

NATURE'S GLOW

MIXING MATTER
Chemical Changes



Math Moment

Look at the table to find out how many times the male firefly flashes in six seconds. How many times will it flash in one minute?

There are about 2,000 species of fireflies. Only the ones that are active at night can make light.

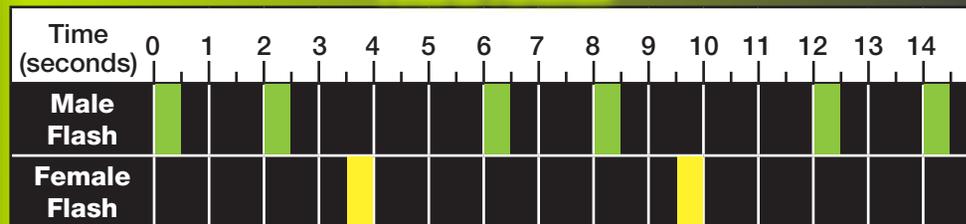
FLYING FIRE IN THE NIGHT

Have you ever seen a summer night sparkle? You may have seen fireflies! These insects are able to create light with their bodies. They can even use their light to send signals.

Fireflies are not really flies. They're beetles with special light-making organs in their abdomens. Those organs contain a chemical called *luciferin*. Once oxygen from the air meets the luciferin, a chemical change happens, and it can't be undone. The atoms in the oxygen and the luciferin rearrange themselves, forming two new products—*oxyluciferin* and light. This process is what makes fireflies glow. It's called *bioluminescence*.

Each species of firefly flashes its own pattern of light. This system helps fireflies attract the right mates. Scientists think that the lights may also be a warning. Most fireflies are poisonous to animals that want to eat them. Their lights may be a way of saying, "If you eat me, you'll be sorry!"

FIREFLY FLASHES



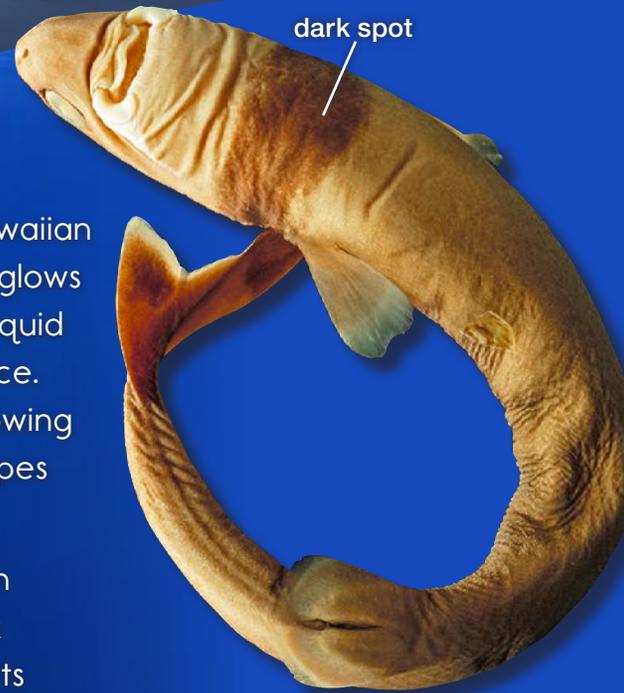
The colorful lines show when the males and females of a certain firefly species flash and for how long. Do you see a pattern?

Lights Beneath the Sea

Oceans are full of creatures that make their own light. Oxygen from the water mixes with light-producing luciferin molecules in the animals. This chemical change does not create or destroy atoms, but it does release light energy.

Animals use their light in many different ways. The Hawaiian bobtail squid uses light for camouflage. Its underside glows pale blue-green at night. When a predator sees the squid from below, the squid blends in with the moonlit surface. Another kind of squid, the vampire squid, squirts a glowing cloud of ink when it's threatened. Then it quickly escapes while the predator is confused by the glare.

The cookiecutter shark has light arranged in a pattern on its underside. The only part that isn't lit up is a dark spot on its neck that looks like a fish. The shape attracts large, hungry fish. Then the cookiecutter shark bites them!



cookiecutter shark (underside)

Wowser!

Almost 90 percent of animals in the deepest ocean water are bioluminescent.



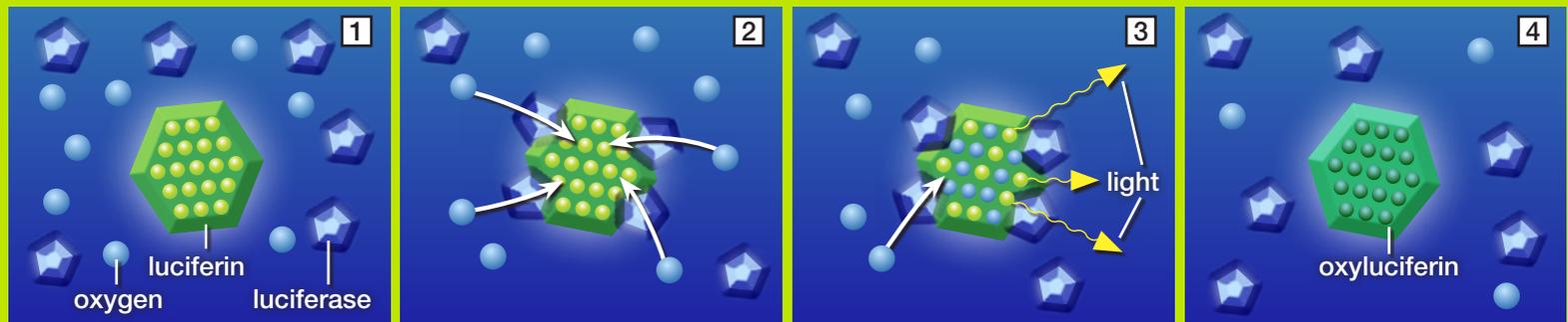
Hawaiian bobtail squid

Images not to scale

Word Wise

The prefix *bio-* means "life" in Greek, and the word *lumen* means "light" in Latin. So bioluminescence is "light from living things."

THE PROCESS OF BIOLUMINESCENCE



1 Oxygen, luciferin, and luciferase are involved in a reaction.

2 Luciferase helps oxygen combine with luciferin.

3 This reaction produces light.

4 Oxyluciferin remains after the reaction.