DISSECT IT®

SYNTHETIC DISSECTION KIT

# MEGA LAB

## FROG + PIRANHA

### LEARNING GUIDE AND LESSON PLAN

STEM.ORG AUTHENTICATED™ EDUCATIONAL PRODUCT

# Contents of This Kit

PIRANHA

FROG

TWEEZERS

SCALPEL

PROBE


4X DISSECT-IT POWDER REFILL PACKETS

DISSECTION LABEL STICKER SHEET


MAGNIFYING GLASS


DISSECTION BOOKLET

**Apply the Dissection Labels to the Dissection Table in the locations marked below.**

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

# Getting Started

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

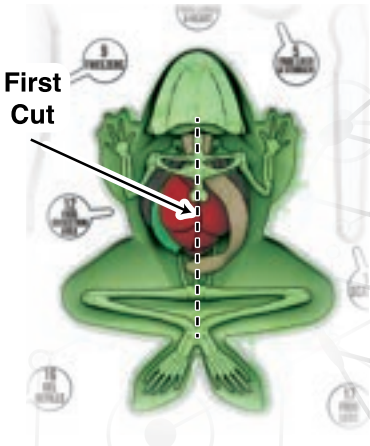
Simply peel off the plastic film, remove the frog from the mold, and place it with the belly facing up on to the dissecting table (see figure below).

***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.

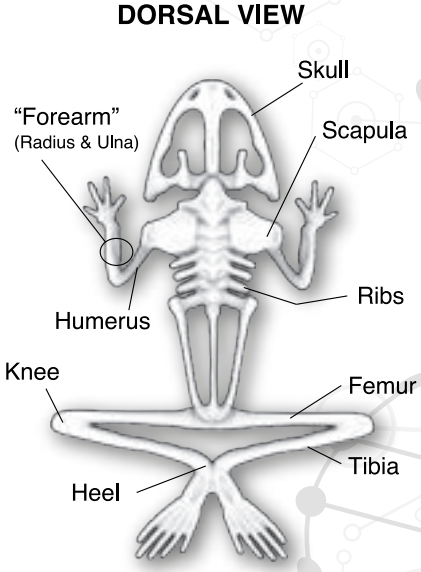



**Figure 1**

## 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 through 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.

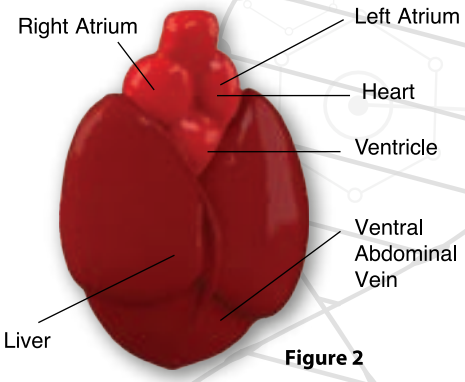



**Figure 2**

## 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.

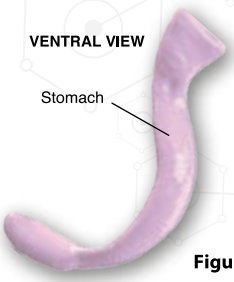


**Figure 3**

## Liver

The liver synthesizes or stores many of the vital substances used throughout the frog's body. (See Figure 4)

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.

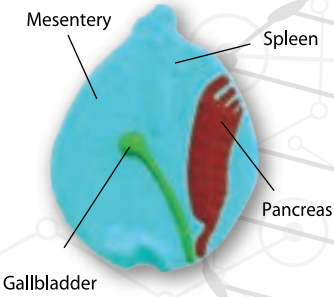


**Figure 4A**

## 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 4B) 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.

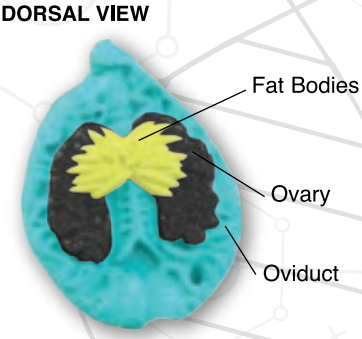


**Figure 4B**

## 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 4A)

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 4A) 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.

