



Sheep Heart Dissection Guide

Examine the outside and inside of a sheep heart, identify the chambers, valves, and major blood vessels, and trace the pathway of blood through the pulmonary and systemic circuits. Relate the structures you observe to the work they perform in a living mammal.



Use with the Mr. E Science sheep heart dissection video and the assigned pre-lab and lab write-up.

The sheep as a mammalian model

The domestic sheep, *Ovis aries*, belongs to Kingdom Animalia, Phylum Chordata, Class Mammalia, and Family Bovidae. Sheep are domesticated grazing mammals and ruminants. Like other mammals, they maintain a relatively stable body temperature and depend on a continuous supply of oxygen and nutrients to their tissues.

The sheep heart has the same four principal chambers and four principal valves as the human heart. It is a useful model for studying circulation, although vessel branching and the position of the heart within the body differ between species.

What you should be able to do

- Orient a heart using several landmarks and distinguish anatomical right from left.
- Locate the four chambers, compare their walls, and explain the role of the septum.
- Identify the four valves and the structures supporting the atrioventricular valves.
- Use vessel connections to trace blood from the body to the lungs and back to the body.

Using this guide

Read the guide and watch the assigned Mr. E Science heart demonstration before beginning. Follow your teacher's directions for cutting and specimen handling. During the lab, identify structures with your partners and explain their functions before requesting a teacher check.

Prepare and orient the heart

Materials and safe handling

Preserved sheep heart; dissecting tray; two blunt probes; forceps; dissecting scissors and a teacher-approved scalpel; protective eyewear, gloves, and protective clothing; paper towels; ruler; and assigned recording materials.

Keep the specimen supported in the tray. Cut away from your fingers and partners, using small, controlled movements. The teacher should demonstrate or perform the main opening cut. Never hold the heart in your palm while cutting. Follow directions for preservatives, sharps, storage, and disposal; wash your hands after cleanup.

