Shell Builders

Trace how living tissue makes a snail's shell.

ZOO.3.3 "Explain how the mantle is used in forming the shell."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline what the mantle does to build, enlarge, or repair the shell, then circle the materials it releases or supplies.

A Shell Made by Living Tissue

1 At dusk, a young land snail slides across a wet stone. Its shell looks like a separate shelter, but the living animal builds it. A thin sheet of tissue called the mantle covers the snail's soft body beneath the shell. The mantle lies against the shell's inner surface, and its edge reaches the opening where the snail comes out. The shell itself is not living tissue. It is a structure made from substances released by mantle cells. That contact between living tissue and hard shell makes both new growth and some repairs possible.

2 To build shell, mantle cells release an organic framework, mostly made of proteins, onto the shell's growing surface. They also supply calcium and carbonate ions, which form hard calcium carbonate crystals within and around that framework. The snail obtains calcium from its food and surroundings. Body fluids carry dissolved materials to mantle cells. The mantle does not pick up a ready-made shell from the environment. It deposits materials in an organized way, producing layers that combine a flexible organic component with hard mineral. This layered construction helps the shell protect the snail's soft body.

3 As the snail grows, the mantle edge adds shell material at the opening. Each new addition extends the opening, leaving room for the larger body while the older part of the shell remains in place. Mantle tissue beneath the shell can also deposit material on the inside, increasing thickness. If a crack lies where the mantle can reach it, cells may add new material underneath the damage. Repair takes time, and a large break may leave the animal exposed. In each case, growth or repair depends on living mantle cells depositing new shell material, not on the old shell healing itself.

2 ANSWER WITH EVIDENCE

Use the passage

1. The shell is not living tissue. How can it still grow?

2. How do the materials supplied by the mantle become a protective shell?

3. How does adding shell material at the opening differ from adding it on the inside?

4. How might the mantle help a snail with a cracked shell, and what limits that repair?

3 YOUR TURN

Your own words

Two growing snails live in the same conditions, but one gets calcium-rich food and the other gets food low in calcium. In three or four sentences, predict a likely difference in their new shell growth and explain it using the mantle, the organic framework, calcium carbonate, and the shell opening.

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PART 1 · READ AND MARK

Underline what the mantle does to build, enlarge, or repair the shell, then circle the materials it releases or supplies. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	The shell is not living tissue. How can it still grow?	**Living mantle cells deposit new material onto the shell.**
2	How do the materials supplied by the mantle become a protective shell?	**Mantle cells release an organic framework and supply calcium and carbonate ions. The ions form hard calcium carbonate crystals within and around the framework, creating protective layers.**
3	How does adding shell material at the opening differ from adding it on the inside?	**The mantle edge adds material at the opening to extend the shell as the snail grows. Mantle tissue adds material inside to increase shell thickness.**
4	How might the mantle help a snail with a cracked shell, and what limits that repair?	**If mantle tissue can reach the crack, its cells may deposit new material beneath it. Repair takes time, and a large break may still leave the snail exposed.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The snail with less calcium in its food may form less hard mineral in its new shell. Both snails' mantles can release an organic framework, but the low-calcium snail may have less calcium available to make calcium carbonate crystals within it. As each mantle edge adds material at the shell opening, the low-calcium snail's new shell may be thinner or grow more slowly.

Accept predictions stated as possibilities, since calcium availability alone does not determine shell growth. Look for a causal link between mantle deposits, calcium carbonate formation, and new material added at the opening.