## 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!

## 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.

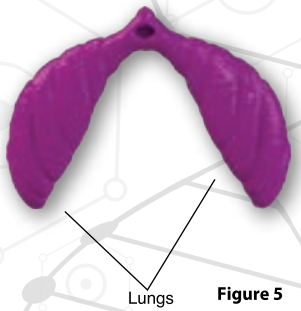


**Figure 5**

## 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)

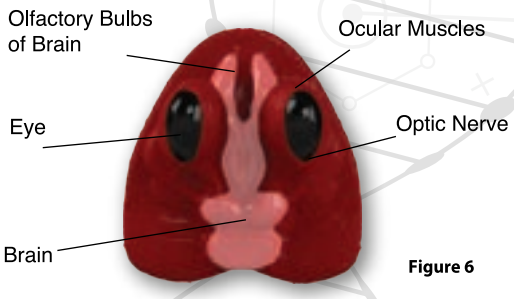


**Figure 6**

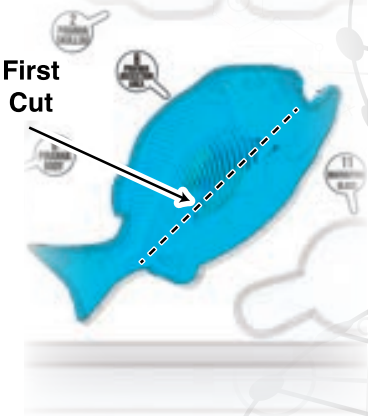
# Getting Started

**Your piranha is ready to dissect right out of the box.**

Simply peel back the plastic film, remove the piranha from the mold, and place it on to the dissecting table (see figure below).

***Keep the piranha mold in a safe place. You will need it for molding future piranha.***

## First Cut




Now that you have laid out your piranha like the figure to the right, you can use your provided scalpel and probe to cut away sections of the skin to reveal the internal organs and skeleton of your piranha. Usually the first cut should be in the middle of the ventral side (underside) of the piranha beginning just below the back of the jaw line all the way to the caudal (tail) end of the piranha. Side incisions may be made to the side of the midlife 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 piranha so you can learn about exciting facts about piranha anatomy.

# The Anatomy

## Skeleton

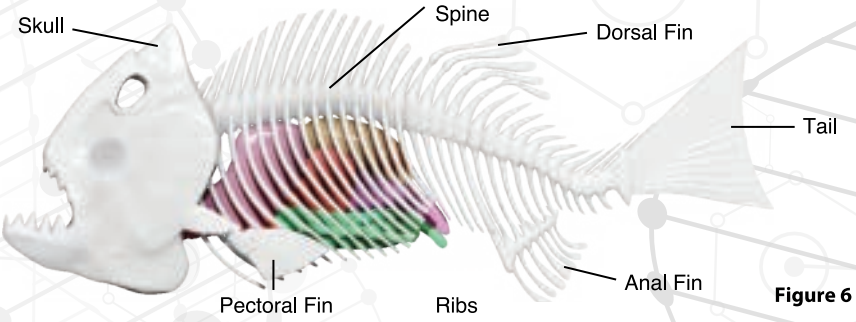



**Figure 6**

Fish are vertebrates, so they have a skeleton that includes a spine and a skull. A skeleton shapes, supports, and protects the soft parts of the fish's body, such as the organs and muscles. Fins and a tail are a part of a fish's skeleton that grows within the skin. The study of bones of fish is more difficult than in other vertebrates. Fish skeletons are made up of many more bones. For example, humans have 28 skull bones and a fossil fish was found with more than 150 skull bones.

## Skin

When you cut through the artificial skin of the Piranha fish, you will find it very similar to a real one. Piranha skin is very thin and covered by circular colorful scales. Fish skin is an external protective surface. It acts as a cover that separates its soft organs from the external environment. Skin and scales together have a lot of vital functions. Many species use it to take oxygen from water directly, mainly when the fish are young. They also help the fish to feel any movement in the surrounding water which helps them know the direction and strength of current. Also through the help of skin and scales, fish can feel the motion of a prey; guess the location of an obstacle or predator; and stay connected with their groups. The beautiful circular scale has an unusual shape and buildup that gives the Piranha fish high flexibility. Scales are bright and mirror like to help them hide from predators.

