

Laboratory Investigation 10

Chapter 17C: Amphibians

Frogs

You may want to refer to pages 263-268 in your textbook for a general discussion of amphibians

Time required: Part A—20 minutes
Part B—80 minutes

Background Information

Frogs are classified as amphibians, or animals that live a double life. The name is appropriate because amphibians spend their immature lives in water and their adult lives primarily on land. Tadpoles, or young frogs, are entirely aquatic. Adult frogs can live on land or in water. In this investigation you will dissect a frog.

Problem

What are the basic external and internal structures of an amphibian? How is an adult frog adapted to live in water as well as on land?

Materials *(per group)*



preserved frog
dissecting tray
dissecting kit (scalpel, scissors, forceps, dissecting needle, dissecting pins eye dropper, probe)

Procedure

Part A External Features

1. Place the frog on its belly (ventral side) in the dissecting pan.
2. Examine the back (hind) legs and front (fore) legs of the frog. The hind legs are strong and muscular and are used for jumping and swimming. The forelegs provide balance and cushion the frog when it lands after jumping. Notice the difference between the toes, of the hind legs and those of the forelegs. In Figure 2 in Observations, label the hind legs and forelegs.
3. Locate the large, bulging eyes. The frog has three eyelids. The two outer ones are the color of the frog's body. These upper and lower lids do not move. The third eyelid is a transparent membrane that protects the eye while permitting the frog to see under water. It also keeps the eye moist when the frog is on land. In Figure 2, label the eye.
4. Behind each eye, find the circular eardrum. Then locate the two openings into the nasal cavity. These nasal openings, or external nostrils, found toward the tip of the snout, will close when the frog is under water. In Figure 2, label the mouth, eardrum, and nasal openings.

5. Feel the frog's skin. It is smooth, moist, and thin. Because the skin is thin and moist, the frog can breathe directly through its skin as well as with its lungs. Flip the frog over to examine its belly. Notice the difference in coloring between the belly and the rest of the frog's body.

Part B Internal Structures

1. Place the frog on its back (dorsal side) in the dissecting pan and pry open its mouth. If you cut the corners of the mouth (about 1—2 cm) with scissors, the mouth will open more easily. CAUTION: Be careful when using scissors.
2. Locate the tongue. Is it attached to the front or the back of the mouth? In a live frog, the tongue is sticky and is used to catch insects.
3. Gently run your finger along the inside of the upper jaw. The ridges that you feel are maxillary teeth. Two vomerine teeth can also be found in the upper jaw. They are located toward the front of the upper jaw, between and slightly behind the internal openings of the nostrils.
4. Find the gullet (throat), the wide opening that leads to the esophagus. On both sides of the gullet, near the jaw hinges, are other openings. These are the openings to the Eustachian tube. Using your probe, find out where the Eustachian tubes lead.
5. In Figure 3, label the tongue, maxillary teeth, vomerine teeth, internal nares, gullet, and Eustachian tube opening.
6. Now you are ready to open the abdominal cavity. Place the frog on its back (dorsal side) in the dissecting pan. Secure it by placing dissecting pins through the tip of the snout and each of the legs. See Figure 1.