Examine the specimen before cutting

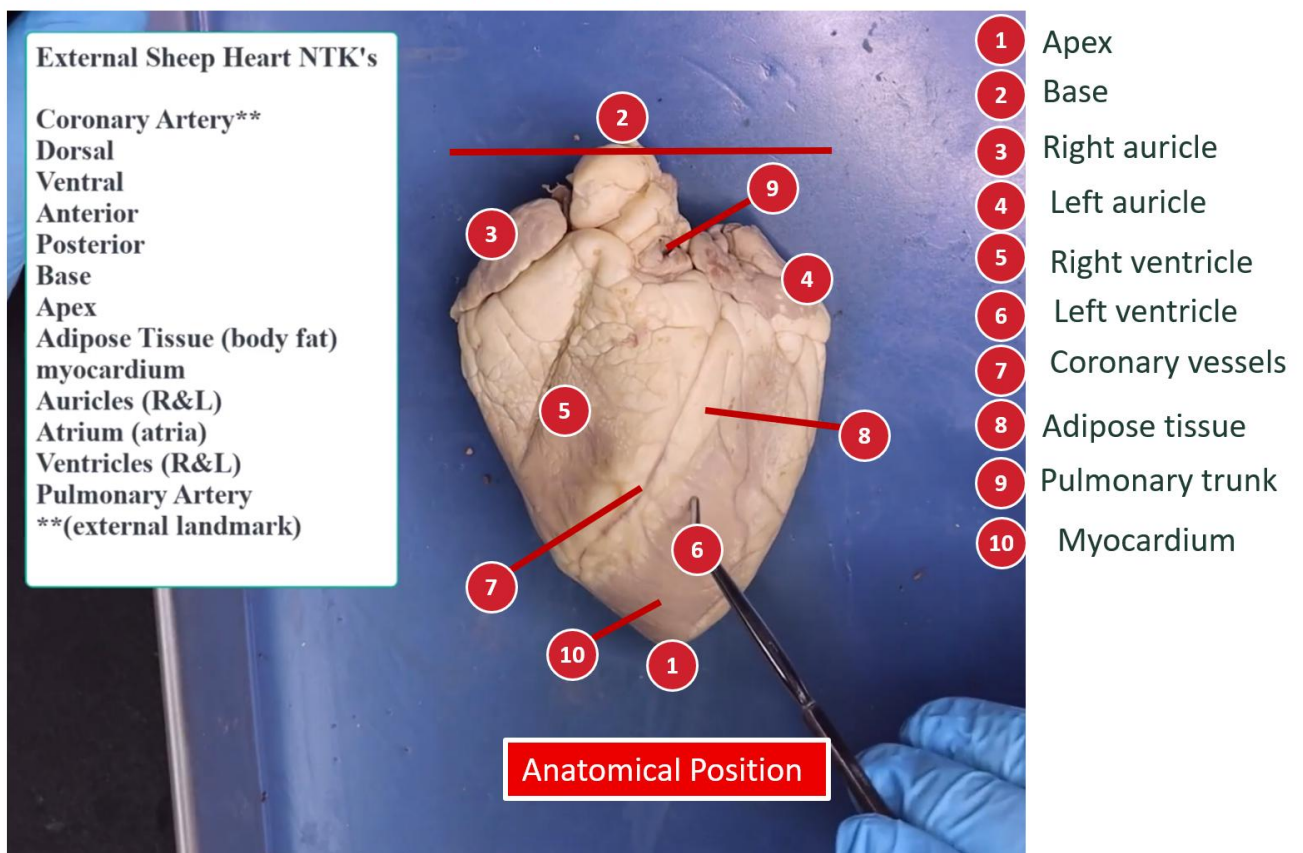
1. Observe the heart's shape and the remaining blood vessels. The broad region where the large vessels attach is the base; the pointed tip is the apex, formed mainly by the left ventricle. Preserved hearts may arrive with vessels cut short and with or without the pericardium.
2. If present, identify the pericardium, the sac surrounding the heart. In life it helps protect and anchor the heart, and fluid between its serous layers reduces friction. Under the teacher's direction, lift and trim the sac without cutting into the heart wall.

3. Position the heart in “anatomical position”, with its ventral surface upward and the dorsal side on the tray. The apex (posterior/caudal) toward the bottom of the tray and the base (anterior/cranial) of the heart facing the top of the tray, as in the demonstration. Look for the oblique groove between the ventricles, containing coronary vessels and often fat. Use the groove together with the apex, auricles, and ventricular walls to confirm orientation.

Anatomical right and left belong to the animal. In this ventral view, the heart’s right side generally appears on your left. Turning the heart over or opening it changes the view, so recheck landmarks rather than relying on a fixed left-right position on the tray.

Use base and apex for the top and bottom of your arranged specimen. Those positions on the tray do not by themselves define the animal’s anterior and posterior directions.

External View - whole Heart



Think About It

1. Why could a diagram’s right ventricle appear on the left side of the page?

Examine the external structures

4. Find the pale, lobulated fat and the reddish-brown muscular tissue. Preservation may change their colors. Gently move only enough fat to expose a vessel; do not strip the surface or cut vessels away.

The myocardium is the muscular middle layer that makes up most of the heart wall. A thin outer covering, the epicardium, lies over it. The endocardium lines the chambers and will be seen after opening. The coronary vessels supply and drain the heart muscle itself.

5. Locate the right and left auricles, the ear-shaped pouches near the base. Each auricle is an extension of an atrium. An atrium is the receiving chamber as a whole; it is not simply the visible flap. Locate the ventricles below the atria and the apex.

6. Examine both ventral and dorsal surfaces. Identify the major vessels tentatively, preserving their openings for probing after the heart is opened. Confirm every vessel by its connection to a chamber rather than by position or color alone.