## Skull

Heads of fish are unlike most terrestrial vertebrates. Most fishes have heads able to expand so that they can eat through suction. Their vertebral columns have a high lateral flexibility to give them the power to move in variant currents. Like humans, fish have a hard skull to protect their brains. The skull encloses and protects the brain and most of the sense organs.
The jawbones of a fish work like hinges to open and close the mouth. The Black Piranha has the strongest bite force recorded for bony fish. Piranha fish jaw bones are so strong, that they can crush a human hand in 5-10 seconds.

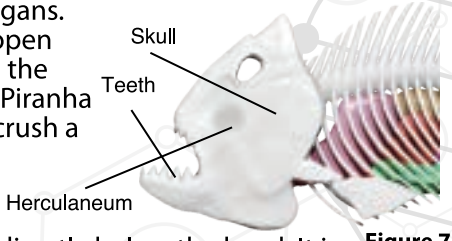


**Figure 7**

## Herculaneum

The herculaneum is a bony cover that lies directly below the head. It is very imporatant as it protects the delicate gills.

## Tail

The tail is made up of thin, rod-like bones. These bones are joined together to give the tail its flattened shape. Fish use their tails to move through the water. Fish tails move side to side.

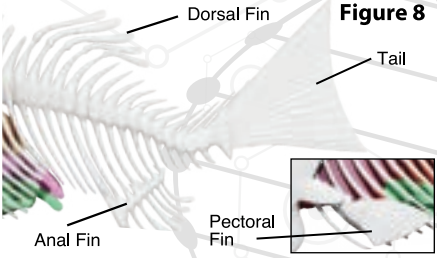


**Figure 8**

## Fins

Piranhas have fins to help them control their movements. The fins are paired (two identical on both sides) and unpaired, and are named for the areas where they are inserted on the body. The fins on a fish's back are called dorsal fins. They are made up of long, rod-shaped bones that make the fin stiff. The dorsal fin stops the fish from rolling over as it swims. The pectoral fins of a fish are supported by thin, rod-like bones. These fins on either side of the body, help the fish turn left and right. The pectoral fins tilt slightly, like the flaps of an aircraft wing. Tilting the fins makes the fish swim up or down, or steer to one side.

## Teeth

The Piranha fish has a mouthful of triangular, blade-like teeth. The top and bottom teeth work together like scissors to cut up food. It eats fruit and seeds as well as other fish. A group of piranha can quickly devour larger prey by neatly chopping it into bits. Since they are such active choppers, a piranha has to replace its teeth all of the time. Their teeth, luckily, grow in four sets. These sets are replaced about every 100 days.

## Spine

The spinal cord is made up of a bundle of nerves that sends messages around the fish's body to and from its brain. The spinal cord is protected by the backbone. A fish's backbone is also known as its spine.


**Figure 9**

## Heart

The heart is the organ that pumps blood throughout the body, delivering oxygen and digested nutrients to the cells of various organs. It transports waste products from the cells to the kidneys and liver for elimination. In fish, the circulatory system is a single circuit, with a 2-chambered heart, unlike the typical 4-chambered heart found in humans. From the fish's atrium, blood is pumped into the ventricle of the heart. From the ventricle, blood is pumped to the gills where gas exchange takes place. Carbon dioxide ($CO_2$) is expelled and oxygen ($O_2$) is taken in. This re-oxygenated blood then flows on to the rest of the body's tissues and organs removing carbon dioxide and replacing it with life-giving oxygen. Blood is finally pumped back to the heart's atrium chamber where the process begins again.

## Stomach

The stomach is often referred to as the gut, and is where food is digested and nutrients absorbed. By examining stomach contents, one can learn a great deal about fish feeding habits. Knowing what a specific fish species eats can also help with bait selection.

## Kidney

Kidneys are organs that filter liquid waste from the blood. The kidney is also extremely important in regulating water and salt concentrations within the fish's body. This allows certain fish species to exist in freshwater or saltwater, and in some cases both.

