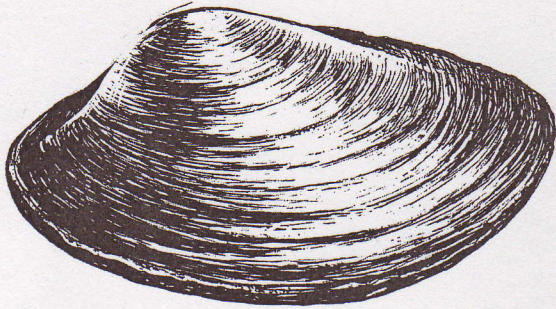


Dissection Guide for the Clam (Mussel) 07.05.15 Name _____

Partner _____

Date _____ Hour _____



Mollusks are soft-bodied invertebrates. They have a muscular foot and a mantle. In most mollusks, the mantle secretes a hard shell. In this investigation you will observe the external and internal structures of a representative mollusk--the clam or fresh-water mussel. Clams are pelecypods, or bivalves, and have a two-part hinged shell. Clams are found in fresh water in streams, ponds, and lakes. They also are very common

burrowed into the mud of ocean mud flats. Clams are often used for food.

Clams belong to the phylum Mollusca. Molluscs (Latin *molluscus*, "soft"), as the origin of the name suggests, are soft-bodied animals having an internal or external shell. Included in the phylum are snails, oysters, slugs, clams, octopuses, and squids. Most molluscs are bilaterally symmetrical (have a left and right side) and have well-developed respiratory, excretory, circulatory, and digestive systems. Some may have a calcareous shell surrounding the body mass.

Molluscs are similar to annelids in their development. Both have trochophore larvae. Molluscs *differ* from annelids, however, in the absence of segmentation. Further, the coelom, so prominent in the annelids, is greatly reduced in the molluscs and is generally restricted to an area surrounding the heart.

Most molluscs are slow moving, but the bodies of several species have been highly modified for rapid locomotion. Although primarily marine organisms, some molluscs are found in fresh water (clams and snails) and on land (snails and slugs).

The molluscs are characterized by having three main body regions: a head-foot, which is the sensory and locomotive part of the body; a visceral mass containing the excretory, digestive, and circulatory organs; and the mantle, which secretes the shell. The gills, which function in respiration, are located inside the mantle.

To what phylum does the clam belong? _____ What does the name of the phylum translate (from the Latin language) to mean? _____

List six common members of the phylum Mollusca: _____, _____, _____, _____, _____, _____

What does it mean when an organism is bilaterally symmetrical? _____

What element (from the Periodic Table) is a major component of a calcareous shell? _____

Name the three main body regions of a mollusk: _____, _____, _____

Clams belong to the class Pelecypoda (which means "hatchet foot"). Members of the class pelecypoda provide delight for epicureans, jewelers, and artisans the world over, because they provide food, pearls, and mother-of-pearl, which can be fashioned into hundreds of forms. Another name for this group is "bivalves," as they possess two shells or valves. Included in the group are clams, oysters, mussels, scallops, and shipworms. They vary in size from one centimeter across up to well over one meter (the Giant Clam of the South Pacific). Since clams and mussels are found both in salt and fresh water, they are common throughout the United States and the entire world.

To what class does the clam belong? _____ What does the name of the class translate (from the Latin language) to mean? _____

What does it mean if an animal is called a bivalve? _____

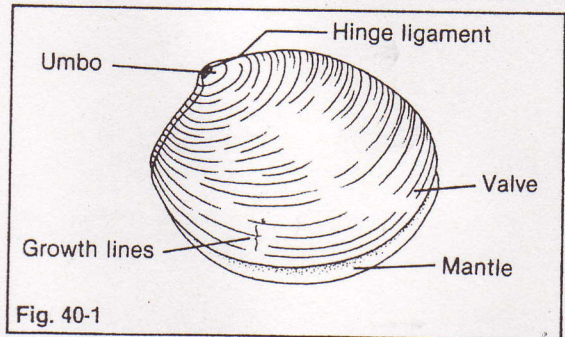
An epicurean would be interested in _____

List five common members of the class Pelecypoda: _____, _____, _____, _____, _____

External Anatomy of the Clam

Obtain a preserved clam and rinse it thoroughly to remove excess preservative. Place the clam in a dissecting tray.

Observe the bivalve shell. Notice the hinge ligament. The small, pointed area near the hinge ligament is called the umbo. It is the oldest part of the shell. The umbo is situated dorsally toward the anterior end of the clam and is surrounded by concentric growth lines. The lines represent alternating periods of slow and rapid growth.



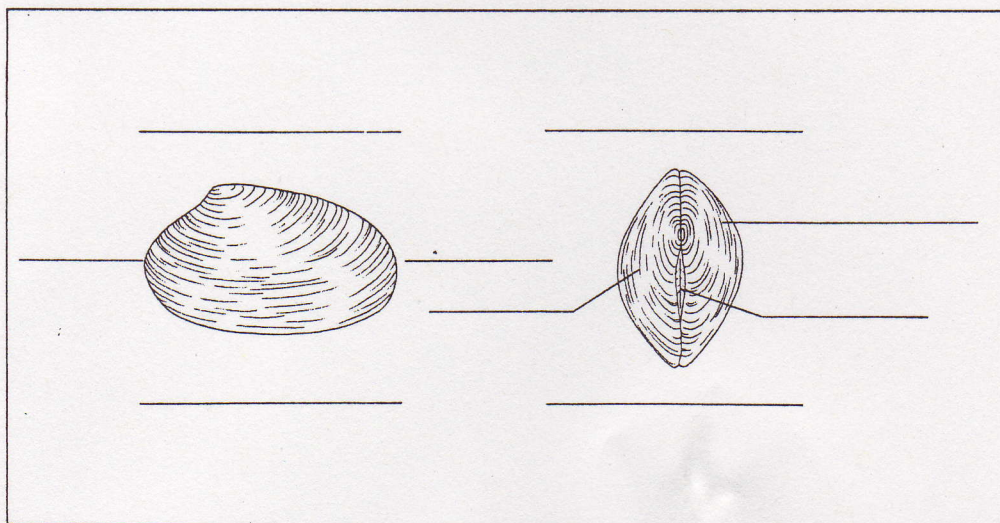
Before you continue with this investigation, it is important to know the orientation of the clam shell. Recall that the umbo is near the *anterior end*. The posterior of the clam shell is at the opposite end. In reference to the clam shell, dorsal is the side, or edge, with the umbo. Ventral is the side, or edge, opposite the umbo. Locate the posterior, anterior, dorsal, and ventral surfaces of your clam shell. Hold the clam shell with the anterior end up and the hinge facing toward you. Locate the posterior, right valve, and left valve of the clam shell.

