

## Photo Description



This image shows a brown, papery shell clinging to tree bark surrounded by light-colored lichen. The shell is hollow and looks like the outline of an insect with visible legs, wings, and head. This empty shell was left behind when a cicada grew too big for its outer skin and shed it to become an adult.

## Scientific Phenomena

**Anchoring Phenomenon:** Exoskeleton shedding (ecdysis) during insect metamorphosis

This image captures evidence of incomplete metamorphosis, where cicadas must shed their rigid exoskeletons multiple times as they grow. Unlike human skin that stretches, insect exoskeletons are hard and cannot expand. When a cicada nymph grows too large for its exoskeleton, it splits the shell open and crawls out, leaving behind this papery "ghost skin." The cicada may do this 4-5 times before becoming a winged adult. This is a visible, tangible example of how organisms change and grow over time—a fundamental life science concept.

## Core Science Concepts

- \* **Life Cycles:** Insects go through predictable stages of growth and change called metamorphosis. Cicadas have an incomplete life cycle with egg, nymph, and adult stages.
- \* **Adaptations:** The exoskeleton is a protective outer covering that helps insects survive, but it must be shed periodically to allow growth.
- \* **Observable Evidence of Change:** Shed exoskeletons are physical proof that organisms grow and transform—students can find and study these remains to understand life processes.
- \* **Interaction with Environment:** Cicadas live in trees and use them as habitat. The lichen visible here shows how multiple organisms share the same living space.

### Pedagogical Tip:

Consider taking students on a "nature walk exoskeleton hunt" in late spring/early summer near trees or shrubs. When students discover shells themselves, ownership and engagement increase dramatically. Take photos and create a class display to revisit throughout the year. This makes the abstract concept of "growth" concrete and observable.

### UDL Suggestions:

**Representation:** Provide labeled diagrams showing what the inside of a cicada looks like so students can compare the empty shell to the living insect. Include videos of the actual shedding process for students who benefit from motion and sequential visual learning.

**Action & Expression:** Allow students to choose how they demonstrate learning—through drawing, building a model with craft materials, creating a comic strip sequence, or verbal explanation to a peer.

**Engagement:** Connect to student curiosity by asking "What animal skin can you shed?" (snakes, hermit crabs) to broaden the concept beyond insects.

### Discussion Questions

1. Why do you think the cicada left this shell behind instead of keeping it on its body? (Bloom's: Analyze | DOK: 2)
2. If you could compare this empty shell to a living cicada, what differences would you notice? What would be the same? (Bloom's: Compare | DOK: 3)
3. How do you think the cicada got out of this shell? What clues can the shell show us? (Bloom's: Evaluate | DOK: 3)
4. What might happen to this shell over time if it stays on the tree? What other living things might use it? (Bloom's: Synthesize | DOK: 3)

### Extension Activities

1. Exoskeleton Collection & Display: Have students search their school grounds or nearby outdoor space for shed exoskeletons (cicadas, grasshoppers, spiders). Create a labeled display with hand-drawn diagrams showing which insect left each shell and why. Students can measure shells and estimate how much bigger the insect grew.
2. Model the Molt: Provide each student with a small paper bag, markers, and craft materials to create a "before and after" model. Have them draw an insect on the outside of the bag, then decorate the inside to show what the insect looks like after molting. Students can present their models and explain why insects must molt to grow.
3. Life Cycle Sequencing Timeline: Display large pictures or have students draw the cicada life cycle stages (egg !' nymph !' more nymphs !' adult). Include the exoskeleton shedding at each stage. Create a classroom timeline on a hallway wall showing that cicadas can spend 2-17 years underground as nymphs before emerging as adults.

### NGSS Connections

Performance Expectation:

4-LS1-1: Use evidence to construct an explanation that plants get the materials they need for growth chiefly from air and water. (Note: Also connects to general growth/life cycle understanding)

Disciplinary Core Ideas:

- \* 3-LS1.B Growth and Development of Organisms
- \* 3-LS2.C Ecosystem Dynamics, Functioning, and Resilience (organisms and habitats)

Crosscutting Concepts:

- \* Patterns (The pattern of shedding occurs repeatedly)
- \* Change and Stability (Physical structures change as organisms grow)
- \* Structure and Function (The exoskeleton provides protection but limits growth)

### Science Vocabulary

- \* Exoskeleton: A hard outer covering that protects an insect's body on the outside, like a suit of armor.
- \* Molt (or Shed): When an animal grows too big for its outer skin or shell and leaves it behind to reveal new skin underneath.
- \* Nymph: The young stage of an insect like a cicada that looks somewhat like an adult but is smaller and doesn't have wings yet.
- \* Metamorphosis: The process of an animal changing and growing into its adult form through different life stages.

\* Habitat: The place where an animal or plant naturally lives, such as a tree, pond, or forest.

## External Resources

Children's Books:

Cicadas: The Largest Bugs on Earth\* by Larijo Metz (Illustrated nonfiction, Grade 2-4 level)

The Life Cycle of a Cicada\* by Rebecca Stefoff (Clear diagrams and accessible text)

Are You a Butterfly?\* by Judy Allen and Tudor Humphries (Metamorphosis concept for younger learners)

YouTube Videos:

\* "Cicada Molt Time-Lapse" - National Geographic Kids (~3 minutes, shows actual shedding process)

[https://www.youtube.com/results?search\\_query=cicada+molt+timelapse+national+geographic](https://www.youtube.com/results?search_query=cicada+molt+timelapse+national+geographic)

\* "The Life Cycle of a Cicada" - Crash Course Kids (~5 minutes, age-appropriate explanation of stages)

<https://www.youtube.com/watch?v=P6Uz3Hwyv0A>

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Teacher Note: This lesson bridges observational learning with life science standards by making an abstract concept—growth and metamorphosis—visible and tangible. The exoskeleton provides a "real thing" students can hold, measure, and wonder about, naturally generating curiosity and deeper thinking.