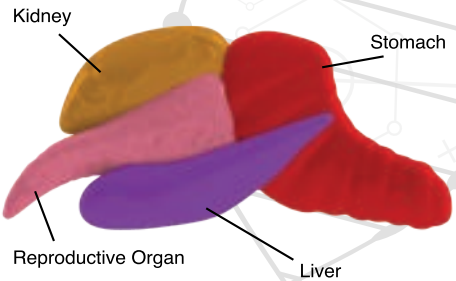



**Figure 10**

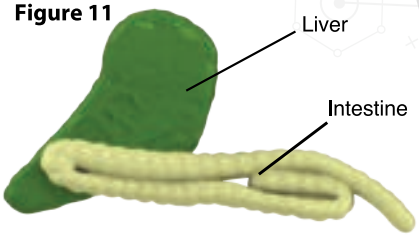
## Liver

The liver has many digestive and storage functions. One function is the production of bile, a solution which breaks down fats in the intestine. The liver also stores fats and carbohydrates, destroys old blood cells, maintains proper blood chemistry, and plays a role in nitrogen waste removal.

## Intestine

The intestine is primarily an organ for absorbing nutrients into the bloodstream. The larger its internal surface, the greater its absorptive efficiency. Piranhas have a large surface area of the intestinal walls by having numerous folds and villi (fingerlike projections), somewhat like those in humans. Undigested substances are passed to the exterior through the anus.

**Figure 11**




## Lateral Line

The lateral line runs down the length of a fish's body. It is made up of a series of microscopic holes located just under the scales of the fish. Lateral line is a primary sense organ, as it can sense low vibrations in the water, and is capable of determining the direction of their source.

## Brain

The brain is the organ that controls the rest of its body. The brain is responsible for all the body's movements.

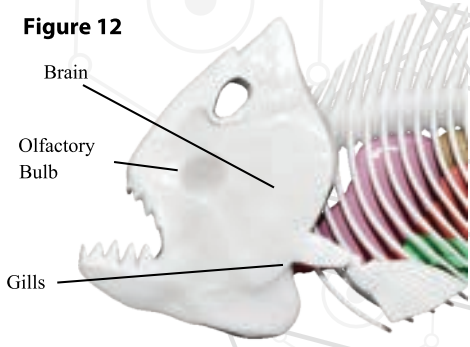
## Gills

Gills are feathery arches along the side of its head. They contain blood vessels that absorb oxygen from water.

## Olfactory Bulb

The olfactory bulb is an organ located in the forehead of fish that receives information about odors detected by cells in the nasal cavity. The axons (smell receptors) extend directly into the olfactory bulb, where information about odors is processed.

