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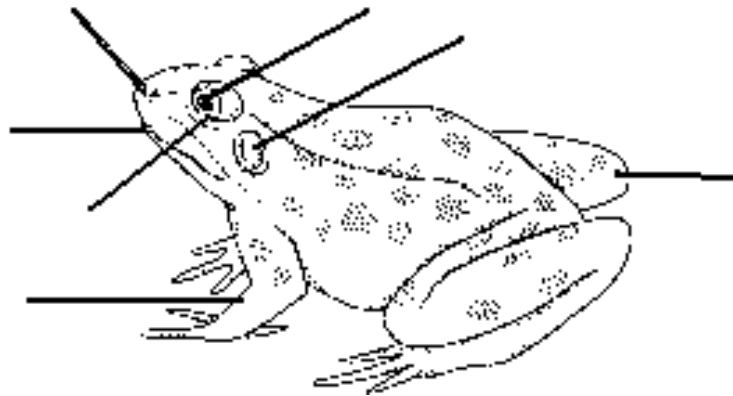
Frog Dissection

Day 1: External Anatomy

1. Look at the frog's **eye**. The **nictitating membrane** is a clear membrane that attached to the bottom of the eye like an eyelid. Use a T-pin to carefully manipulate the nictitating membrane to see how it works.
2. Just behind the eyes on the frog's head is a circular structure called the **tympanum**, or **tympanic membrane**. This works like an eardrum and is used for hearing.
3. In front of the eyes and behind the mouth are two holes. These are the nostrils, or **external nares**.

Label the following:

mouth
external nares
eye
nictitating membrane
tympanic membrane
fore limb
hind limb

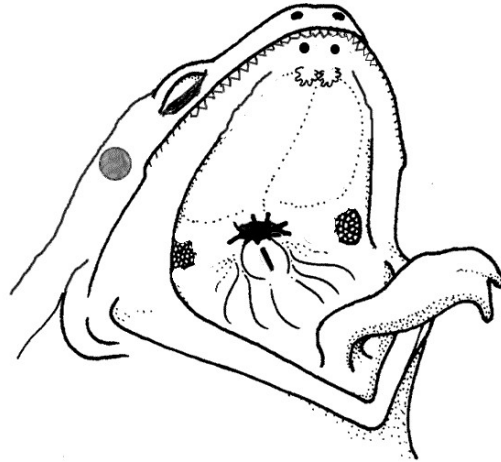


4. Pry open the mouth. You can make a small cut in each corner through the cartilage where the **maxilla** (upper jaw) and **mandible** (lower jaw) join together. This will help you open it more.
5. Find the **tongue** and pull it out. Does it attach to the front or the back of the mouth?
6. On the roof of the mouth, you will find the two tiny openings of the nostrils, the **internal nares**. If you put a pin into those openings, you will find it exits on the outside of the frog.
7. The frog has two sets of teeth. The **vomerine teeth** are found on the roof of the mouth. The **maxillary teeth** are found around the edge of the mouth. Both are used for holding prey, as frogs swallow their meals whole and do NOT chew. Run your finger over both sets of teeth and note the differences between them. Notice that only the upper jaw has teeth.
8. Find the **esophagus**, a single round opening, in the center of the mouth toward the back. This is where food exits the mouth and goes into the digestive system. This tube leads to the stomach.
9. Just behind the tongue, and before you reach the esophagus is a slit like opening called the **glottis**. (You may need to use your straw to get it to open up). This is the opening to the lungs. The frog breathes and vocalizes with the glottis. Use your probe to open the glottis and compare that opening to the esophagus. Air travels from the nares (nostrils) to the glottis, then down the bronchi, where it branches to the lungs.

10. Close to the joint of the jaw are two openings, one on each side. These are the **Eustachian tubes**. Insert a pin or your straw into the Eustachian tube to see that these lead to the tympanic membranes. They are also used to equalize pressure in the inner ear while the frog is swimming.

Label the following:

tongue
internal nares
vomerine teeth
maxillary teeth
esophagus
glottis
Eustachian tubes



11. Look at the frog's hind legs. Carefully pull on the skin and notice that it pulls free from the muscle. The skin contains many blood vessels that enable the frog to exchange gases under water, through its skin, helping it breath.
12. Gently put your hand around the frog's middle and carefully roll its internal organs between your fingers. Does your frog have a rib cage?
13. Now examine the two pair of limbs.
 How do the forelimbs differ from the hind limbs?
 How many toes are on each forelimb? Are the toes connected on the forelimbs?
 How many toes are on each hind limb? Are the toes connected on the hind limbs?
 Are there any claws or nails on the 'fingers' of the frog?
14. Male frogs often have a swollen 'thumb' on their forelimbs. Compare your frog with others in your class. Do you think you have a male or female frog?

Day 2: Internal Anatomy

- Place the frog in the pan, ventral side up. First cut through just the skin as shown in the diagram. Under the skin you will be able to see the muscles of the frog. Notice that there is no rib cage. Note also the blood vessels that line the inside of the skin. Remember that these vessels carry blood cells that contain the oxygen and food nutrients necessary for survival.
- Using the same pattern as you did with the skin, cut through the muscles to expose the internal organs. As you cut through the 'chin' area you will feel a bone. Carefully cut through this bone so you don't damage the organs below.

