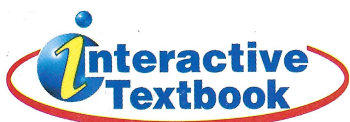


Mollusks, Arthropods, and Echinoderms

Chapter Preview

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 Skills Lab *A Snail's Pace*
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This weevil from Southeast Asia uses its impressive front legs to court females. ▶



Mollusks

Reading Preview

Key Concepts

- What are the main characteristics of mollusks?
- What are the major groups of mollusks and how do they differ?

Key Terms

- mollusk
- open circulatory system
- gill
- gastropod
- herbivore
- carnivore
- radula
- bivalve
- omnivore
- cephalopod

Target Reading Skill

Comparing and Contrasting

When you compare and contrast things, you explain how they are alike and different. As you read, compare and contrast three groups of mollusks by completing a table like the one below.

Characteristics of Mollusks

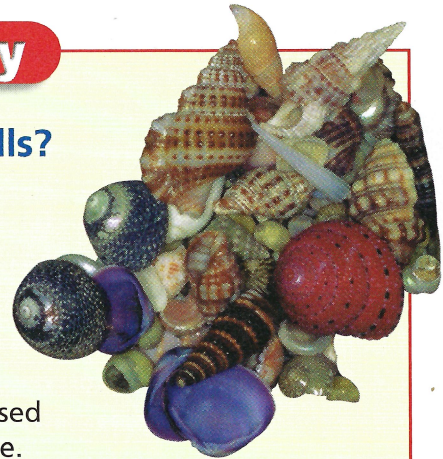
Type of Mollusk	How They Obtain Food	How They Move
Gastropod		
Bivalve		
Cephalopod		

Lab
zone

Discover Activity

How Can You Classify Shells?

1. Your teacher will give you an assortment of shells.
2. Examine each shell carefully. Look at the shape and color of the shells and feel their inner and outer surfaces.
3. Classify the shells into groups based on the characteristics you observe.

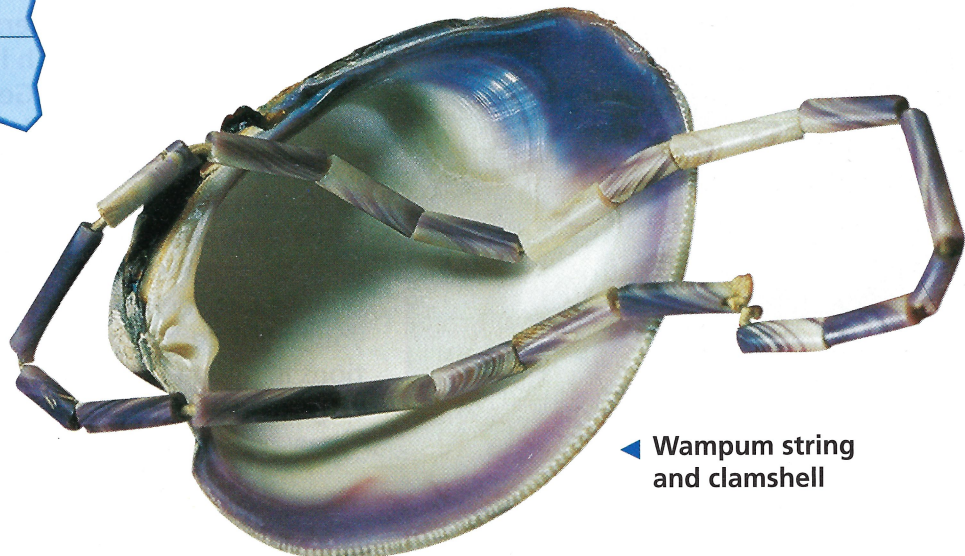


Think It Over

Inferring How might it help an animal to have a shell? How might it be a disadvantage?

From the shells of clams, Native Americans in the Northeast once carved purple and white beads called wampum. They wove these beads into belts with complex designs that often had special, solemn significance. A wampum belt might record a group's history. When warring groups made peace, they exchanged weavings made of wampum. Iroquois women would honor a new chief with gifts of wampum strings.

The soft bodies inside the shells used to make wampum were a major source of food for Native Americans. Today, clams and similar animals, such as scallops and oysters, are still valuable sources of food for people in many parts of the world.



