

Skills Practice Lab

Frog Dissection

Amphibians, such as frogs, are examples of animals that have structural adaptations for living in or near water and for living on land. As tadpoles, they have gills, but adult frogs have lungs. Tadpoles have tails, but adult frogs have legs. Many changes occur in the metamorphosis of a tadpole. The structures that frogs have depend on the stage of the frog's life cycle. In this lab, you will dissect a frog in order to observe the external and internal structures of frog anatomy.

MATERIALS

- dissecting pins (6–10)
- dissecting tray
- dull probe or dissecting needle
- felt-tip marker
- forceps
- gloves
- lab apron
- paper towels
- plastic storage bag and twist tie
- preserved frog
- safety goggles
- scissors



OBJECTIVES

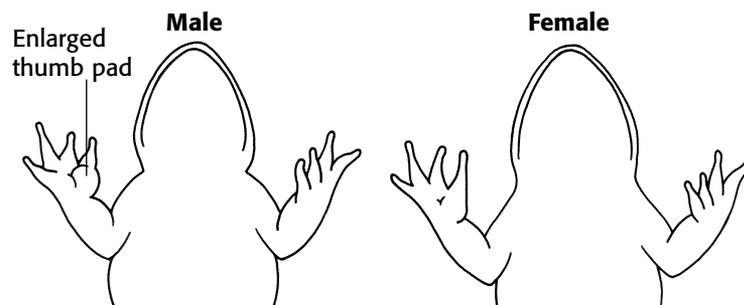
Describe the appearance of various organs found in a frog.

Name the organs that make up various systems of a frog.

Procedure

1. Put on safety goggles, gloves, and a lab apron.
2. Rinse and place a frog on a dissection tray with its dorsal side down. To determine the frog's sex, look at the hand digits, or fingers, on its forelegs. A male frog usually has thick pads on its "thumbs," which is one external difference between the sexes, as shown in **Figure 1**. Male frogs are also usually smaller than female frogs. Observe several frogs to see the difference between males and females.

FIGURE 1 HAND DIGITS OF MALE AND FEMALE FROG



Frog Dissection *continued*

3. Review the following information about the frog's head.

On the outside of the frog's head are two *external nares*, or nostrils; two *tympani*, or eardrums; and two eyes, each of which has three lids. The third lid, called the *nictitating membrane*, is transparent.

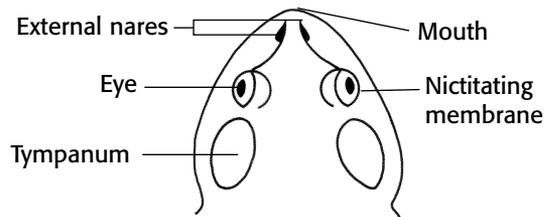
4. Use **Figure 2** to locate and identify the external features of the head. Find the mouth, external nares, tympani, eyes, and nictitating membranes.

5. Review the following information about the frog's mouth.

Inside the mouth are two *internal nares*, or openings into the nostrils; two *vomerine teeth* in the middle of the roof of the mouth; and two *maxillary teeth* at the sides of the mouth. Also inside the mouth behind the tongue is the *pharynx*, or throat.

In the pharynx, there are several openings: one into the *esophagus*, the tube into which food is swallowed; one into the *glottis*, through which air enters the *larynx*, or voice box; and two into the *Eustachian tubes*, which connect the pharynx to the ear.

FIGURE 2 EXTERNAL FEATURES OF FROG HEAD



6. Turn the frog on its back, and pin down the legs. Cut the hinges of the mouth, and open it wide. Use **Figure 3** to locate and identify the structures inside the mouth. Use a dull probe to help find each part: the vomerine teeth, the maxillary teeth, the internal nares, the tongue, the openings to the Eustachian tubes, the esophagus, the pharynx, and the slitlike glottis.

7. Look for the opening to the frog's cloaca, located between the hind legs. Use forceps to lift the skin, and use scissors to cut along the center of the body from the cloaca to the lip. Turn back the skin, cut toward the side at each leg, and pin the skin flat. **Figure 4** shows how to make these cuts.

