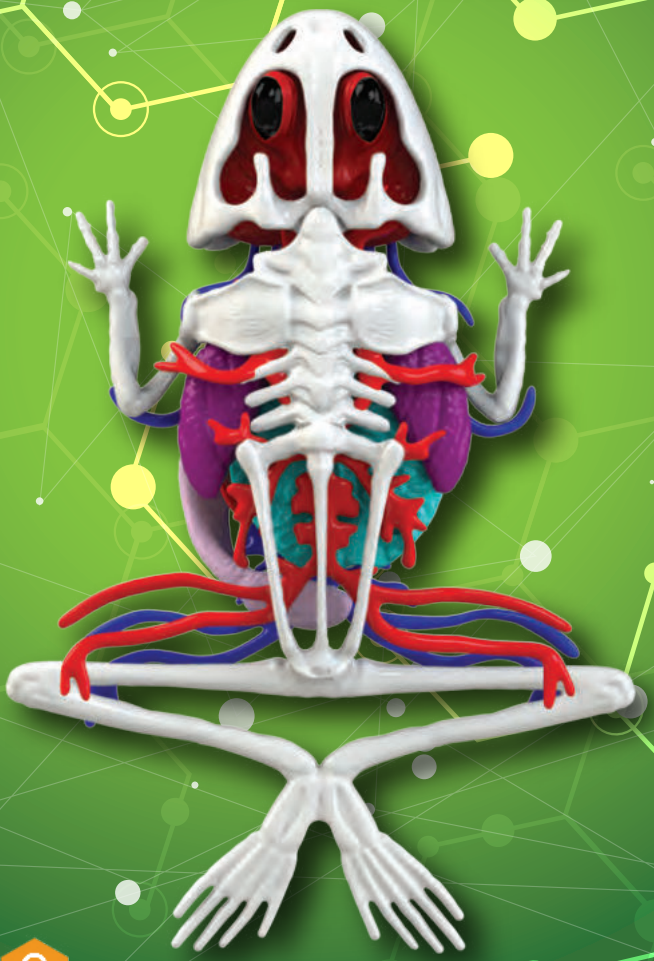
DISSECT IT+®

SYNTHETIC DISSECTION KIT

FROG LAB



STEM.ORG AUTHENTICATED™ EDUCATIONAL PRODUCT

Contents of This Kit

2X DISSECT-IT POWDER REFILL PACKETS

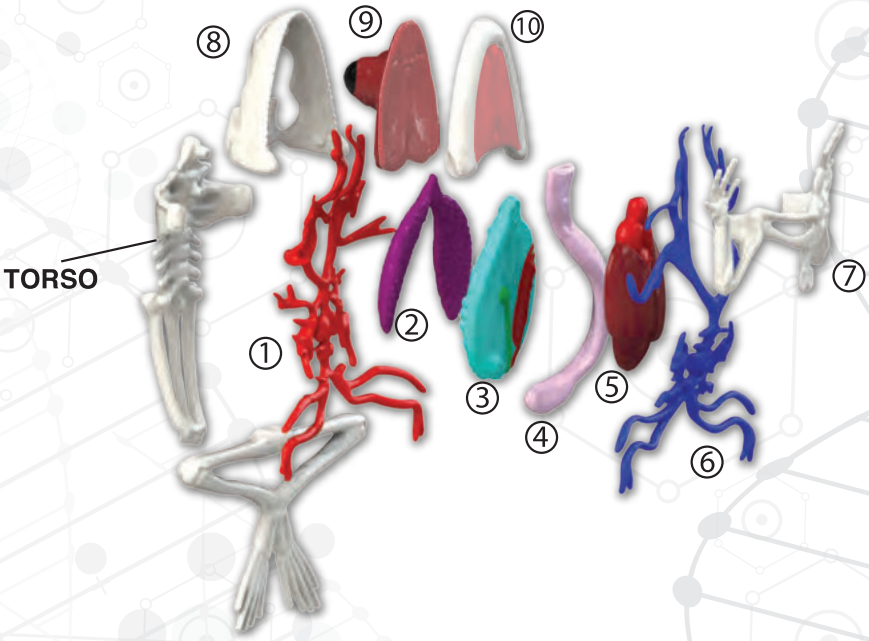
FROG

SCALPEL

PROBE

You will also need a measuring cup, a plastic spoon or small wooden spatula for mixing (not included).

