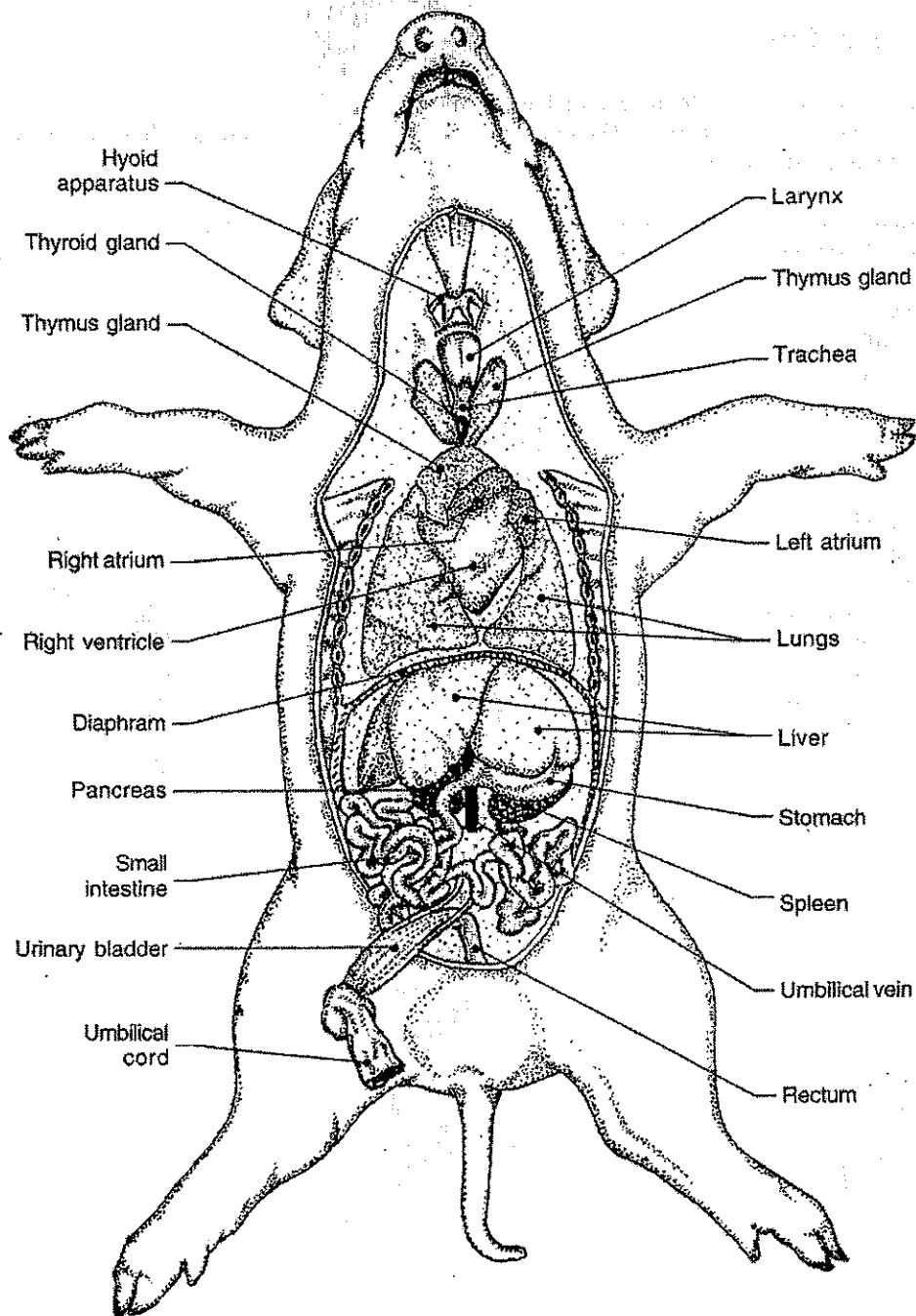


# Pig Dissection

## Guide



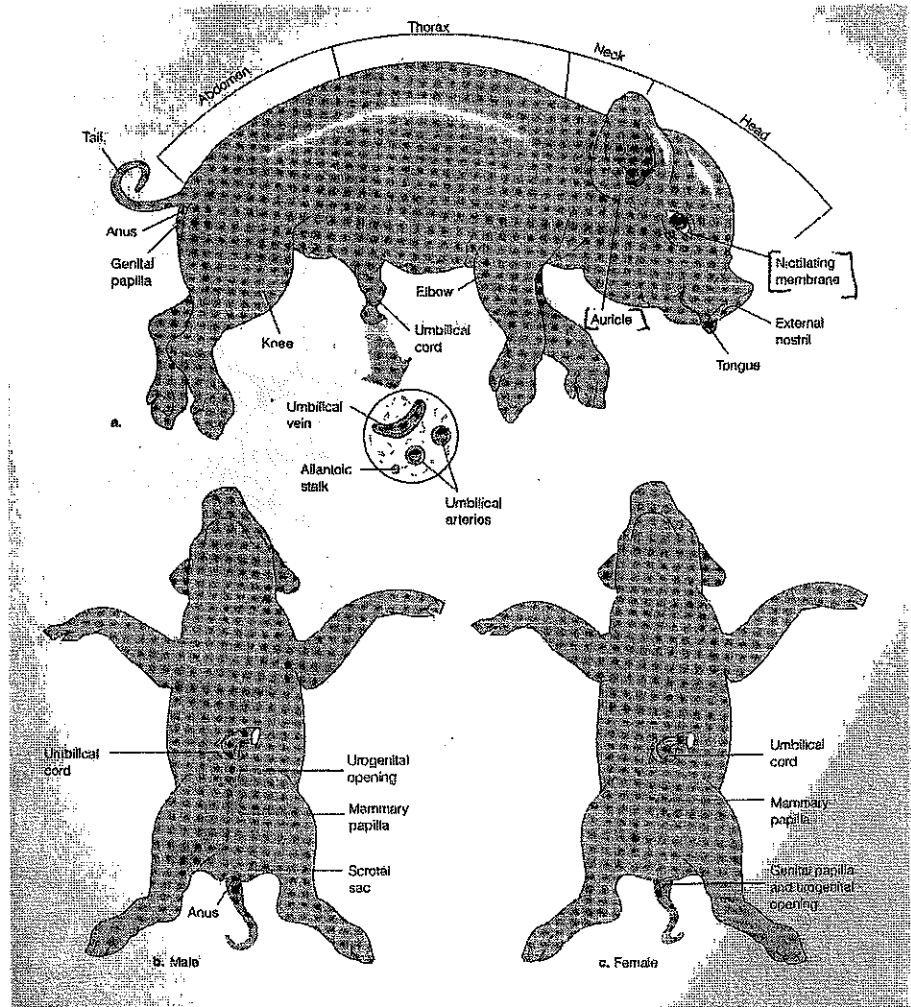
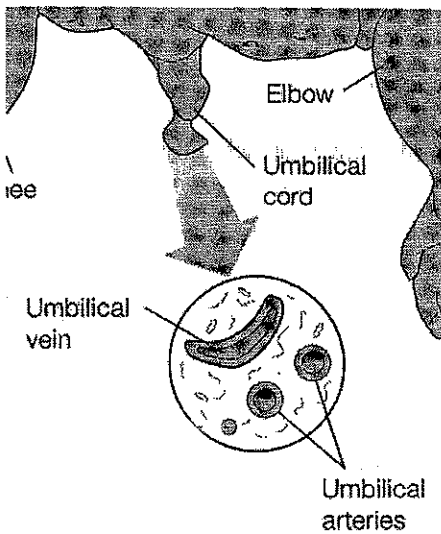
**Follow instructions and lab rules at all times, not doing so will result in your being pulled from the lab and required to finish an alternative assignment for assessment.**

**Wear disposable gloves and eye protection at all times when handling the pig or other preserved animals/specimens.**

These pigs are embalmed in formaldehyde prior to being stored in a preservative that does not contain formaldehyde, although the smell will remain. Most preserving solutions are relatively harmless; however, they will dry the skin and some students may be allergic to the solutions. For these reasons, never handle the pigs with your bare hands and always wear eye protection when working with sharp instruments.