FIGURE 3 STRUCTURES OF FROG MOUTH

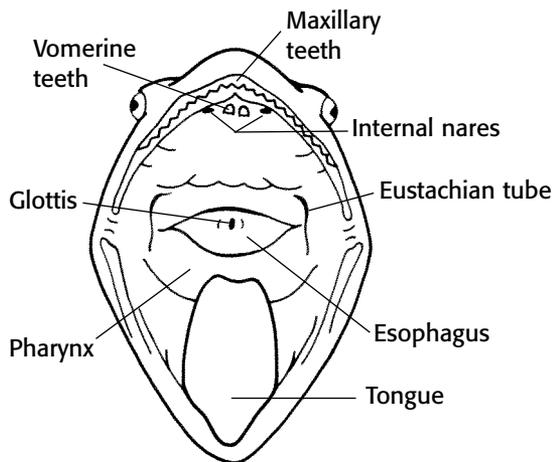
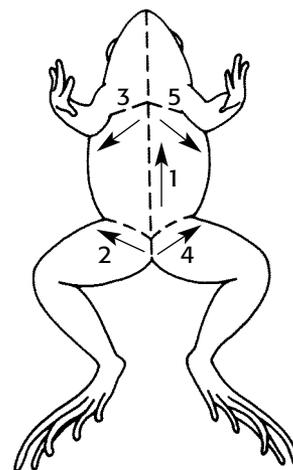


FIGURE 4 INCISIONS FOR DISSECTION



Frog Dissection *continued*

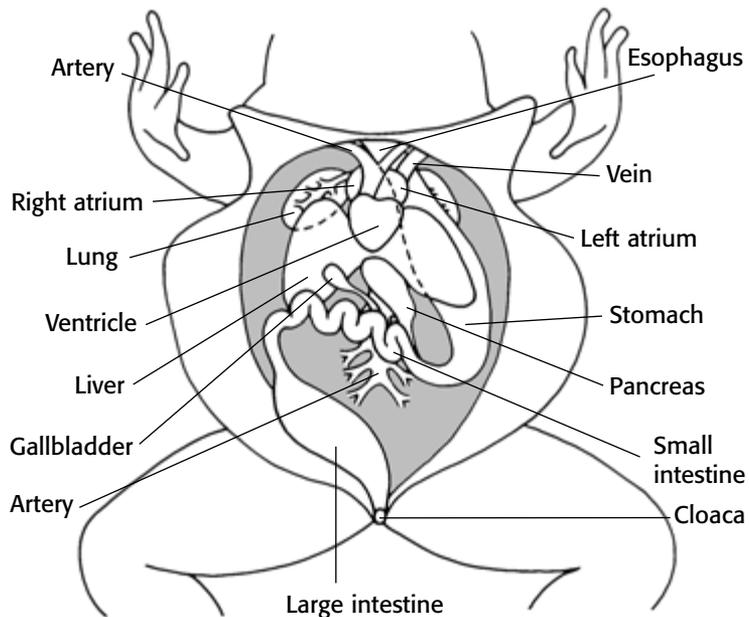
8. Lift and cut through the muscles and breastbone to open up the body cavity. If your frog is a female, the abdominal cavity may be filled with dark-colored eggs. If so, remove the eggs on one side so you can see the organs beneath them.

9. Review the following information about the frog's digestive system.

The digestive system consists of the organs of the digestive tract, or food tube, and the digestive glands. From the esophagus, swallowed food moves into the *stomach* and then into the *small intestine*. Bile is a digestive juice made by the *liver* and stored in the *gallbladder*. Bile flows into a tube called the *common bile duct*, into which *pancreatic juice*, a digestive juice from the *pancreas*, also flows. The contents of the common bile duct flow into the small intestine, where most of the digestion and absorption of food into the bloodstream takes place. Indigestible materials pass through the *large intestine* and then into the *cloaca*—the common exit chamber of the digestive, excretory, and reproductive systems.

10. Use **Figure 5** to locate and identify the organs of the digestive system: esophagus, stomach, small intestine, large intestine, cloaca, liver, gallbladder, and pancreas.

