Armor in Motion

How a blue crab's outer skeleton supports movement, defense, and growth

ZOO.5.2 "Explain how exoskeletons are used in locomotion, protection, and development."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline a sentence that explains movement, circle a sentence that explains protection, and number four actions in the molting sequence. Use your marks to trace how the exoskeleton serves the crab at different times.

A Blue Crab's Changing Armor

1. At low tide, a blue crab moves sideways across wet sand. Its rigid outer skeleton cannot bend like skin, so flexible joints connect the hard sections of its legs. Muscles attached to the inside of those sections pull on them. When one muscle contracts, it swings a leg at a joint, and another muscle helps pull the leg back. The crab pushes against the sand, and its body moves sideways. The same arrangement lets its flattened rear legs paddle through water. Hard sections provide levers for movement, while joints allow controlled changes in direction.

2. A blue crab's shell is made of chitin strengthened with calcium carbonate. The hard covering resists scrapes from rocks and makes it harder for some predators to bite through the crab's body. Its claws can pinch an attacker, while their outer covering shields the muscles that close them. This armor has limits: flexible joints are less protected than broad shell plates. A crab may hide beneath a ledge when a predator approaches. A tough shell reduces damage, but it does not make the crab safe from every threat.

3. As the crab grows, its rigid exoskeleton does not grow with it. The crab forms a new, folded exoskeleton beneath the old one. During a molt, the old covering splits, and the crab pulls itself free. It takes in water, expanding its body and the new covering before the new shell hardens. The soft covering offers less protection, so the crab often stays hidden while it hardens. Once firm, the larger shell again supports muscles and resists attacks. Young crabs molt more frequently than adults because they grow faster. Molting allows the crab to increase in size, but each molt creates a dangerous period.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the hard sections and flexible joints of a blue crab's exoskeleton work together when it moves?

2. How does the exoskeleton protect the crab, and why is that protection incomplete?

3. Why must the crab molt to grow, and how does its body become larger after the old covering splits?

4. Why might hiding be especially important just after a molt, even though the crab has a new exoskeleton?

3 YOUR TURN

Your own words

Invent a sand-dwelling arthropod with a distinctive exoskeleton. In one paragraph, explain how its structure helps it move and protects it, then explain how it grows by molting and handles a risk during that process.

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PART 1 · READ AND MARK

Underline a sentence that explains movement, circle a sentence that explains protection, and number four actions in the molting sequence. Use your marks to trace how the exoskeleton serves the crab at different times. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the hard sections and flexible joints of a blue crab's exoskeleton work together when it moves?	**Muscles pull on the hard sections, which act as levers. Flexible joints let the leg sections swing.**
2	How does the exoskeleton protect the crab, and why is that protection incomplete?	**The hard covering resists scrapes and some bites, but its flexible joints are less protected.**
3	Why must the crab molt to grow, and how does its body become larger after the old covering splits?	**Its rigid exoskeleton cannot grow with it. After shedding the old covering, the crab takes in water and expands its body and new covering before the new shell hardens.**
4	Why might hiding be especially important just after a molt, even though the crab has a new exoskeleton?	**The new covering is soft and offers less protection until it hardens.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

My sand-dwelling arthropod has hard, shovel-shaped front legs with joints between the sections. Muscles pull against the inside of the leg plates, so the legs can scoop sand while the body moves into a burrow. Ridges on its outer skeleton help shield its body from scraping sand and small predators. To grow, it sheds its old skeleton and expands a soft new one. While the new covering hardens, it stays deep in its burrow because its body is easier to injure.

Accept plausible invented features if the response connects exoskeleton structure to both movement and protection. It should also explain that molting permits growth but leaves the animal temporarily vulnerable.