Assembly



① **ARTERIES**– Sit between the TORSO and the LUNGS and between the SKULL and the BRAIN/EYES

② **LUNGS** – Snap onto the TORSO.

③ **LOWER ORGANS**– Snaps onto 2. Contains the Spleen, Pancreas, and Gallbladder, Mesentery, Cloaca, and Ovaries

④ **STOMACH** – Snaps onto 3.

⑤ **HEART & LIVER** – Snaps onto 4.

⑥ **VEINS**– Sit under the RIBS and between the JAW and the BRAIN/EYES

⑦ **RIBS** – Snaps onto 5 and the TORSO.

⑧ **SKULL** – Snap onto the TORSO.

⑨ **BRAIN & EYES** – Snaps onto 8.

⑩ **JAW** – Snaps onto 8.

Getting Started

Your frog is ready to dissect right out of the box.

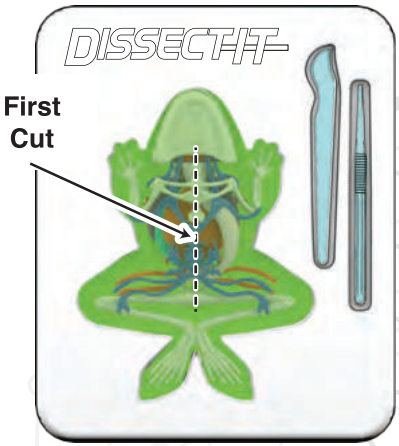
Simply peel off the plastic film, remove the frog from the mold, and place it with the belly facing up on to the dissecting table (see figure below).

Keep the frog mold in a safe place. You will need it for molding future frogs.

First Cut

Now that you have laid out your frog like the figure below you can use your provided scalpel and probe to cut away sections of the skin to reveal the internal organs and skeleton of your frog. Usually the first cut should be in the middle of the ventral side (underside) of the frog beginning just below the posterior (back) of the jaw line all the way to the caudal (tail) end of the frog. A side incision may be made to the side of the midline (central incision) distally (toward each side) to allow a flap of skin to be laid back to expose the position and location of the internal organs.

We recommend reading the manual as you dissect your frog so you can learn about exciting facts about frog anatomy.



The Anatomy

Skin

Try cutting through the artificial skin. Like many amphibians their skin is very thin, much thinner than that of reptiles, birds or mammals. Frogs use their skin for many vital bodily functions. Many species can breathe through their skin, even when they are underwater. They don't need to drink with their mouths, since their skin absorbs water.

Amphibians have glands in the skin to produce mucus. This mucus helps keep their bodies moist — that's why so many frogs and toads are "slimy" when you touch them.

Poisonous frogs and toads secrete toxins as a defense against predators. Usually, these toxins are mild: they might cause burning in the mouth or eyes of an attacker. But a few frogs are so poisonous that they are deadly. Native Americans in northwestern South America even arm their blowdarts for hunting with the toxins from Poison Dart Frogs.

Skeleton

Here are the major bones of the frog which you will explore in your "dissection".

Like humans, frogs have a strong skeleton that provides the body's structure and supports and protects the internal organs.

The frog's skeleton is composed of bone and cartilage. Muscles attach to the bones and enable the frog to move. As you inspect the skeletal structure, please note that many of the bones in a frog are very similar in structure and function to those in humans and other mammals; these include such bones as the scapula (shoulder blade), humerus (proximal arm bone), radius and ulna (forearm bones), femur (hip bone) and tibia (shin bone). The skull protects the brain and eyes.

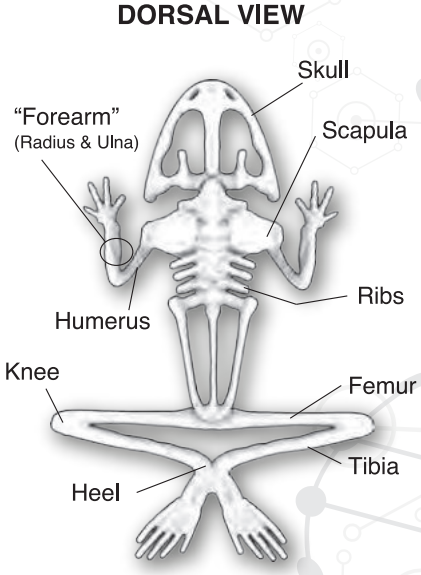


Figure 1

Heart

The frog's heart is divided into three chambers: two atria and one ventricle. (Compare this to the four-chambered human heart with two atria and two ventricles).

