

Name _____

THE CLAM

Clams are economically and ecologically important. They have evolved highly developed mechanisms for survival in the sea. Many of the mechanisms relate to straining and sorting microscopic food material suspended in the water. The gills of the clam serve a dual purpose: (1) to provide oxygen to the organism and (2) to move food particles toward the mouth. This is a "ciliary mucoid feeder" or organism that uses hair-like cilia combined with mucus secretions to catch microscopic food particles and pass them on to the mouth. To aid this process, the clam circulates water in through the incurrent siphon, over and under the gills, and out through the excurrent siphon.

PURPOSE:

The purpose of this lab is to observe the body plan of the clam and the extreme modifications of the various members of this phylum which includes the snails, slugs, lams, chitons, squids, nautili, and octupi.

MATERIALS:

Clam Dissecting Kit Microscope slide Microscope Stain (Methylene blue)
Specimen mollusks

PROCEDURE:

USE THE DRAWINGS TO HELP LOCATE THE ORGANS

I. A. Study the shell of the clam and note that it consists of two valves hinged together along the dorsal side. On the anterior part of each valve is a swollen region, the umbo. Concentric lines extend outward from the umbo and represent lines of growth, much like the growth rings of a tree. The growth lines are a result of non-uniform growth and are more closely spaced during winter growth than in summer. According to this theory, each set of close rings and wide rings represent a year's growth.

1. Estimate the age of the clam you are studying: _____

2. Changes in the rings can also be produced by sudden changes in temperature, lack of food, disease and other stress. Based on this, is your clam probably older or younger than your estimate of age? _____

Explain your

answer. _____

B. The valves (shell) are held together by two large muscles located on opposite ends of the shell. To open the clam, **CAREFULLY cut these muscles by inserting the scalpel between the shell and cutting in the direction where the shells are joined together.**

3. What is the shape of the muscles you cut? _____

C. As you open the shell you should see the mantle, the membrane next to the shell. Near the posterior end, the mantle thickens and forms the siphons which the water enters (the incurrent siphon) and water exits (the excurrent siphon).

4. Describe the location of each siphon(top/bottom). _____

D. **Remove the mantle layer from a part of one valve.** Note the smooth, fine grained inner surface of the valve. The shell lining is called mother of pearl.

5. What is the advantage to having this smooth inner surface? _____ Locate the

large muscular structure which makes up a large part of the body. This tissue is known as the foot. Locate the gills which hang down into the mantle cavity .

6. How many gills are there? _____

F. Dorsal to the gills is the pericardial sac that encloses the heart. **Carefully cut open this sac and locate the heart.** The heart has three chambers, 2 lateral atriacles and one ventricle. Cut away the gills and locate the kidney which appears as a dark-colored organ lying near the gills and just below the pericardial cavity.

7. What is the function of this organ? _____

G. Use scissors or a scalpel blade to cut a small piece of gill tissue and place the tissue on a clean microscope slide. Add a drop of water, put on a coverslip and examine under the microscope. Also examine the prepared slide of the clam gill.

8. What structures cover the outside of the gill? _____

9. What substance is being carried to the gills for disposal? _____

10. What substance is the blood picking up in the gills? _____

H. Most of the digestive system is located in the visceral mass. **Carefully cut the visceral mass into left and right halves.** The mouth is located between the palps and leads to a short esophagus and into an expanded stomach which is flanked on either side by two large digestive glands. **Remove these glands** and note where the stomach leads into the intestine that winds through the visceral mass and then passes into the pericardial sac as the rectum. The rectum empties into the excurrent siphon via the anus. Locate as many sections of the digestive tract as possible in your dissection.

11. The gills of the clam serve a food gathering function as well as a gas exchange function. The gills produce a mucous covering which traps small particles of food. How might ciliary movements aid the clam in feeding?

12. In which group of animals, free-swimming or attached marine animals, would you expect to find the "ciliary-mucoid" method of feeding more common? Why?

13. While the clam lives in the sand or mud, it obtains its food from the water above the bottom. How does the clam achieve this goal? _____

II. A. Examine the specimens of other mollusks. Answer the questions about them.

1. Examine the chitons. How many shells are found on these? _____

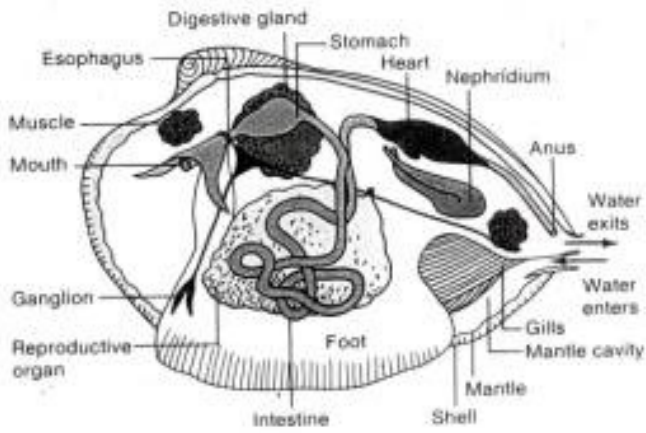
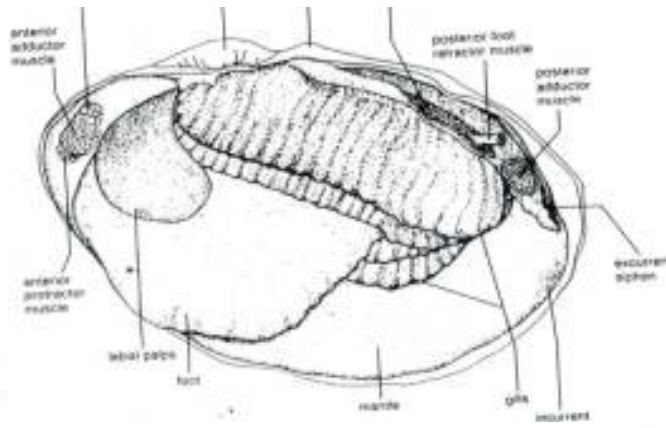
2. What type of substrate does the chitin shell look like it is adapted for?

