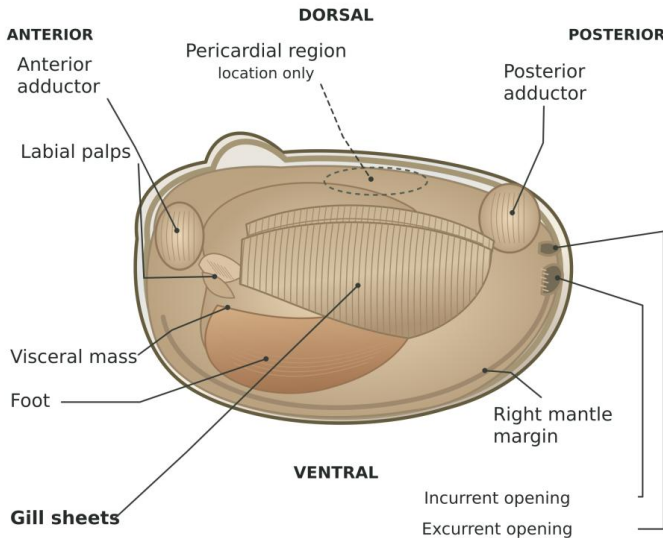


A Dissection Guide to the Clam

Explore the shell, discover the soft body, and connect structures with their functions.

A field guide for your dissection tray



Left valve and left mantle removed

Near-side gill sheets partly separated; far-side gills hidden.
Solid leaders identify surfaces; dashed leaders mark hidden regions.

Follow the specimen from protective shell to exposed tissues and deeper organs.

Your two landmarks

External: umbo beside the hinge. Internal: ridged gills beneath the mantle.

Explore the headings, figures, and numbered steps as you work through the pre-lab and dissection.

Video: Mr. E Science Clam Dissection, Parts 1 and 2.

Website: mrescience.com

Meet the clam

Classification

Kingdom Animalia • Phylum Mollusca • Class Bivalvia. A valve is one half of the shell; a bivalve has two valves. The soft body includes a mantle, muscular foot, and visceral mass containing internal organs.

This guide follows the freshwater mussel used in the classroom clam demonstration. Genus and species must come from the specimen supplier or a confirmed identification; the video alone does not establish them.

Genus and species: _____

Confirmed source: _____

Natural history

Freshwater mussels live in rivers, streams, ponds, and lakes. Many rest partly buried in sediment, with the posterior water openings exposed. The foot helps the animal burrow and reposition. Water passing through the gills supplies oxygen and carries small food particles.

Freshwater mussels occur in many parts of the world. The native country or region of this particular specimen depends on its species; use the supplier information rather than guessing from shell shape.

Native range of confirmed species: _____

Become familiar with the guide

Find the external and internal diagrams and the drawing checkpoints. Use the pre-lab to explore the relevant sections while watching both videos. You do not need to read this guide cover to cover as a book.

Materials and safety

Materials needed

Preserved clam; dissecting tray; goggles; protective gloves; scissors; teacher-approved scalpel; blunt probe; hand lens if available; ruler; paper towels; pencil and colored pencils; lab write-up; designated specimen disposal container.

Before handling the specimen

Wear goggles and gloves. Follow the teacher's instructions for the preservative used. Keep food and drinks away, and keep the specimen in the tray. Tell the teacher about spills, cuts, or irritation immediately.

Opening a resistant shell

A teacher must demonstrate or perform the initial opening. Never force a blade into a closed shell or use a scalpel as a pry bar. Keep fingers out of the cutting path. Stop and ask for help when the shell resists.

Preserve your evidence

Use shallow cuts and a blunt probe. Complete each drawing before removing the tissues it must show. A diagram helps you find structures; your drawing records your specimen, including differences in color and shape.

Three drawings: A external valve; B inside the empty valve; C exposed internal anatomy. Use "not visible" when a required structure cannot be identified.

