used to be. The white sections stay pale. The blue-black is starch, made from glucose, made by photosynthesis. Same kind of cycling the anchor exposes, only frozen in place on a leaf.

> DRIVING QUESTION
> *"Why did only the green parts of the leaf make starch?"*