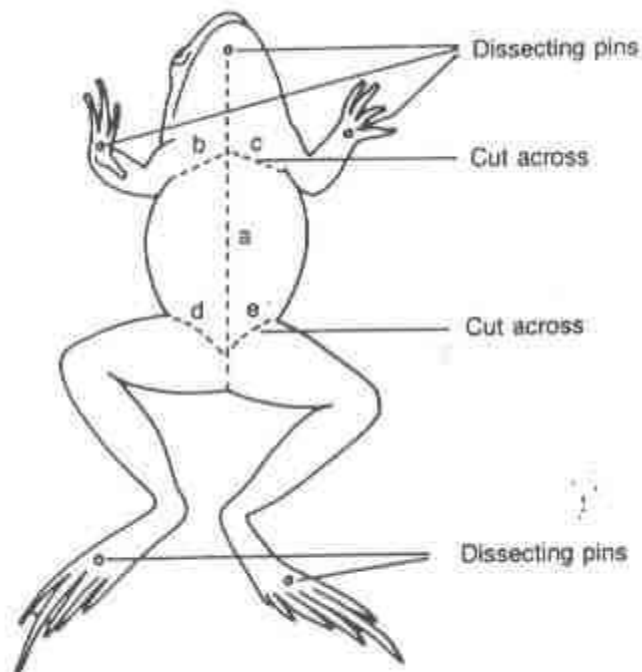


Figure 1

7. Your first incision will be made along the midline of the belly—from the pelvis to the throat. Begin by lifting the belly skin with forceps and inserting the point of your scissors at the midline near the pelvis. Carefully cut along the midline toward the throat. Note: Cut through the skin only. See line a in Figure 1.
8. At the top and bottom of this incision, make cross cuts toward the forelegs and hind legs. See lines b, c, d and e in Figure 1. Fold back the flaps of skin and secure them with dissecting pins.
9. You are now ready to cut through the muscle layer. Repeat the incisions you made in steps 7 and 8, this time cutting through the muscle layer. Work carefully. Note: Do not cut too deeply or you will damage the underlying organs.
10. The sternum, or breastbone, is located between the forelegs. Cut through this tough structure. Fold back the muscle layer and secure it with pins.
11. If your frog is a female, the body cavity may be full of black eggs and ovary tissue. If they are present, carefully remove the eggs and tissue. Rinse the body cavity with water.
12. The largest organ in the abdominal cavity is the reddish-brown liver. Find it and count the number of lobes (sections).
13. Locate the greenish sac attached to the liver. This is the gallbladder. It stores bile, which breaks down fats during digestion.
14. Beneath the liver, find the large white stomach. It will be on the right side as you look at the frog. The stomach connects to the small intestine. The straight part of the small intestine (near the stomach) is called the duodenum; the remaining, coiled section of the small intestine is the ileum. Separate some of the coils of the ileum and you will see that they are connected by thin, transparent membranes. Such membranes are called mesenteries.
15. The small intestine eventually widens to form the large intestine. The large intestine is a straight tube leading to the anus. The lower portion of the large intestine is called the cloaca.
16. Two smaller organs are somewhat more difficult to find. In the mesentery along the inner curve of the stomach, locate the pinkish pancreas. In the mesentery of the coiled part of the small intestine, see if you can find a small reddish spherical structure. This is the spleen.
17. In Figure 4, label the liver, gallbladder, stomach, small intestine, large intestine, cloaca, mesentery, and pancreas.
18. Using the scissors, carefully remove the liver. Cut through the upper end of the stomach and the lower end of the large intestine. Then remove the stomach and intestines.
19. How long do you think the small intestine is? Record your guess. Then stretch out the small intestine and measure it.

20. Cut open the stomach and a section of intestine to examine the lining and internal features.
21. Locate the lungs, two reddish-brown saclike structures. Insert a clean medicine dropper (with the bulb removed) down the frog's windpipe. Label the lung in Figure 5.
22. Locate the heart between the lungs. Cut through the thin membrane that surrounds the heart. This will expose the heart for closer examination.
23. The frog's heart has three chambers. Find the two upper chambers—the right and left atria (singular: atrium)—and the lower ventricle. Compare the thickness of the walls of the atria and the ventricle. In Figure 5, label the heart, right and left atria, and ventricle.
24. Find the two dark-red kidneys attached to the back wall of the abdominal cavity. Find the urinary bladder, which empties into the cloaca. The tubes leading from each kidney to the bladder are called ureters. Label the kidney, urinary bladder, and ureter in Figure 5.