External anatomy and orientation

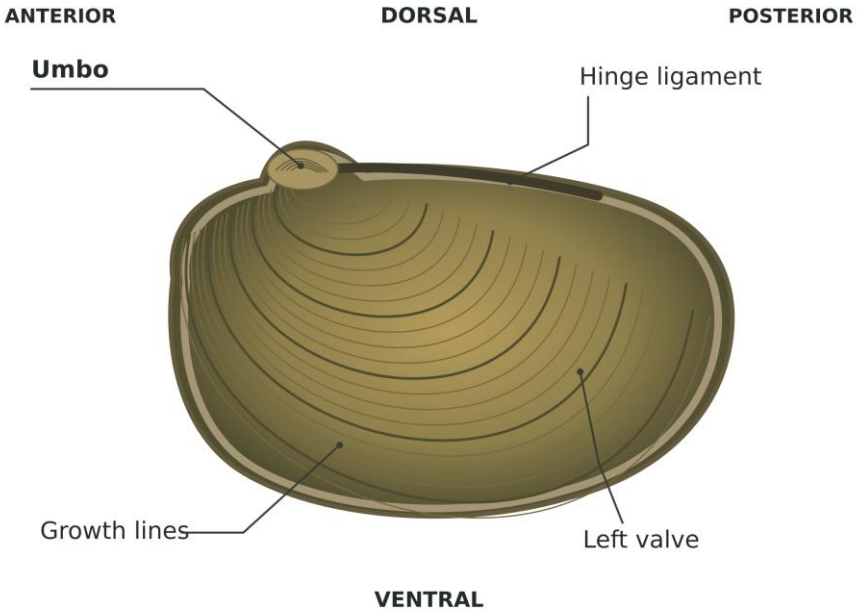
Part 1: approximately 0:44–4:59. Use the facing diagram.

1. Find the umbo, the raised older shell region beside the hinge. The umbo is the external landmark; it is not another name for the hinge.
2. Identify dorsal along the hinge and ventral along the opposite free edge. On the demonstrated specimen, the shorter end measured from the umbo is anterior; the longer end is posterior. Confirm this clue for your specimen.
3. Follow the video's orientation check: dorsal edge against the tray, ventral edge upward, anterior away from you, and posterior toward you. Identify the animal's right and left valves before rotating it. Its right and left do not change when you turn it.
4. Observe the growth lines. Shell material is added as the animal grows, but a visible line does not necessarily represent one year. Measure shell length from anterior to posterior in centimeters.

Drawing checkpoint A

Draw one exterior valve. Identify right or left in the title. Label dorsal, ventral, anterior, posterior, umbo, and growth rings. Use colored pencils to record the shell's actual colors.

External shell diagram



Exterior view • the ligament lies behind the umbo

Figure 1. Exterior of the left valve. The raised umbo is the external landmark. Shape and color vary with species and preservation.

Use the shell to orient the animal

Find the umbo, then the hinge along the dorsal edge. The elastic hinge ligament helps open the valves when the adductor muscles relax. Growth lines record shell growth; do not count them as years.

Complete Drawing A before opening. Turning this valve over reverses anterior and posterior on the page; compare Figure 2.

Opening and the empty valve

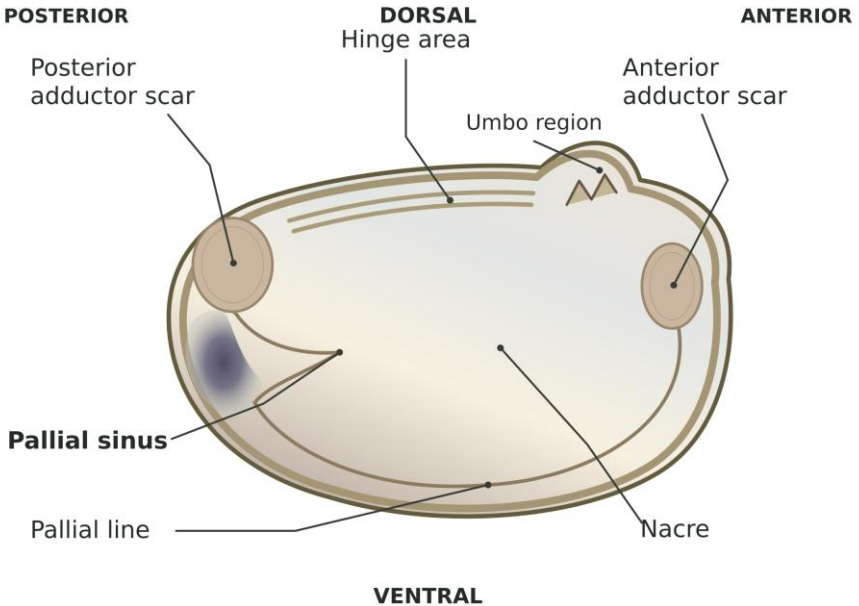
Part 1: approximately 5:03–11:01. Use the facing shell diagram after opening.