Explain. _____

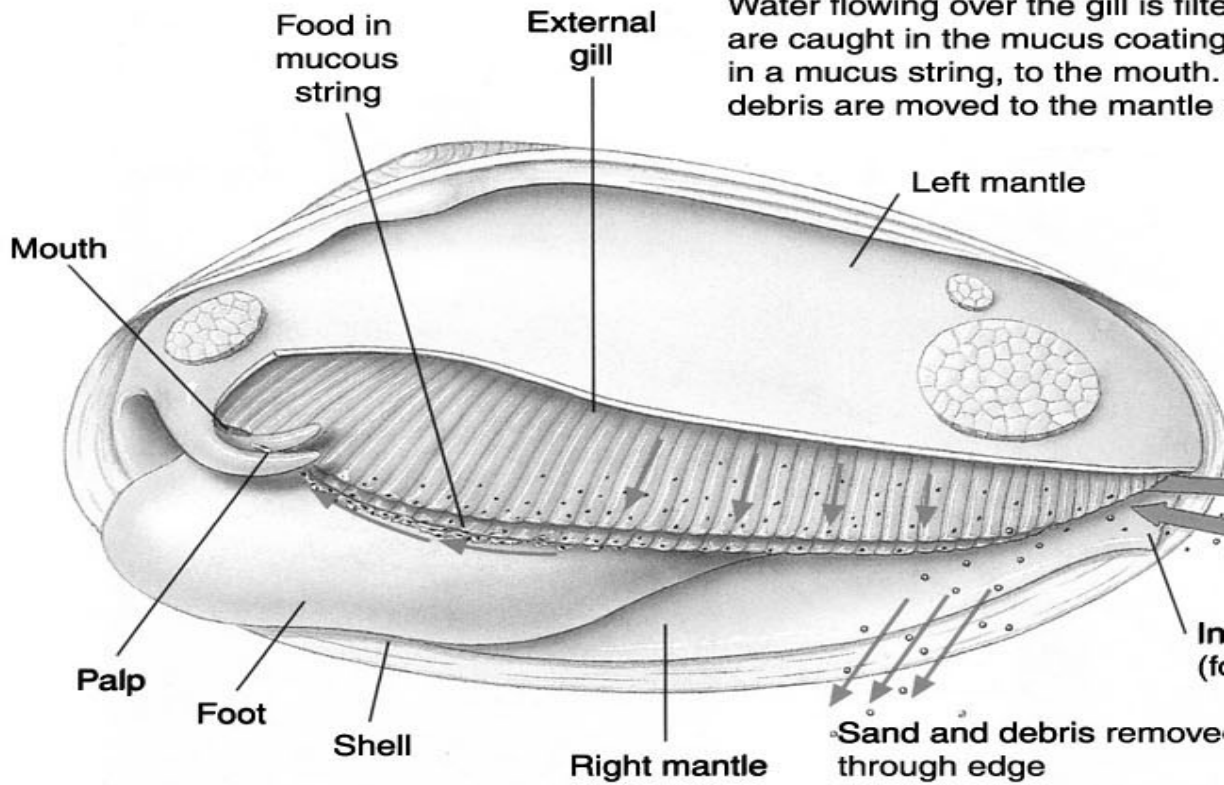
3. Examine a representative of the Cephalopods (squids). How is this different from the clam you just dissected? _____

4. Examine some of the shells of gastropods. What difference do you see in these compared to the clam? _____

5. Examine the outer edge of the gastropod shell. This is the growing edge. Describe how the shell has grown starting from the apex (tip). _____