◀ Wampum string and clamshell

Characteristics of Mollusks

Clams, oysters, and scallops are all mollusks (phylum Mollusca). Snails and squids are mollusks, too. **Mollusks** are invertebrates with soft, unsegmented bodies that are often protected by a hard outer shell. **In addition to a soft body often covered by a shell, a mollusk has a thin layer of tissue called a mantle that covers its internal organs, and an organ called a foot.** In many mollusks, the mantle produces the hard shell. Depending on the type of mollusk, the foot has different functions—crawling, digging, or catching prey.

Body Structure Like segmented worms, mollusks have bilateral symmetry and a digestive system with two openings. However, unlike segmented worms, the body parts of mollusks are not usually repeated. Instead, the internal organs are located together in one area, as shown in Figure 1.

Circulatory System Most groups of mollusks have an **open circulatory system**, in which the blood is not always inside blood vessels. The heart pumps blood into a short vessel that opens into the body spaces containing the internal organs. The blood sloshes over the organs and returns eventually to the heart.

Obtaining Oxygen Most mollusks that live in water have **gills**, organs that remove oxygen from the water. The gills have tiny, hairlike structures called cilia and a rich supply of blood vessels. The cilia move back and forth, making water flow over the gills. The gills remove the oxygen from the water and the oxygen moves into the blood. At the same time, carbon dioxide, a waste gas, moves out of the blood and into the water.








Reading Checkpoint

Which organs of a mollusk obtain oxygen from water?

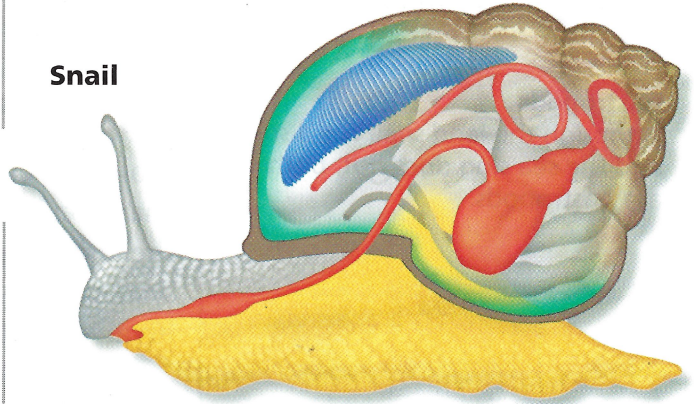
FIGURE 1

Comparing Mollusks

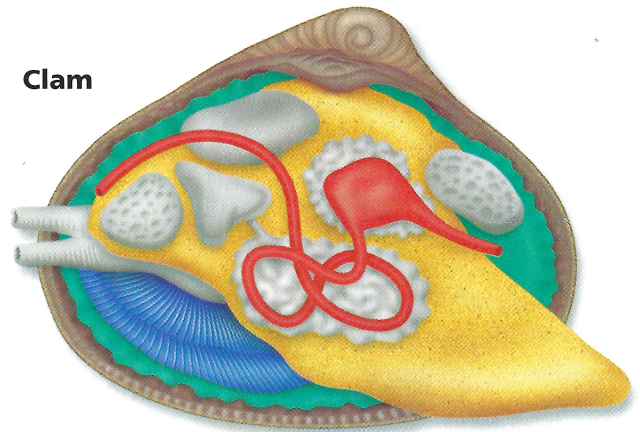
Although they don't look much alike at first, a snail, a clam, and a squid have the same basic body structures.