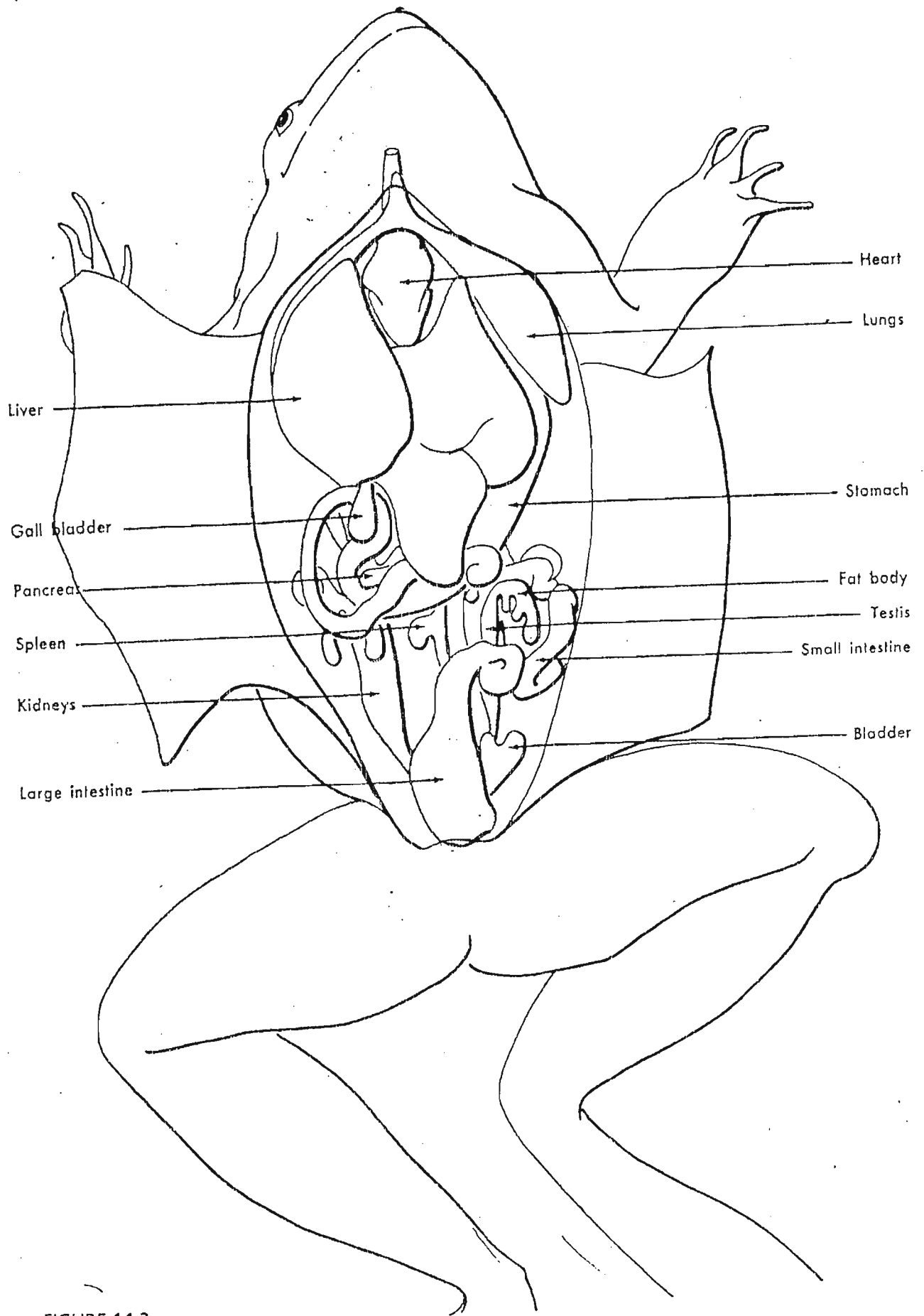