## External Anatomy

1. Familiarize yourself with the external anatomy of the pig. There are four body regions on your pig; the head, neck, thorax, and abdomen. The thoracic cavity lies within the thorax, while the abdominal cavity lies within the abdomen.
2. Examine the head, locate the mouth, external nostrils, ears, eyes – with two eyelids and a third nictitating membrane which can be drawn across the eyeball for protection.
3. Locate the umbilical cord. If it is collapsed, make a fresh transverse cut to examine it more closely. Identify the two round umbilical arteries which carry blood from the fetus to the mother's placenta and the flattened umbilical vein which carries blood from the placenta to the fetus.
4. Look just below the umbilical cord to determine the sex of your pig. If it is a male, there will be a urogenital opening in this area. This opening is located below the tail in the female. Locate the anus just below the tail in both sexes. Locate a pig of the opposite sex and compare what you see.



## The Digestive System

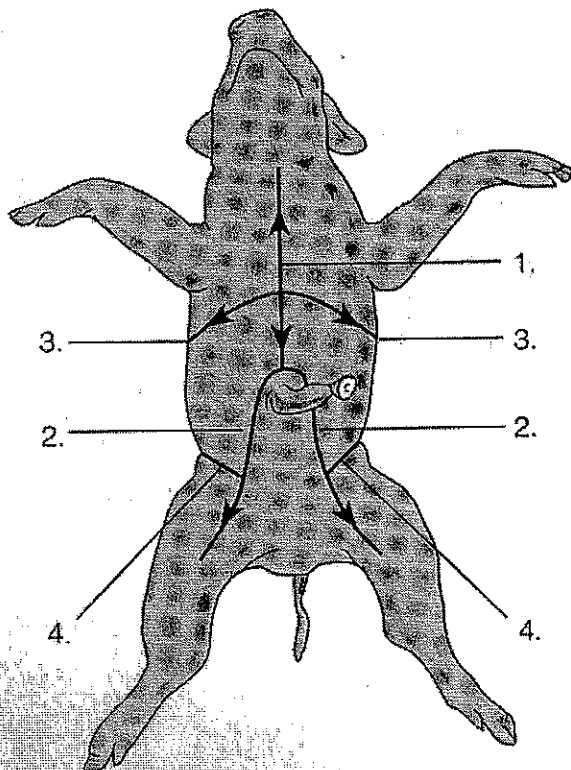
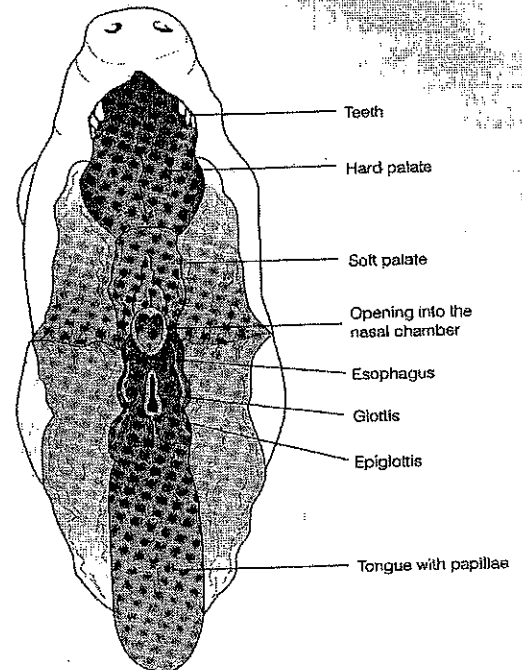
Most internal organs are located inside the body cavity. The diaphragm, a large muscular structure used in breathing, divides the body cavity into the thoracic and abdominal cavities. Along the tubular digestive tract, several specialized organs work to break down food and absorb minerals and nutrients. Note how the organs are arranged and their special functions which aid in the digestion process.