5. Rest the clam on its right valve, with the left valve uppermost. Have the teacher confirm orientation and safe access to the adductor attachments.
6. As demonstrated, keep the cutting tool against the inner shell surface while releasing the anterior and posterior adductor attachments. Do not plunge toward the soft body. Ask for help if access is unsafe.
7. Lift the left valve gently. Free its thin mantle attachment with a probe, trimming only as directed. Check remaining attachments instead of pulling harder. Have the teacher assist at the hinge if needed.
8. Set the removed valve inner surface upward. Reidentify dorsal, ventral, anterior, and posterior. Locate both adductor scars, the pallial line and any pallial sinus, the inner shell surface, and the umbo region.
9. Locate the posterior water-opening region. These mantle openings, often called siphons, are not holes through the hard shell. On the empty shell, label only their location.

Drawing checkpoint B

Draw the inside of the empty valve. Label the required features listed on the write-up. Call muscle attachment marks “scars.” Keep the soft body supported by its remaining valve.

Inside the empty valve



Left valve interior • shell reference with a pallial sinus

Figure 2. Inner left valve with a pallial sinus, following the supplied shell reference. Posterior is left; anterior is right. The dark patch is shell coloration near the siphon region, not an opening through the shell.

Recognize the shell markings

The pallial line marks mantle attachment. Its sharp inward bend is the pallial sinus, associated with retractile siphons. Sinus depth and shell coloration vary among bivalves; some, including freshwater mussels, lack this deep indentation.

Nacre is the pearly inner shell layer; its appearance varies. Hinge teeth align the valves. On Drawing B, record the sinus if present and mark the posterior siphon location. The siphons pass between the valves.

Expose the internal anatomy

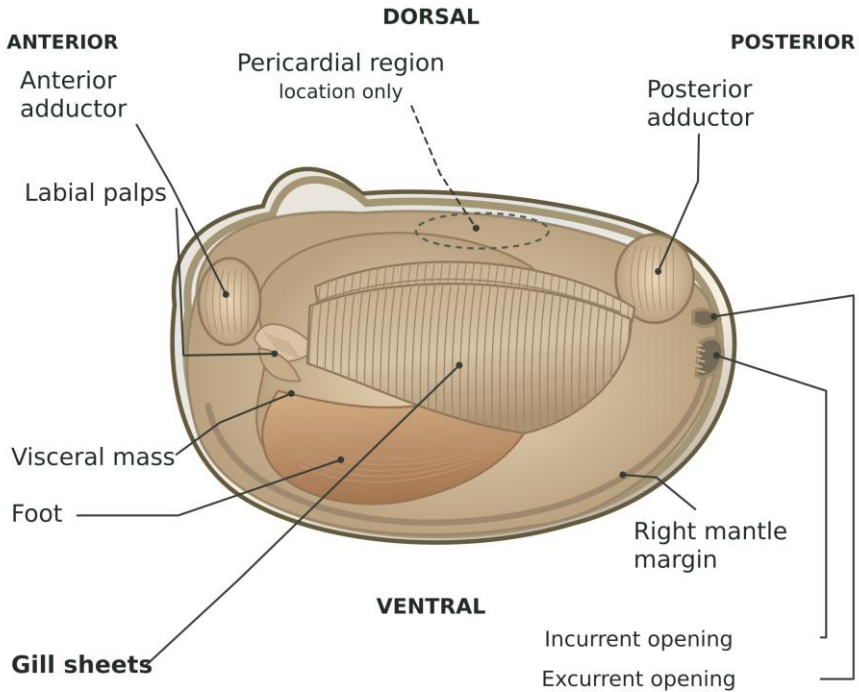
Part 2: approximately 0:28–4:31. Use the facing diagram.

10. Identify the thin left mantle. Lift it with a probe, then reflect or trim it as demonstrated. Preserve the opposite mantle and posterior water openings.
11. Find the gills: thin sheets with visible ridges or striations. These are your internal landmark. Look for two sheetlike halves of the gill on each side of the body. Gently lift a sheet without removing it.
12. Locate the central visceral mass and muscular foot extending below it. Find the anterior and posterior adductor muscles and the small labial palps near the anterior mouth region.
13. Identify the right mantle margin and posterior water openings: excurrent above, incurrent below. In freshwater mussels these are short mantle openings, often called siphons in classroom guides. They may be contracted. Ask for help when shape alone is not enough to identify a structure.
14. Locate the dorsal pericardial region near the hinge. It contains the heart, but the heart is not exposed in this view. Mark the region “location only.”

Drawing checkpoint C

Complete the large internal drawing before trimming gills or opening the visceral mass. Use solid leader lines for observed structures; use a dashed line marked “location only” for a hidden region. Obtain the teacher’s checkpoint.

Internal anatomy diagram



Left valve and left mantle removed

Near-side gill sheets partly separated; far-side gills hidden.
Solid leaders identify surfaces; dashed leaders mark hidden regions.

