

## Photo Description



This image shows a brown, papery shell that a cicada left behind on tree bark surrounded by green lichen. The shell looks like the outside covering of an insect's body. The cicada crawled out of this shell when it was ready to become a grown-up and fly away.

## Scientific Phenomena

Anchoring Phenomenon: Exuviae (insect molting/shedding)

This image captures ecdysis—the process where insects shed their old exoskeletons to grow larger. Cicadas spend years underground as nymphs, then climb to trees and emerge from their hard outer shells. The shell splits open, and the adult cicada pulls itself out, leaving behind this perfect cast. This happens because insects have rigid exoskeletons that cannot stretch; they must shed them periodically to increase in size. For cicadas, this final molt is transformative—the nymph becomes a winged adult capable of flight and reproduction.

## Core Science Concepts

- \* Life Cycles and Growth: All living things grow and change. Cicadas go through different stages: egg !' nymph (underground) !' adult (above ground). Shedding helps them grow bigger.
- \* Adaptation and Survival: The hard shell protects the cicada while it's underground. When the cicada is ready to be an adult, it finds a safe tree to shed its shell.
- \* Evidence of Life: Empty shells are evidence that an animal once lived there. Scientists use these clues to learn about creatures we don't always see.
- \* Structures and Functions: The cicada's shell (exoskeleton) protects its soft body inside, just like our skin protects us. When the cicada grows, it needs a bigger shell.

### Pedagogical Tip:

First graders are concrete learners who benefit from handling real objects. If possible, collect actual shed cicada shells (or high-quality replicas) for students to observe with magnifying glasses during independent exploration time. This tactile experience deepens understanding far more than images alone. Allow at least 5–10 minutes of unstructured observation before introducing vocabulary.

### UDL Suggestions:

Representation: Offer multiple ways to "see" the phenomenon—the photo, real shells (if available), videos of cicadas emerging, and labeled diagrams. Action & Expression: Let students draw the shell, act out the molting process, or build a model with craft materials. Engagement: Connect to student experience: "Your clothes get too small as you grow. Cicadas' shells get too small too—but they can't just buy new clothes! They have to shed their old shell."

## Zoom In / Zoom Out

### Zoom In: Cellular Level—How the Cicada's Body Changes Inside

Beneath the hard shell, the cicada's body is made of tiny cells. As the cicada grows underground, its cells multiply and get bigger, but the shell stays the same size. Eventually, the shell becomes too tight, like an outfit that doesn't fit anymore. The cicada's body sends special signals to help it push out of the shell. Scientists who study insects use microscopes to see these tiny cells changing and growing inside the exoskeleton.

### Zoom Out: Forest Ecosystem—Cicadas in the Bigger Picture

Cicada shells and the cicadas themselves are part of a forest community. Birds eat adult cicadas for food. Underground, nymph cicadas drink juice from tree roots. When cicadas die or shed their shells, they become food or nutrients for soil and decomposers. The lichen growing on the tree bark in this photo also needs the tree for a home. All these living things—cicadas, birds, trees, lichen, and soil creatures—depend on each other in the forest ecosystem. The cicada shell is evidence of one organism's role in this larger web of life.

## Discussion Questions

1. What do you think was inside this shell before the cicada left it? (Bloom's: Remember | DOK: 1)
2. Why did the cicada need to leave its shell? What does this tell us about how the cicada grows? (Bloom's: Understand | DOK: 2)
3. If you found this shell on a tree, how would you know that a cicada lived inside it? (Bloom's: Analyze | DOK: 2)
4. What might happen if the cicada could not shed its old shell? (Bloom's: Evaluate | DOK: 3)

## Potential Student Misconceptions

Misconception 1: "The cicada died and left its dead body on the tree."

- Scientific Clarification: The shell is NOT the cicada's body—it's just the outer covering, like taking off a coat. The cicada is alive and well! It crawled out of the shell, and now the empty shell stays behind on the tree. The cicada flew away to find food and a mate.

Misconception 2: "The cicada will grow back inside the shell."

- Scientific Clarification: Once a cicada sheds its shell, it doesn't use that shell again. The shell is too small now. The cicada's new, soft skin underneath will harden into a new, bigger shell when it's fully grown. Adult cicadas keep the same shell for the rest of their lives (they don't molt again).

Misconception 3: "Cicada shells are like our bones that we keep our whole life."

- Scientific Clarification: Our bones stay with us and grow with us, but cicada shells don't grow. Insects have to shed their shells because shells are rigid and can't stretch. It's more like outgrowing your winter coat every year and needing a bigger one!

## Extension Activities

1. Cicada Shedding Drama: Students act out the cicada life cycle. Some students are nymphs crawling underground (moving slowly on hands and knees), then "climb" up a pretend tree, and finally "shed" a blanket or fabric to emerge as adults (standing tall and "flying"). Repeat several times so all students experience each role. This kinesthetic activity solidifies understanding of the transformation.

