Feet That Do More

Trace three jobs of a sea star's water vascular system

ZOO.6.5 "Describe how the water vascular system is used for locomotion, feeding, and gas exchange."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline a cause-and-effect link about movement, circle one about feeding, and number the two directions gases travel across a tube foot. Use your marks to trace how the same system does different jobs.

A Sea Star at Work

1. At low tide, a sea star crosses a sloping rock without fins or legs. Its water vascular system is a network of fluid-filled canals connected to hundreds of tube feet. Seawater enters through a small opening called the madreporite, then passes through canals to sacs called ampullae. When an ampulla contracts, it pushes fluid into a tube foot, extending it. The foot attaches to the rock with a sticky secretion. Muscles in the foot then shorten, pulling the sea star forward; another secretion helps the foot let go. Many feet repeat this sequence, so the animal keeps moving.

2. On the same rock, a sea star finds a mussel sealed inside two shells. Some tube feet attach to one shell while others attach to the other. Repeated contractions of the feet pull on the shells until a narrow gap opens. The sea star can then push part of its stomach through the gap and begin digesting the mussel. The tube feet do not carry food through the canals. Instead, water pressure extends the feet, and their grip gives the sea star the force it needs to reach food protected by a hard shell.

3. While the sea star moves and feeds, it also needs oxygen. Seawater surrounds its thin-walled tube feet. Oxygen dissolved in that water diffuses across a foot's surface into the fluid inside, and carbon dioxide diffuses from the fluid into the surrounding water. Tiny skin gills elsewhere on the body also exchange gases. Fluid within the water vascular system distributes some of the oxygen that enters through the tube feet. This exchange does not require the feet to open a shell or pull the body along. Even when a foot stays in place, its exposed surface can allow gases to cross.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do fluid pressure and tube feet help the sea star move across the rock?

2. How do tube feet help the sea star feed on a mussel, and what begins digesting the food?

3. Describe the two directions gases travel across a tube foot. Why does this exchange matter to the sea star?

4. How do movement and feeding use tube feet in a similar way? How is gas exchange different?

3 YOUR TURN

Your own words

Write a 70 to 95 word aquarium label about a sea star crossing a steep rock to reach a closed mussel. Explain how its water vascular system helps it move, get food, and exchange gases, then predict what would change if its tube feet could no longer grip.

Feet That Do More

PART 1 · READ AND MARK

Underline a cause-and-effect link about movement, circle one about feeding, and number the two directions gases travel across a tube foot. Use your marks to trace how the same system does different jobs. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do fluid pressure and tube feet help the sea star move across the rock?	**An ampulla pushes fluid into a tube foot, extending it. The foot attaches to the rock, then shortens to pull the sea star forward before letting go.**
2	How do tube feet help the sea star feed on a mussel, and what begins digesting the food?	**Tube feet grip and pull on the two shells until a gap opens. The sea star pushes part of its stomach through the gap to begin digestion.**
3	Describe the two directions gases travel across a tube foot. Why does this exchange matter to the sea star?	**Oxygen diffuses from seawater into the fluid inside the foot, while carbon dioxide diffuses from that fluid into seawater. This supplies oxygen and removes carbon dioxide.**
4	How do movement and feeding use tube feet in a similar way? How is gas exchange different?	**Movement and feeding use fluid pressure to extend tube feet and use their grip to pull. Gas exchange occurs when gases diffuse across the feet's thin surfaces, even if the feet are not pulling.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

A sea star climbs the steep rock by sending fluid into its tube feet, which extend and stick to the surface. Shortening feet pull its body upward as other feet release and reattach. At the mussel, feet grip both shells and pull until a gap opens, allowing the sea star to put its stomach inside. Oxygen diffuses from seawater into fluid through the thin feet, while carbon dioxide moves out. If the feet stopped gripping, climbing and opening the mussel would fail, but gas exchange could continue.

Accept descriptions of sticky attachment without naming secretions. For the final prediction, accept that gas exchange may continue if the tube feet remain exposed to seawater.