Structure	Connection and function
Venae cavae	Enter the right atrium; return oxygen-poor blood from the body. Cranial and caudal correspond to the superior and inferior terminology often used in human anatomy.
Pulmonary trunk	Leaves the right ventricle and divides into pulmonary arteries carrying blood to the lungs. Often called the pulmonary artery in the demonstration.
Pulmonary veins	Enter the left atrium; return oxygen-rich blood from the lungs.
Aorta	Leaves the left ventricle; carries blood into systemic circulation.
Brachiocephalic trunk	A branch of the aortic arch supplying routes toward the head, neck, and forelimbs; may have been trimmed away.
Coronary arteries	Branch from the aorta near its origin and deliver oxygen-rich blood to the myocardium.

A missing or shortened vessel is a specimen limitation. Record it as not visible rather than guessing its identity.

Open the heart

Plan the section with your teacher

The demonstration and original lab use a broad lengthwise opening to display the chambers. The goal is a frontal section that separates ventral and dorsal portions and exposes both sides of the heart. It is not a transverse slice that removes the apex.

7. Return the heart to the ventral view with the apex down. Review the chamber positions and ask the teacher to confirm the cutting plane before making an incision. Examine and record the external landmarks first.

8. Keep the heart flat and stable in the tray. Have the teacher make or supervise a controlled section through the ventricular region in the approved plane. Work gradually through the tough tissue near the base so that the section also opens the atrial regions. Do not try to force the entire cut in one stroke.

9. As directed, continue the section toward the apex and across the base. Leave a small tissue hinge along one edge if this allows the heart to open like a book. If the halves separate completely, retain both and keep track of their original positions.

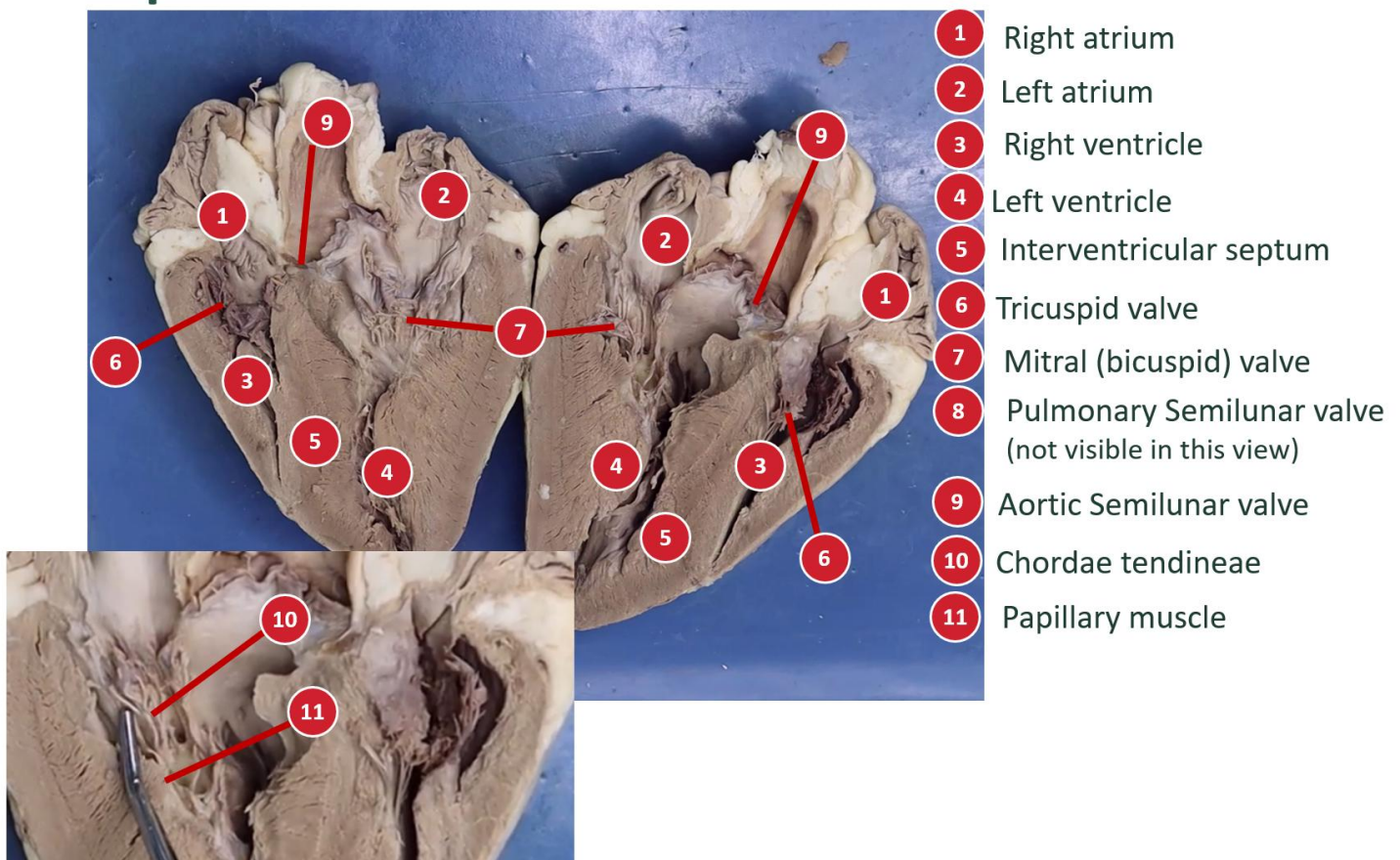
10. Gently open the heart. Stop cutting once the chambers can be examined. Preserve valve leaflets, chordae tendineae, and papillary muscles wherever possible. A section may divide some of them, so inspect both cut surfaces.

