PHYLUM MOLLUSCA

The mollusca include chitons, clams, oysters, snails, slugs, squids, nautilus and octopuses. The majority of the 80,000 + species are marine, but a number are freshwater or terrestrial. Members of this phylum have soft, unsegmentated bodies usually enclosed, wholly or partly, in a shell composed of calcium carbonate (CaCO\textsubscript{3}) and protein. In several groups (i.e. gastropoda and cephalopods) the shell is reduced or absent. The typical molluscan body consists of three major parts: the anterior head, a ventral foot and a dorsal visceral mass. This body plan varies greatly resulting in several diverse classes of molluscs.

Class: Gastropoda

Snails, slugs, whelks, limpets and opistobranchs are included in this class. Opistobranchs are a diverse and specialized group of gastropods with a reduced or absent shell. A typical opistobranch known as nudibranchs are among the most colorful invertebrates in the world. Gastropods have a long, flat foot, a distinct head with eyes and tentacles, and a visceral mass usually housed with in a spiral shell. Examine a variety of gastropod shells.

The common European brown snail, *Helix aspersa*, is placed in the subclass Pulmonata (along with the garden slug) and is an air breathing, terrestrial form with lungs instead of gills (hence the name Pulmonata). Examine a live specimen and locate the three major body regions. Notice the two pairs of tentacles and look for the pulmonary aperature on the side of your specimen just under the edge of the shell. This constricting aperture opens into the lungs. The shell is coiled as a result of torsion. Find out more about torsion in you textbook.

Study Questions

1. Describe how the snail moves across a surface.
2. Gently touch your snail in several places and describe what happens
3. What is torsion in gastropods?

Figure 1. Draw *H. aspersa* 10 cm long and label all visible anatomy.

Class: Polyplacophora

This class includes the chitons, an entirely marine group found in rocky habitats. Their oval-oblong body is covered by eight overlapping plates and equipped with a muscular ventral foot.

Figure 2. Draw a dorsal view of a chiton 10 cm long and label.
**Class: Scaphopoda**

Commonly known as tusk or tooth shells, the scaphopoda are elongated dorsoventrally and enclosed in a tubular shell open at both ends. They frequent deep, muddy ocean bottoms along the north Pacific coast. Aboriginal Americans utilized these white shells as a form of currency known as “wampum”.

**Figure 3.** Draw a tusk shell 10 cm long.

**Class: Bivalvia**

Formerly known as Class Pelecypoda, Bivalvia includes clams, oysters, mussels and scallops. Enclosed within two shells, the head is much reduced and the body is laterally compressed. The shells are hinged dorsally and are often mirror images of one another. Bivalves are represented by both marine and freshwater species. After examining the anatomy of the bivalve shell, a freshwater clam will be available for dissection.

**External and internal anatomy of the shell.** Obtain a Pismo clam shell look for the 
**elastic hinge ligament** and **hinge teeth** on the dorsal surface and note the concentric growth lines on the shell surface. A dark, horny protein, the **periostracum**, covers the outer surface of the shell. Anteriodorsally is a raised area called the **umbo**, representing the oldest part of the shell. Articulated both valves and find the siphon openings at the posterior edge. Inside the shell notice the circular **anterior** and **posterior adductor muscle scars**. Locate the **pallial line** and **pallial sinus**. When alive the hinge ligament holds the valves together securely while the adductor muscles maintain closure.

**Internal anatomy of a clam.** Place a preserved freshwater clam into a dissecting tray. The clams may have a wooden peg wedged between the two valves. If not, you will have to slip your scalpel between the valves along the ventral margin. Twist the scalpel handle wedging the valves open enough to insert a scalpel. Cut through each adductor muscle to open the clam. To accomplish this turn the clam so that the left valve faces up and slide a scalpel close to the left valve and cut each adductor muscle. Now lift up the left valve exposing the internal organs. Locate the **mantle**, a thin layer of tissue lining each valve attached along the pallial line. The **mantle cavity** is the space enclosed by the mantle. Locate the siphons; the **incurrent siphon** is ventral and the **excurrent siphon** is dorsal. Observe the **muscular foot** covered by a pair of **gills** on each. Seen from the posterior the gill appears as a pair of curtains covering the lateral sides of the foot. The **labial palps** are located at the anterior end of the gills. The **mouth** can be found at the anterior base of the palps.

The **heart** lies within a thin membranous sac, the **pericardial sinus**, located near the hinge ligament. The sinus is part of the coelomic cavity. **Nephridia** (kidneys) lie ventral to the heart and are a greenish or brownish mass embedded in mantle tissue. Most of the digestive system is embedded in the **visceral mass**. You will need to bisect this by first making a midsagittal cut through the foot and continue through the visceral mass. Locate the mouth, **esophagus**, **stomach**, **digestive gland**, and **intestine**. The **rectum** and **anus** can be seen near the excurrent siphon. Within the visceral mass, surrounding the intestine, are the yellowish **gonads**.
Study Questions

4. Explain how a clamshell grows in thickness and in diameter.
5. How does a pearl form?
6. Explain how clams reproduce
7. How do clams acquire air and ingest food. How is digestion accomplished?

Class: Cephalopoda

This class includes squid, octopus, cuttlefish and the nautilus. Cephalopods have large heads with conspicuous eyes and a mouth surrounded by eight or more fleshy arms. The elongated body may be enclosed by an external skeleton (Nautilus). The remaining cephalopods have an internal skeleton (developed to varying degrees) or completely lack a skeleton (octopus). Examine the various cephalopods displayed in class. There may be an opportunity to dissect a local squid, Loligo (see your instructor)

Study Questions

10. How can you distinguish between a gastropod shell and a Nautilus shell?
11. Compare the eye of a vertebrate and a cephalopod.