1. Place the pig with the belly facing upwards in the dissecting pan. Using twine, tie the two sets of legs in a spread eagle position with the twine running under the pan.

2. To expose the interior of the mouth cavity, use your scissors to cut at the corners of the mouth along the line of the tongue until the lower jaw can be lowered. Continue cutting until lowering the jaw exposes the back of the mouth cavity.

3. Locate the **teeth**, **tongue** (covered with papillae which house the taste buds), and the roof of the mouth which includes the **hard and soft palate** (the hard palate allows the pig to breathe and eat at the same time).

4. Identify the structures and openings at the back of the mouth. Identify the **glottis** (the space in the beginning of the respiratory passageway), the **epiglottis** (small flap of tissues that covers the glottis when swallowing), and the **esophagus** (the beginning of the digestive tract).



Now you are ready to begin examining the internal organs.

1. Cut along the mid-chest line starting from a small incision in the center of the line.

**REMEMBER TO CUT AS SHALLOW AS POSSIBLE – YOU DO NOT WANT TO DAMAGE THE ORGANS.**

2. Continue your cuts to either side of the umbilical cord being careful not to cut too deep. Pull gently on the umbilical cord, the cord and the flap of skin should only be held in place by the umbilical vein at this point. Cut the vein and peel back the skin.

3. Make two lateral cuts from the mid point of your mid-chest dissection cut.

4. Finally make two cuts at the bottom of the abdominal cavity. This should produce two flaps of skin which can be opened like a book to reveal the organs of the abdominal cavity.

1. The **diaphragm** is the large domed muscle which separates the body cavity into the thoracic (above the diaphragm) and abdominal (below the diaphragm) cavities. The contraction and the relaxation of this muscle causes the entire thoracic cavity to expand and contract – causing air to enter and exit the lungs.

2. The **liver** is the large brown organ that lies just below the diaphragm. Although it has many jobs, its main digestive function is the production of bile – which breaks down fats. If you lift up the liver, you should be able to find the **gallbladder**, this is where the liver stores bile.

3. The **stomach** is the large, saclike organ lying just below the liver. The stomach mechanically churns food and mixes it with water, stomach acid, and enzymes which help break the food down. If you follow the stomach upwards, you will find where the **esophagus** passes through the diaphragm and joins the stomach.