11. Locate the thick-walled left ventricle, the thinner-walled right ventricle, and the muscular septum between them. Use those structures to reestablish right and left. Identify the atrial regions near the base before tracing vessel openings.

If the first cut does not reveal everything

One section will not always display every valve or vessel clearly. Let the teacher check the specimen before extending a cut. Any additional opening should follow an identified chamber or vessel and preserve as much of its valve as possible. Do not make exploratory cuts through unidentified tissue.

Opened Heart Overview



Think About It

2. Why should you identify external landmarks before opening the heart, even though many vessels will be confirmed afterward?

Study the chambers and heart wall

12. Locate the right atrium and left atrium near the base. Compare their relatively thin walls with those of the ventricles. Atria receive blood and help fill the ventricles; they do not pump blood through the entire pulmonary or systemic circuit.

13. Compare the right and left ventricular walls at similar levels, avoiding the septum and papillary muscles. If assigned, measure the free-wall thickness in millimeters. Record the actual measurements and note an uneven or oblique cut that could affect the comparison.

The left ventricle has a substantially thicker myocardium because it must generate the higher pressure needed for systemic circulation. The right ventricle pumps through the lower-resistance pulmonary circuit. Both sides normally move the same volume of blood over time; a thicker wall does not mean one side pumps more blood per minute.

14. Find the interventricular septum, the muscular wall separating the ventricles. It helps keep the blood in the two ventricular chambers separate. Distinguish this wall from a valve leaflet, which is a much thinner flap at an opening.

15. Examine the smooth endocardial lining, then find muscular ridges and projections within the ventricles. Locate papillary muscles by following the slender chordae tendineae from a valve leaflet to the muscle that anchors them.

Structures to distinguish

Structure	How to recognize it
Myocardium	Thick muscular wall visible along the cut surfaces.
Endocardium	Thin lining covering the inner surfaces of the chambers.
Interventricular septum	Muscular partition between the right and left ventricles.
Papillary muscles	Muscular projections anchoring chordae tendineae.
Chordae tendineae	Slender connective-tissue cords joining papillary muscles to atrioventricular valve leaflets.