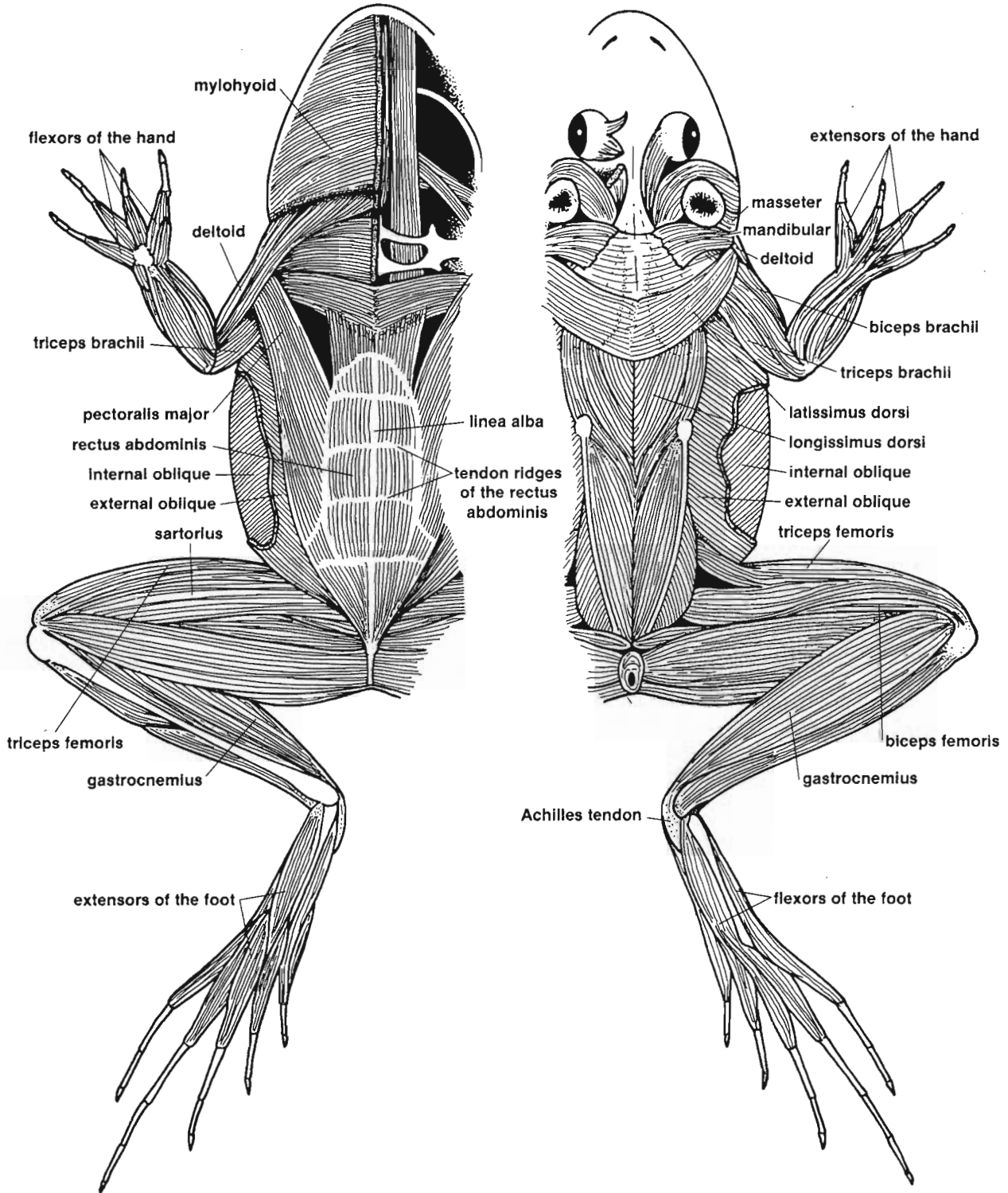