FIGURE 5 ABDOMINAL AND CHEST CAVITIES OF FROG



11. Review the following information about the frog's respiratory and circulatory systems.

The respiratory system consists of the nostrils and the larynx, which opens into two *lungs*—hollow sacs with thin walls. The walls of the lungs are filled with *capillaries*, which are microscopic blood

vessels through which materials pass into and out of the blood. The circulatory system consists of the heart, blood vessels, and blood. The heart has two receiving chambers, or *atria*, and one sending chamber, or *ventricle*. Blood is carried to the heart in vessels called *veins*. Veins from different parts of the body enter the right and left atria. Blood from both atria goes into the ventricle and then is pumped into the *arteries*, which are blood vessels that carry blood away from the heart.

12. Use **Figure 5** to locate and identify the left atrium, right atrium, and ventricle of the heart. Find an artery attached to the heart and another artery near the backbone. Find a vein near one of the shoulders. Find the two lungs.

Frog Dissection *continued*

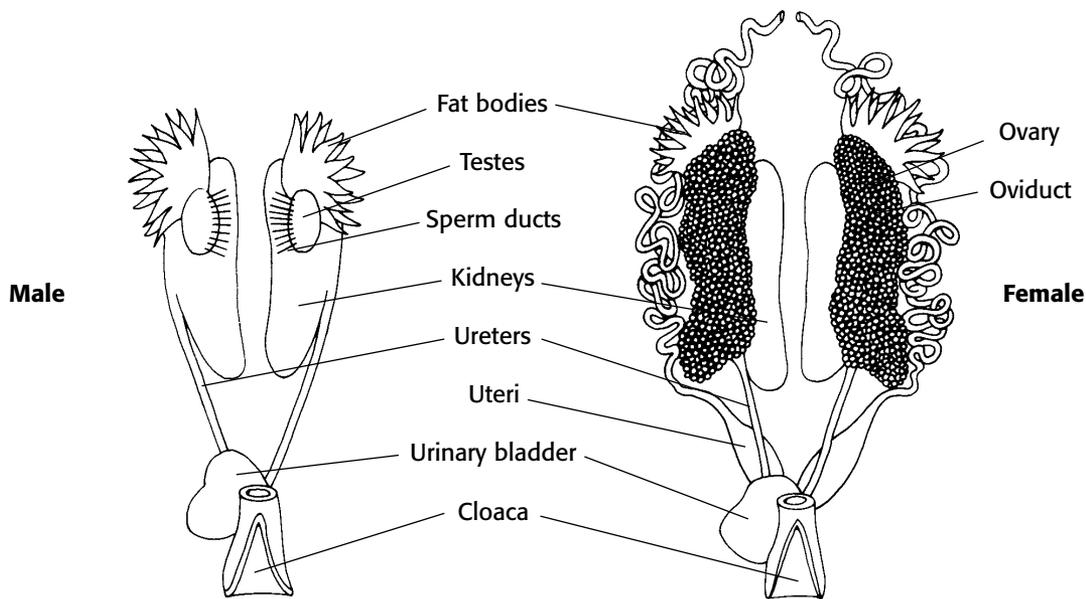
- 13.** Review the following information about the frog’s urinary and reproductive systems.

The urinary system consists of the frog’s kidneys, ureters, bladder, and cloaca. The *kidneys* are organs that excrete urine. Connected to each kidney is a *ureter*—a tube through which urine passes into the *urinary bladder*. This is a sac that stores urine until it passes out of the body through the cloaca.

The organs of the male reproductive system are the testes, sperm ducts, and cloaca. Those of the female system are the ovaries, oviducts, uteri, and cloaca. The *testes* produce *sperm*, or male sex cells, which move through *sperm ducts*—tubes that carry sperm into the cloaca, from which the sperm move outside the body. The *ovaries* produce *eggs*, or female sex cells, which move through *oviducts* into the *uteri*, then through the cloaca outside the body.

- 14.** Use a probe and scissors to lift and remove the intestines and liver. Use **Figure 6** to identify the parts of the urinary and reproductive systems.
- 15.** Remove the peritoneal membrane, which is connective tissue that lies on top of the red kidneys. Observe the yellow fat bodies that are attached to the kidneys. Find the ureters and the urinary bladder. Find the testes and sperm ducts in the male and the ovaries, oviducts, and uteri in the female.

FIGURE 6 URINARY AND REPRODUCTIVE SYSTEMS OF THE FROG



- 16.** Remove the kidneys and look for threadlike spinal nerves that extend from the spinal cord. Dissect a thigh, and trace one nerve into a leg muscle. Note the size and texture of the leg muscles.
- 17.** Dispose of your materials according to your teacher’s instructions.
- 18.** Clean up your work area, and wash your hands thoroughly before leaving the lab.

