

Lab: Frog Dissection

External Anatomy

1. Observe the dorsal and ventral sides of the frog.

Dorsal side colour _____ Ventral side colour _____

2. Examine the hind legs. How many toes are present on each foot? _____ Are they webbed? _____

3. Examine the forelegs. How many toes are present? _____ Are the toes webbed? _____

Are there enlarged pads on the “thumbs” of the frog? _____ These are found only in male frogs. What is their function?

4. Use a ruler to measure your from the tip of the head to the end of the frog's backbone. Compare the length of your frog to other frogs

Your Frog (cm)	Frog 2	Frog 3	Frog 4	Frog 5	Average Length

5. Locate the frog's eyes, the **nictitating membrane** is a clear membrane that attached to the bottom of the eye.

Press down on the eyeballs while observing inside the frogs mouth. What happens? What is this function of this?

Use tweezers to carefully remove the nictitating membrane. You may also remove the eyeball.

What colour is the nictitating membrane? _____ What colour is the eyeball? _____

6. Just behind the eyes on the frog's head is a circular structure called the **tympanic membrane**. The tympanic membrane is used for hearing. Measure the diameter (distance across the circle) of the tympanic membrane. Diameter of tympanic membrane = _____ cm

Anatomy of the Frog's Mouth

Procedure: Pry the frog's mouth open and use scissors to cut the angles of the frog's jaws open. Cut deeply so that the frog's mouth opens wide enough to view the structures inside.

1. Locate the **tongue**. Play with the tongue. Does it attach to the front or the back of the mouth?

_____ (You may remove the tongue). Draw a sketch of the tongue, paying attention to its shape.

Tongue Sketch:

2. In the center of the mouth, toward the back is a single round opening, the **esophagus**. This tube leads to the stomach. Use a probe to poke into the esophagus.

3. Close to the angles of the jaw are two openings, one on each side. These are the **Eustachian tubes**. They are used to equalize pressure in the inner ear while the frog is swimming. Insert a probe into the Eustachian tube.

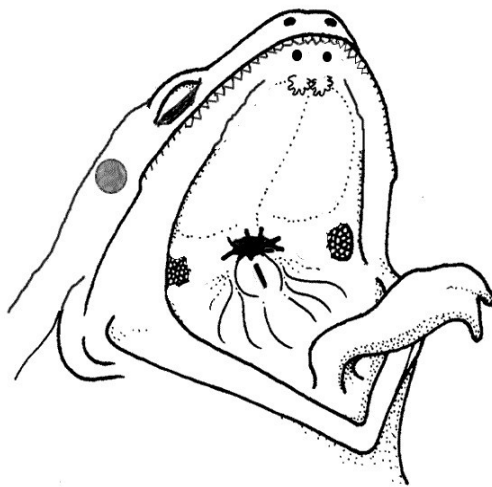
To what structure does the Eustachian tube attach? _____

4. Just behind the tongue, and before you reach the esophagus is a slit like opening. (You may need to use your probe to get it to open up). This slit is the **glottis**, and it 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.

5. 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, frogs swallow their meals whole and do NOT chew. Run you finger over both sets of teeth and note the differences between them.

6. On the roof of the mouth, you will find the two tiny openings of the **nostrils**, put your probe into those openings, where do they exit? _____

7. Label each of the structures **underlined above**.



8. Complete the table.

Structure	Function	Location
Vomerine Teeth		
Eustachian Tubes		
Tympanic Membrane		
Esophagus		
Glottis		
Tongue		

Internal Anatomy

Dissection Instructions

1. Place the frog in the dissecting pan ventral side up.
2. Use scissors to lift the abdominal muscles away from the body cavity. Cut along the midline of the body to the forelimbs.
3. Make transverse (horizontal) cuts near the arms and legs.
4. Lift the flaps of the body wall and pin back.

*If your specimen is a female, the body may be filled with eggs. You may need to remove these eggs to view the organs.

Locate each of the organs below. Check the box to indicate that you found the organs.

