

Names: \_\_\_\_\_ Section & Group#: \_\_\_\_\_ Date: \_\_\_\_\_

## The Frog: An Anatomical Dissection Group Pre-lab Activity

**Write all answers in the space provided. Submit this prelab together with your frogs on the day of dissection.**

1. Read the entire procedure of the frog dissection lab activity and familiarize yourself with the organs to be identified.
2. View the Virtual Frog at [http://www.mhhe.com/biosci/genbio/virtual\\_labs/BL\\_16/BL\\_16.html](http://www.mhhe.com/biosci/genbio/virtual_labs/BL_16/BL_16.html) and use the information to answer the following questions.

### **External anatomy**

1. Click on the **external anatomy** button. Sketch the dorsal and ventral sides of a frog and label the parts including 1) tympanic membrane, 2) nostrils, 3) anus/cloaca, 4) forelimbs, and 5) hindlimbs.
2. Research: What external features can we use to determine if a frog is male or female?
3. Click on the **internal anatomy** button, then on the **digestive system** button. Make a flowchart describing how to cut the jawbone and locate the different features of the buccal/mouth cavity.

### **Internal anatomy**

1. Click on the **internal anatomy** button, then on **initial cut**. Sketch the locations of the cuts you will have to make on the ventral side of the frog to expose its internal organs.
2. Explore each of the systems available in the internal anatomy window. Refer to the lab activity procedure and familiarize yourself with the appearance and general locations of the boxed structures.

**On dissection day, be prepared to identify the different boxed structures and answer the questions posed in the lab activity procedure sheet.**

*1 a) External anatomy, dorsal view*

*1 b) External anatomy, ventral view, showing the locations of cuts made to expose internal organs*

*2) What external features can we use to determine if a frog is male or female?*

*3) Flowchart describing how to cut the jawbone and locate different features of the buccal cavity.*

**BIOLOGY II**  
**Laboratory Activity**  
***The Frog: An Anatomical Dissection***

**I. Objectives**

1. To be able to identify the internal organs of a frog.
2. To develop basic dissection techniques.
3. To observe organ-systems of a representative vertebrate.

**II. Materials:**

frog specimen ( <i>Rana sp.</i> )	ether	cotton balls
dissecting pan	ice bath	
dissecting set		
dissecting probe	surgical scissors	
dissecting needle	pins	
scalpel		

**III. Procedure:**

**A. Pithing the Frog**

In a double-pithed frog, the brain and the spinal cord have been destroyed so that the animal feels no pain. Many of the functions of its internal organs however, will continue almost unchanged for a considerable period of time.

1. Chill the frog thoroughly. Remove, pat it dry and carry out the following steps quickly.  
**Alternative:** Put the frog in a jar. Soak a large cotton ball in ether and then place this cotton ball to the jar. Wait for a few minutes for the ether to have its effect on the frog.
2. Hold the frog firmly with the left hand with its legs outstretched, and with the index finger, bend the head downward over the middle finger.
3. Run the tip of the dissecting needle along the head until the cup-like depression at the base of the skull is located. This is called the foramen magnum.
4. With a steady hand, push the needle into the foramen magnum and completely destroy the brain.

**Note:** If the frog shows some signs of reviving, put it back into the ice bath/use another round of ether to knock it unconscious, and repeat the procedure above.

5. After destroying the brain, partly withdraw the needle from the brain cavity and direct it posteriorly.
6. Push the needle all the way down into the vertebral canal and with a quick side-to-side movement, destroy the spinal cord. Move it back and forth to sever all connections so that the frog is neurologically dead. The legs will extend sharply as the needle contacts the nerves within the cord.
7. When the frog becomes unresponsive, withdraw the needle.
8. Rinse the frog thoroughly with running tap water after pithing.

**B. Studying the Internal Organ-Systems**

**Digestive System**

The digestive tract is said to be of complete type when both mouth and anus are present. The digestive system of a frog is of the complete type and may be subdivided into the buccal or mouth cavity, the digestive tract, the digestive glands and accessory structures.

## → LOCATE THE BOXED STRUCTURES

### a. Buccal/Mouth Cavity

The buccal cavity is the large cavity exposed upon opening the mouth. Cut the mouth at each hinge joint to allow its opening.

1. Note the **maxillary teeth** in the upper jaw.
2. At the floor of the cavity, locate the **sticky tongue**. How is the tongue attached? Food is captured through the tongue and is passed on to the esophageal lining.
3. The **glottis** is the slit-like opening leading to the respiratory system and is found at the region between the tongue and the esophageal opening. Locate it.
4. In male frogs, near the hinge of the lower jaw on either side, observe a pair of slits leading to the **vocal sacs**. What conclusions can be reached about which frogs make sounds?
5. Turn to the roof of the mouth cavity and locate a pair of holes, the **internal nares or internal nostril openings**. How can this position be considered an adaptation to a frog in the water?
6. A pair of V-shaped formations can also be observed in the roof of the mouth. These are known as the **vomarine teeth**. What might be its function?
7. Locate the openings of the **Eustachian tubes** near the hinge of the upper jaw. Where do they lead?
8. Draw the mouth cavity of the frog showing the structures you have just observed.