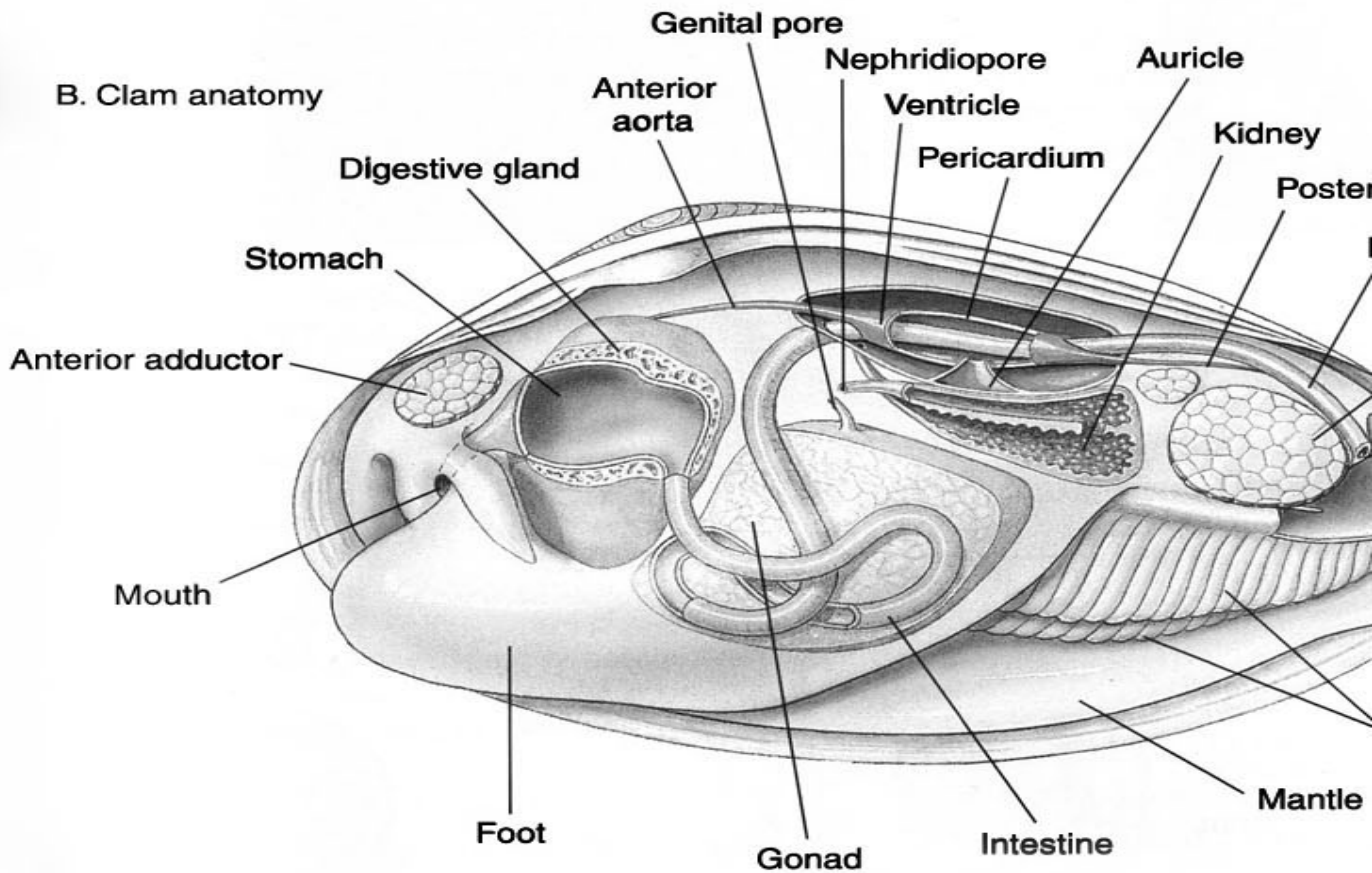


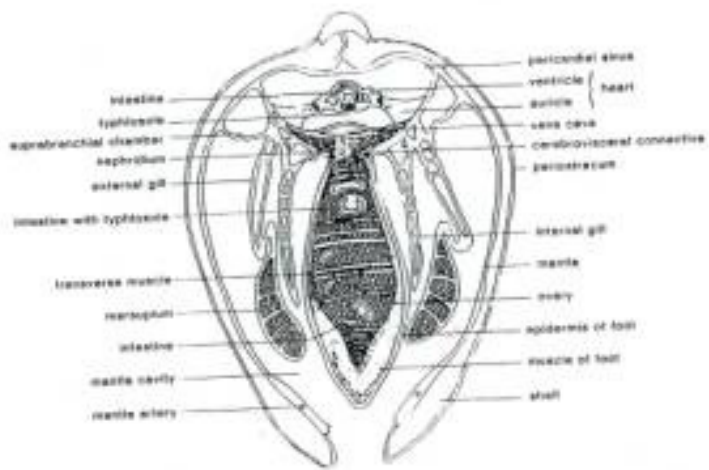
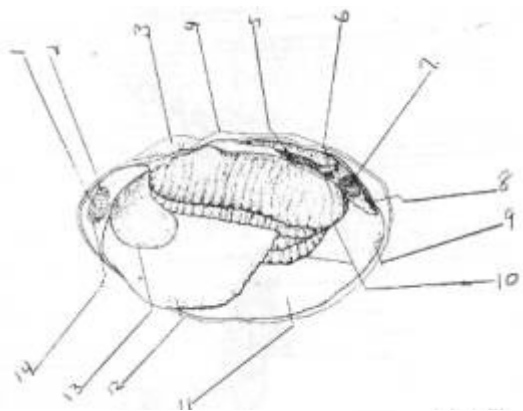
A. Feeding Mechanism of clam.

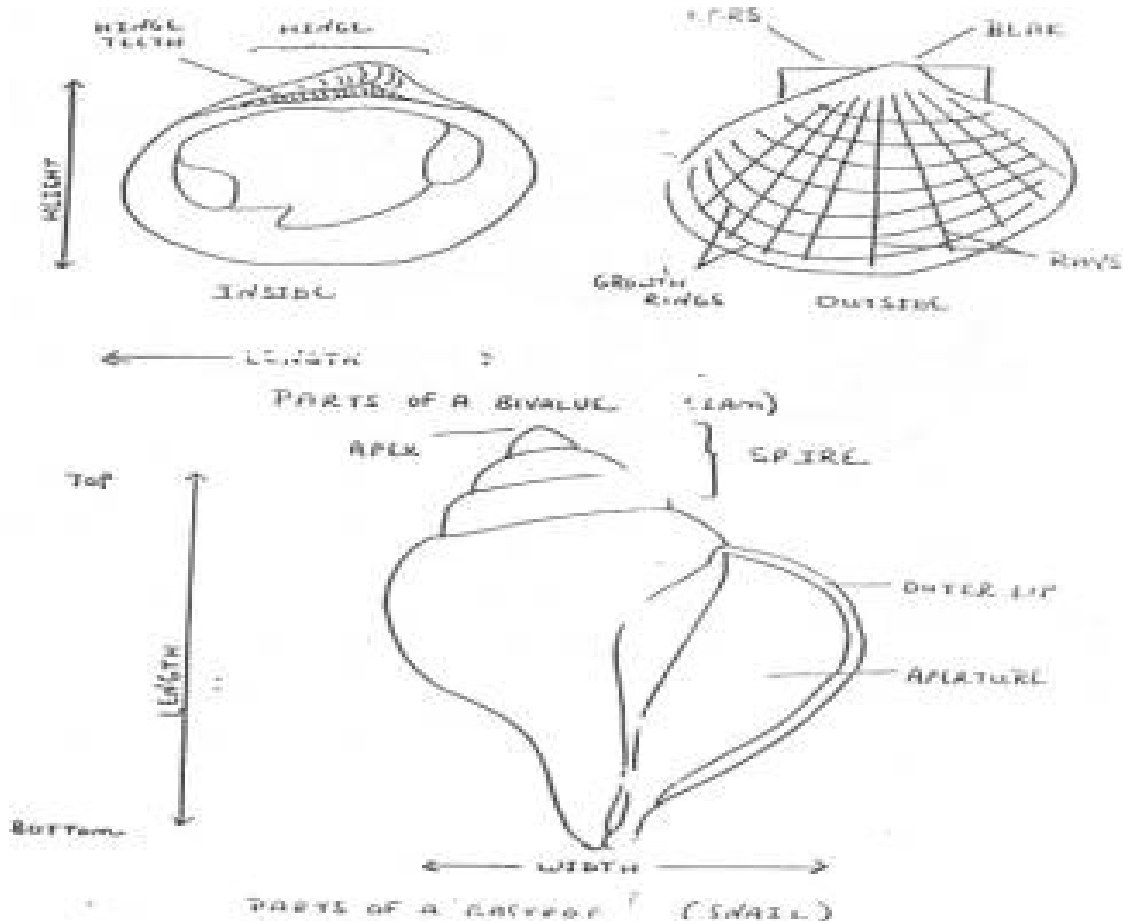


Water enters the mantle cavity from the right and is pulled forward by the beating of the gills. Food particles are caught in the mucus coating in a mucus string, to the mouth. Sand and debris are moved to the mantle edge and removed through the edge.