1. **Fat Bodies**--Spaghetti shaped structures that have a bright orange or yellow colour, if you have a particularly fat frog, these fat bodies may need to be removed to see the other structures. Usually they are located just on the inside of the abdominal wall.
2. **Peritoneum**-- A spider-web like membrane that covers many of the organs; you may carefully pick it off to get a clear view
3. **Liver**--The largest structure of the the body cavity. This brown colored organ is composed of three lobes. The **right lobe**, the **left anterior lobe**, and the **left posterior lobe**. The liver is not primarily an organ of digestion, it does secrete a digestive juice called bile. Bile is needed for the proper digestion of fats.
4. **Heart**-- at the top of the liver, the heart is a triangular structure. The **left and right atrium** can be found at the top of the heart. A single **ventricle** located at the bottom of the heart. The large vessel extending out from the heart is the **conus arteriosis**.
5. **Lungs**-- Locate the lungs by looking underneath and behind the heart and liver. They are two spongy organs.
6. **Gall Bladder**--Lift the lobes of the liver, there will be a small green sac under the liver. This is the gall bladder, which stores bile. (hint: it kind of looks like a booger)
7. **Stomach**--Curving from underneath the liver is the stomach. The stomach is the first major site of chemical digestion. Frogs swallow their meals whole. Follow the stomach to where it turns into the small intestine. The **pyloric sphincter valve** regulates the exit of digested food from the stomach to the small intestine.
8. **Small Intestine**--Leading from 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.
9. **Large Intestine**--As you follow the small intestine down, it will widen into 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)

10. Spleen--Return to the folds of the mesentery, this dark red spherical object serves as a holding area for blood.

11. Esophagus--Return to the stomach and follow it upward, where it gets smaller is the beginning of 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 probe into it and see where it leads.

STOP! If you have not located each of the organs above, do not continue on to the next sections!

You will each be completing a formal biological drawing of the internal anatomy of the frog with emphasis on the digestive and circulatory organs. Make some sketches and take pictures before moving on.

Removal of the Stomach: Cut the stomach out of the frog and open it up. You may find what remains of the frog's last meal in there. Look at the texture of the stomach on the inside.

What did you find in the stomach?

Measuring the Small intestine: Remove the small intestine from the body cavity and carefully separate **the mesentery** from it. Stretch the small intestine out and measure it. Now measure your frog. Record the measurements below in centimeters. Frog length: _____ cm Intestine length _____ cm

Urogenital System

The frog's reproductive and excretory system is combined into one system called the urogenital system. You will need to know the structures for both the male and female frog

Kidneys - flattened bean shaped organs located at the lower back of the frog, near the spine. They are often a dark color. The kidneys filter wastes from the blood. Often the top of the kidneys have yellowish stringy fat bodies attached.

Testes- in male frogs, these organs are located at the top of the kidneys, they are pale colored and roundish.

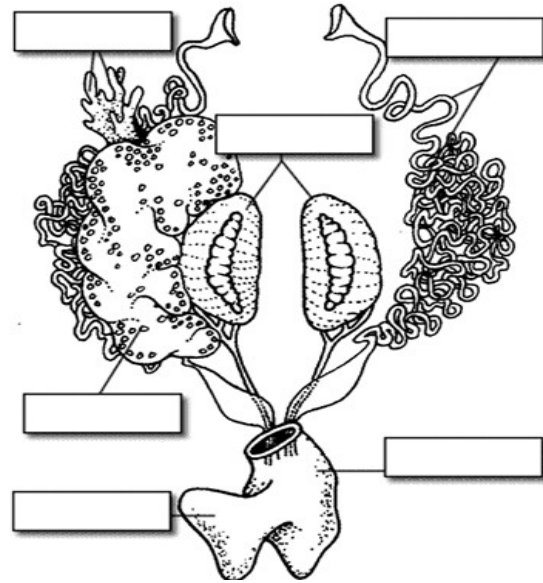
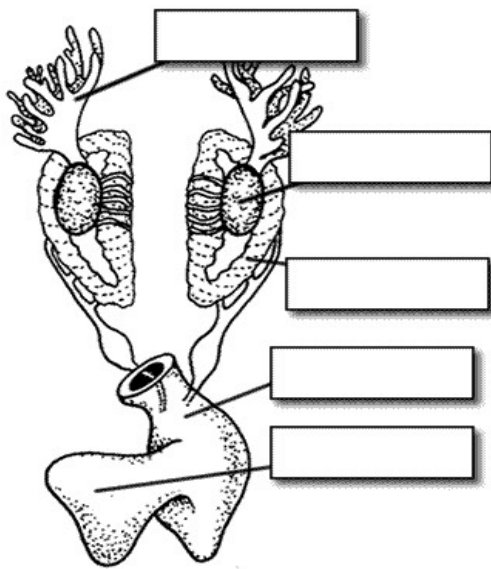
Oviducts- females do not have testes, though you may see a curly structure around the outside of the kidney, these are the oviducts. Oviducts are where **eggs** are produced. Males can have structures that look similar, but serve no actual purpose. In males, they are called vestigial oviducts.

Bladder- An empty sac located at the lowest part of the body cavity. The bladder stores urine.

Cloaca- mentioned again as part of the urogenital system - urine, sperm and eggs exit here.