Think About It

3. How does the difference in ventricular wall thickness relate to pressure and resistance in the two circuits?

Identify the valves and trace the vessels

16. Locate the tricuspid valve between the right atrium and right ventricle. Locate the mitral, or bicuspid, valve between the left atrium and left ventricle. Both names for the left valve are in current use. Together these are the atrioventricular, or AV, valves.

Pressure differences open and close the valves. During ventricular contraction, papillary muscles tighten the chordae tendineae, helping prevent the AV leaflets from turning backward into the atria. The cords do not pull the valves open or act as strings that actively open and close them.

17. Find the aortic and pulmonary semilunar valves at the ventricular outlets. Their pocketlike cusps prevent blood from returning to the ventricles. Semilunar valves have no chordae tendineae. If a valve was cut, inspect the remaining cusps and its position.

Valve	Location	Backflow prevented
Tricuspid	Right atrium to right ventricle	Into the right atrium
Mitral or bicuspid	Left atrium to left ventricle	Into the left atrium
Pulmonary semilunar	Right ventricle to pulmonary trunk	Into the right ventricle
Aortic semilunar	Left ventricle to aorta	Into the left ventricle

18. Gently pass a blunt probe through the aorta and confirm its connection with the left ventricle. Use a second probe to trace the pulmonary trunk to the right ventricle. Let the probe follow the open passage; never force it through resistance or a valve leaflet.

19. Trace a vena cava opening to the right atrium and a pulmonary vein opening to the left atrium. When the vessels are shortened, ask the teacher to confirm the openings. Observe any remaining brachiocephalic branch of the aorta.

Think About It

- Why would a vessel's connection to a chamber be stronger evidence of its identity than its apparent position on a preserved heart?

The heartbeat

During ventricular relaxation, blood fills the ventricles through open AV valves. Atrial contraction adds to this filling. As the ventricles contract, AV valves close; when ventricular pressure exceeds arterial pressure, semilunar valves open. As the ventricles relax, semilunar valves close.

The first sound, "lub," is associated with AV valve closure. The second, "dub," is associated with semilunar valve closure. The pulmonary and systemic circuits operate continuously in series.

Trace blood through the two circuits

Arteries carry blood away from the heart; veins return blood to it. These names describe direction, not oxygen content. Follow the sequence below, then point to each visible structure on your specimen.