Key					
	Shell		Mantle		Foot
	Gills		Digestive tract		

Snail



Clam



Squid

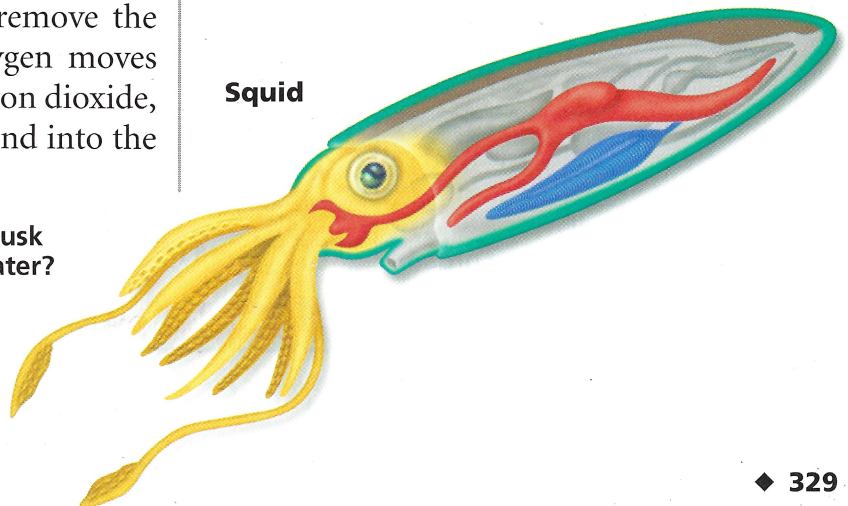




FIGURE 2
Gastropods

Although the land snail has a shell and the sea slug does not, both are gastropods.

Snails and Slugs

Biologists classify mollusks into groups based on their physical characteristics. These characteristics include the presence of a shell, the type of shell, the type of foot, and the type of nervous system. **The three major groups of mollusks are gastropods, bivalves, and cephalopods.**

The **gastropods** are the largest group of mollusks. They include snails and slugs, like the ones shown in Figure 2, and live nearly everywhere on Earth. They live in oceans, on rocky shores, in fresh water, and on land. **Gastropods have a single external shell or no shell at all.**

Obtaining Food Like all organisms, gastropods need food. Some gastropods are **herbivores**, animals that eat only plants. Some are scavengers that eat decaying material. Still others are **carnivores**, animals that eat only other animals.

But no matter what they eat, gastropods use an organ called a **radula** (RAJ oo luh), a flexible ribbon of tiny teeth, to obtain food. Herbivores use the radula like sandpaper to tear through plant tissues. Carnivores use their radulas in different ways. For example, a gastropod called an oyster drill uses its radula to bore a hole through an oyster's shell. Then it scrapes up the oyster's soft body tissues.

Movement A gastropod usually moves by creeping along on a broad foot. The foot may ooze a carpet of slippery mucus, which you may have seen if you've ever watched a snail move. The mucus makes it easier for the gastropod to move.

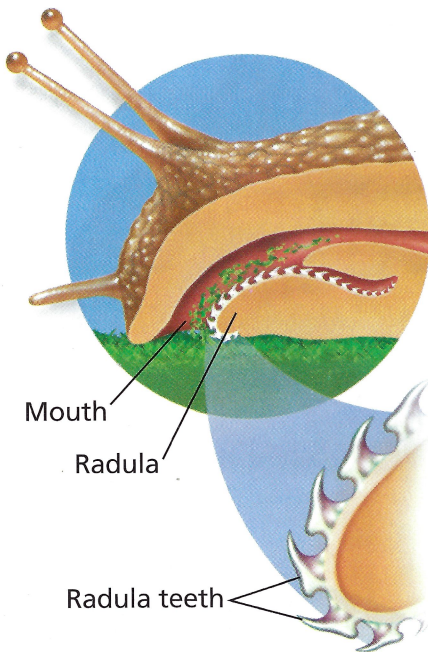
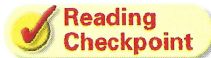


FIGURE 3
The Radula of a Snail
A snail has a food-gathering organ called a radula, which tears and scrapes up food.



What is the function of a radula?

Two-Shelled Mollusks

A second group of mollusks, **bivalves**, includes oysters, clams, scallops, and mussels. **Bivalves are mollusks that have two shells held together by hinges and strong muscles.** They are found in all kinds of watery environments.

Obtaining Food Like gastropods, bivalves need food. But unlike gastropods, bivalves do not have radulas. Instead, most are filter feeders that strain tiny organisms from water. Bivalves capture food as water flows over their gills. Food particles stick to mucus that covers the gills. The cilia on the gills then move the food particles into the bivalve's mouth. Most bivalves are **omnivores**, animals that eat both plants and animals.

Movement Like gastropods, bivalves don't move quickly. The larvae of most bivalves float or swim through the water. But the adults stay in one place or use their foot to move very slowly. For example, oysters and mussels attach themselves to rocks or other underwater surfaces. Clams, in contrast, move. Look at Figure 4 to see how a clam digs into mud.

Protection Sometimes an object such as a grain of sand gets stuck between a bivalve's mantle and shell. The object irritates the soft mantle. Just as you might put smooth tape around rough bicycle handlebars to protect your hands, the bivalve's mantle produces a smooth, pearly coat to cover the irritating object. Sometimes a pearl forms eventually around the object. Some oysters make beautiful pearls that are used in jewelry.

