# Built to Survive

How arthropod body structures support survival

**ZOO.5** "Students will understand the basic structure and function of phylum Arthropoda, and how they demonstrate the characteristics of living things. Describe the evolutionary advantages of segmented bodies, hard exoskeletons..."

NAME _____ DATE _____

## 1 READ AND MARK

Read it twice

**YOUR JOB** Underline three arthropod body structures, circle a survival benefit linked to each one, and draw a line connecting each pair.

### From Shore to Garden

1. At low tide, a shore crab picks across slick rocks while a spider waits in a dry crevice. Both are arthropods, animals with body segments, jointed appendages, and an outer skeleton called an exoskeleton. Segments can carry specialized parts: a crab's front appendages end in chelae, or claws, that grip food and defend its body. A spider's legs bend at joints, allowing precise movement through tight spaces. Its fangs deliver venom that helps subdue prey. These different tools arise from a shared body plan, yet help the two animals survive in very different places.

2. The exoskeleton is a hard outer covering that shields soft tissues and gives muscles firm places to pull. Muscles move a crab's legs by pulling across joints, while flexible membranes at those joints allow the legs to bend. The covering also helps reduce water loss, an advantage for arthropods on land. But a rigid shell cannot stretch as an animal grows. A young crab sheds its old covering in a molt, then expands before its new covering hardens. During this brief period, its body is less protected, so hiding can improve its chance of surviving.

3. On a garden plant, a caterpillar chews leaves while a butterfly visits flowers. These are two stages of one insect species, not two species. Complete metamorphosis includes egg, larva, pupa, and adult stages; the pupa is the stage during which the body is reorganized. In incomplete metamorphosis, an insect hatches as a nymph that resembles an adult and grows through several molts without a pupal stage. Different life stages can use different foods and spaces, reducing competition within a species. Together, specialized segments, movable joints, protective coverings, and varied life cycles help arthropods occupy many habitats and diversify into enormous numbers of species.

## 2 ANSWER WITH EVIDENCE

Use the passage

1. How do the crab's chelae and the spider's venom help each animal survive?

2. Explain one way an exoskeleton supports movement and one way it protects an arthropod.

3. Why must a young crab molt, and what risk does it face before its new covering hardens?

4. How might complete metamorphosis reduce competition between young and adult butterflies?

## 3 YOUR TURN

Your own words

Design a protective glove for a person climbing a rocky wall. In five or six sentences, describe two arthropod-inspired features, explain how each helps, and identify one problem your design must solve.

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## PART 1 · READ AND MARK

Underline three arthropod body structures, circle a survival benefit linked to each one, and draw a line connecting each pair. Accept any marking that follows this job and points at the right text.

## PART 2 · ANSWERS

| # | QUESTION | ANSWER |
|---|---|---|
| 1 | How do the crab's chelae and the spider's venom help each animal survive? | **The crab's chelae grip food and defend its body. The spider's venom helps subdue prey.** |
| 2 | Explain one way an exoskeleton supports movement and one way it protects an arthropod. | **It provides firm places for muscles to pull when moving legs. It shields soft tissues.** |
| 3 | Why must a young crab molt, and what risk does it face before its new covering hardens? | **Its rigid exoskeleton cannot stretch as it grows, so it must shed it. Until the new covering hardens, the crab is less protected.** |
| 4 | How might complete metamorphosis reduce competition between young and adult butterflies? | **Caterpillars eat leaves, while adult butterflies visit flowers, so the two stages can use different food sources.** |

## PART 3 · YOUR TURN (SAMPLE ANSWER)

My climbing glove has hard plates inspired by a crab's exoskeleton to protect fingers from sharp rock. Hinges between the plates mimic jointed appendages, so fingers can curl around small holds. Textured pads on the palms improve grip. One problem is that rigid plates might pinch when the hand bends. I would connect the plates with flexible fabric and test the glove on a practice wall.

Accept other accurate links between structures and functions in the passage. For the design, look for two distinct arthropod-inspired features, a function for each, and a realistic design problem.