Frog Dissection *continued*

Analysis

1. Identifying Relationships What do you think is the function of the nictitating membrane? Why?

2. Analyzing Data A frog does not chew its food. What do the positions of its teeth suggest about how the frog uses them?

3. Organizing Data Through which structures does food pass as it moves through a frog's digestive tract?

4. Organizing Data List the structures, in order, through which sperm pass in a male and eggs pass in a female.

5. Organizing Data Through which structures does urine pass in a frog?

6. Examining Data Which parts of the frog's nervous system can be observed in its abdominal cavity and hind leg?

7. Making Inferences The abdominal cavity of a frog at the end of the hibernation season would contain very small fat bodies or none at all. What is the function of the fat bodies?

Frog Dissection *continued*

8. Analyzing Data What features did you notice in the frog that have helped it adapt to living on land?

9. Explaining Events Why did you dissect the nerves last?

Conclusions

1. Making Predictions Structures of an animal's body that help it survive in its environment are adaptations. How do the frog's powerful hind legs help it survive both in water and on land?

2. Applying Conclusions Suppose in a living frog the spinal nerve extending to the leg muscle was cut. What ability would the frog lose? Why?

3. Drawing Conclusions Think about the skin of the frog you dissected. A frog can respire through its skin, but a fish cannot. Why do you think this is so?

Extensions

1. Designing Experiments Before disposing of your frog, expose the brain and spinal cord, under your teacher's guidance. Use a textbook illustration to identify the parts of the brain and the spinal cord.

2. Research and Communications Investigate the decline of populations of frogs in some areas of the United States. Discuss the reported increase in frog deformities.

Frog Dissection

Teacher Notes

TIME REQUIRED One or two 45-minute periods

SKILLS ACQUIRED

Collecting data
Identifying patterns
Inferring
Interpreting
Organizing and analyzing data

RATING

Easy ← 1 2 3 4 → Hard

Teacher Prep–2
Student Setup–2
Concept Level–2
Cleanup–2

THE SCIENTIFIC METHOD

Make Observations Students make observations about frog anatomy as they dissect a frog.

Analyze the Results Analysis questions 1, 2, 6, 7, and 8 require students to analyze their results.

Draw Conclusions Conclusions questions 1–3 require students to draw conclusions from their data.

MATERIALS

Materials for this lab can be ordered from WARD'S. Use the Lab Materials QuickList Software on the **One-Stop Planner CD-ROM** for catalog numbers and to create a customized list of materials for this lab.

SAFETY CAUTIONS

- Discuss all safety symbols with students.
- Do not use specimens preserved with formaldehyde.
- Prolonged contact with WARD'Safe, which should be used to store the specimens, may be irritating to skin and eyes and may cause allergic reaction in hypersensitive individuals. Discontinue use if redness or swelling occurs. In case of contact, flush with water, including under eyelids, for 15 minutes. Contact physician if irritation or redness persists. May be toxic if swallowed. If the student is conscious, drink 8–10 oz (240–300 mL) water to dilute material; Induce vomiting. Get prompt medical attention.
- Carefully instruct students in the correct handling of all dissecting instruments, especially the scalpel. Do not allow students to use razor blades.

DISPOSAL

Wrap the remains of dissected frogs in old newspaper, place in a plastic “biohazard” bag, and tie the bag securely. Inform the school custodian of the bag’s contents, and hand it over personally for its safe disposal.

TECHNIQUES TO DEMONSTRATE

Before the lab, demonstrate the use of the dissection kit including the probe, forceps, and scalpel as well as how to pin the specimen. Show students how to hold the scalpel properly and how to use short strokes to make an incision.

TIPS AND TRICKS**Preparation**

This lab works best in groups of two students.

All WARD’S specimens are treated with WARDSafe. These specimens require no additional preparation. They greatly minimize student discomfort, especially eye irritation.

Procedure

Emphasize to students that dissection is not haphazard “cutting and slicing.” Rather, it is making careful incisions to expose parts, and then using a probe to separate organs from their coverings. Point out that the intent is to carefully unwrap the animal’s structures without damaging the structures.