Describe the location of the hinge in relation to the two shell-halves. _____

What is the name of the oldest part of the clam shell? _____

ATTEMPT (sometimes this is difficult) to count the number of concentric growth lines (think about tree rings) on the shell. What is your best estimate? _____

On the following drawings of the clam shell, label the following: dorsal, ventral, anterior, posterior, right valve, left valve, and hinge. The terms can be used more than once if necessary.



Tag the following: (Note: Do not try to pin the shell. Make your tags and "stick" them to the parts with moisture from the shell.)

- Dorsal
- Ventral
- Anterior
- Posterior
- Right valve
- Left valve
- Umbo

Verified _____

Hold the clam in the dissecting tray as shown in the figure at the right. With a scalpel carefully scrape away some of the *horny outer layer* of the shell. Scrape until you see the "white part" (prismatic layer) of the shell—it does not need to be a very large area. **CAUTION: Scrape in a direction away from your hand to avoid cutting yourself.**

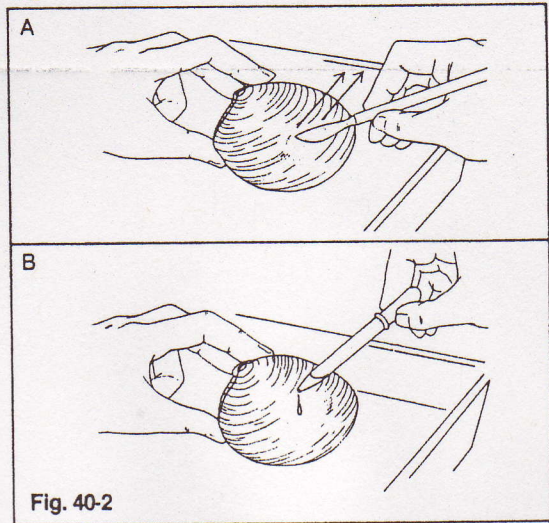


Fig. 40-2

Completed _____

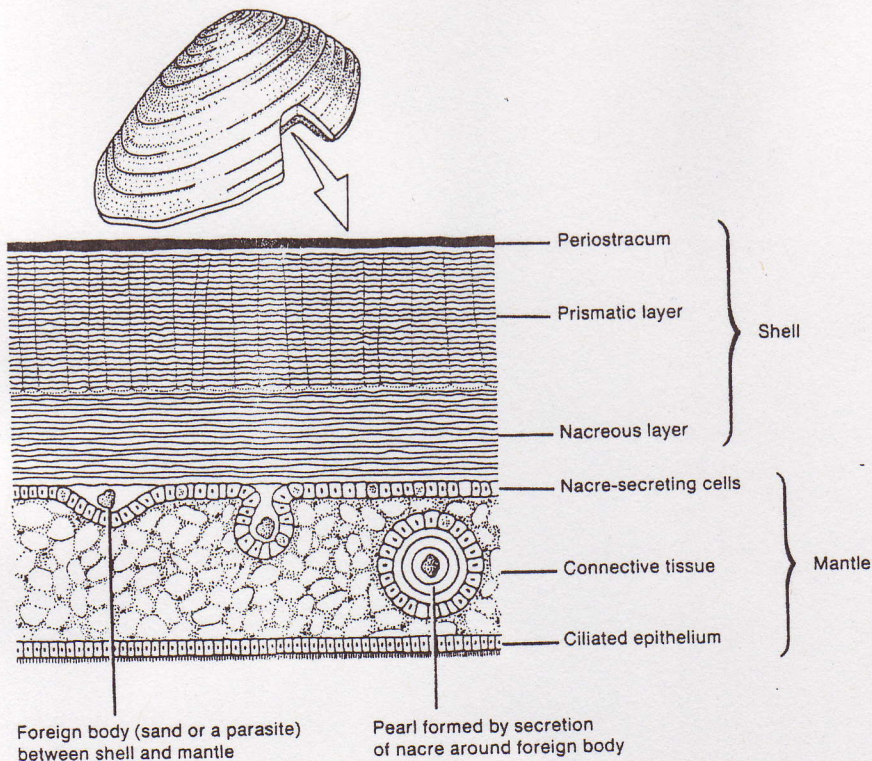
The shell of a clam is made up of three layers: the horny outer layer, the thick, middle layer called the prismatic layer, and the innermost layer called the pearly layer. Have your instructor place one drop of acid on the exposed prismatic layer. **CAUTION: Do not let any acid contact your skin to avoid acid burns.** The bubbling of the acid indicates that calcium carbonate (CaCO_3) is present. Carefully rinse the shell with water once you have made your observations.

Describe what happened when acid was placed on the exposed prismatic layer: _____

Describe a situation where what you observed might actually be applied to the clam in its natural environment: _____

Name the material (chemical) that makes up the clam shell: _____ Give the chemical formula of the material: _____

Here is some extra information on the make-up of the clam shell:



How many layers make up the "shell" of the clam? _____

How many layers make up the "mantle" of the clam? _____

Which part of the clam shell forms pearls? _____

A pearl is formed as a reaction to a _____ between the shell and mantle.

The white part of the clam shell (you applied the acid to in the exercise above) is the _____

Epithelium is better known as by its common name: _____

****Put on a pair of safety glasses during the process of opening the mussel.**

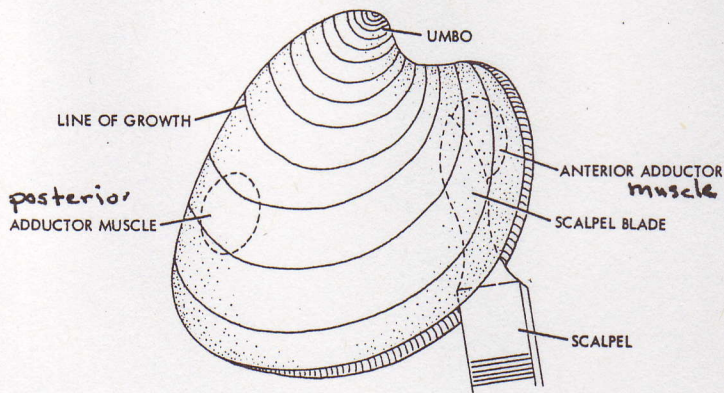
Internal Anatomy of the Clam:

Your clam should be slightly gapped open. There might even be a piece of wood wedged between the valves—this guarantees the preservative gets inside the shell halves.