Lab zone Skills Activity

Classifying

While wading in a stream, you step on a small animal with a hard covering. As you examine the animal, you discover that it has a soft body inside its shell. It may be a mollusk. What characteristics would you look for to classify the animal into a group of mollusks?

FIGURE 4

How a Clam Digs

A razor clam digs into the mud by changing the shape of its foot.

Predicting How might the clam use its foot to move back up?

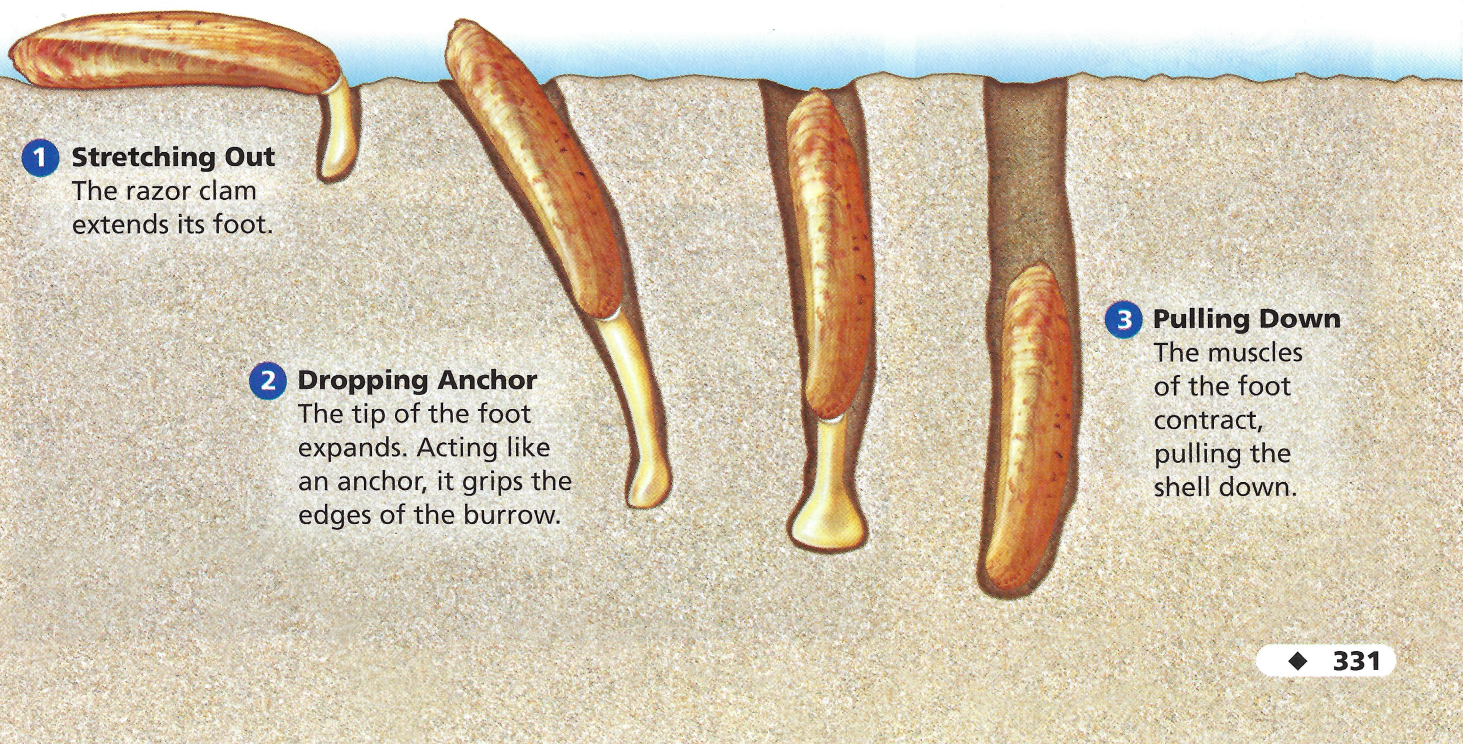
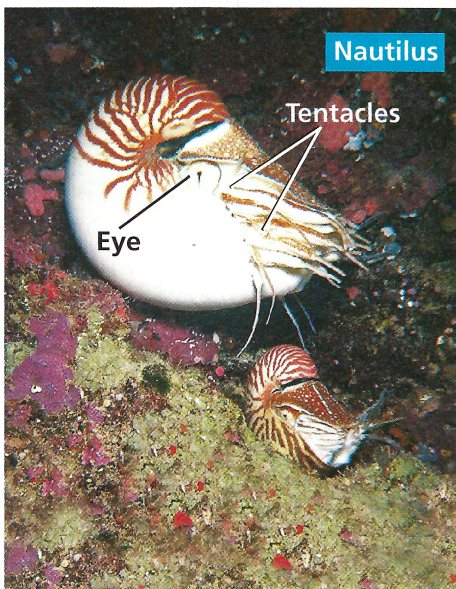