**Figure 12**

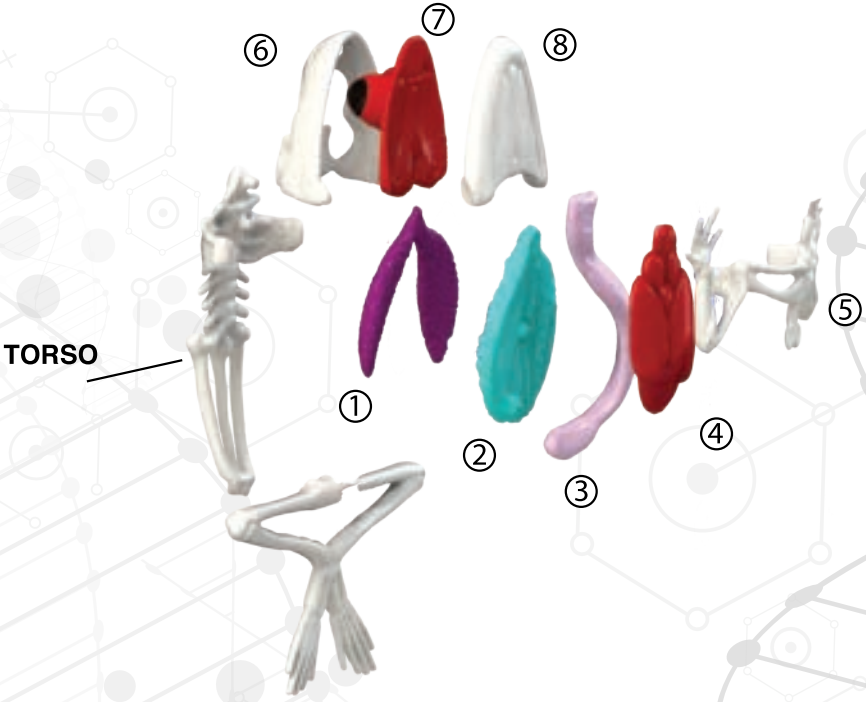



## Nares

All fish possess a sense of smell. Paired holes called nares, are used for detecting odors in the water, and are located on a fish's snout. Experiments have shown that piranhas have a very sharp sense of smell as it helps them find their food in the often murky waters of their native habitat, it also helps warn them of danger.

# Frog Assembly

Before molding a new frog you will need to reassemble the anatomy. To begin, locate the skull and leg pieces and attach them to the torso. Next, snap the brain and eyes into the skull and connect the jaw on top. The arteries come next and the top tips slide in between the skull and the eye/brain piece. After that, the lungs go over the arteries and snap into the torso. On top of the lungs the lower organs, the stomach, and heart/liver then get attached to each other (in that order). The veins then go over the heart, and the top tips slide in between the eye/brain piece and the jaw. Finally, the ribs go on top of the veins and snap into the shoulders of the torso.




① **LUNGS** – Snap onto the TORSO.

② **LIVER** – Snaps onto 1. Contains the Spleen, Pancreas, and Gallbladder.

③ **STOMACH** – Snaps onto 2.

④ **HEART** – Snaps onto 3.

⑤ **RIBS** – Snaps onto 4 and the TORSO.

⑥ **SKULL** – Snap onto the TORSO.

⑦ **BRAIN AND EYES** – Snaps onto 6.

⑧ **JAW** – Snaps onto 6.

# 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, organs, veins, and arteries by cleaning off any excess gel material from your last frog.

2. Now assemble the frog skeleton system and organs as shown in the sequence on page 10 and in the drawing to the right (Figure 13). 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.

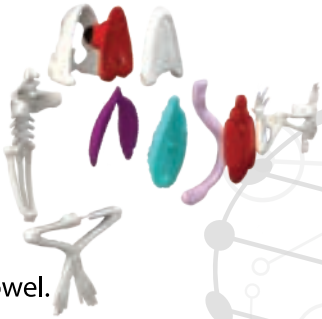


Figure 13

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.

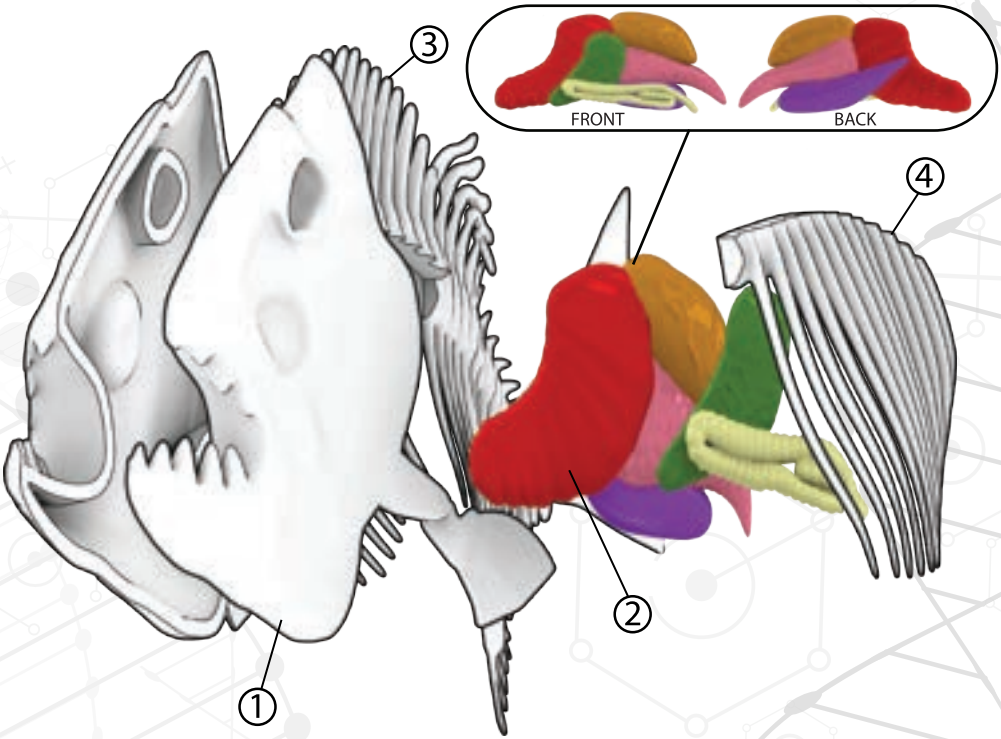
6. Once your mixture is a smooth pudding like consistency, pour it into the frog mold. Stop pouring once the material has reached the first lip of the frog mold as pictured to the right (Figure 14). Store in refrigerator for one hour or until the gel has solidified.