B. Clam anatomy







Shell Lab

1a	Shell had two halves and you have only half of it (bivalve)	GO TO NUMBER 2
1b	Shell is a snail shell and does not have two halves (gastropod)	GO TO NUMBER 11
2a	The shell's hinge has a straight row of many tiny, evenly spaced "teeth"	GO TO NUMBER 3
2b	The shell's hinge does not have "teeth," but may have points or scars where the hinges join; or the hinge may	GO TO NUMBER 4

	not be visible at all	
3a	The hinge is straight (and the shell has brown zebra-like stripes)	<i>TURKEY WING</i>
3b	The hinge is not completely straight (shell is white)	<i>ARK SHELL</i>
4a	Part of the hinge seems to be rolled outward (and the shell is white with many ribs)	<i>ANGEL WING</i>
4b	No part of the hinge rolls out.	GO TO NUMBER 5
5a	Shell is much longer than it is high (check diagram for difference between length and width); or may have a wedge shape	GO TO NUMBER 6
5b	Shell is not much longer than it is high it is more round or oval	GO TO NUMBER 8
6a	Ends of the shell are blunt; shell very rectangular in shape	GO TO NUMBER 7
6b	Ends of the shell are rounded; shell is wedge-shaped; shell is no longer than one inch	<i>FLORIDA COQUINA</i>
7a	Shell is <u>more than</u> four times as long as it is high (and looks like an old-fashioned razor)	<i>JACKKNIFE or RAZOR CLAM</i>
7b	Shell length is less than four times the height (and the beak is almost in the center)	<i>TAGELUS</i>
8a	Shell has rays	GO TO NUMBER 9
8b	Shell does not have rays	GO TO NUMBER 10
9a	Hinge line has ears	<i>SCALLOP</i>
9b	Hinge line does not have ears	<i>COCKLE</i>
10a	Shell is fragile, no hinge is visible, and you can almost see through it	<i>JINGLE SHELL</i>
10b	Shell is not as above, but has concentric growth rings	<i>DOSINIA</i>
11a	Shell is fairly flat and dish-like	GO TO NUMBER 12
11b	Shell is not as above (more round in cross-section)	GO TO NUMBER 14
12a	Shell is coiled (but only at one end)	GO TO NUMBER 13
12b	Shell is not coiled (and is shaped like a small, low cone)	<i>LIMPET</i>
13a	Shell has a deck or shelf inside	<i>SLIPPER or BOAT SHELL</i>
13b	Shell not as above, but has a row of several	<i>ABALONE</i>

	open holes)	
14a	Shell has visible spire at top (although it may be tiny)	GO TO NUMBER 15
14b	Shell is smooth and has no spire at all	GO TO NUMBER 21
15a	Aperture is roundish or oval in outline (it is less than twice as long as it is wide)	GO TO NUMBER 16
15b	Aperture is not round, but is at least twice as long as it is wide	GO TO NUMBER 18
16a	Shell is compressed and has a deep umbilicus (a large, funnel-shaped hole underneath)	<i>SUNDIAL</i>
16b	Shell not as above	GO TO NUMBER 17
17a	Shell Is globular (ball-shaped) and has smooth surface	<i>MOON SNAIL</i>
17b	Shell Is top-shaped and dark in color	<i>PERIWINKLE</i>
18a	Shell has very flattened spire (and is quite thin, with a criss-crossed surface pattern)	<i>FIG SHELL</i>
18b	Shell not as above	GO TO NUMBER 19
19a	Shell has knobs on spire (or where spire begins)	GO TO NUMBER 20
19b	Shell has no knobs on spire	<i>OLIVE SHELL</i>
20a	Aperture is much wider at the top than the bottom	<i>KNOBBED WHELK</i>
20b	Aperture is wide all the way down and has a notch at the bottom	<i>CONCH</i>
21a	Teeth are present inside aperture (and outer lip of aperture curls inward)	<i>COWRIE</i>
21b	Teeth are not present inside aperture	GO TO NUMBER 22
22a	Shell has a ridge running at right angles to aperture (and is creme-colored with orange edges)	<i>FLAMINGO TONGUE</i>
22b	Shell does not have a ridge across the back; but the apex (where the spire should be) has a small hole in it	<i>BUBBLE SHELL</i>