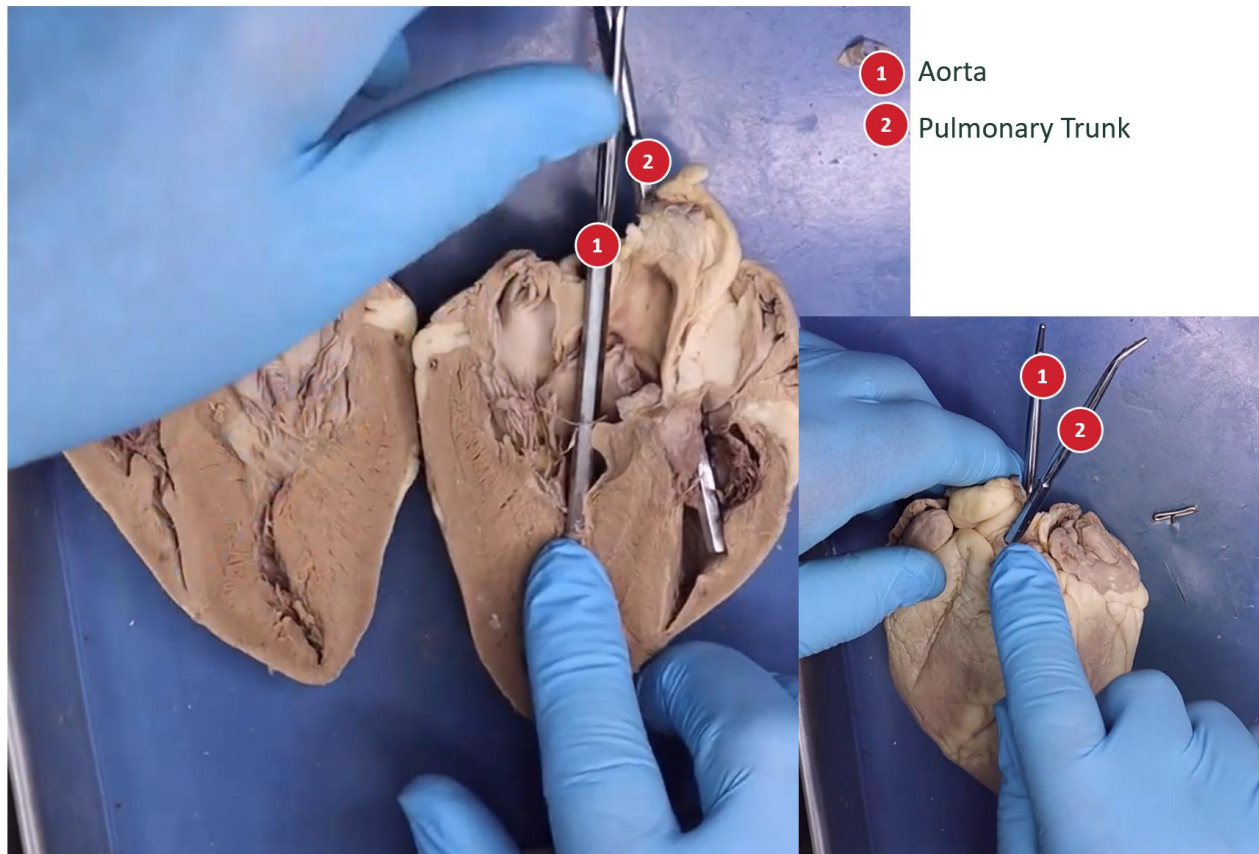
Order	Structure or region	What happens here
1	Body tissues	Systemic capillaries deliver oxygen and collect carbon dioxide.
2	Systemic veins and venae cavae	Blood returns from the body toward the heart.
3	Right atrium	Receives returning systemic blood.
4	Tricuspid valve	Blood passes into the right ventricle.
5	Right ventricle	Pumps blood toward the lungs.
6	Pulmonary semilunar valve	Blood leaves the right ventricle.
7	Pulmonary trunk and arteries	Carry oxygen-poor blood to the lungs.
8	Lung capillaries	Blood gains oxygen and releases carbon dioxide.
9	Pulmonary veins	Carry oxygen-rich blood back to the heart.
10	Left atrium	Receives returning pulmonary blood.
11	Mitral or bicuspid valve	Blood passes into the left ventricle.
12	Left ventricle	Pumps blood toward the body.
13	Aortic semilunar valve	Blood leaves the left ventricle.
14	Aorta and systemic arteries	Blood travels to systemic capillaries; the cycle repeats.