Figure 14

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, probe, and tweezers cut sections of the skin to reveal the internal organs and skeleton of your frog.

# Piranha Assembly

Before molding a new piranha you will need to reassemble the anatomy. To begin locate the piranha organs as shown in the figure below. Use the organ assembly guide in the lower right to assemble your organs. Once you have your organs assembled, you should attach them to the spine. This will allow you to easilly attach the ribs and skull. Now that you have reassembled your Piranah it is ready for molding.



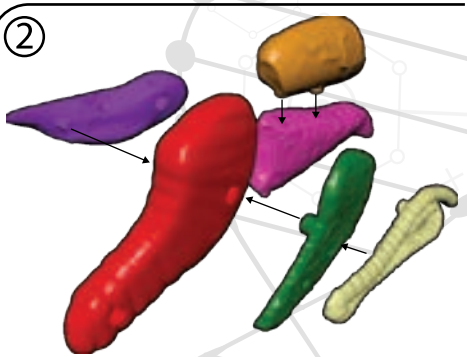

① **SKULL** – Snaps onto 3.

② **ORGANS** – Snaps onto 1 and 3.

③ **SPINE** – Snaps onto 1, 2 and 4.

④ **RIBS** – Snaps onto 3.

**ORGAN ASSEMBLY**



# Molding a New Piranha

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

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

2. Now assemble the piranha skeleton system and organs as shown in the sequence in the drawing below (figure 15). After you have assembled the skeleton and internal organs, place the assembly into the cavity of the clear plastic piranha mold. Be sure to place the skeleton-organ assembly so that the detachable ribs face up in the mold.

3. Then place the clear plastic piranha 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 a towel.

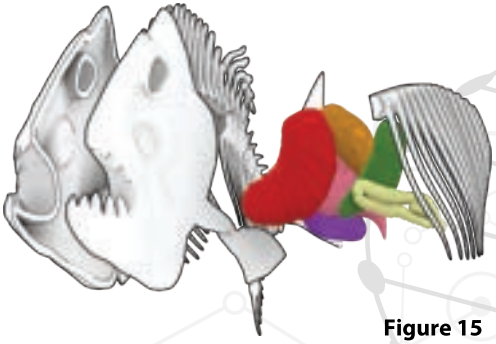


**Figure 15**

5. Mixing the piranha 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 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 3/4 cup (175ml) 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 piranha mold. Stop pouring once the material has reached the first lip of the piranha mold as pictured below. Store in a refrigerator for one hour, or until the gel has solidified.

**Figure 16**

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

# 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).

## 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 tails. 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 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.

# Piranha Facts

The word "Piranha" literally translates as "tooth fish" in the indigenous Brazilian language of Tupi. Piranhas are fish, which means that they are covered in scales, breathe with gills, and hatch from eggs. Piranhas are also cold-blooded. If an animal is cold-blooded, they are not able to control their body temperature and must rely on their environment to heat up or cool down. They need warm water to survive and do not eat when the water temperature is less than 54°F (12°C) degrees.

## Size

Most piranhas don't get any bigger than 2 feet (60 centimeters) long. For example, The Red-Bellied Piranha and the Piracy Piranha grow to about 20 inches (51 cm) long, while the Black Spot Piranha grows to about 11 inches (28 cm).