2. **Shell Hunt & Observation:** Take the class outside to search for shed insect shells, cicada exoskeletons, or other natural evidence on trees and plants. Use magnifying glasses to observe details. Students can sketch what they find and create a class chart titled "What We Found" with pictures and descriptions. (Safety note: Ensure students do not pick at live insects or damage tree bark.)

3. **Model Molting with Art:** Provide each student with a paper cicada outline, markers, and tissue paper or colored cellophane. Students color the "adult" cicada inside and wrap it loosely with the tissue to represent the "shell." They can then carefully unwrap their model to see the adult emerging. Display models as a visual reminder of the molting process.

### Cross-Curricular Ideas

**Mathematics:** Create a cicada growth chart. Draw or place images of a cicada at different life stages (egg, tiny nymph, medium nymph, large nymph, adult) in order from smallest to largest. Measure shell sizes or compare lengths using non-standard units (paperclips, blocks). Graph how many shells students found on a nature walk or sort shells by size groups.

**English Language Arts:** Write or dictate a simple life cycle story from the cicada's point of view: "My name is Cicada. I was born underground. I grew and grew. My shell got too small. I climbed the tree. I shed my shell. Now I can fly!" Students can illustrate each sentence and create a class book. Practice sequencing words like "first," "next," and "finally."

**Art:** Create a 3D shell sculpture using papier-mâché, clay, or construction paper rolled and shaped to resemble a cicada shell. Students can paint it brown and add details like texture lines. Display shells alongside the photo to show the real and artistic versions, or create a "shell museum" for families to visit.

**Social Studies/Community:** Invite a local naturalist, park ranger, or university entomologist to visit the classroom and share cicada shells, photographs, or a live observation (in a safe container). Students can ask questions about the scientist's job and what they learn from studying insects. This builds awareness of nature experts in the community and shows that scientists use observation skills like the students are practicing.

### STEM Career Connection

#### Entomologist (Insect Scientist)

An entomologist is a scientist who studies insects like cicadas, beetles, and butterflies. They observe insects in nature, collect shells and exoskeletons as clues, and learn how insects grow and change. Entomologists help us understand why insects are important to plants, animals, and people. They might work outside in forests or in laboratories with microscopes.  
Average Annual Salary: ~\$65,000–\$75,000 USD

#### Naturalist or Nature Educator

A naturalist is a person who knows a lot about plants and animals in the forest. They teach other people (like your class!) about nature by showing them real shells, taking them on nature walks, and answering questions. Naturalists help people care about and protect forests and the creatures that live there.  
Average Annual Salary: ~\$35,000–\$50,000 USD

#### Forest Ecologist

A forest ecologist studies how all the living things in a forest work together—trees, cicadas, birds, soil, and more. They learn how insects like cicadas help the forest stay healthy. Forest ecologists might count cicadas, study tree health, or protect forests from getting sick. They use science to keep forests safe for all the animals and plants that live there.  
Average Annual Salary: ~\$60,000–\$72,000 USD

## NGSS Connections

Grade 1 Performance Expectations:

- 1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and animals use their external parts to help them survive, grow, and meet their needs.
  - Connection: Students can explore how the hard shell helps the cicada survive underground.
- 1-LS1-2: Read texts and use evidence to describe that animals have predictable life cycles.
  - Connection: The shed shell is direct evidence of the cicada's life cycle transformation.

Disciplinary Core Ideas:

- 1-LS1.A Structure and Function
- 1-LS1.B Growth and Development of Organisms

Crosscutting Concepts:

- Patterns (The life cycle is a pattern; molting is a repeating behavior)
- Structure and Function (The shell's structure allows growth through shedding)

## Science Vocabulary

- \* Shell (or exoskeleton): A hard, outer covering that protects an animal's soft body.
- \* Shed or Molt: When an animal leaves behind its old outer skin or shell so it can grow bigger.
- \* Nymph: A young cicada that lives underground before it becomes an adult.
- \* Adult: A grown-up animal that is ready to have babies.
- \* Evidence: Clues or signs that help us learn about something (like a shell proves a cicada was there).
- \* Life Cycle: All the different stages an animal goes through as it grows from a baby to an adult.

## External Resources

Children's Books:

- The Very Hungry Caterpillar by Eric Carle (Addresses metamorphosis and growth cycles; accessible for First Grade)
- Cicada! USA's Loudest Bug by Ethan Herbst (Non-fiction; cicada-specific)
- From Caterpillar to Butterfly by Deborah Heiligman (Explores life cycles with engaging illustrations)

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Instructional Note: This lesson is most impactful when taught in late spring or summer when cicadas are active in many regions. Consider timing it with a class outdoor exploration or inviting a local naturalist or entomologist to share real specimens and expertise.