Between class periods, have students cover each specimen pinned to the dissection tray with a paper towel dampened with WARDSafe. Each group should then store their specimen in a plastic bag that is tied securely. Have students use a felt-tip marker to write their names directly on the plastic bags.

If you do not wish to have students perform this dissection, alternative methods of studying the structures are available. These include models, filmstrips, videocassettes, and computer simulations.

Give the following instructions to students who carry out Extensions question 1. Cut off the tip of the nose and gently pick and scrape away the top of the skull to expose the brain. Then carefully dissect part of the spinal cord. Have everyone in the class observe the completed dissection and use a textbook illustration to identify the olfactory lobes, cerebral hemisphere, optic lobes, cerebellum, cranial nerves, medulla, spinal cord, and spinal nerves. Discuss the functions of each part.

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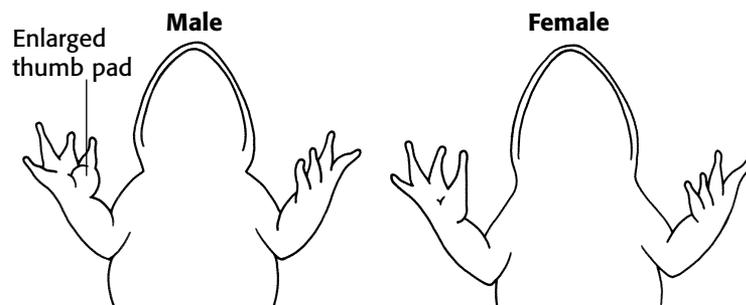
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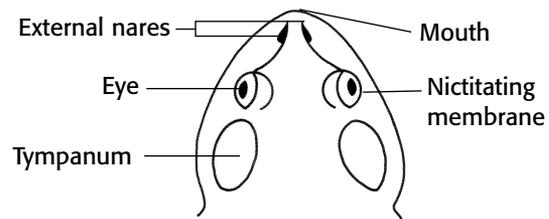
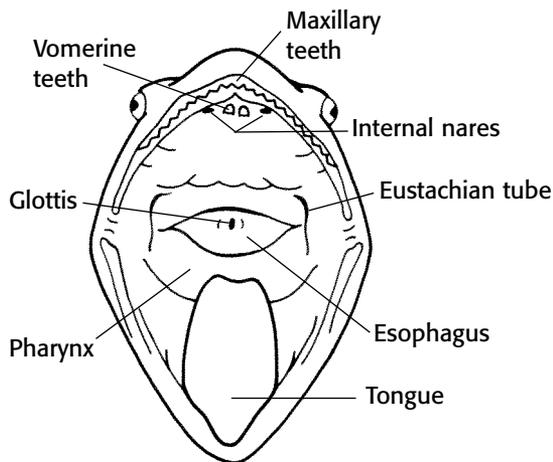
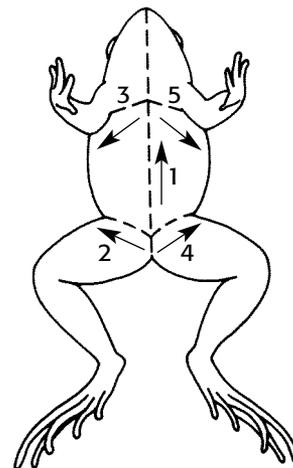
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4. Use **Figure 2** to locate and identify the external features of the head. Find the mouth, external nares, tympani, eyes, and nictitating membranes.**5.** Review the following information about the frog's mouth.

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6. Turn the frog on its back, and pin down the legs. Cut the hinges of the mouth, and open it wide. Use **Figure 3** to locate and identify the structures inside the mouth. Use a dull probe to help find each part: the vomerine teeth, the maxillary teeth, the internal nares, the tongue, the openings to the Eustachian tubes, the esophagus, the pharynx, and the slitlike glottis.**7.** Look for the opening to the frog's cloaca, located between the hind legs. Use forceps to lift the skin, and use scissors to cut along the center of the body from the cloaca to the lip. Turn back the skin, cut toward the side at each leg, and pin the skin flat. **Figure 4** shows how to make these cuts.**FIGURE 2 EXTERNAL FEATURES OF FROG HEAD****FIGURE 3 STRUCTURES OF FROG MOUTH****FIGURE 4 INCISIONS FOR DISSECTION**

Frog Dissection *continued*

8. Lift and cut through the muscles and breastbone to open up the body cavity. If your frog is a female, the abdominal cavity may be filled with dark-colored eggs. If so, remove the eggs on one side so you can see the organs beneath them.