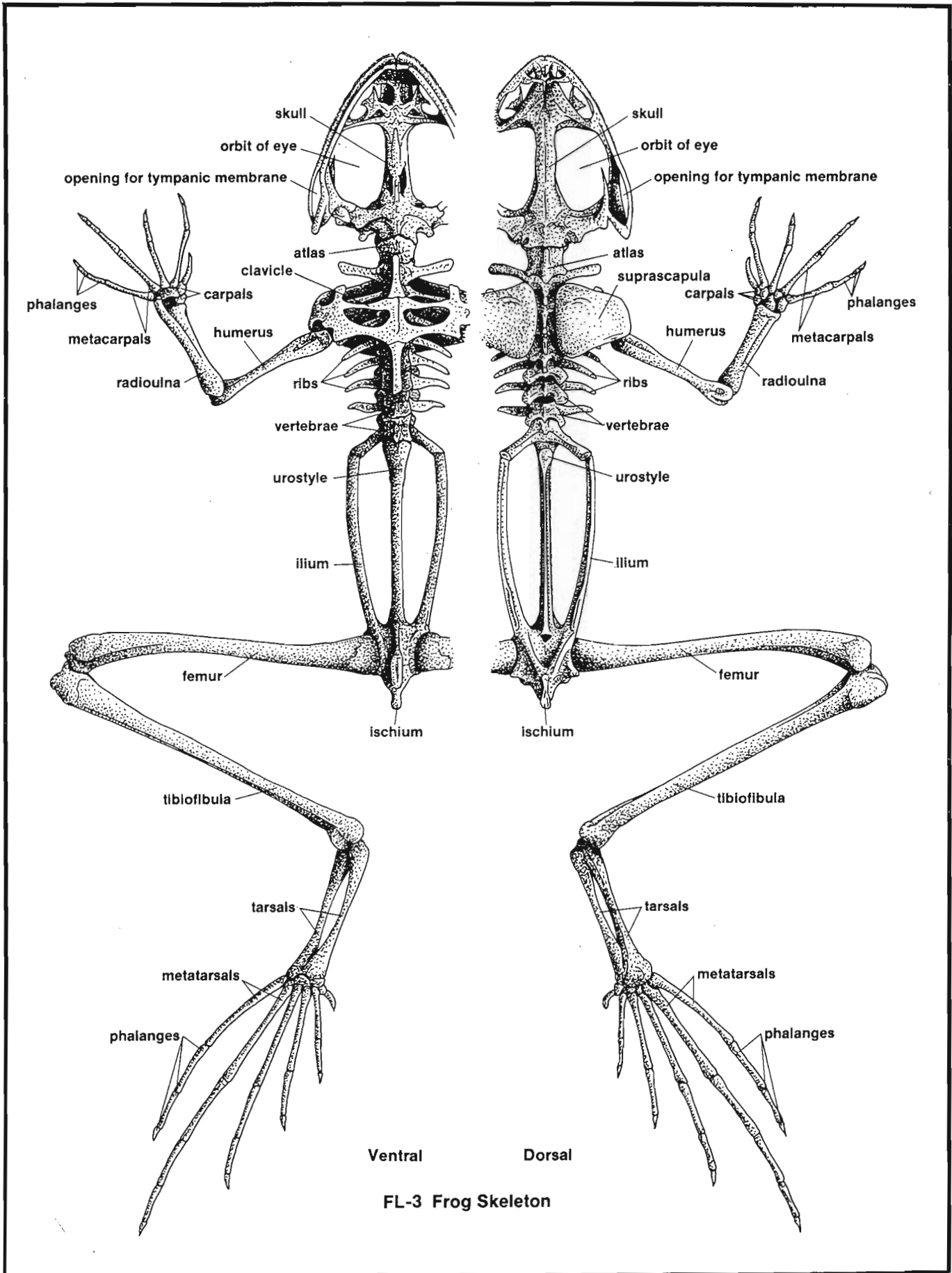
FIGURE 14-2.