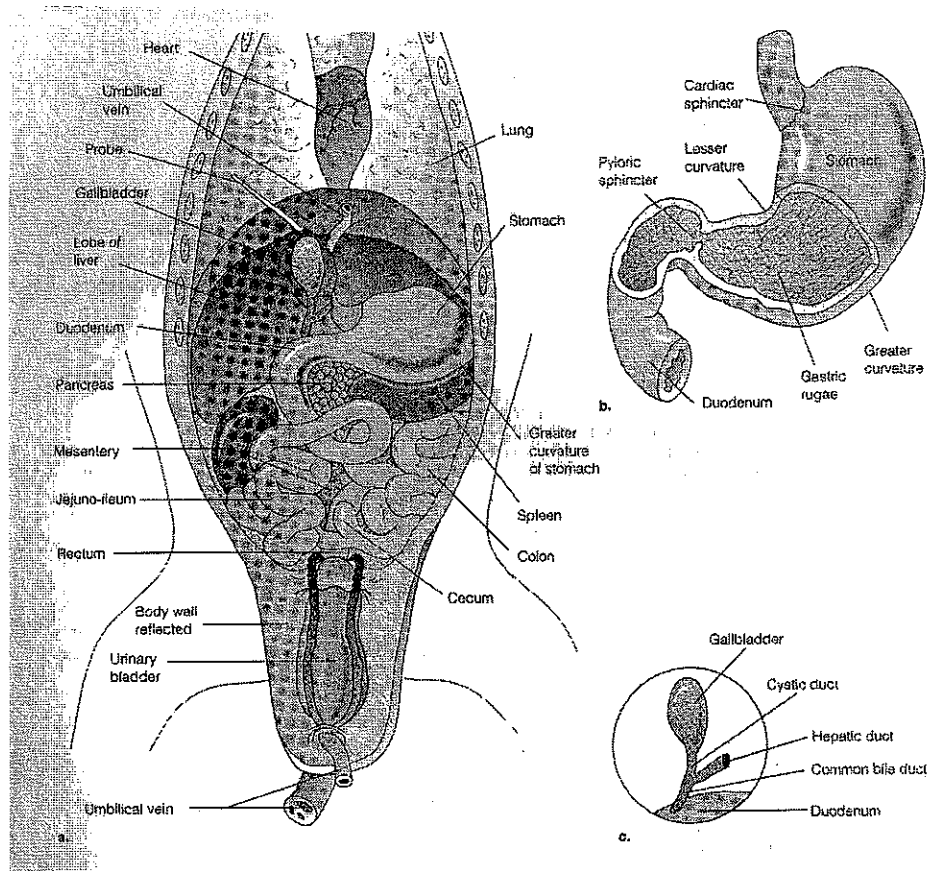
4. The **spleen** is located the greater curvature of the stomach. It filters blood.

5. Cut into the stomach along the greater curvature. Notice the folds in the stomach lining (**gastric rugae**). These folds allow the stomach to expand when food is plentiful and contract when it is not. There are two sphincters (ring like muscles which seal off a body passage), the **cardiac sphincter** where the esophagus enters the stomach; and the **pyloric sphincter** where the food exits the stomach into the duodenum. They control the movement of food through the stomach so that food is not passed along before it is properly broken down.

6. Locate the **duodenum**, it is the portion of the small intestine between the stomach and the jejunum. The **pancreas** gland is located in a loop of the duodenum. Enzymes from the pancreas and bile from the gallbladder are added to food as it passes through the duodenum. See if you can locate the the common bile duct (which is the duct from the gallbladder and the liver) which enters the duodenum.

7. The **jejunum-ileum** is the long, highly convoluted portion of the small intestine which extends from the duodenum to the large intestine. This is where most food is absorbed into the circulatory system (blood). The jejunum-ileum also has microscopic **villi** and **microvilli** – which are folds that increase the surface area of the jejunum-ileum thus increasing its ability to absorb food. Spreading apart the folds in the jejunum-ileum, notice the strong, thin membrane known as **mesentery**. The mesentery supports the folds and contains many blood vessels. These blood vessels carry nutrients from the jejunum-ileum to the body.

8. Make a small cut in the jejunum-ileum, exposing the inner surface. Using a dissection scope or a hand lens – look for the villi.



9. Lying at the end of the jejunum and just below it, you will find the **large intestine, or colon**. The large intestine is wider than the small intestine and held together by mesentery. One of the important activities of the large intestine is the reabsorption of water that has been to the food mass as it passed along the digestive tract.

10. At the end of the large intestine lies the **rectum**. The rectum ends in the **anus**, where solid waste exits the body. The rectum compacts the waste and in doing so is able to continue the reabsorption of water.

## The Circulatory and Respiratory Systems

We have just discussed how food is processed and nutrients are absorbed through the digestive tract and into the blood. The circulatory system then circulates the blood throughout the body, carrying the food (as well as other materials) to every part of the body. However, without oxygen for cellular respiration, the energy from the food could not be processed (remember cellular respiration?). The respiratory system brings oxygen to the blood, just as the digestive system brought food. The production of energy from sugars, as well as other cellular metabolic processes, produces wastes like carbon dioxide and urea. The wastes must be expelled by the excretory system, using the kidneys to expel urea and the lungs to expel carbon dioxide. Thus these three systems are closely tied to each other.