The frog's heart circulates its blood through a process in which blood passes through the vena cava and the ventral abdominal vein, and enters the right atrium of the heart. It's pumped into the right side of the ventricle by contraction of the atrium.
The ventricle then contracts, and the blood is sent through the pulmonary artery to the lungs, where carbon dioxide is removed and oxygen is replaced in the blood. This oxygen rich blood then returns to the heart — to the left atrium, where it is pumped into the left side of the ventricle and then back out through the aorta to the rest of the body.

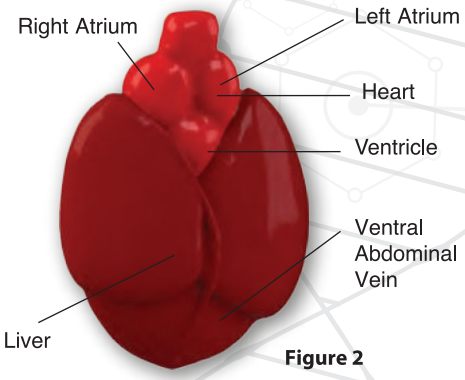


Figure 2

Liver

The liver synthesizes or stores many of the vital substances used throughout the frog's body. (See Figure 2)

It also absorbs substances from the blood that may be toxic to other animals, and breaks them down into harmless components. Liver cells produce bile, which is carried by a system of bile ducts to the gallbladder, where it is stored.

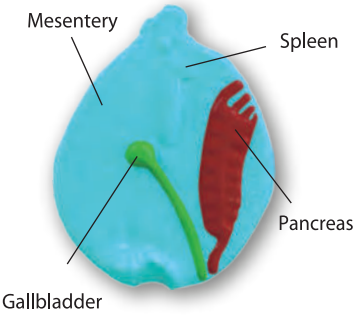


Figure 3A

Lungs

The lungs are divided into two lobes, the right and the left. When the frog breathes, it inhales oxygen into the lungs. This oxygen is exchanged for carbon dioxide in the blood within the lung's tiny blood vessels known as capillaries. The carbon dioxide is then expelled from the body when the frog exhales.

When frogs hibernate, their metabolism slows down and nearly comes to a halt: frogs stop breathing with their lungs, and absorb most of their oxygen through the skin.

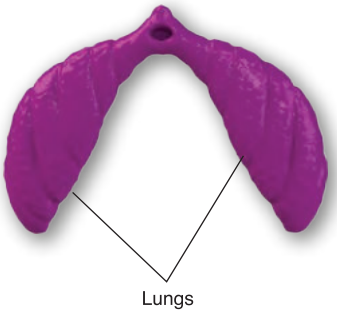


Figure 4

Stomach

Digestion begins in the stomach. Though as tadpoles they are usually vegetarian, all adult amphibians are carnivores meaning they eat other animals.

Most frogs eat insects, worms, and other invertebrates. Large frogs may also eat birds, mice, snakes, and even other frogs. Although some species may have primitive forms of teeth, most amphibians don't have teeth and cannot chew their food. Prey is swallowed whole, often while it is still alive, and is then sent to the stomach.

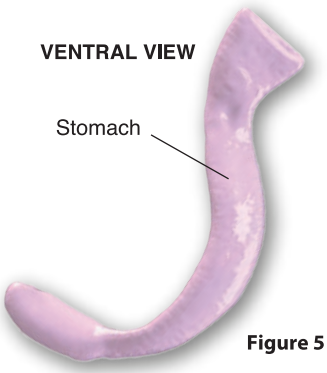


Figure 5

Intestinal Tract

Most digestion occurs in the small intestine. Partially digested food from the stomach enters the small intestine and mixes with powerful digestive enzymes secreted by the pancreas. (See Figure 3A) The enzymes break the food down into very small particles that can be absorbed by the intestinal walls. Then the particles are secreted into the blood stream and carried to the liver for processing.