FL-4 Frog Muscles

Ventral

Dorsal



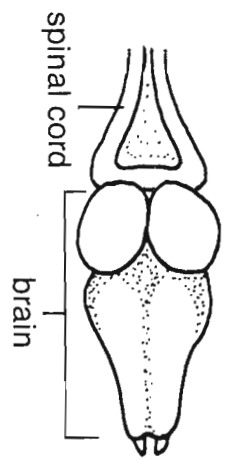


Ventral Dorsal

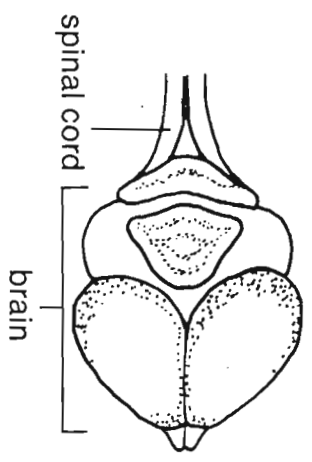
FL-3 Frog Skeleton

NERVOUS SYSTEMS OF VERTEBRATES

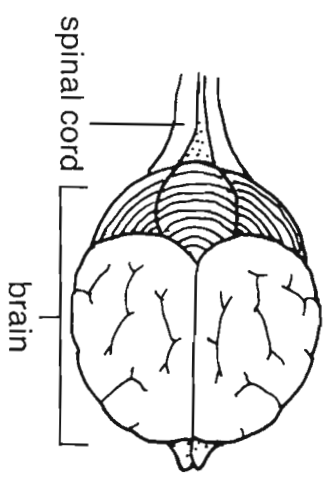
AMPHIBIAN



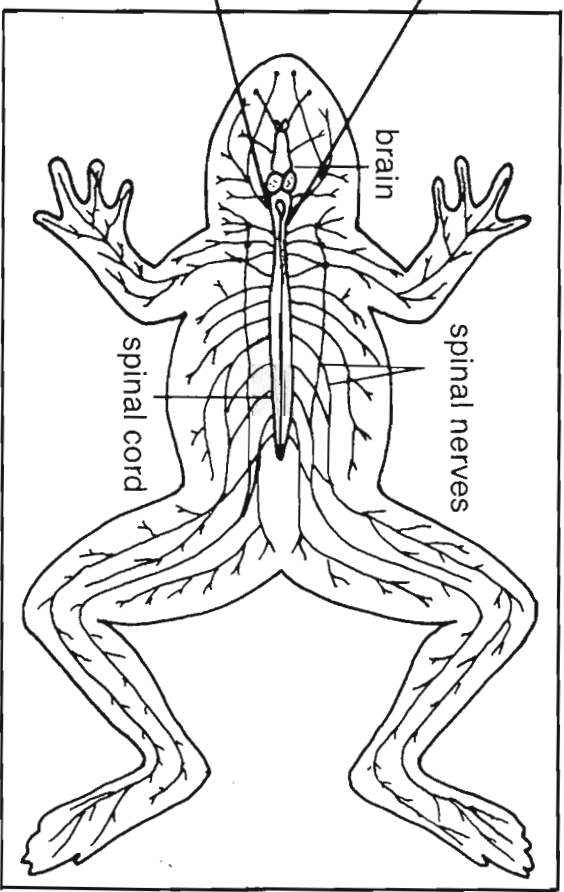
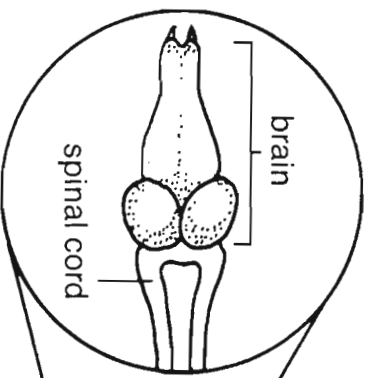
BIRD