## Habitat

Piranhas live in rivers and streams in South America. 20 different species are found in the Amazon River. Some piranhas have been found around the world, but these are thought to be pets that were released into waterways. In some U.S. states, it is illegal to transport, purchase, possess, or sell piranhas; other states require permits.

## Diet

Piranhas are omnivores which mean that they will eat meat and plants. Most piranhas get a bad reputation as terrifying predators that will tear to shreds any flesh that dares dip into its waters. This actually isn't true. Some piranhas eat more seeds than meat. Some species are vegetarian, others species eat shrimp, crustaceans, worms, carrion, and other fish. Attacks on humans are very rare. There are lots of different kinds of piranhas, though the most common variety is known as the Red-Bellied Piranha, which is named because of its red belly. The Red-Bellied Piranha is considered one of the more dangerous and aggressive species of piranha. In general, when Red-Bellied Piranhas are feeding normally, the fish will spread out, and a scout will signal when a food source is found. When alerted, piranhas are very orderly. Some of the fish will take a bite and then move aside so another fish can take a bite. Just one Red-Bellied Piranha can eat around 2.46 grams per day or around one-eighth its body mass. Some piranhas are very sneaky. They swim very quickly toward a target and bite hard as they collide. They will cut bits of fins and scales from other fishes to survive.

## Groups

Piranhas live in groups called shoals (schools). It is a popular belief that these fish travel in groups so that they can attack a prey in a planned feeding frenzy. Scientists, however, think they travel together as a form of protection from predators. That's not to say that frenzies never occur. When threatened, the shoal will group together with other shoals to take down the predator.

## Offspring

Female piranhas lay thousands of eggs at a time in the sand below the water source where they live. The Red-Bellied Piranha female, for example, lays her eggs in a nest that is dug by her mate. After the male fertilizes the eggs, they attach to plants at the bottom of the water source and hatch within just a few days. Piranhas can live up to eight years.

## Shape

Piranhas range in color from yellow, to steel-grey, to bluish, to partly red, to almost black. Piranhas have a bulldog-like face with a very large lower jaw and many razor-sharp teeth. All piranhas have a single row of sharp teeth in both their top and bottom jaw. Their teeth are tightly packed and interlocking (via small cusps) and are used for rapid puncture and shearing.

## Piranhas as Food

In some countries, locals use the teeth of piranha fish in tools and weapons. Piranha fish are also a popular food, though if caught on a hook or line it may be attacked by other piranhas. In recent decades, dried specimens have been marketed as tourist souvenirs.

## Piranha Attacks

Piranhas occasionally bite, and sometimes, injure bathers and swimmers, but truly serious attacks are rare and the threat to humans has been largely exaggerated. However, piranhas are a considerable nuisance to commercial and sport fishers because they steal bait, mutilate catch, damage nets and other gear, and may bite when handled.

## Fossil Evidence

Piranha ancestors' fossils in the continent's rivers date back to 25 million years ago, but modern piranhas have been around for about 1.8 million years.

## Life Cycle

Like every other animal on this planet, fishes grow large enough to reproduce. Although each and every fish species has a unique method of reproduction, for generalizing we can divide the life cycle of a fish into seven stages. These seven stages are common in almost all the different species of fish.

1. **Egg:** In this stage, the embryo is formed inside the hardened egg, once the egg is fertilized. Then it will start to develop organs. After this, eye spots and tails are completely developed. Species living in warmer water hatch faster compared to species living in colder water.

2. **Larvae:** Once the eggs are hatched, they are known as larvae. New larvae have yolk sacs. Which is the nutrition source for them. A larvae can survive for 2-4 days by using their yolk sac food supply. They can have live food once their eyes and mouth are developed.