Try first to pry it open with your hands. If this will not work, use a screwdriver to very gently pry the valves apart. Your clam should look like the one shown to the right.

Look at the partially opened shell. Observe the anterior adductor muscle, posterior adductor muscle, mantle, and foot. The opening between the two shells is called the gape. Carefully insert the scalpel between the mantle and the left valve of the shell. Cut the anterior adductor muscle as close to the shell as possible.

CAUTION: The scalpel is a sharp instrument. Always be very careful when handling it and cut away from your hand and body.



Repeat this procedure to cut the posterior adductor muscle. Open the shell. If necessary, carefully run your fingers or scalpel between the shell and the mantle to separate the mantle from the shell. The space between the two halves of the mantle is the mantle cavity.

Open the left valve as far as possible. When done, your specimen should look like the diagram below.

Completed (the two shell halves are open as shown to the right).

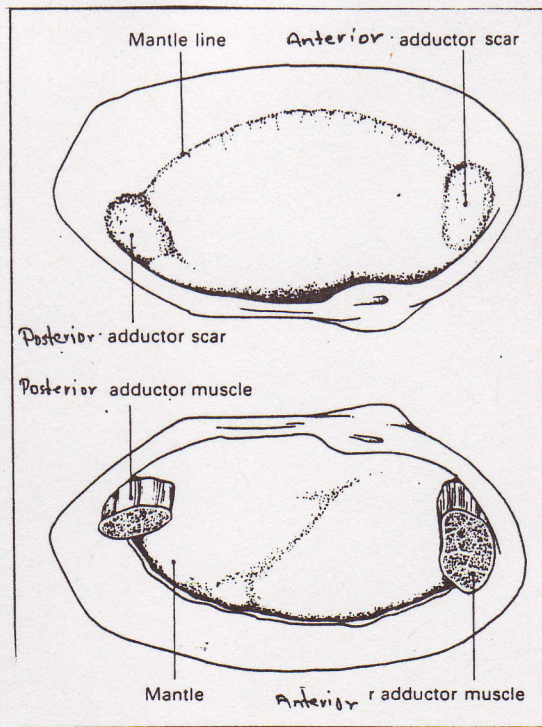
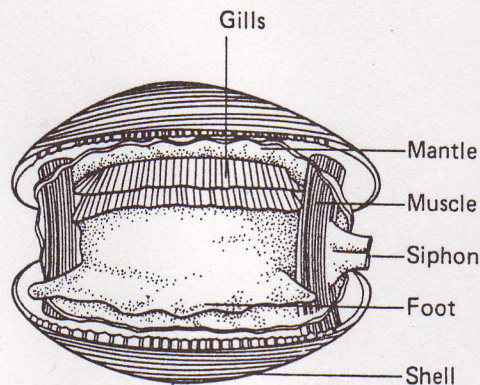
Verified _____

Observe the hinge. Notice the interlocking teeth that hold the two valves of the shell together. Locate the "scars" from the anterior and posterior adductor muscles on the inner surface of the left valve. These scars indicate where the posterior and anterior adductor muscles were attached.