MAMMAL

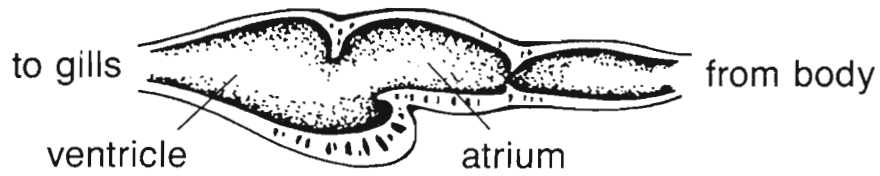


Comparing Vertebrate Brains

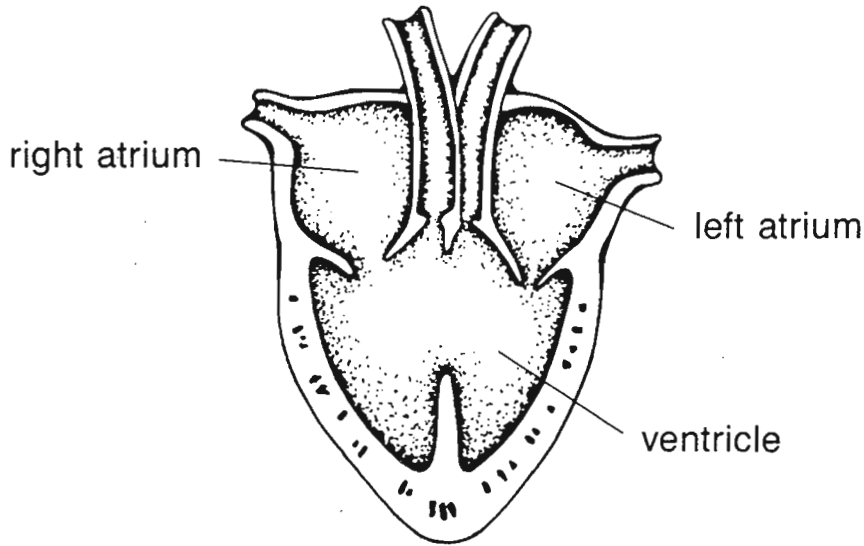


Frog Nervous System

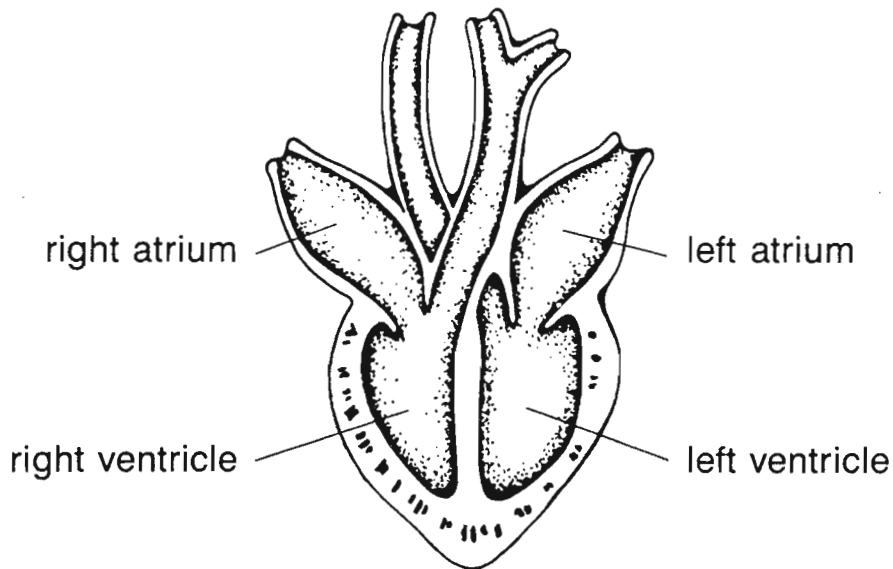
CIRCULATORY SYSTEMS OF VERTEBRATES



HEART OF FISH



HEART OF AMPHIBIANS AND MOST REPTILES



HEART OF BIRDS AND MAMMALS

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