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

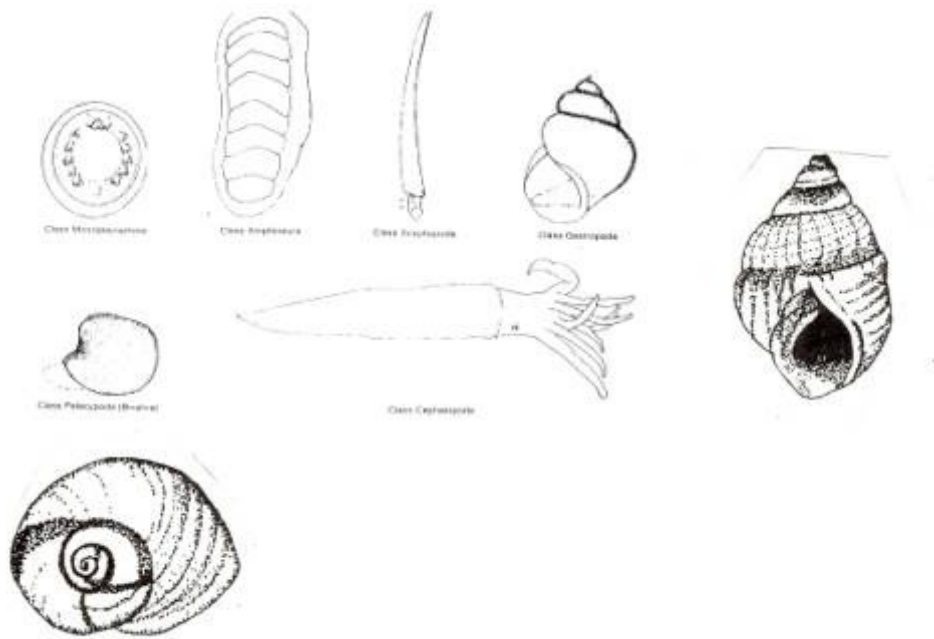
7. _____

8. _____

9. _____

10. _____

Name the following mollusks using any information you can find the lab





E. Oyster shell



C. Common mud snail



A. Flat-coiled land snail



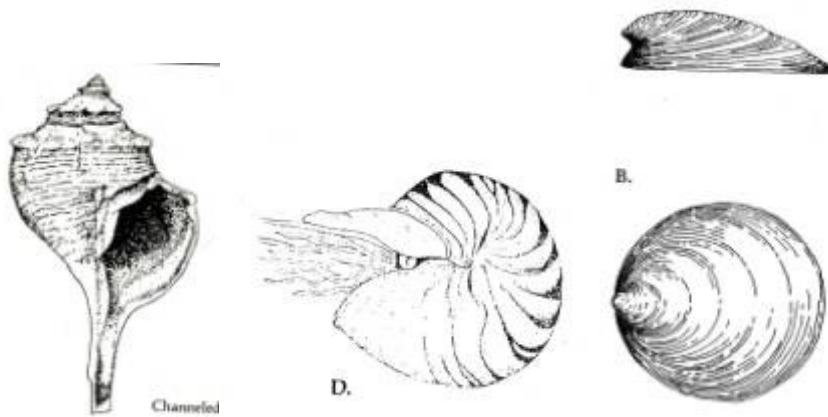
B. Common pond snail



A.



C.



Squid Dissection

<http://www.biologycorner.com/worksheets/squid.htm>

External Anatomy:

1. Locate the water jet. The water jet is found on the **ventral** side of the squid.

2. The tentacles and arms are attached to the head of the squid. Locate and compare the two.
3. Find the two large eyes on the head of the squid.
4. Locate the body, which is covered by the mantle, and fin.
5. Spread apart the tentacles and use a probe to feel inside the mouth. The jaws (or beak) can be felt inside the mouth. (At the end of the lab you may try to remove the jaws if you have time)

Questions

1. How many arms does the squid have? How many tentacles?
2. Based on the structure of the arms and the tentacles, describe how you think their purposes differ. What do the arms do and what do the tentacles do?
3. What is the function of the waterjet? If water shoots out the water jet to propel the squid in the water, which direction does the squid swim-head first, or foot first?
4. Name two external features that are adaptations for the squid's predatory life.
5. Name two traits that the squid shares with other mollusks.

Internal Anatomy

Procedure: Turn the squid **ventral** side up. Pull the mantle up with the scissors where the water jet is, it should be loose and easy to pull up. Use scissors to cut from the water jet to the fins. Open the mantle to expose the structures inside.

1. Find the inksac, this is a small dark sac near the water jet.
2. Find the esophagus, this is best found by looking into the mouth and seeing where it leads, use a probe to poke within the mouth.
3. To find the stomach, follow the esophagus toward the posterior.
4. The anus empties into the water jet, use scissors to cut the water jet down the center so you can see the small opening of the anus.
4. Locate the gills, these are feathery structures that may be hidden under other things, there are two of them on each side.
5. Follow the gills toward the interior to find an enlarged structure at their base, this is the gill heart
6. All the way toward the fin is a whitish or yellowish structure, this is the gonad. The male gonad is generally white, the female gonade is usually more yellow to clear.
7. Find the hard point at the end of the fin and gently grips it with forceps pulling away from the squid. In this way you should be able to remove in one piece the pen.

QUESTIONS

Use the descriptions above to label the squid. Use the underlined words above to help you label.

1. Is your squid is a male or female? How can you tell?

-

2. How many gills does the squid have?

-

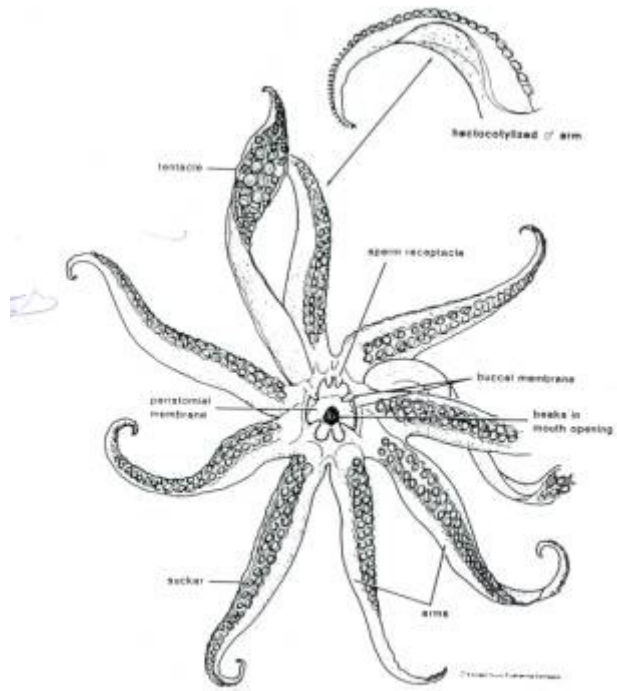
3. Where does the ink sac empty into and what is its function?