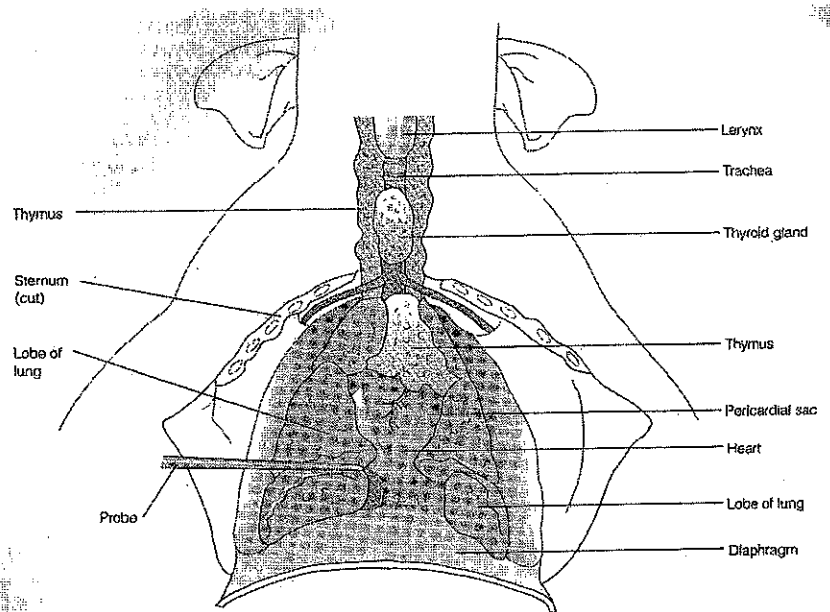
1. Use scissors to deepen the cut made along the midline of the chest upwards to the base of the lower jaw.

2. Cut through the body wall in the region of the thorax, clipping through the ribs slightly to the left or right of the sternum (the flat bone lying in the center of the chest to which the ribs attach).

3. Continue cutting past the rib cage to the base of the lower jaw.

4. Carefully cut layers of away at the neck until the thymus gland is exposed. Push away the two masses of the thymus gland and expose the larynx and the trachea. The **larynx** contains your vocal cords and is the structure between the glottis and the trachea.

The trachea leads to the lungs. If you push aside the trachea you will expose the esophagus which lies just below it.

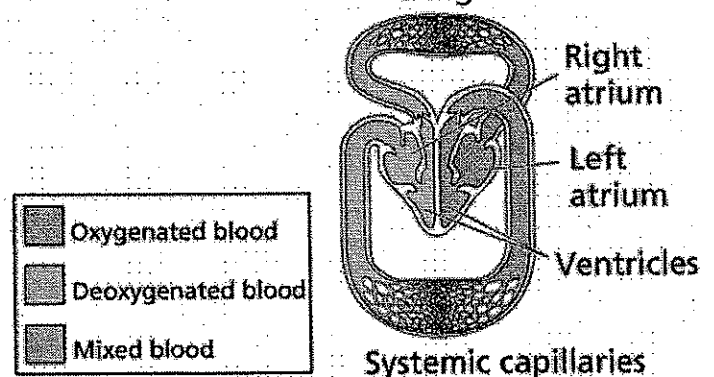


The heart and lungs lie within the **thoracic cavity**.

There are two circulatory circuits or pathways found in mammals. The pulmonary circuit, which carries blood from the heart to the lungs in arteries and back in veins; and the systemic circuit which carries blood from the heart in arteries to all the other organs of the body and then returns the blood to the heart in veins. Arteries are vessels which carry blood away from the heart; while veins return blood to the heart.

