

Photo Description



This image shows a brown, empty shell of a cicada stuck to tree bark surrounded by green and white lichen. The shell looks like a hollow bug that has been left behind. The cicada crawled out of this shell and flew away as a grown-up insect!

Scientific Phenomena

Anchoring Phenomenon: Exoskeleton Shedding (Ecdysis)

Cicadas experience incomplete metamorphosis. Young cicadas, called nymphs, live underground for several years drinking juice from plant roots. When they are ready to become adults, they crawl up a tree and their hard outer skin (exoskeleton) splits open. The adult cicada wriggles out, leaving behind this papery brown shell. This shell-shedding is called molting or ecdysis. The cicada must shed its exoskeleton to grow because the hard shell doesn't stretch like skin does—it's like outgrowing a suit of armor and needing a bigger one!

Core Science Concepts

- * Life Cycles: All living things go through different stages of life. Cicadas change from underground nymphs into flying insects. This big change is part of their life cycle.
- * Growth and Change: Insects have hard outer shells called exoskeletons that don't grow with them. When an insect gets too big, it must shed its old shell to grow into a larger one.
- * Adaptation and Survival: Cicadas hide underground as nymphs to stay safe from predators and find food. When they become adults, they move above ground and can fly to find mates and lay eggs.
- * Habitats and Organisms: Cicadas live in trees where they find shelter and food. The lichen and bark in this photo show that the tree supports many different living things.

Pedagogical Tip:

To build schema before this lesson, bring in photos of other exoskeletons (butterfly chrysalis, snake shed skin, hermit crab shells). Ask: "What do these have in common?" This primes students to recognize that many creatures shed or outgrow their coverings—it's not just cicadas! This connects to their prior knowledge about growth.

UDL Suggestions:

Multiple Means of Representation: Provide three ways to experience this content: (1) Visual—show this image and video of cicadas emerging; (2) Tactile—let students carefully handle a real shed cicada shell (if available) or a cast-off toy exoskeleton model; (3) Kinesthetic—have students physically act out the molting process by "wriggling out" of a paper bag or tube. This supports diverse learners and multiple intelligences.

Zoom In / Zoom Out

Zoom In: The Microscopic Level

Under a microscope, the cicada shell looks like it has tiny holes and ridges all over it. These tiny holes are called spiracles—they are like little doors that the young cicada used to breathe air underground! When the cicada was growing as a nymph, it breathed through these holes. When the adult cicada climbs out, its new exoskeleton under the old shell also has spiracles in different places. Scientists can look very closely at exoskeletons to learn how insects breathe and grow. The shell is made of a strong material called chitin (pronounced KY-tin), which is like the plastic your lunch box is made of—it's hard and doesn't bend or stretch!

Zoom Out: The Forest Ecosystem

This one cicada shell is part of a huge, connected forest system. The cicada spends years drinking juice from tree roots underground, which connects it to the soil, fungi, and water deep below. When it emerges as an adult, it becomes food for birds, lizards, and other predators—connecting it to the food chain. The lichen on the tree bark shows that many tiny living things also live on this tree. When the cicada dies, its body returns nutrients to the soil, feeding plants, which feed other insects, which feed larger animals. One cicada shell is a tiny piece of a giant puzzle where everything is connected!

Discussion Questions

1. Why do you think the cicada had to leave its shell behind? (Bloom's: Analyze | DOK: 2)
2. What do you think happened to the cicada after it crawled out of this shell? (Bloom's: Synthesize | DOK: 3)
3. Look at the lichen on the bark. What other living things might use this tree as a home? (Bloom's: Apply | DOK: 2)
4. How is a cicada shell like a coat that doesn't fit anymore? (Bloom's: Evaluate | DOK: 3)

Potential Student Misconceptions

Misconception 1: "The cicada died and left behind a dead bug."

Clarification: The shell is NOT a dead cicada—it's like an empty coat or armor that the cicada outgrew. The cicada is alive and healthy! It crawled out of this shell and flew away as a grown-up insect. The shell is just the old covering it no longer needs. You can compare it to how a snake leaves behind a shed skin, but the snake is still alive and healthy.

Misconception 2: "All insects have hard shells they need to shed to grow."

Clarification: Not all insects molt. Insects like beetles, flies, and butterflies have different kinds of life cycles. Some insects (like cicadas, grasshoppers, and cockroaches) do shed their exoskeletons multiple times as they grow. But other insects like butterflies go through a different kind of change called metamorphosis, where they become a chrysalis or cocoon instead. Both are ways insects grow, but they work differently.

Misconception 3: "The cicada will grow a new shell that is bigger, just like how our bones grow bigger."

Clarification: When a cicada molts, the new exoskeleton underneath is already fully formed before the old one splits open—but it starts out soft and flexible, like wet clay. Once the cicada crawls out and the new shell is exposed to air, it hardens and becomes tough. Our bodies are different because our bones and skin grow gradually over time and can stretch. Insect exoskeletons can't stretch, so they have to completely replace them to get bigger!