Fasten the frog with its belly side up (ventral) to the bottom of the dissecting pan by means of pins inserted through each of the four extended limbs. Put enough water in the pan to keep the frog moist. Insert the surgical scissors through the skin just above the anal opening and make incisions as shown in Figure 1. Study the ventral and lateral muscle layers now exposed by the removal of the skin. Muscles can only shorten when they contract. Note their patterns and explain how they might function.

Observe the large blood vessel lying along the midline under the muscle layer. This is the **abdominal vein**. To what structures does it lead?

Repeat the same incisions as carried out on the skin, being careful not to damage underlying organs. Cut through the bones of the **shoulder girdle** and remove muscle layers with forceps. The body cavity may be nearly filled with black-colored eggs. If so, this is an indication that the specimen is a female.

## → PIN THE BOXED STRUCTURES

### b. Digestive Tract

1. Pass a probe from the mouth to the bag-shaped, muscular **stomach** and identify the **esophagus**, a short tube connecting the two. Describe the shape of the stomach. Make a slit along the stomach and empty its contents. Note the longitudinal folds called **rugae** lining the inner wall. What is the function of the rugae? The stomach becomes smaller at its pyloric end where it leads to the small intestine.
2. From the stomach, the digestive tube becomes the long, narrow and coiled **small intestine**, where most of the chemical digestion and absorption is completed. The **duodenum** is the short section of the small intestine leading from the pylorus. The highly coiled **ileum** is the major portion of the small intestine which widens into the **large intestine**.
3. Spread the portion of the coiled intestine apart and locate the membranous **mesentery**. Examine it closely and determine its function.
4. The **cloaca** lies below the large intestine between the hind legs. It is a short, narrow tube which opens to the outside through the **anus**. Urine, feces and gametes pass through the cloaca and anus.

### c. Digestive Glands

1. Locate the large **liver** anterior to the body cavity. How many lobes does it have? Push the right

- lobe forward and note beneath it the greenish, round sac **gall bladder**. What is its function?
2. The **pancreas** is a whitish or yellowish gland of elongate-irregular shape which is attached to the lower part of the stomach and duodenum. It is described to be both an exocrine and an endocrine gland. Why?

### Circulatory System

The circulatory system is responsible for the transport of gases, nutrients, metabolic wastes, hormones and other substances in the different parts of the body. It assists in maintaining constancy of the internal environment (homeostasis) of the organism.

1. Examine the **heart** lying in a thin sac, the **pericardium**. Use the dissecting needles to locate the great veins and arteries leading to and from the heart.
2. Examine the **lungs** and notice the **pulmonary veins** and **pulmonary arteries** connecting the heart and lungs.
3. Remove the heart, leaving as much of the **blood vessels** attached as possible.

Locate the **right atrium**, the **left atrium** and the **ventricle**. The large vessel arising from the ventricle and forming a "Y" is the **conus arteriosus**. Three major arteries arise from each branch: **carotid artery** to the head, **aortic artery** to the body and the **pulmocutaneous artery** to the lungs and skin. Why does the same specialized blood vessel has to supply blood to the lungs and skin?

4. Examine the **dorsal side** of the heart. Three branches of the **vena cava** unite in a thin-walled sac which is the **sinus venosus**, opening to the right atrium.

### Urogenital System

1. Locate the cream-colored **oviducts** through which eggs pass from the anterior of the body cavity to the cloaca.
2. Remove the oviducts to reveal the brownish **kidneys** which lie along the back on either side of the spine. Notice that they are covered by a thin, tough membrane, the **peritoneum** which lines the body cavity.
3. Locate a small, twisting tube, the **ureter**, leading from each kidney to the cloaca. Attached to the cloaca is the **urinary bladder**. What is its function?

**Note:** Do not confuse the ureters with the oviducts in the female. If your frog is an immature female, you will find two lobed, grayish **ovaries** lying close to the kidneys. The **testes** of the male are in a corresponding position.

### IV. Guide Questions:

1. Briefly relate how the mouth and its structures adapt a frog to its terrestrial existence.
2. What structures in the mouth adapt a frog to its aquatic life?
3. Test yourself by locating the following on your specimen: gall bladder, stomach, intestine, liver, pancreas, small and large intestines, ureter, urinary bladder, esophagus, ovaries (in females), testes (in males), mesentery and the different chambers of the heart and its accompanying blood vessels.

### Reference:

UP General Zoology Laboratory Manual. 1983. Published by the Department of Zoology, Institute of Biology, College of Science, University of the Philippines, Diliman.