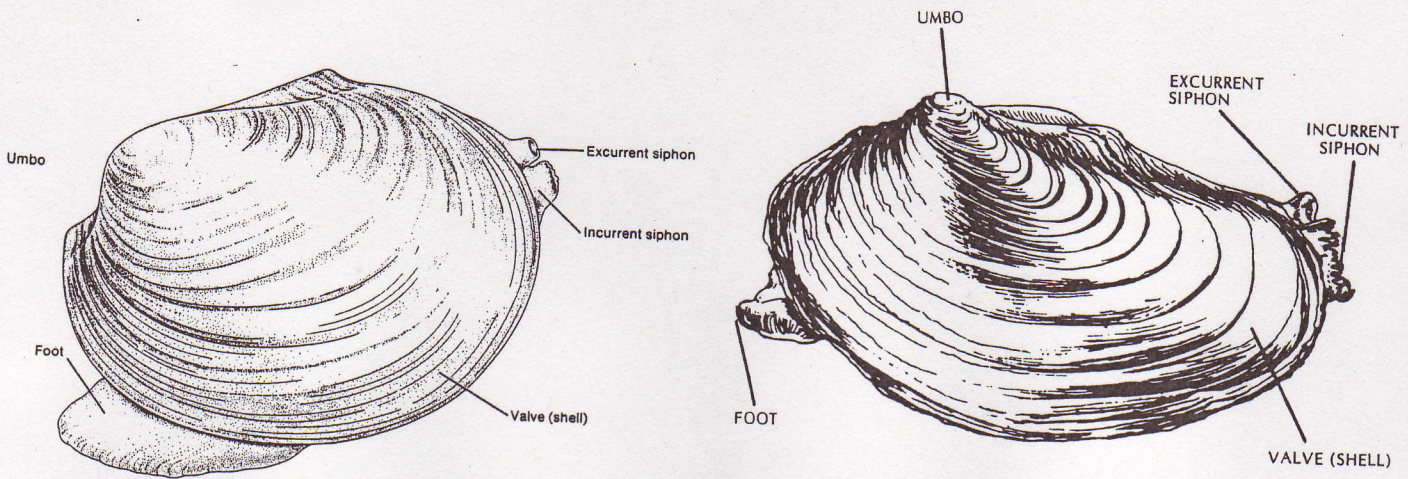
What is the gape? _____

What forms the "scars" on the valves? _____

Describe the inner layer of the shell. _____



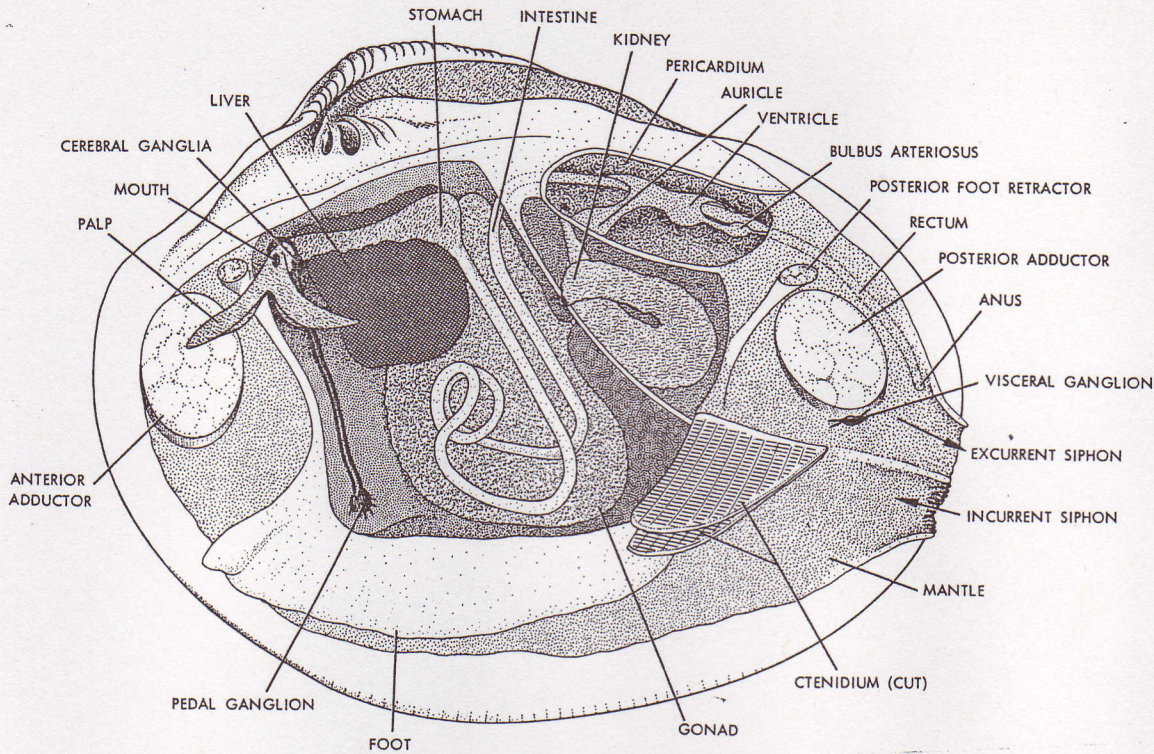
Lets stop for just a moment on this page and look at some of the living clam's anatomy. The diagrams below show how he looks when healthy and alive. The foot and siphons are extended. Yours will not look exactly like this because it is dead and these appendages have been retracted into the shell.



Here are some terms you will need to become familiar with to continue with the dissection. Spend a few minute studying them—it will help!

Structure	Description/Location	Function
Anterior adductor muscle	Anterior edge inside shell	Holds two halves of shell together
Posterior adductor muscle	Posterior edge inside shell	Holds two halves of shell together
Mantle	Membranous tissue that covers entire body; yellow or cream-colored	Secretes shell
Foot	Hatchet-shaped; hard; anterior and ventral to gills	Locomotion, movement
Gills	Folded, ridged tissue with microscopic cilia	Respiration, gas exchange
Incurrent siphon	Fold in mantle; posterior end ventral to excurrent siphon	Regulates flow of water into clam
Excurrent siphon	Fold in mantle; posterior end; dorsal to incurrent siphon	Regulates flow of water out of clam
Palps	Leaflike structures anterior to gills and posterior to anterior adductor muscle	Directs water carrying food into mouth
Mouth	Slit between palps	Passage of food into digestive system
Stomach	Saclike structure near mouth	Digestion of food
Intestine	Coiled tubule from stomach through body to anus	Absorption of digested food
Digestive gland (liver)	Light green mass surrounding stomach	Secretes enzymes into digestive system to digest food
Anus	End of intestine near excurrent siphon	Removal of undigested food
Reproductive organ	Spongy reddish mass ventral to palps	Production of eggs and sperm
Pericardial cavity	Area between visceral mass and hinge; dorsal to foot	Protects and houses heart
Heart	Inside pericardial cavity	Pumps blood throughout body
Kidneys	Spongy brownish organs found below pericardial cavity	Waste removal

Locate the mantle, a thin layer of tissue that covers the visceral mass and foot. The visceral mass is a soft mass of tissue located dorsal to the foot. The mantle is usually cream or yellow in color with a brownish edge in a preserved clam. Locate the incurrent siphon and excurrent siphon. The siphons are folds in the mantle at the posterior of the clam. The incurrent siphon is ventral to the excurrent siphon. The incurrent siphon takes in water that contains oxygen and microscopic food particles. Water and waste materials are removed from the mantle cavity through the excurrent siphon. Examine these structures with a hand lens.

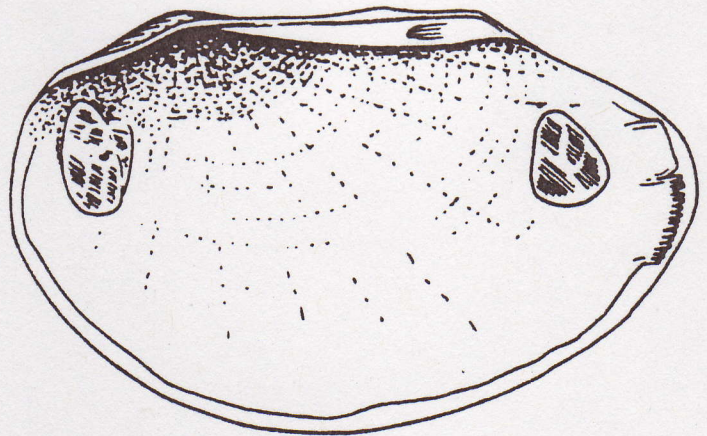


Label the drawing to the right with the following structures:

anterior adductor muscle,
 posterior adductor muscle,
 incurrent siphon, excurrent siphon, mantle,
 right valve