FIGURE 5
Three Cephalopods

A nautilus, an octopus, and a squid are all cephalopods. In cephalopods, the foot is adapted to form tentacles.

Drawing Conclusions Why is cephalopod, which is Greek for “head foot,” a good name for members of this group?

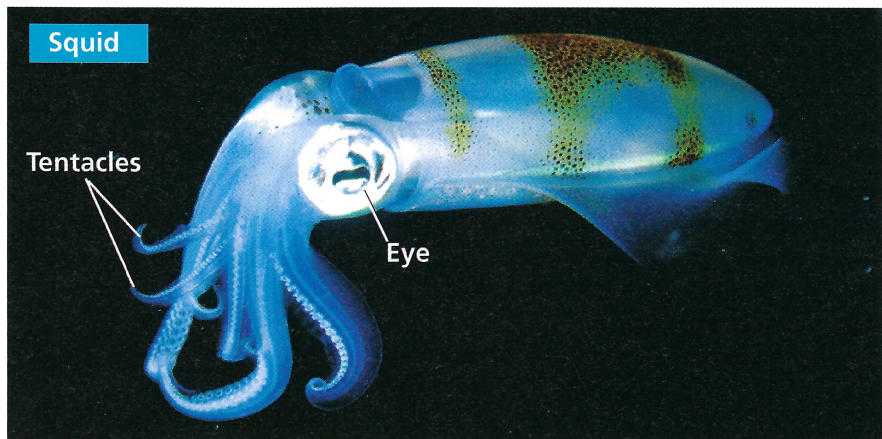
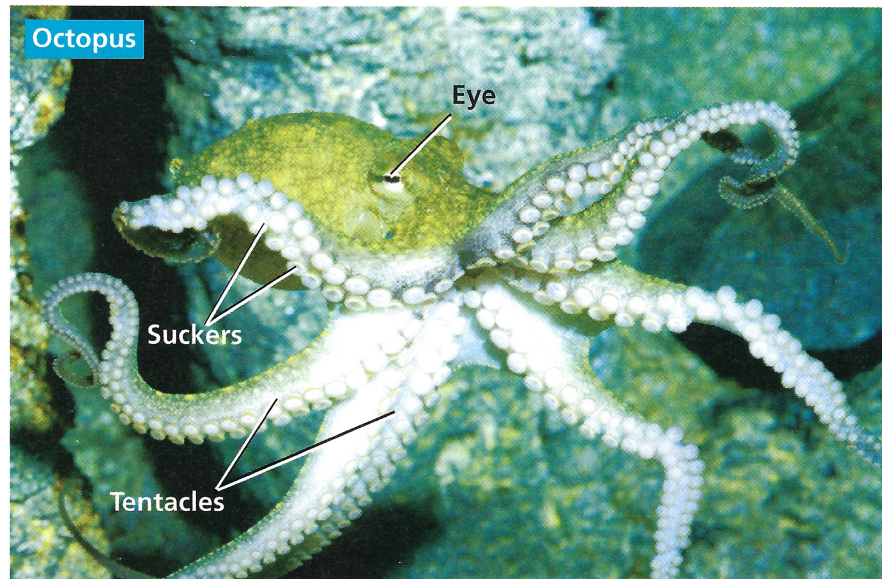


Octopuses and Their Relatives

Octopuses and squids are **cephalopods** (SEF uh luh pahdz). So are nautilus and cuttlefishes. A **cephalopod is an ocean-dwelling mollusk whose foot is adapted to form tentacles around its mouth.** Unlike bivalves, not all cephalopods have shells. For example, nautilus have an external shell, squids and cuttlefish have a small shell within the body, and octopuses have no shells. Cephalopods are the only mollusks with a closed circulatory system.