### Mammal and bird

### Lung

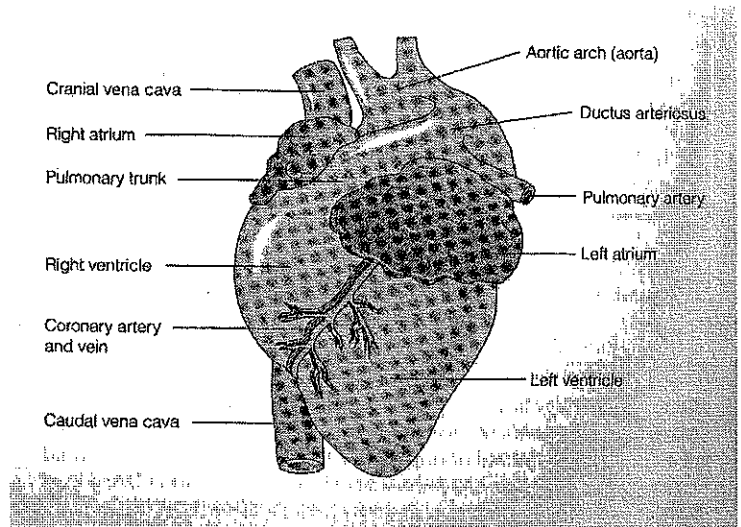


1. Expose the heart lying between the two lungs. The heart is surrounded by a **pericardial sac**, which is a tough membrane which protects the heart. Cut away and remove the pericardial sac and any other membranes until you can identify the four chambers of the heart.

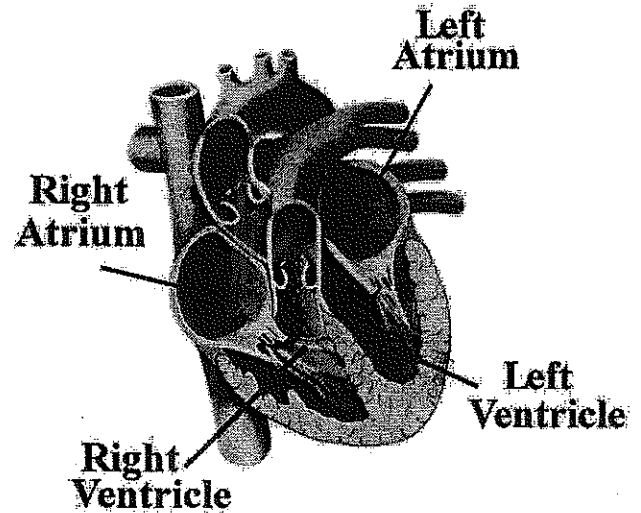
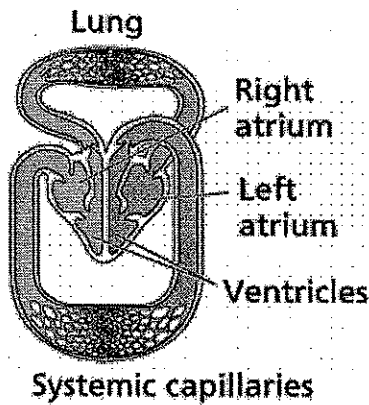
2. The **right and left atrium** are small, dark, chambers of the heart located on the top of the organ. They receive the blood from the **venae cavae** and the **pulmonary veins**, respectively.

3. The right and left ventricle are large muscular chambers which contract to pump blood.

4. Note the pathway that blood flows in a mammal. From the right atrium, it enters the right ventricle where it is pumped sending it out to the lungs. The blood returns from the lungs and enters the left atrium. Then the blood enters the left ventricle and is sent to the body in arteries and returned by veins to start over in the right atrium. The loop to the lungs and back is called the **pulmonary circuit** and the loop to the body and back is called the **systemic circuit**.



**Mammal and bird**



5. Follow the trachea until it branches into the two **bronchi** which lead to the two lobes of the lungs. Tease apart the lung tissue to observe that the bronchi further divide into bronchioles which ultimately lead to the **alveoli** (too small to see without a microscope). The alveoli are the thin walled sacs that are covered with capillaries. It is in these sacs that oxygen and carbon dioxide are exchanged with the circulatory system.