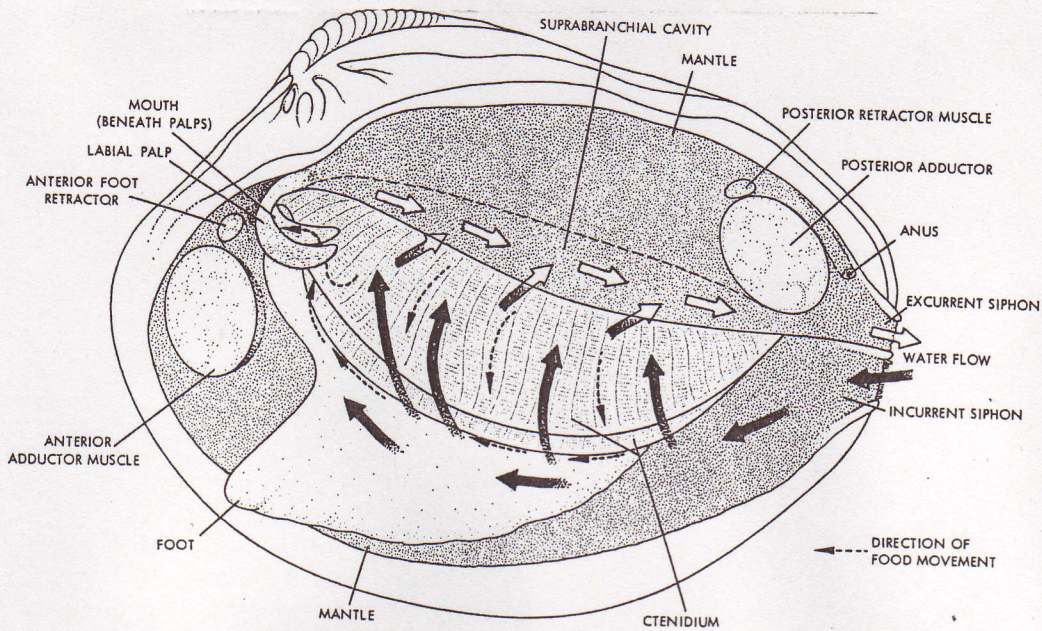
Tag each of the following on your specimen:

Anterior adductor muscle,
 posterior adductor muscle,
 incurrent siphon, excurrent siphon, mantle

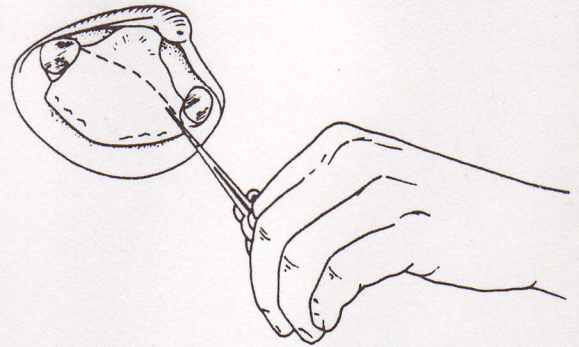


Verified _____

The diagram below shows the path of water through the body of the clam.



With a pair of scissors, carefully cut away a portion of the mantle as shown in the picture to the right. (You might have already performed this step when you opened the clam and “tore” away the mantle.)

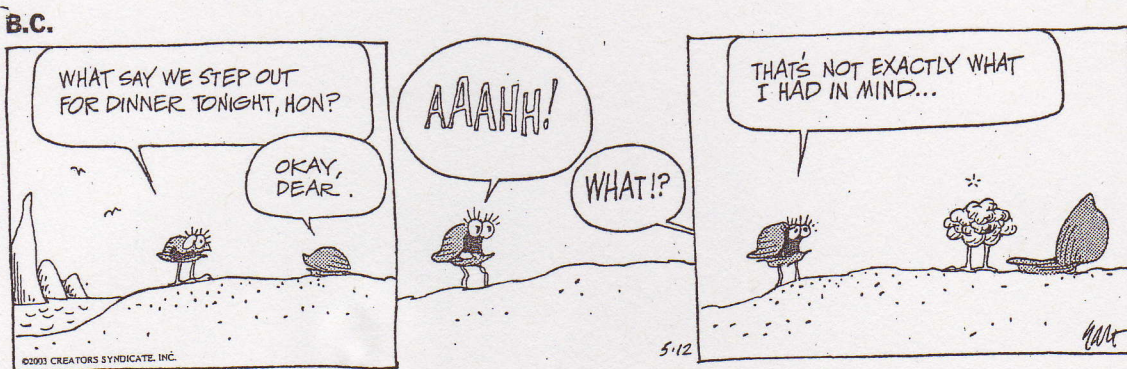


With the mantle removed you can now observe the gills, folds of tissue covered with microscopic cilia. Gills are found in pairs, one on each side of the visceral mass. Use a probe and a hand lens to examine the gills. Observe the muscular, hatchet-shaped foot located anterior and ventral to the gills. Locate the palps, a pair of leaflike structures ventral to the anterior adductor muscle and anterior to the gills. The mouth is a slit located between the palps. Water from the incurrent siphon passes over the gills toward the palps. Mucus and cilia on the palps trap food and direct it toward the mouth. Water then circulates out of the mantle cavity through the excurrent siphon.