Extension Activities

1. Cicada Life Cycle Drawing: Give students a large piece of paper divided into four boxes. Have them draw and label the cicada's life cycle: (1) Egg underground, (2) Nymph drinking from roots, (3) Nymph crawling up tree, (4) Adult cicada flying. Students can color, add labels with your help, and dictate or write one sentence per stage.
2. Shell Hunt Scavenger Hunt: Take students outside (weather permitting) to look for other shed skins or shells: snake skins, spider webs, bird feathers, or insect shells. Create a classroom display labeled "Things Animals Leave Behind" and discuss why creatures shed or outgrow their coverings.
3. Sound Investigation: Play a 10-15 second audio clip of cicada sounds (see resources below). Ask: "What do you hear? Why do you think cicadas make this sound?" Discuss that adult cicadas use sound to find mates. This connects the visible shell to the adult cicada's behavior and function.

Cross-Curricular Ideas

ELA Connection: Life Cycle Sequencing and Storytelling

Have students create a 4-page "Cicada's Story" booklet with pictures and dictated or written sentences. Each page represents one stage: "I was born in the soil," "I drank juice from roots," "I climbed up the tree," "I came out of my shell!" This builds narrative comprehension and introduces the concept of chronological sequence. Students can share their stories aloud to practice speaking skills.

Math Connection: Counting and Time Measurement

Introduce that cicadas spend 2–17 years underground as nymphs before becoming adults (depending on the species). Use a simple number line or timeline on the classroom wall showing "2 years," "5 years," and "17 years." Ask: "How much longer is 17 years than 2 years?" This introduces subtraction in a real-world context and helps students understand that some life cycles take a very, very long time—much longer than a butterfly's!

Art Connection: Observational Drawing and Texture

Provide students with the photograph (or a real cicada shell, if available) and have them create detailed observational drawings using crayons, colored pencils, or pastels. Encourage them to notice and draw the bumpy texture, the folds in the shell, and the lichen around it. Display the drawings alongside the original photo and discuss how artists help us see details we might miss. This also strengthens fine motor skills and visual literacy.

Social Studies Connection: Habitats and Human Responsibility

Discuss how trees are homes for many creatures, including cicadas and lichen. Take a "tree walk" outside and observe what lives on or around trees in your schoolyard. Talk about why it's important to protect trees and care for nature. Ask: "If we cut down all the trees, where would cicadas live? Where would lichen grow?" This introduces environmental stewardship and interdependence in an age-appropriate way.

STEM Career Connection

Entomologist (Insect Scientist)

An entomologist is a scientist who studies insects—including cicadas! They observe how insects grow, what they eat, where they live, and how they change. Entomologists might spend time outside looking for insects, drawing pictures of them, taking videos, or looking at them under microscopes in a laboratory. They help us understand why insects are important and how to protect them. Some entomologists even travel to rainforests or other special places to find insects no one has ever studied before!

Average Annual Salary: \$68,000

Forest Ecologist

A forest ecologist studies all the living things in a forest—trees, insects, birds, fungi, and more—and how they all connect to each other. They might spend a lot of time outdoors in the forest, counting insects, measuring trees, and taking notes about what they see. Forest ecologists help us understand how forests stay healthy and what happens when forests change. They might help protect forests so that cicadas and other creatures have safe homes.

Average Annual Salary: \$72,500

Museum Educator and Naturalist

A museum educator (or naturalist) works at science museums, nature centers, or zoos and teaches people about insects and nature. They might collect real cicada shells to show visitors, give presentations about how cicadas change, or lead nature walks outside. Museum educators help people of all ages get excited about science and the natural world. If you love insects and like sharing what you know with others, this could be a perfect job!

Average Annual Salary: \$45,000

NGSS Connections

Performance Expectation: 2-LS2-1 Plan and conduct investigations to provide evidence that plants get the materials they need for growth chiefly from air and water

Relevant DCIs:

- 2-LS1.B Growth and development of organisms
- 2-LS2.A Interdependent relationships in ecosystems

Relevant CCCs:

- Patterns (Patterns of change in life cycles)
- Scale, Proportion, and Quantity (How big things start small and grow)

Science Vocabulary

- * Exoskeleton: A hard shell on the outside of an insect's body that protects it, like a suit of armor.
- * Molt (or Molting): When an animal sheds or leaves behind its old skin or shell so it can grow bigger.
- * Nymph: A young insect that looks different from its parents and hasn't grown up yet.
- * Life Cycle: All the stages an animal goes through from birth to growing up to having babies.
- * Lichen: Tiny living things that grow on rocks and tree bark and often look like green, gray, or white patches.

External Resources

Children's Books:

The Very Hungry Caterpillar* by Eric Carle (Great for understanding metamorphosis and life cycles—use this as a comparison to cicadas)

Insects* by Gail Gibbons (Clear illustrations of insect life cycles, including cicadas)

From Tadpole to Frog* by Wendy Pfeffer (Life cycles of other animals; compare to cicadas)

Teacher Note: This lesson works beautifully in spring or summer when cicada shells are most visible outdoors. Pair it with outdoor exploration to make the learning authentic and memorable!