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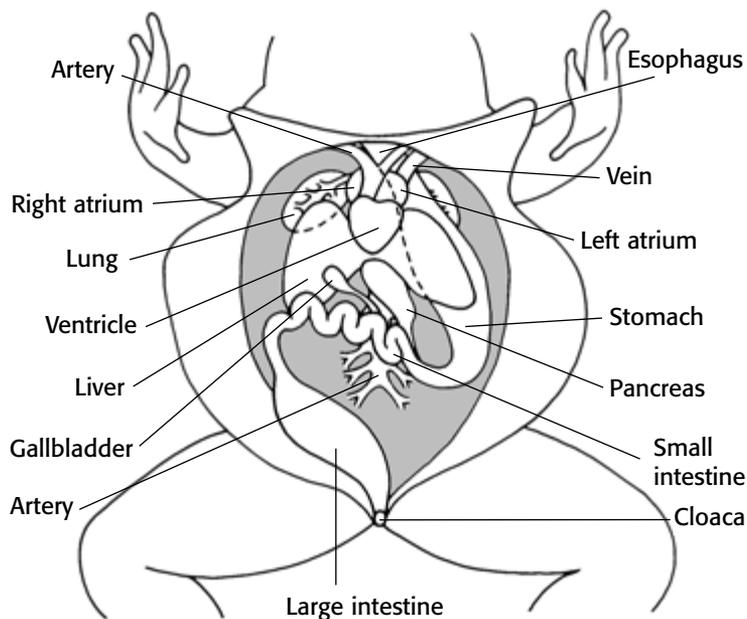
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12. Use **Figure 5** to locate and identify the left atrium, right atrium, and ventricle of the heart. Find an artery attached to the heart and another artery near the backbone. Find a vein near one of the shoulders. Find the two lungs.

FIGURE 5 ABDOMINAL AND CHEST CAVITIES OF FROG



Frog Dissection *continued*

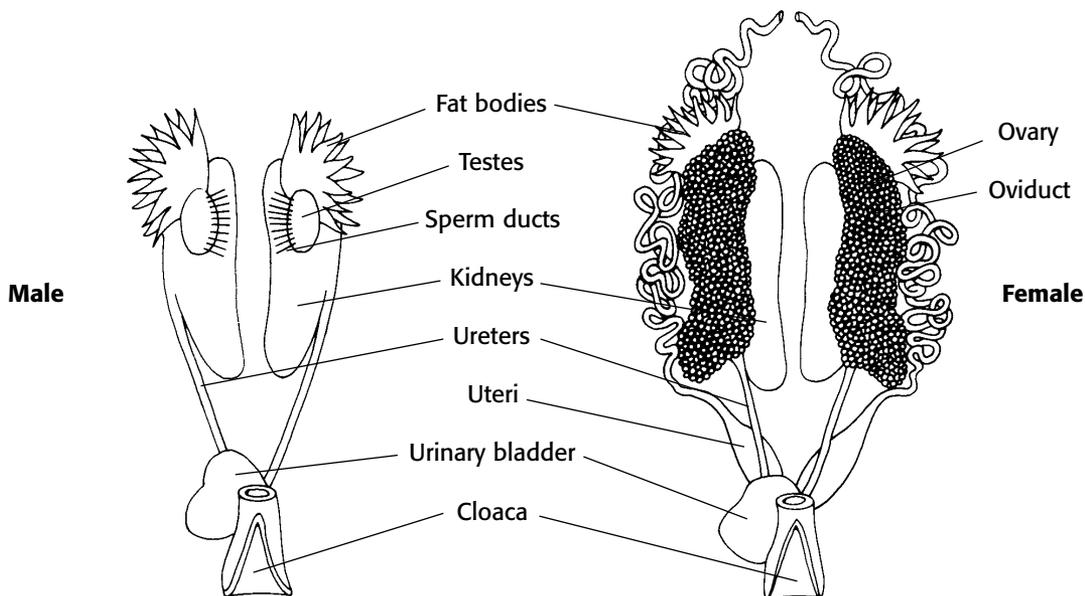
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The organs of the male reproductive system are the testes, sperm ducts, and cloaca. Those of the female system are the ovaries, oviducts, uteri, and cloaca. The *testes* produce *sperm*, or male sex cells, which move through *sperm ducts*—tubes that carry sperm into the cloaca, from which the sperm move outside the body. The *ovaries* produce *eggs*, or female sex cells, which move through *oviducts* into the *uteri*, then through the cloaca outside the body.