What are the two functions of the gills? 1. _____
 2. _____

Tag on your specimen: gill, foot

Verified _____

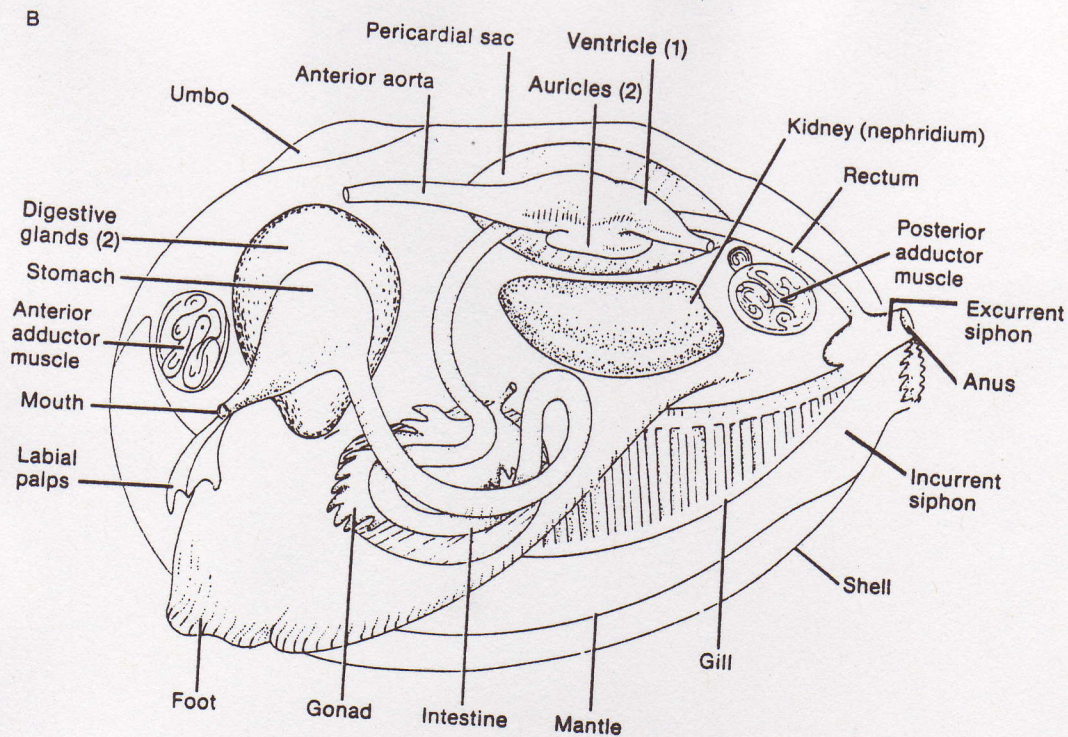
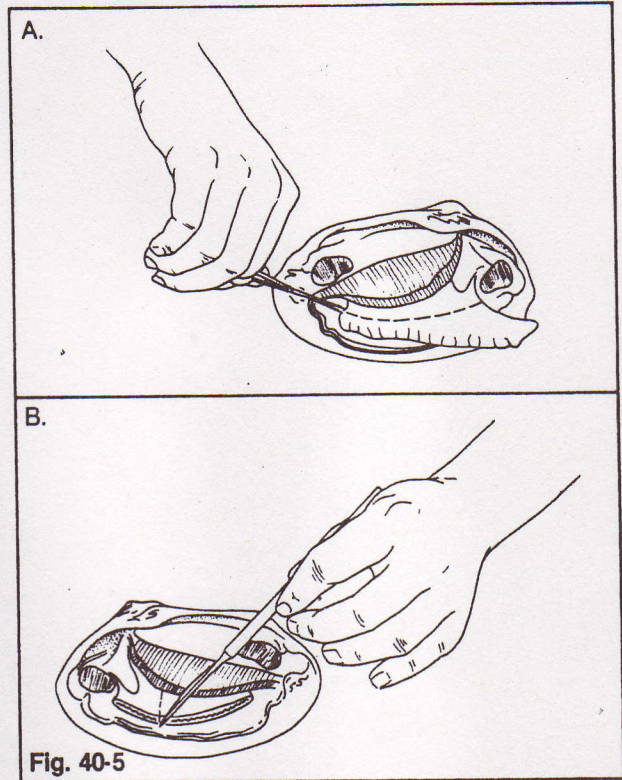


Locate the visceral mass. In order to study the visceral mass in detail, remove the gills and set them aside in your dissecting tray.

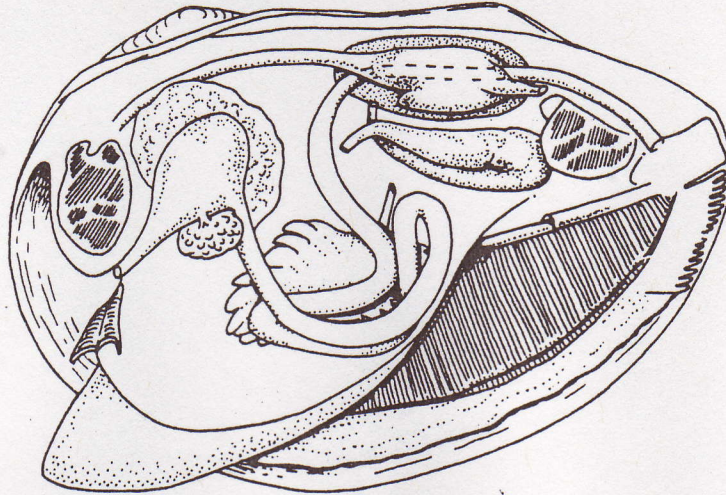
Then use a pair of scissors to cut off the ventral portion of the foot as shown in the diagram to the right. With a scalpel, carefully cut the remaining portion of the foot into right and left sides. Now it is time to explore. Some of the organs below will be easy to find on your specimen and some of them will be very difficult. It depends on the quality of your specimen and the skill you impart. See what you can find....The diagram at the bottom of the page might prove helpful.

With the foot removed, locate the following structures:

- reproductive organs, a spongy reddish mass;
- the saclike stomach near the mouth;
- the digestive gland, a light green mass surrounding the stomach;
- the coiled intestine leading from the stomach to the anus near the excurrent siphon;
- the pericardial cavity, an area between the visceral mass and the hinge;
- the heart contained within the pericardial cavity;
- the kidneys, spongy brownish organs below the pericardial cavity.



On the diagram below, label each of these parts: visceral mass, reproductive organ, stomach, anus, digestive gland, intestine, anus, pericardial cavity, heart, and kidneys.



Follow your teacher's directions for storing the clam for further use or properly disposing of the clam and its parts. Thoroughly wash, dry, and put away your dissecting tray, scalpel, probe, scissors, and any other equipment you may have used. Wash your hands with soap and water.

Name the three basic types of mollusks and give an example of each (use your textbook).

1. _____
2. _____
3. _____

How are mollusks classified (which phylum)? _____

What structures hold the two shells together in a bivalve mollusk? _____

What type of feeder is the clam? _____

As water goes through the clam's body, what does it bring in? _____ and _____

As the water goes through the clam's body, what does it take out? _____

Reproduction

Most mussels and clams are male or female; a few species are hermaphroditic. The reproductive cycle in these organisms is quite interesting in that the juvenile stage is parasitic on fish. The eggs are released into the cavity of the gills where fertilization takes place. Each zygote then develops into a larva, called a glochidium. The larvae stay within the gill through the winter and are released into the water the following spring. If they come into contact with a fish, a contact stimulus causes them to close their valves and thus become attached to the gills or the fins of the fish host.

What is the advantage of their being attached to the gills or fins? _____

The tissue of the fish reacts by growing around the larva. After several weeks, the parasitic larval form is released and begins a free-living existence.