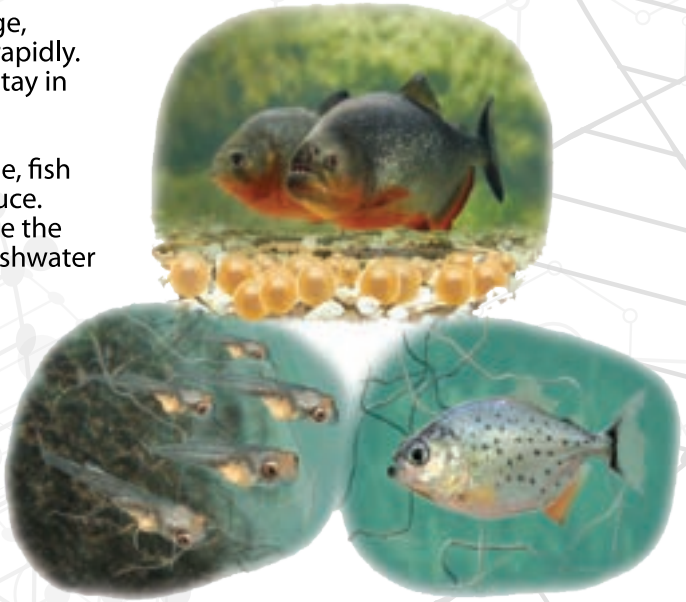
3. **Fry:** Young fish are called fry once the yolk sac is fully absorbed. In this stage they are ready to start eating on their own. Fishes go through several development phases.

4. **Juvenile:** Metamorphosis is the process that marks an end point to the fry stage. In this phase, fishes acquire characteristics of an adult fish like: fins, more color, body parts, etc., and they are considered juveniles. This stage is considered as a point of high mortality for fish.

5. **Smolt:** In this stage, fishes grow more rapidly. Generally, smolts stay in brackish water.

6. **Adult:** In this stage, fish are able to reproduce. Now they complete the migration from freshwater to saltwater.

7. **Spawning:** Females release the eggs in water and males release milt that helps to fertilize the eggs.



# Frog Lab Quiz

1. **Frog have glands which produce _____ which helps to keep their bodies moist.**

2. **How many chambers does a frog's heart have?**

   ○ a.) 2
   ○ b.) 3
   ○ c.) 4

3. **Oxygen is exchanged for _____ _____ within the lung's capillaries.**

4. **True or False: Most frogs have teeth.**

   ○ True ○ False

5. **Where does most digestion occur?**

   ○ a.) Stomach
   ○ b.) Small Intestine
   ○ c.) Large Intestine

6. **Eggs are produced in the _____.**

7. **True or False: The main function of the kidneys is to filter blood.**

   ○ True ○ False

8. **Amphibians live both on _____ and in _____.**

9. **True or false: Tadpoles live entirely in the water.**

   ○ True ○ False

10. **On average a single bull frog will lay how many eggs at a time?**

    ○ a.) 200
    ○ b.) 2,000
    ○ c.) 20,000

1.) mucus 2.) b: 3 3.) carbon dioxide 4.) false 5.) small intestine
6.) ovaries 7.) true 8.) on land and in water 9.) true 10.) c: 20,000

# Piranha Lab Quiz

1. **The word "Piranha" literally translates as _____ ____**

2. **How many rows of teeth do Piranhas have?**

   ○ a.) 1
   ○ b.) 2
   ○ c.) 3

3. **Piranhas live in groups called _____**

4. **True or False: Scientists believe piranhas travel in groups for protection.**

   ○ True ○ False

5. **Piranhas live on which continent?**

   ○ a.) Africa
   ○ b.) South America
   ○ c.) Asia

6. **Like all fish, piranhas are ____ blooded.**

7. **True or false: Piranha attacking humans is common.**

   ○ True ○ False

8. **Since piranhas eat both plants and animals they are _____.**

9. **True or False: Piranha ancestors' fossils in the date back to 25 million years.**

   ○ True ○ False

10. **Red-Bellied Piranha can eat around ____ grams of food per day.**

    ○ a.) 6.58
    ○ b.) 2.46
    ○ c.) 1.22

1.) Tooth Fish 2.) a: 1 3.) shoals 4.) true 5.) b: South America
6.) cold 7.) false 8.) omnivores 9.) true 10.) b: 2.46

# Notes

# *But wait...*

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CE

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Manufactured by:
JOKER ENTERTAINMENT
JOKER AG/SA
Cyber Clean Europe GmbH
Enzianstraße 6
D-82319 Starnberg, Germany
Tel. +49 (0)8151 919034 - 0
11299906IMV2

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