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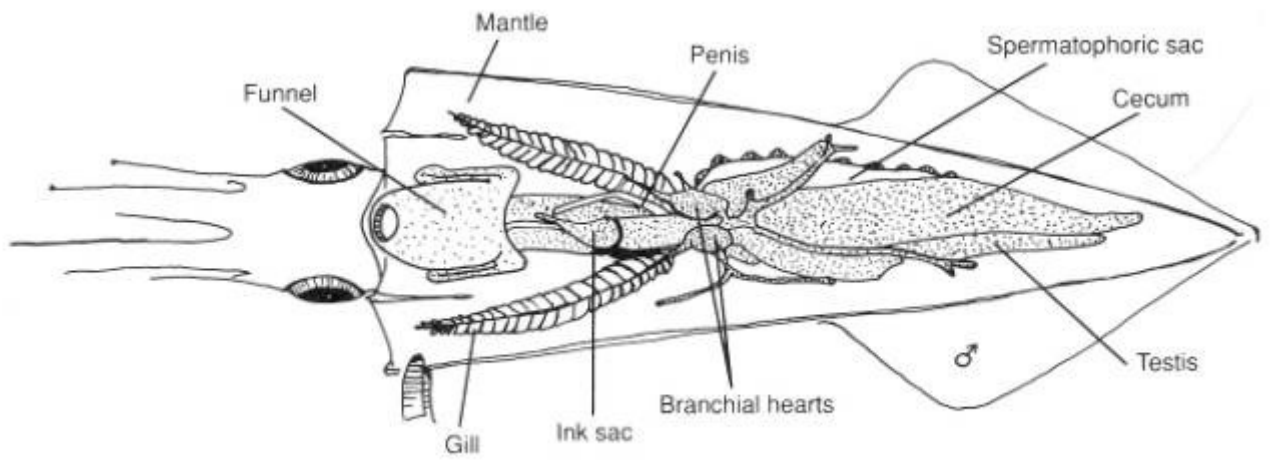
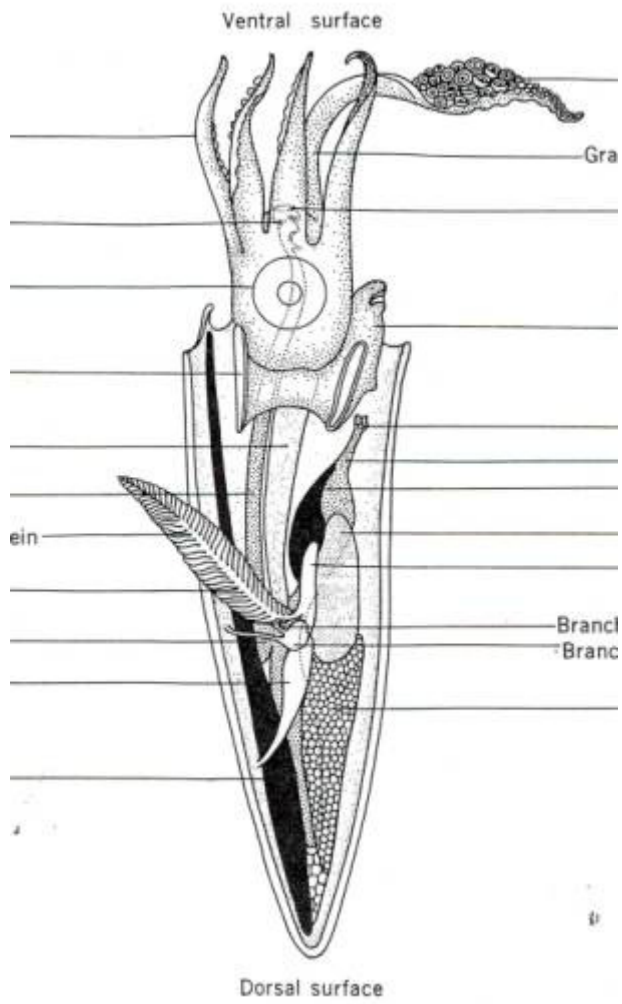
4. What is the function of the pen?

-

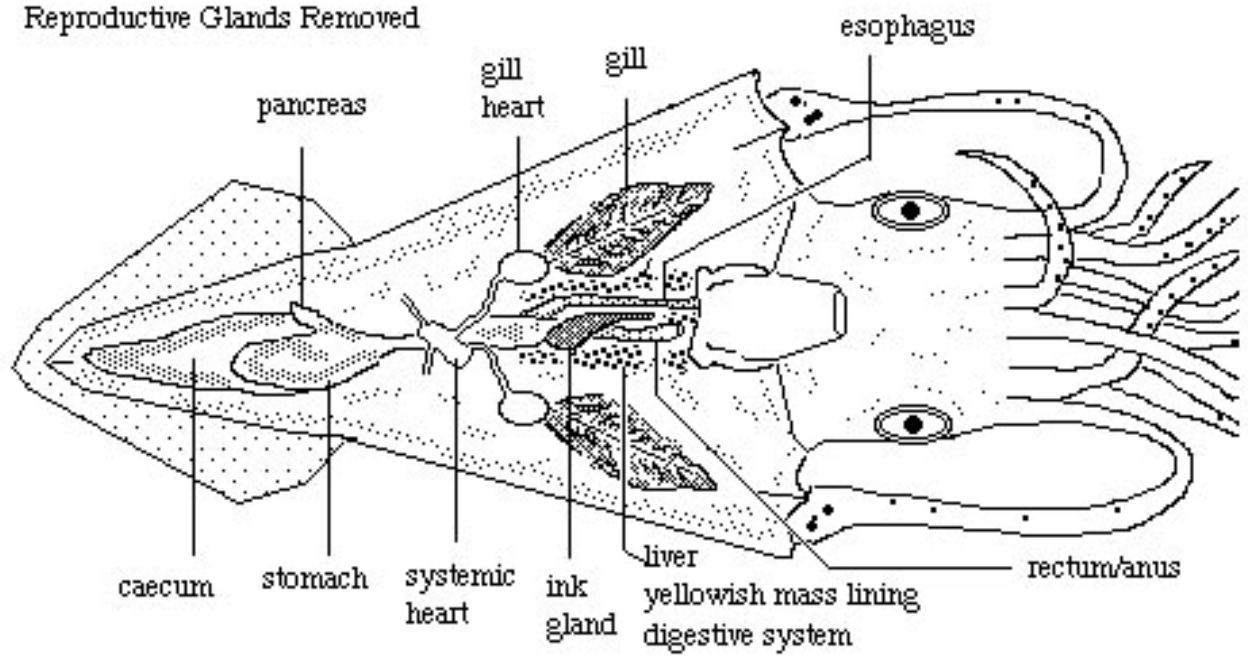
5. How do wastes exit the squid? (be specific)