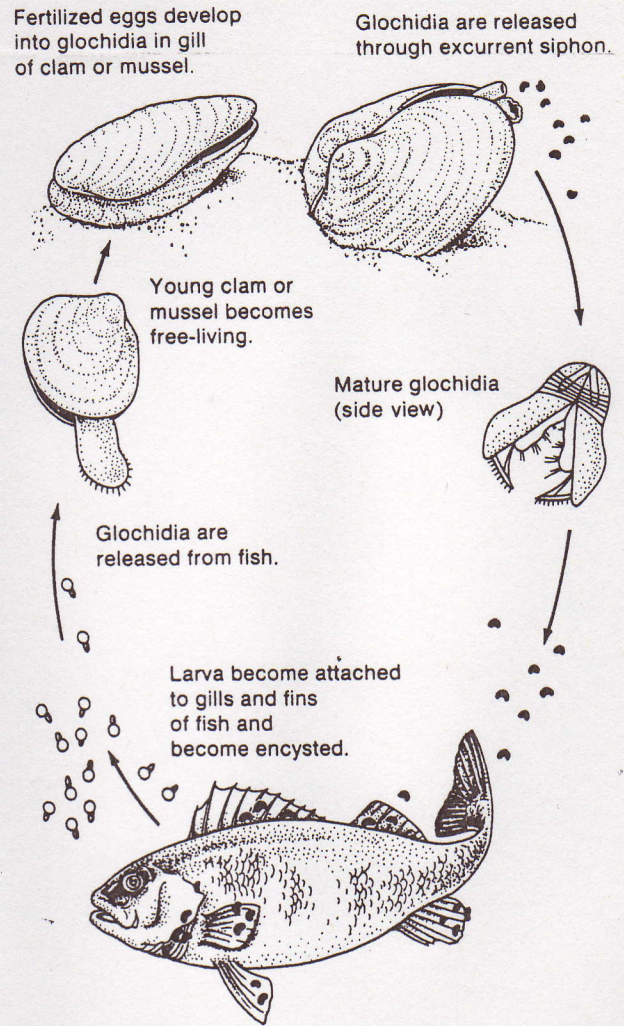


FIG. 34-4
Life cycle of a clam or mussel.

CLAM: EXTERNAL STRUCTURE.

VALVE★

OUTER LAYER_A

MOTHER-OF-PEARL LAYER:

PALLIAL LINE_F

HINGE LIGAMENT.

ANT. ADDUCTOR_D/RETRACTOR_{D'}/SCAR_{D²}

POST. ADDUCTOR_E/RETRACTOR_{E'}/SCAR_{E²}

MANTLE_{F¹}

FOOT_C

VISCERAL MASS_{C¹}

GILL PAIR_H

GILL PAIR_{H²}

MANTLE_{F²}

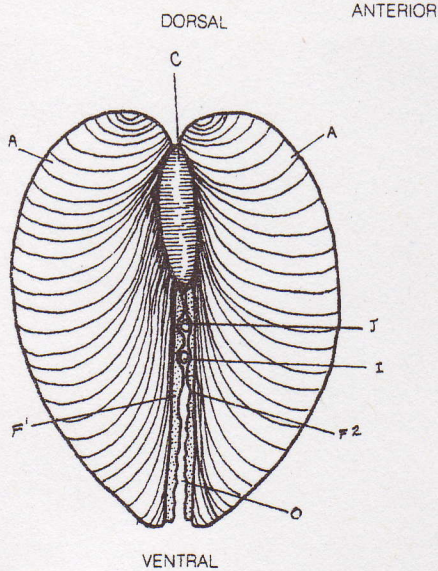
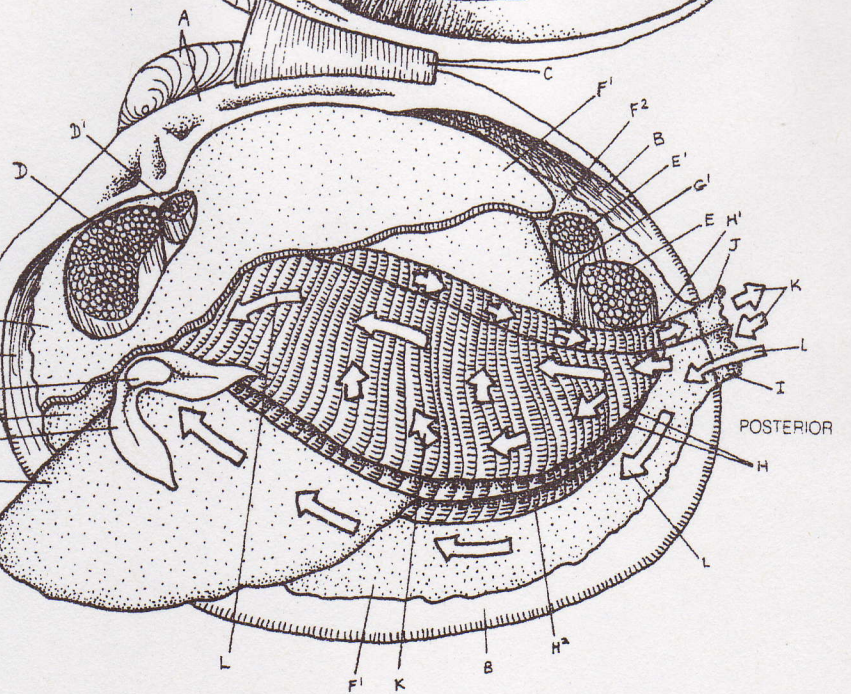
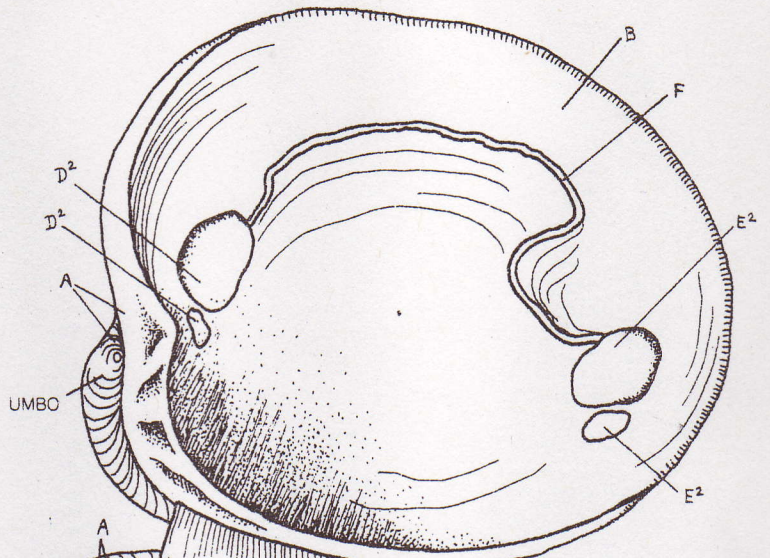
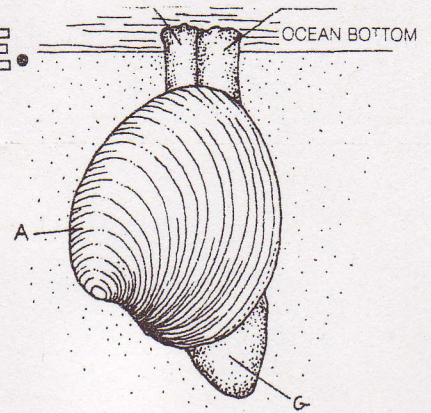
INCURRENT SIPHON.