- 14.** Use a probe and scissors to lift and remove the intestines and liver. Use **Figure 6** to identify the parts of the urinary and reproductive systems.
- 15.** Remove the peritoneal membrane, which is connective tissue that lies on top of the red kidneys. Observe the yellow fat bodies that are attached to the kidneys. Find the ureters and the urinary bladder. Find the testes and sperm ducts in the male and the ovaries, oviducts, and uteri in the female.

FIGURE 6 URINARY AND REPRODUCTIVE SYSTEMS OF THE FROG



- 16.** Remove the kidneys and look for threadlike spinal nerves that extend from the spinal cord. Dissect a thigh, and trace one nerve into a leg muscle. Note the size and texture of the leg muscles.
- 17.** Dispose of your materials according to your teacher's instructions.
- 18.** Clean up your work area, and wash your hands thoroughly before leaving the lab.

Name _____ Class _____ Date _____

Frog Dissection *continued***Analysis**

- 1. Identifying Relationships** What do you think is the function of the nictitating membrane? Why?

Because the membrane is transparent, the nictitating membrane may permit the frog to see underwater while protecting the eye.

- 2. Analyzing Data** A frog does not chew its food. What do the positions of its teeth suggest about how the frog uses them?

The teeth hold onto living prey until it can be swallowed.

- 3. Organizing Data** Through which structures does food pass as it moves through a frog's digestive tract?

Food passes through the esophagus, stomach, small intestine, large intestine, and cloaca.

- 4. Organizing Data** List the structures, in order, through which sperm pass in a male and eggs pass in a female.

Sperm pass through the testis, sperm duct, and cloaca. Eggs pass through the ovaries, oviducts, uteri, and cloaca.

- 5. Organizing Data** Through which structures does urine pass in a frog?

Urine passes through the kidneys, ureters, urinary bladder, and cloaca.

- 6. Examining Data** Which parts of the frog's nervous system can be observed in its abdominal cavity and hind leg?

The spinal cord (in the backbone) and spinal nerves can be observed in the abdominal cavity and hind leg.

- 7. Making Inferences** The abdominal cavity of a frog at the end of the hibernation season would contain very small fat bodies or none at all. What is the function of the fat bodies?

They are a source of stored food during hibernation.

Name _____ Class _____ Date _____

Frog Dissection *continued*

8. Analyzing Data What features did you notice in the frog that have helped it adapt to living on land?

Legs, lungs, and a heart with two atria and a ventricle helped frogs adapt to life on land.

9. Explaining Events Why did you dissect the nerves last?

Other structures covered the nerves and had to be dissected first.

Conclusions

1. Making Predictions Structures of an animal's body that help it survive in its environment are adaptations. How do the frog's powerful hind legs help it survive both in water and on land?

The legs enable the frog to both swim in water and jump on land and thus catch food and escape predators.

2. Applying Conclusions Suppose in a living frog the spinal nerve extending to the leg muscle was cut. What ability would the frog lose? Why?

The frog would lose the ability to swim or jump. The spinal nerves conduct impulses from the spinal cord and brain, which control muscle movement.

3. Drawing Conclusions Think about the skin of the frog you dissected. A frog can respire through its skin, but a fish cannot. Why do you think this is so?

The scales that cover the skin of a fish do not allow oxygen molecules to diffuse across the fish's skin. A frog's skin is thin and moist, allowing diffusion of oxygen.

Extensions

1. Designing Experiments Before disposing of your frog, expose the brain and spinal cord, under your teacher's guidance. Use a textbook illustration to identify the parts of the brain and the spinal cord.

2. Research and Communications Investigate the decline of populations of frogs in some areas of the United States. Discuss the reported increase in frog deformities.