Squid, ventral view of mouth area

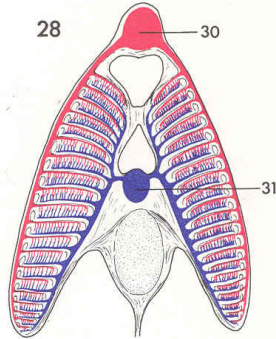
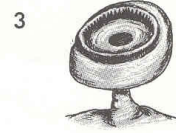
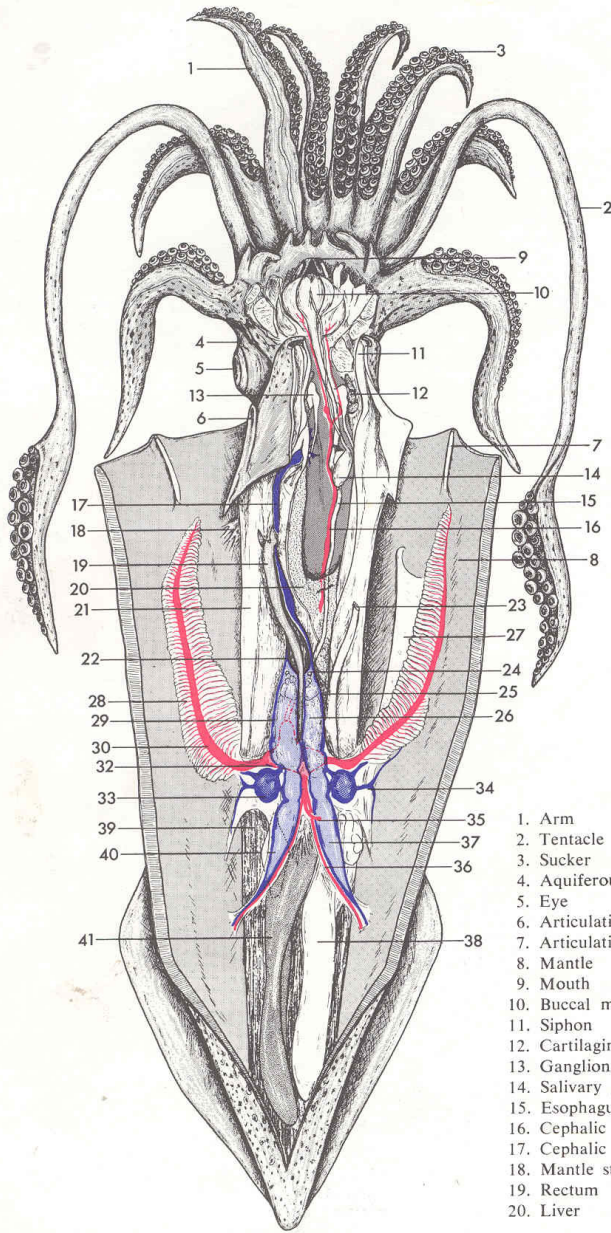


Reproductive Glands Removed

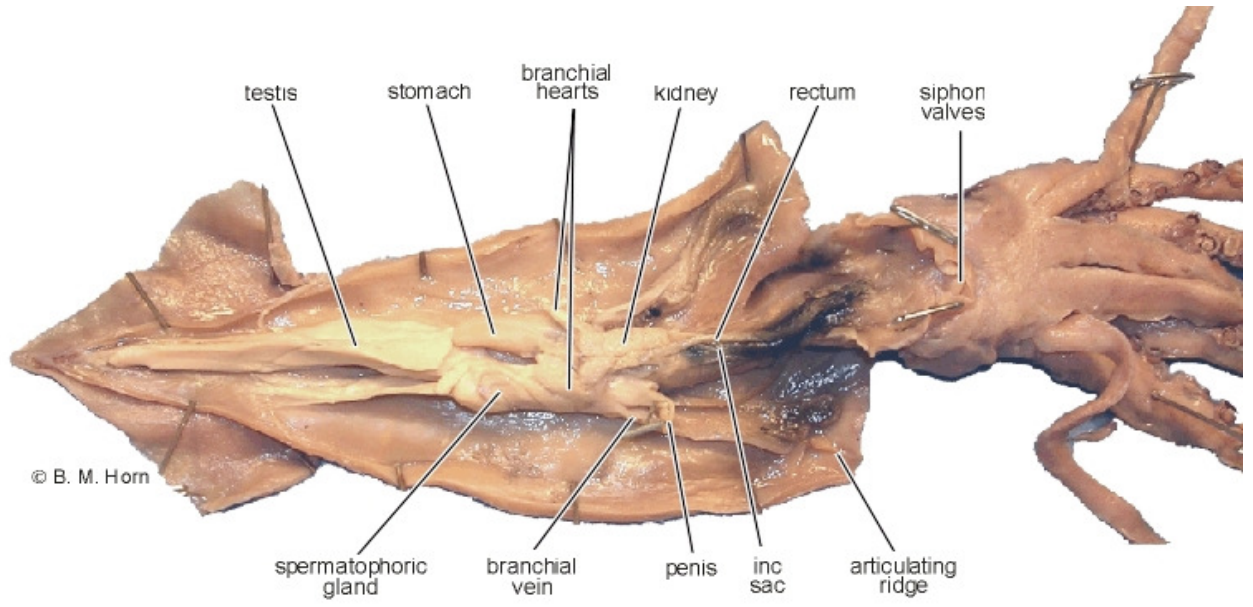


SQUID ANATOMY 1.