Complete the investigation

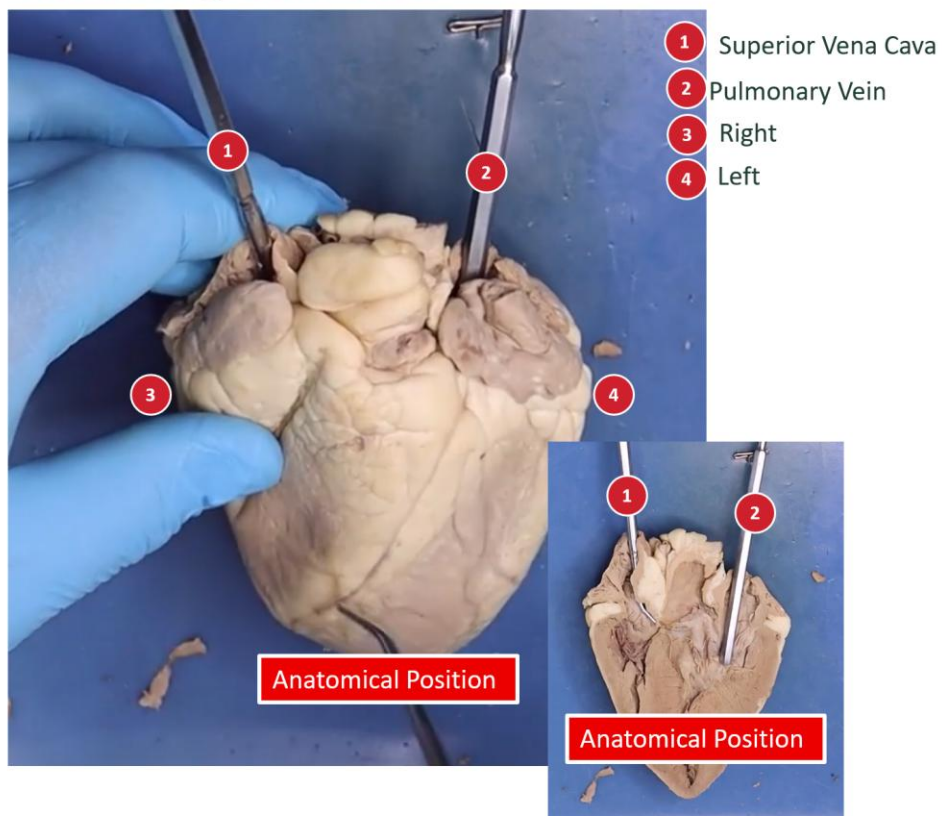
Final identification check

With your partners, identify the base, apex, auricles, four chambers, ventricular walls, septum, four valves, chordae tendineae, papillary muscles, and the major vessel connections that remain on your specimen. Explain the direction of blood flow through each connection. Ask your teacher to check the structures before cleanup.

Main Artery View



Returning Vein View



Record your observations

Use the assigned lab write-up for observations, measurements, diagrams and photos. For drawings, use colored pencils and straight leader lines. Label the view and anatomical right and left. Draw what you actually observe and distinguish missing structures from structures you could not identify. Red and blue may show relative oxygen content, but blood is not blue in life.

Cleanup

Store or dispose of the specimen and tissue scraps as directed. Place preservative fluid and sharps in the designated containers. Clean tools, tray, and work surface according to classroom instructions; dry reusable tools before returning them. Remove gloves and wash your hands thoroughly.

Sources

Ted Ehrheart, Mr. E Science. Sheep heart demonstration transcript supplied as hear transcript.docx. Used for the demonstration sequence and probe-based identification.

Sheep Heart Dissection Lab.pdf and Heart-Sheep PreLab.pdf. Supplied classroom materials used to align structures, preparation, and learning expectations.

David H. Hall. An Illustrated Dissection Guide to the Mammalian Heart. Supplied as guide_heart.pdf. Used as a reference for anatomy and the frontal opening approach.

OpenStax. Anatomy and Physiology 2e, sections 19.1 Heart Anatomy and 19.3 Cardiac Cycle. Used to check valve terminology and function. openstax.org/books/anatomy-and-physiology-2e/pages/19-1-heart-anatomy

The blood-flow chart is an original editable teaching aid. Reference-book illustrations are not reproduced.

Questions for discussion

1. How does the heart supply oxygen to its own thick muscular wall?
2. Why do pulmonary arteries carry oxygen-poor blood while pulmonary veins carry oxygen-rich blood?
3. What could happen to blood flow if an AV valve failed to prevent backflow?
4. How do the atria, ventricles, septum, and valves work together to maintain directed circulation?