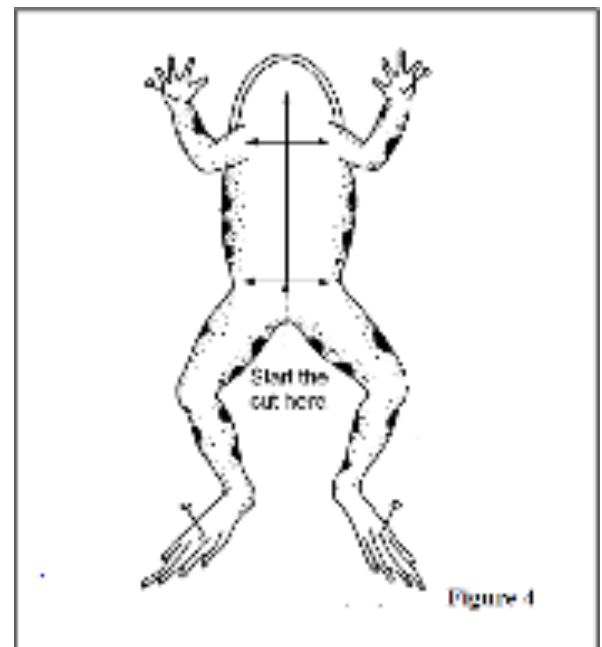


Figure 4

3. If you have a female frog, the body cavity may be filled with **eggs**. They are small black and white bead like structures in the lower abdomen. This egg mass grows directly from the **ovaries**. You may have to remove the eggs, ovaries, and **oviducts** so that you can see the structures beneath them. If you remove them, place them off to the side in your tray. You may also need to remove the **peritoneum** - A spider-web like membrane that covers many of the organs- as you go through the dissection.
4. The **liver** is a large, brownish colored organ covering most of the body cavity. The frog's liver has 3 lobes. The liver has a variety of functions. One of these is to produce bile, which is stored in the gall bladder. When food enters the stomach, bile is emptied into the small intestine where it helps to digest fats.
5. The **heart** is a small triangular shaped organ between the front legs, just above the liver. The frog's heart has three chambers. The **left and right atrium** can be found at the top of the heart. A single **ventricle** located at the bottom of the heart. Can you find all three chambers? Can you find any veins or arteries connected to the heart? **If you have time later, you can remove the heart and cut through it vertically.**
6. Underneath the liver and off to each side of the heart you will see the **lungs**. They are sometimes difficult to see but should appear as spongy organs. Remember they attach to the glottis through the bronchi. Your teacher can help you try to inflate them.
7. Under the liver, we see a small, greenish sac (kind of like a booger). This is the **gall bladder** and it stores the bile from the liver. You might also see it by separating the right and middle lobes of the liver. At this time you can remove the liver, gall bladder and heart placing them off to the side in your tray.
8. Around this area you should also see the **fat bodies**. These will be yellowish "fingers" or spaghetti shaped structures that store energy for the frog especially for during hibernation and breeding times. If you need to, you can remove them to help you see other organs.
9. Examine the **stomach**. The stomach is a large firm whitish sac on the frog's left side (on your right). The stomach is the first major site of chemical digestion. Frogs swallow their meals whole. **If you have time later, you can open it up to see what your frog has been eating.**
10. If you follow the stomach upward you will find the **esophagus**. The esophagus is the tube that leads from the frog's mouth to the stomach. Open the frog's mouth and find the esophagus, poke your straw into it and see where it leads.
11. If you follow the stomach downward you will find the **small intestine**. The small intestine is a long folded, tube-like organ, that is posterior the stomach. The first straight portion of the small intestine is called the **duodenum**, the curled portion is the **ileum**. The ileum is held together by a membrane called the **mesentery**. Note the blood vessels running through the mesentery, they will carry absorbed nutrients away from the intestine. Absorption of digested nutrients occurs in the small intestine. **If you have time later you can remove the small intestine and remove the mesentery to see how long it is.**
12. If you follow the small intestine you will see where it connects to the **large intestine**. The large intestine leads to the **cloaca**, which is the last stop before solid wastes, sperm, eggs, and urine exit the frog's body. (The word "cloaca" means sewer.)

13. The **pancreas** is a thin, yellowish ribbon under the stomach and intestines. The pancreas secretes insulin and other digestive enzymes.
14. Locate the **spleen** under the mesentery tissue. It will be a small, round reddish organ. It is a little more difficult to find in a female frog. This is a holding area for blood.
15. The frog's reproductive and excretory system is combined into one system called the urogenital system. There are two **kidneys** which are flattened, brownish bean shaped organs found in the lower part of the frog's abdomen in the dorsal body wall. You can remove the **peritoneal membrane**, which is connective tissue that lies on top of the red kidneys. Female kidneys can only be seen after removal of the ovaries and oviducts. Often the tops of the kidneys have yellowish stringy fat bodies attached. Kidneys filter waste from the blood.
16. If your frog is a male, it will have two white, round organs above the kidneys. These are the **testes**, which produce sperm for reproduction. Females have a curly structure around the outside of the kidney, these are the **oviducts**. Oviducts are where eggs are produced. In frogs, fertilization occurs outside the body. The sperm are deposited in the water at the same time the female is laying her eggs. What is a baby frog called?
17. Below the kidneys you may be able to locate the **bladder**. It will be an empty sac located at the lowest part of the body cavity. The bladder stores urine, which leaves the body through the cloaca.

Label the following:

- heart*
- gall bladder*
- stomach*
- small intestine*
- large intestine*
- cloaca*
- spleen*
- bladder*
- liver*
- lungs*