Obtaining Food Cephalopods are carnivores. A cephalopod captures prey using its muscular tentacles. Then it crushes the prey in a beak and scrapes and cuts the flesh with its radula.

A cephalopod’s tentacles contain sensitive suckers, which you can see on the octopus in Figure 5. The suckers receive sensations of taste as well as touch. A cephalopod doesn’t have to touch something to taste it because the suckers respond to chemicals in the water. For example, when an octopus feels beneath a rock, its tentacles may find a crab by taste before touching it.



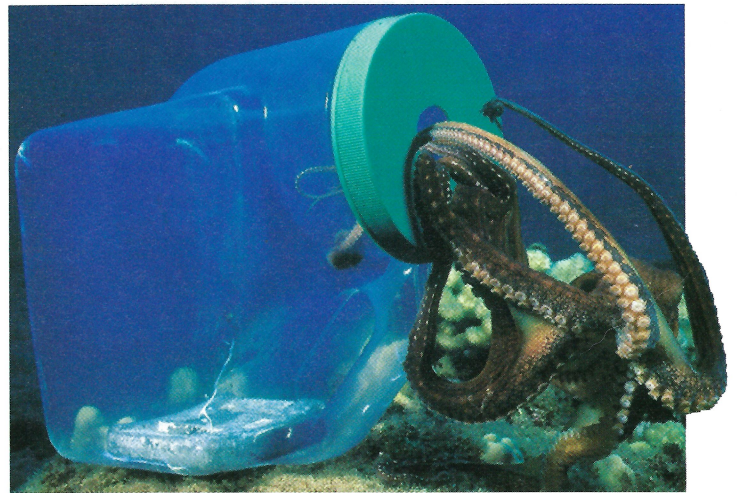
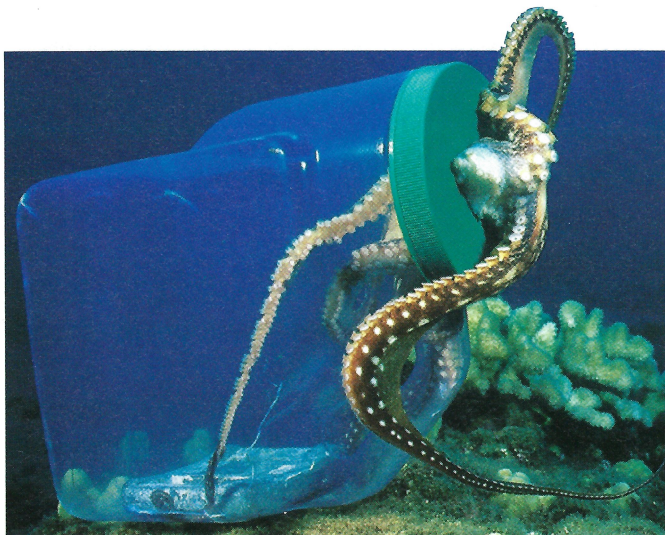


FIGURE 6
An Escaping Octopus
 This octopus has figured out how to escape from a jar through a tiny hole in the lid.

Nervous System Cephalopods have large eyes and excellent vision. They also have the most complex nervous system of any invertebrate. Cephalopods have large brains and can remember things they have learned. For example, in captivity, octopuses can learn when to expect deliveries of food. Some even figure out how to escape from their tanks.

Movement Cephalopods swim by jet propulsion. They squeeze a current of water out of the mantle cavity and through a tube. Then, like rockets, they shoot off in the opposite direction. By turning the tube around, they can reverse direction.

 **Reading Checkpoint** What does the foot of a cephalopod look like?

Section 1 Assessment

 **Target Reading Skill Comparing and Contrasting** Use the information in your table about mollusks to help you answer Question 2 below.

Reviewing Key Concepts

- Listing** List the characteristics of a mollusk.
 - Explaining** How is a mollusk's mantle related to its shell?
 - Predicting** What would happen to a mollusk if the cilia on its gills did not work? Explain.
- Identifying** What are three groups of mollusks?
 - Classifying** What are the characteristics of the three groups of mollusks?
 - Comparing and Contrasting** How are the foot structures of a snail, a clam, and an octopus similar? How are they different?

Lab zone At-Home Activity

Edible Mollusks Visit a local supermarket with a family member and identify any mollusks that are being sold as food. Be sure to look in places other than the fish counter, such as the canned-foods section. Discuss the parts of the mollusks that are used for food and the parts that are not edible.