Figure 3. Left side after the left valve and left mantle are removed. Gill sheets are partly separated to reveal their layering.

Find the ridged gills first, then the palps, foot, visceral mass, and adductors. The heart remains hidden in the dashed pericardial region. Use the preserved colors you observe for Drawing C.

Each side has a gill with two sheetlike halves. The right-side gill is hidden behind the body in this view.

Digestive circulatory and respiratory systems

Digestive system

Food particles carried by water become trapped in mucus on the gills. Tiny beating cilia move them toward the labial palps and mouth. The palps sort and direct food; they do not reach out and grab it like arms.

Food passes through mouth, esophagus, stomach, and intestine, then undigested material leaves through the anus. The digestive gland assists digestion. The stomach, gland, and much of the intestine lie within the visceral mass.

Circulatory system

The heart lies in the pericardial cavity near the dorsal hinge. In open circulation, circulating fluid called hemolymph moves through vessels and tissue spaces before returning to the heart. “Open” does not mean open to the surrounding water, and the heart is not a spray nozzle.

Respiratory system

Oxygen moves from water across the gill surfaces into the animal; carbon dioxide moves out. Thin gill sheets provide a large exchange surface.

Water route: incurrent opening → mantle cavity → through gills → excurrent opening.

Food route: gills → palps → mouth → digestive tract. These routes are related but different.

Excretion nerves and reproduction

Excretory system

Paired kidneys, also called nephridia, remove metabolic wastes from internal fluids and help regulate water and dissolved salts. They are associated with the dorsal region near the heart and can be difficult to distinguish. You are not required to expose them in this lab.

Excretion removes wastes made by cells. Passing undigested food through the anus is a different process.

Nervous system

Groups of nerve cells called ganglia and their connecting nerves coordinate the foot, muscles, and other tissues. Sensory cells help the animal respond to its surroundings. Individual nerves and ganglia are not required identifications in this dissection.

Reproductive system

Gonads produce eggs or sperm. Reproductive tissue may spread through much of the visceral mass rather than appearing as one neatly separated organ. Do not determine sex from preserved color alone; record it only if confirmed by the teacher.

Endocrine coordination

Chemical signals help coordinate body activities, including reproduction. No endocrine gland is a required identification in this lab.

For these systems, understanding function is more useful than cutting away tissue simply to search for structures that are too small or poorly preserved to identify.

Deeper dissection

Part 2: approximately 4:31–7:57. Use the facing cutaway after Drawing C and the teacher checkpoint.

15. With permission, trim only enough gill tissue and palps to expose one side of the visceral mass. Keep the dorsal heart region intact.

16. Following the demonstration, make a shallow cut into the exposed visceral mass. Open it gradually, inspecting each layer. Do not cut through the supporting shell.

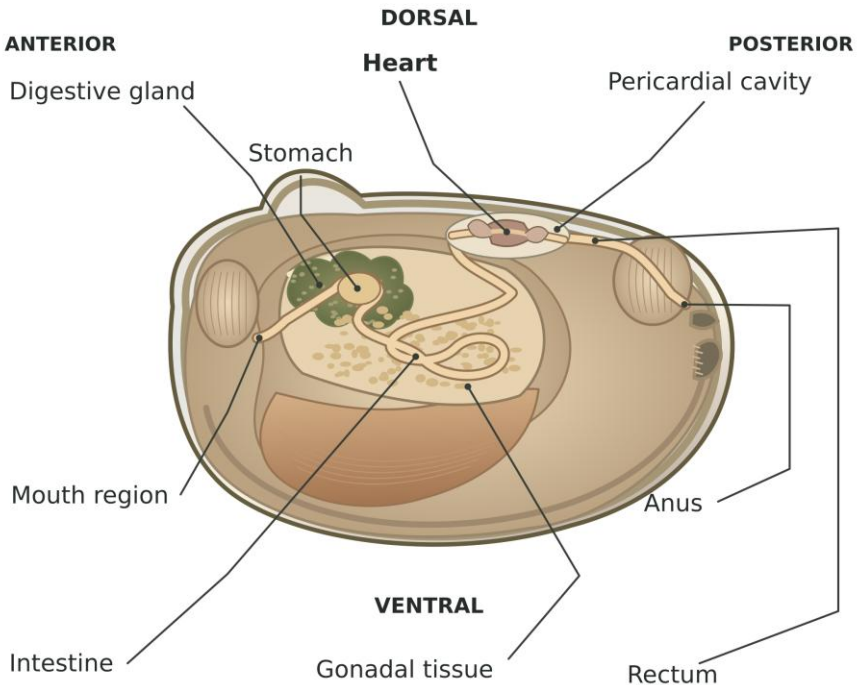
17. Find the digestive gland and surrounding gonadal tissue. The gland appears greenish in the video; preservation can change its color. Use position and texture as well as color.