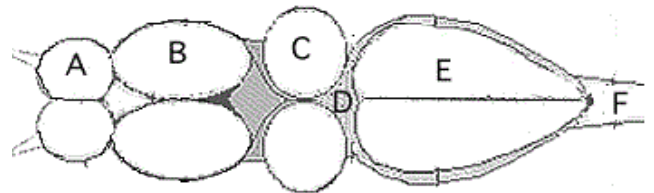
Is your frog male or female? _____

Label the parts of the urogenital system.



Study and Removal of the Frog's Brain

Starting at the most anterior part of the head, the **olfactory nerves** connect to the nostrils and then to the **olfactory lobes (A)** where odors are processed. Just posterior to the olfactory lobes are two elongate bodies with rounded bases, this is the **cerebrum (B)**, and it is the frog's thinking center.



The cerebrum is the part of the brain that helps the frog respond to its environment. Posterior to the cerebrum are the **optic lobes (C)**, which function in vision. The ridge just behind the optic lobes is the **cerebellum (D)**, it is used to coordinate the frog's muscles and maintain balance. Posterior to the cerebellum is the **medulla oblongata (E)** which connects the brain to the **spinal cord (F)**.

Brain Part	Function	Letter
Cerebellum		
Cerebrum		
Olfactory Lobe		
Optic Lobe		
Medulla Oblongata		

Removal of the Frog's Brain

Turn the frog dorsal side up. Cut away the skin and flesh on the head from the nose to the base of the skull. With a scalpel, scrape the top of the skull until the bone is thin and flexible. Be sure to scrape AWAY from you. With your scalpel held almost horizontally, carefully chip away the roof of the skull to expose the brain. Use scissors to cut away the heavier bone along the sides of the brain.

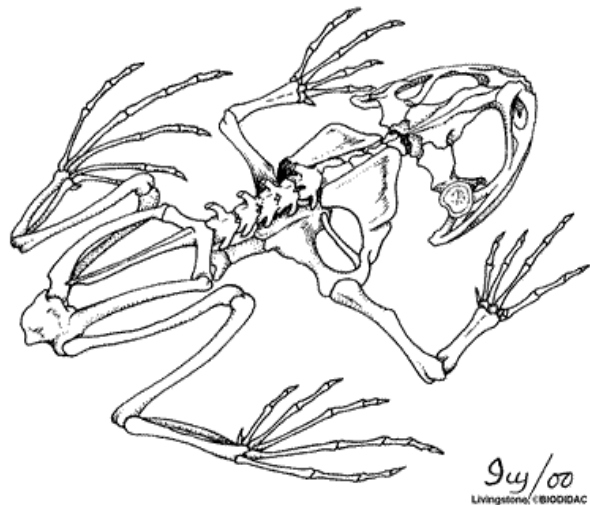
To receive extra credit for removing the brain, you must present it to me on a paper towel. All lobes should be attached with as much tissue as possible present. GOOD LUCK!

Musculoskeletal System

The bones of the frog follow the same pattern (basically) as other vertebrates. The lower leg of the frog is a muscular leg that the frog uses for jumping. There are 3 main sets of bones in the lower leg. The femur is found in the upper thigh, and the tibiofibula is found in the lower part of the leg. The foot and ankle are made of the tarsals and metatarsals (toes).

To expose the frog's leg bones you must remove the thigh muscle - the biceps femorus and the calf muscle - the gastrocnemius. You can leave the Achilles tendon intact (this tendon connects the muscle to the bone). The tarsals and metatarsals do not need to be exposed.

Label the leg bones: Femur, Tibiofibula, tarsals, metatarsals, pelvic girdle



Individually complete the post-lab questions in full sentences on a separate page and a biological drawing of the internal anatomy of the frog with emphasis on the digestive and circulatory structures.

Post-Lab Questions

1. What do you think is the function of the nictitating membrane, and why is this important?
2. A frog does not chew its food. What do the positions of its teeth suggest about how the frog uses them?
3. Describe the path of food through the digestive tract.
4. Describe the path of blood through the circulatory system, starting at the right atrium.
5. Describe the path of air through the respiratory system.
6. Describe how frogs reproduce. What structures are involved and what mating behaviours are displayed?
7. The abdominal cavity of a frog at the end of hibernation season would contain very small fat bodies or none at all. What is the function of the fat bodies?
8. What is the function of the cloaca?
8. What adaptations are present that benefit the frogs aquatic lifestyle?
9. What adaptations are better suited for life on land?
10. Why is the word “amphibian” appropriate for the life cycle of an individual frog?
11. During one mating of frogs, the female lays some 2,000 to 3,000 eggs in water as the male sheds millions of sperm over them. How do these large numbers relate to the frog’s fitness for life in water?
12. What characteristics does the frog have in common with vertebrates in class mammalia? What is unique to class amphibia?