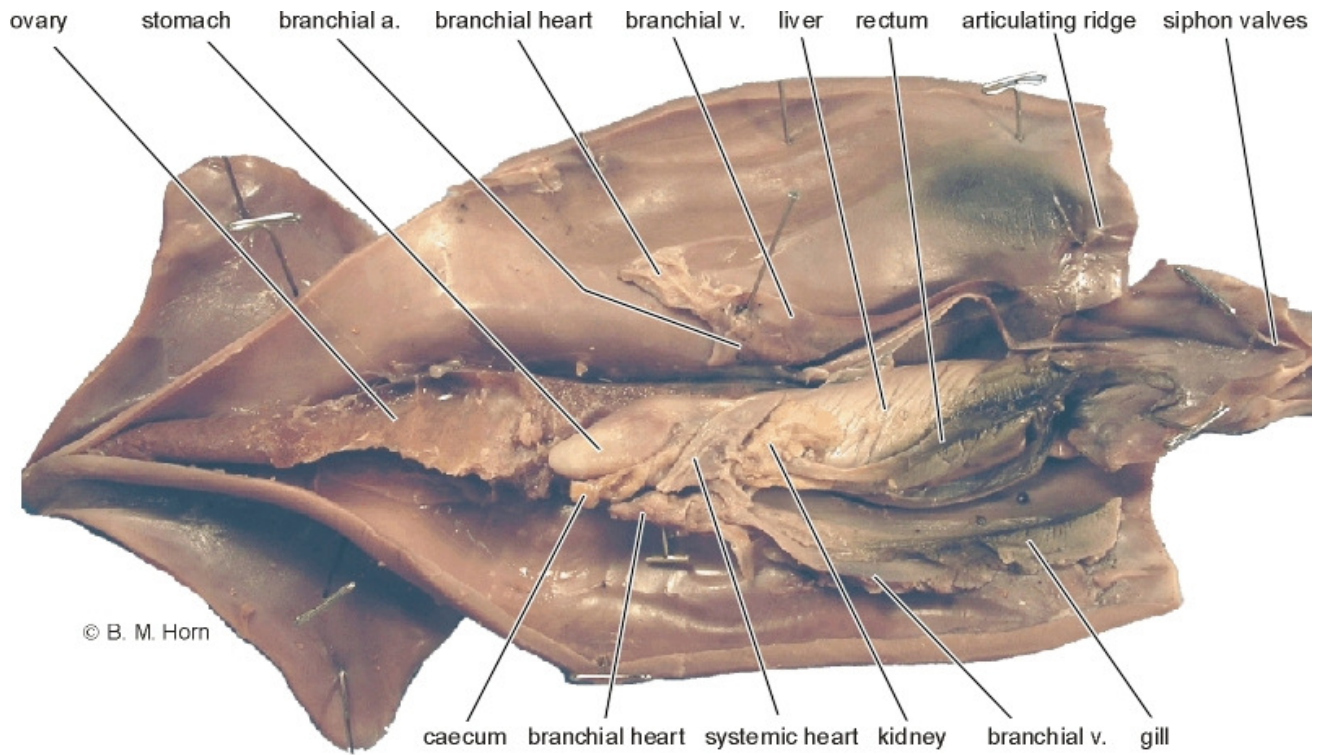
General



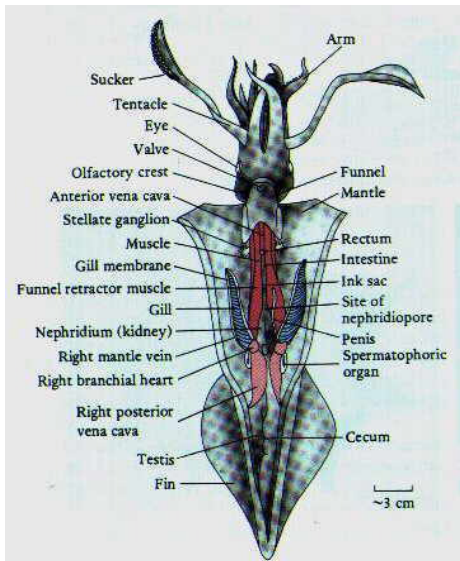
- | | |
|--------------------------------|-------------------------------|
| 1. Arm | 21. Siphon retractor muscle |
| 2. Tentacle | 22. Ink sac |
| 3. Sucker | 23. Genital opening |
| 4. Aquiferous pore | 24. Nephriopore |
| 5. Eye | 25. Kidney |
| 6. Articulating cartilage | 26. Pancreas |
| 7. Articulating ridge | 27. Gill-mantle membrane |
| 8. Mantle | 28. Gill |
| 9. Mouth | 29. Vena cava (nephridial) |
| 10. Buccal mass | 30. Efferent branchial vein |
| 11. Siphon | 31. Afferent branchial artery |
| 12. Cartilaginous body (skull) | 32. Systemic heart |
| 13. Ganglion | 33. Branchial heart |
| 14. Salivary gland | 34. Median mantle vein |
| 15. Esophagus | 35. Medial mantle artery |
| 16. Cephalic aorta | 36. Lateral mantle artery |
| 17. Cephalic vena cava | 37. Posterior vena cava |
| 18. Mantle stellate ganglion | 38. Gonad |
| 19. Rectum | 39. Pen |
| 20. Liver | 40. Stomach |
| | 41. Caecum |



Male Squid (*Ommastrephes*) - Dissection 1



Female Squid (*Ommastrephes*) - Dissection 4 - left branchial heart & gill reflected



FYI SHELL COLLECTING

Many people find shell collecting a fascinating hobby. They spend leisure time hunting and cleaning shells, and mounting them in attractive displays. Some collectors become so interested in their hobby that they begin a scientific study of shells which is called *CONCHOLOGY*. Hundreds of amateur and professional shell collectors exchange ideas, information, and shells through shell clubs in cities in almost every country.

Beginning collectors gather all the shells they can find, even broken and discolored ones. Serious collectors replace poor shells with those of the finest quality as soon as they can. The best quality shells are live shells--- those taken with the small animal still inside. These shells have their natural color and luster because they have not been bleached by the sun or worn down by sand. However, people should be careful when they collect the living animals. Some cone snails of the Indian Ocean and southwest Pacific have a poisonous sting. The next best quality are recently dead shells. Storm waves or outgoing tides leave them on the beach. The poorest shells are dead shells. Most shells found on beaches are dead shells. The sun has faded their colors, and sand and water have dulled their luster.

Searching For Shells

You can find the best sea shells during the night and in the early morning hours at low tide. Use a strong flashlight or lantern to light your way. Look for clams buried in the sand, snails sheltered under rocks, scallop hiding in eelgrass.

As you gather shells, write down the date and the exact location where you find each one. Keep these notes with the shells until you add them to your collection. Then put the information on labels that identify the shells.

Cleaning Shells

The best and simplest way to clean live mollusk shells is to boil them. Put the shells in a pan of water, bring to a boil slowly to a boil, and boil for 5-10 minutes. With luck, the meat will fall out. Use a twisted safety pin to pull out snail meat. Save the snail's operculum because it belongs with the shell. Wash the shells with soap and water, and place them on paper to dry in the sun. Very small live shells can be soaked in alcohol for several days, and the dried in the sun.

Displaying Shells

You can mount your shells on cardboard, or you can put them on cotton in flat boxes with glass or plastic covers. Some collectors use a cabinet with large drawers to store their shells. A square cardboard tray holds each kind of shell. A label bears the name of the shell, and tells where, when, and by whom it was collected. The label also gives information about the shells surroundings, such as grass, , mud, sand, or depth of water. A logbook serves an index to the shells in the collection and gives further information about them.

Every part of the shell helps identify it. For example, the number and location of the teeth in a shell hinge show that the mollusk belongs to a certain family of clams. The color, ridges, and shape of the snail shell identify the group to which it belongs. Each part of a shell has a special name, such as lip, ribs, or shoulders.

A shell collection should be arranged so that it belongs with the shells of the simplest kinds of mollusks. Many shells have popular names, such as mouse cone or Florida cone. These names may vary from one country to another, and even from one area to another. For this reason, collectors and biologists identify the shells by their scientific names.

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