The bile produced by the gallbladder (See Figure 3A) is released into the small intestine. Bile aids in digestion and helps the frog absorb fat. Food material that is not broken down in the small intestine passes to the large intestine or colon.

The colon contains many bacteria and protozoa which help to break the food down even more. The frog, the bacteria, and protozoa exist in a symbiotic relationship — the frog's body provides a home for these microscopic creatures, and in turn they help the frog digest its food. Any material left in the colon is passed out of the body as feces through the Cloaca.

Cloaca and Ovaries

The cloaca is the terminal part of three different body systems. Feces from the intestinal tract are excreted here. So is urine from the urinary bladder.

During mating season, eggs are produced in the ovaries of the female frog (See Figure 3B) and pass into the oviducts. They are then released from her oviducts into the cloaca before being released into the environment for fertilization by the male frog. Likewise, male frogs release semen through the cloaca.

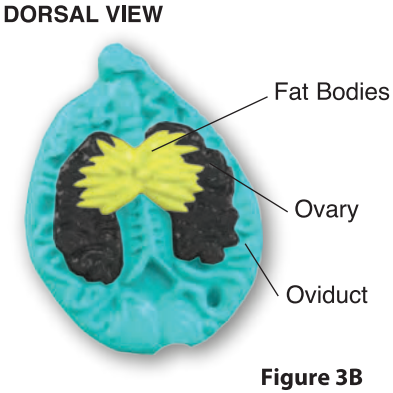


Figure 3B

Urinary Bladder

Kidneys filter the blood and remove the by-products of metabolism by producing urine. Urine is stored in the urinary bladder before being released from the body. Unlike most mammals, frogs and other amphibians have the ability to re-absorb much of the water in their bladders if it becomes necessary. Frogs and toads may also empty their bladders as a defense mechanism against predators as anybody who has ever caught a wild toad has surely experienced!

Brain and Eyes

Frogs do not have large brains. A large part of what they do have is devoted to sight. This helps them find food and avoid predators.

You will notice that a frog's eyes bulge out from their head. This allows them to see in front, to the side, and partially behind them. (Figure 6)

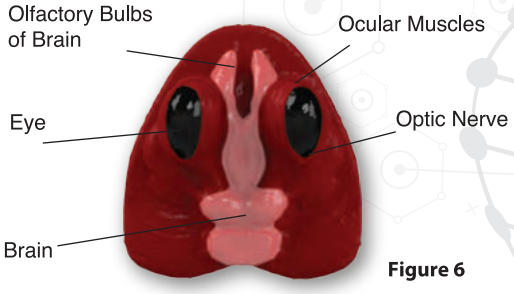


Figure 6

Arteries and Veins

Frogs have a closed circulatory system meaning that all of the blood in their bodies is enclosed within in blood vessels. As you will see in the model these blood vessels range in size and oxygen and nutrients are exchanged to the tissues through the smallest ones. The frog's circulatory system consists of the heart, the arteries, and the veins, each which serves a different function.

The arteries, which are red, are responsible for carrying oxygen-rich blood away from the heart and dispersing it to the rest of the body. Within the arterial system there are left and right branches and each of these branches subdivide into three major vessels or aortic arches: common carotid to head, systemic to body and viscera, and pulmocutaneous to lung and skin. (Figure 7)

The veins, which are blue, on the other had carry blood which is low in oxygen from the body back into the heart where it is then reoxygenated. The venous system contains four types of veins: pulmonary veins, caval veins, renal portal veins, hepatic portal veins. (Figure 8)

Figure 7

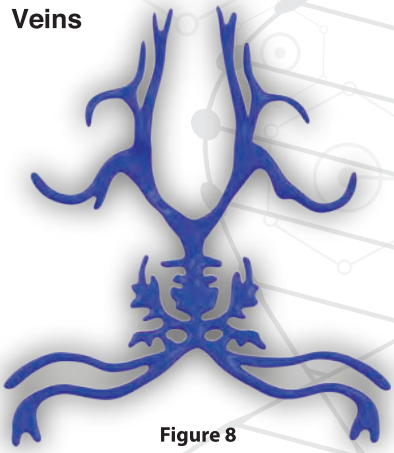


Figure 8

Molding a New Frog

To familiarize yourself with the preparation process, read steps 1 through 7 first, before actually preparing the frog.