18. Look for small cross sections of intestine in the opened mass. Do not assume that every hole is intestine or invent a complete tract when only parts are visible. Ask for confirmation.

19. Locate the pericardial region near the dorsal hinge. Under teacher direction, open its covering gently with a probe and small scissors. Identify the heart only when its anatomy and position are clear.

20. Record a brief deeper observation beside Drawing C. If the heart cannot be distinguished, write “heart not resolved.” Remember, as discussed in lecture, the natural “nozzle” is simply an analogy (maybe not the best one) and it simply is there to remind you that the clam has an open circulatory system where the blood leaves the vessels to oxygenate the organs.

Deeper anatomy diagram



Explanatory cutaway • left side

Gill sheets and palps omitted; visceral wall and pericardium opened.
Organ positions shown; intestinal loops simplified. Not a single cut.

Figure 4. Explanatory cutaway for the facing procedure. Several tissue layers are omitted to show relationships; one shallow cut will not reveal every organ.

The gland surrounds the stomach region; gonadal tissue spreads through the visceral mass. The rectum passes through the heart region and ends at the anus near the posterior adductor.

Look for portions of these structures in your specimen. Do not copy a complete digestive tract into an observation drawing if you can identify only small sections.

Finish and check your understanding

Cleanup

21. Check the three drawing titles, directions, labels, and leader lines. Answer the write-up's three Think About It questions.
22. Place tissues and the specimen in the designated container. Dispose of preservative liquid only as directed; do not pour it away without instructions.
23. Clean and dry tools and tray as directed. Follow the teacher's blade-handling procedure, return equipment, and clean the work surface.
24. Remove gloves and wash hands with soap and water.

Guide self-check

Try these without looking at the answer box. Discuss your answers with a partner, then check the inside back cover.

1. Which external landmark helps you find the dorsal edge?
2. What is the internal landmark beneath the mantle?
3. How does an adductor scar differ from an adductor muscle?
4. Why should you draw the gills before trimming them?
5. Does "open circulation" mean hemolymph leaves the clam and enters the pond?
6. What should you record when a required structure cannot be identified?

Ready to explain

Point to one structure and describe its location, appearance, and function. Then explain how you know its label is correct. Your observations matter more than making the specimen look exactly like a diagram.

Video and reference sources

Mr. E Science classroom sources

Ted Ehrheart. Clam Dissection, Parts 1 and 2. The procedures and video time ranges follow the supplied timestamped transcripts.

Part 1: https://youtu.be/d_qM4Q-7qBY

Part 2: <https://youtu.be/XQtujOxzf-4>

Mr. E Science Clam Guide, Prelab, and Write-Up

Illustrations

The soft-anatomy diagrams use a generalized freshwater mussel body plan. Figure 2 follows the supplied shell reference with a pallial sinus. Shell markings differ among bivalves. The cutaway simplifies organ shapes and the intestinal course.

Anatomy reference

OpenStax. Biology 2e, section 28.4, Mollusks and Annelids. Reference for the molluscan body plan, feeding, excretion, and nervous organization.

<https://openstax.org/books/biology-2e/pages/28-4-superphylum-lophotrochozoa-mollusks-and-annelids>

Richard Fox, Lander University. Freshwater Unionoid Mussels. Used to check mantle openings, gill layering, and deeper organ positions.

<https://lanwebs.lander.edu/faculty/rsfox/invertebrates/actinonaias.html>

Shell anatomy: Kentucky Geological Survey, Bivalve parts.

<https://www.uky.edu/KGS/fossils/fossil-pelecypoda-Bivalves-parts.php>

Guide self-check answers

These answers apply only to the six self-check questions on page 14. They are not the pre-lab answer key.

1. The umbo beside the hinge. The hinge edge is dorsal.
2. The thin, ridged gills.
3. A scar is a shell attachment mark; the muscle is soft tissue that closes the valves.
4. Trimming removes or changes the evidence. The drawing should record the original observed arrangement.
5. No. Hemolymph circulates through vessels and tissue spaces within the animal.
6. Write “not visible” or “not resolved.” Mark an expected hidden region “location only,” and ask the teacher for help.

Booklet printing

This guide contains 16 pages sized $5\frac{1}{2} \times 8\frac{1}{2}$ inches, in reading order. Use booklet printing on letter-size paper, duplex, then fold and staple at the center. Check a test sheet before printing a class set.

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