EXCURRENT SIPHON.

MOUTH_M

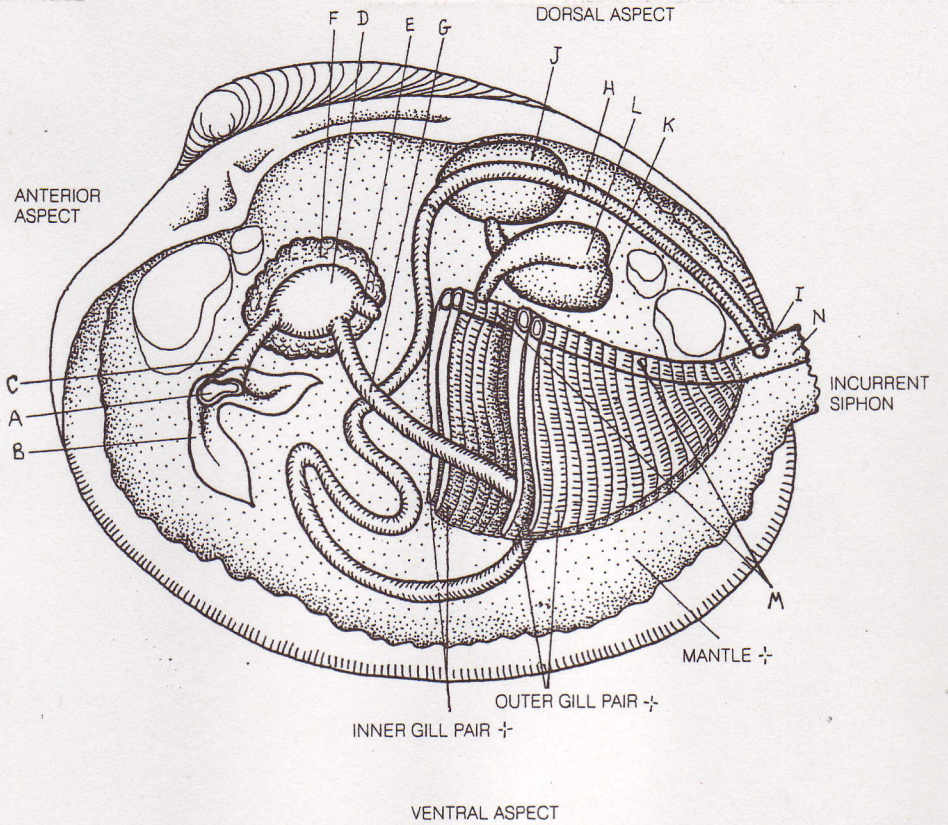
LABIAL PALP_N

MANTLE CAVITY.



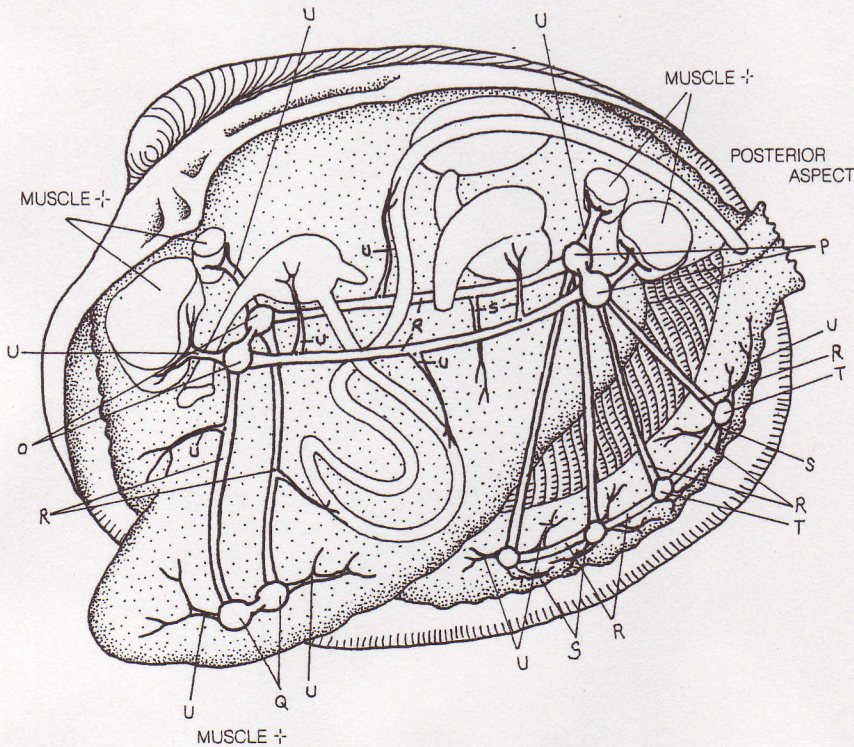
CLAM: INTERNAL STRUCTURE.

MOUTH_A
 LABIAL PALP_B
 ESOPHAGUS_C
 STOMACH_D
 STYLE SAC_E
 DIGESTIVE GLAND_F
 INTESTINE_G
 RECTUM_H
 ANUS



PERICARDIAL SAC_J
 NEPHRIDIUM_K
 BLADDER_L

EXCURRENT SIPHON_N



GANGLIA
 CEREBRAL_★
 VISCERAL_P
 PEDAL_Q
 NERVE TRUNK_R
 SENSORY NERVE_S
 SENSORY RECEPTOR_T
 MOTOR NERVE_U