1. Prepare the bones and organs by cleaning off any excess gel material from your last frog.

2. Now assemble the frog skeletal system, organs, veins, and arteries as shown in the sequence in the drawing to the right (Figure 9). After you have assembled all of the pieces, place the assembly into the cavity of the clear plastic frog mold. Be sure to place the assembly so that the ventral (underside) of this assembly faces upwards in the frog mold.

3. Next place the clear plastic frog mold with the internal structure assembly inside on to the clear plastic dissecting table so that the mold is level.

4. Since some of the compound may spill over the edge if you pour too much it is important to make sure that you are working over newspaper or paper towel.

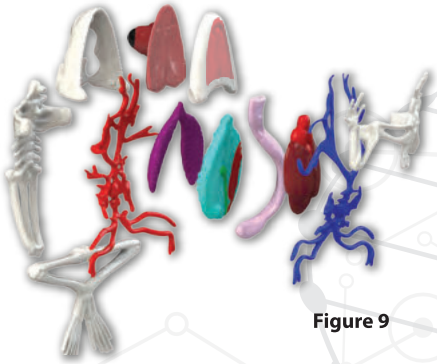


Figure 9

5. Mixing the frog body: You will need a medium sized bowl, a plastic spoon or wooden spatula for mixing, and a measuring cup for the water. Take the bag of green powder and with adult supervision carefully cut open the bag. Now take the open bag of powder and empty it into the bowl. Using your measuring cup measure 1 cup (250ml) of warm water. Then, take the water and slowly pour it into the bowl with the powder and stir until the parts are well combined.

6. Once your mixture is a smooth pudding like consistency pour it into the frog mold. Stop pouring once the material has reached the first lip of the frog mold as pictured below (Figure 10). Store in a refrigerator for one hour or until the gel has solidified.

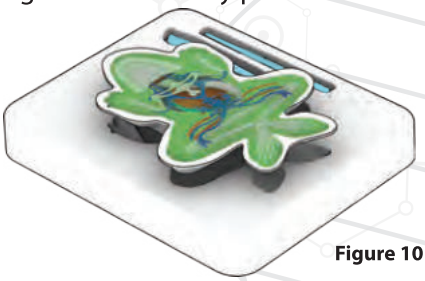


Figure 10

7. Now your frog is ready to dissect. Simply remove the frog from the mold and place it with the belly facing up on to the dissecting table. Since the frog is not real, it is not possible to dissect as a real frog. However, using your provided scalpel and probe, cut sections of the skin to reveal the internal organs and skeleton of your frog.

The Frog

Frogs have fascinated people since the beginning of civilization. They're everywhere: frogs can be found on every continent in the world except Antarctica. And nearly everyone knows some famous fictional frog, whether it's the Frog Prince from folklore or Kermit from the Muppets.

Bullfrogs, with their rumbling foghorn calls and their long, flipping tongues, are the species of frog many Americans know best. You'll use this kit to simulate a bullfrog dissection.

However, there are more than three thousand frog species, and the lives they lead are endlessly varied. There are tree frogs that never descend to earth: their eggs are laid in tiny pockets of water stored at the base of leaves. There are desert frogs that live part of their lives underground,where they stay cool and damp. Others dwell happily in icy mountain streams, or in the tropics, where they hatch their eggs in water as hot as 90°F (32°C) degrees .

Amphibians

All frogs are amphibians. Amphibians are ancient animals: they've been around for at least 360 million years. Today, all the world's amphibians can be divided into three main groups: the *Anura*, which are the frogs and toads, the *Caudata*, or tailed amphibians, which include salamanders, and the *Caecilians*, or *Apoda*, which are blind, legless creatures that primarily live under ground or under water. The word "amphibian" comes from the Greek Amphibios, meaning "with a double life," and amphibians all share a very important characteristic: they spend part of their life cycle on land and part in the water.

Most amphibians have something else in common: they undergo metamorphosis, a process of physical change that alters their anatomy to allow them to change from an exclusive water dweller in the larval stage to one that can breathe air as they grow from an egg into a mature adult.

Metamorphosis

Here is how metamorphosis works: Adult frogs lay eggs. After they are hatched from their eggs, they emerge as larvae called tadpoles. After hatching, the tadpoles of most species swim independently, although there are a few species where tadpoles stay attached to their mother's bodies until they're ready to fend for themselves.

Tadpoles live entirely in water, and swim by beating their strong tail. They breathe through gills, much like a fish. Tadpoles are efficient eating machines, feeding on particles of plants, animal remains, and algae that they find in the water.

As tadpoles grow and mature into froglets (baby frogs)or toadlets (baby toads), their bodies undergo many changes. Legs sprout, allowing them to hop or walk about. The tails disappear in a process known as "resorption." Their gills are also resorbed as they grow lungs and begin to breathe air. By the end of metamorphosis, the frogs are no longer just dependent on water-dwelling alone, but can spend time on land. The whole process can take as short as a few days for some species, or as long as four or five years for species like the North American bullfrog.

Population Decline

We know a great deal about frogs, but some mysteries remain. One of the biggest is why frogs seem to be disappearing all over the world. This decline in global amphibian populations seems to have begun around 10 years ago. The first evidence of a problem was anecdotal: people simply noticed there seemed to be fewer frogs around. But recently scientists have collected data to support this perception. Many frog species do seem to be in danger.

Why? One reason may be human activities that create dangerous pollution and which destroy the habitats that frogs need to live and grow. However, it is unlikely that a single cause would account for the serious decline of a wide variety of amphibian species all over the world. It may take years to solve this mystery. Meanwhile, we must all work to conserve and protect the natural environments where frogs live.

Frogs are an integral part of their ecosystem. We hope this toy will help you improve your knowledge of frog anatomy, and deepen your understanding of the biology which makes frogs such an important — and fascinating — part of the world's natural environment.

Bullfrogs

Bullfrogs, Rana Catesbeiana, are a very common species of frog in North America. They're large, measuring 4-7in (100-175 mm), and highly aquatic: adults rarely travel far from rivers, lakes or ponds.

Bullfrogs hibernate during the winter, then emerge for the warm weather and begin sending mating calls at their breeding sites during the springtime. Bullfrog calls are instantly recognizable — they're the deep, foghorn-like calls that can sometimes be heard from as far as a kilometer away. The males call to attract mates and to declare their territories. A single female bullfrog can lay 20,000 eggs at a time; in warm summer waters. However, bullfrog tadpoles develop slowly — it can take up to five years for them to reach maturity.

The bullfrog's appetite is legendary. They eat (or try to eat!) anything that moves, from bugs to baby ducks to snakes. The frogs in turn are preyed upon by snakes, raccoon, large birds, and many other predators.

A bullfrog can live 7 to 9 years in the wild, though the record for a frog in captivity is 16 years.

The frog you'll be dissecting had a much shorter life span, of course — 0 years from the day it was molded to the present. It's plastic. However, following the steps below and reading about the various bones, veins, arteries and organs inside the frog will help you learn about the complex biology of real bullfrogs.

In Conclusion

Next time you're in an area with ponds, streams or lakes, look and listen for frogs. You already know a good deal about their appearance, inside and out; with a little practice, you can learn to identify males from females, and bullfrogs from other species. You can even sort them out by their calls.

But wait...

There's more to explore!
Check out our other Dissection Kits

Visit www.topsecrettoys.us for more great toys!

⚠ WARNING:
CHOKING HAZARD -- Small parts. Not for children under 3 yrs.

Not suitable for children under 36 months. Choking hazard (small parts). Product specifications, colors and contents may vary from those illustrated. **IMPORTANT:** Please retain packaging/illustrations and purchase details for future reference as they may contain important information.

CE

SAFETY WARNING:

This product is to be used under the direct supervision of an adult. Do not allow material to come in contact with the eyes. Do not place material in the mouth. Keep very young children and animals away from the activity area. Store out of reach of young children. Wash hands after use. Do not use any equipment which has not been supplied with this product or recommended in the instructions for use with this product. Do not eat, drink, or smoke in the activity area.

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