

# DISSECT IT

SYNTHETIC DISSECTION KIT

## SALAMANDER



**STEM** ORG  
AUTHENTICATED™  
EDUCATIONAL PRODUCT

# Contents of This Kit



**2X DISSECT-IT POWDER  
REFILL PACKETS**



**SALAMANDER**



**SCALPEL**

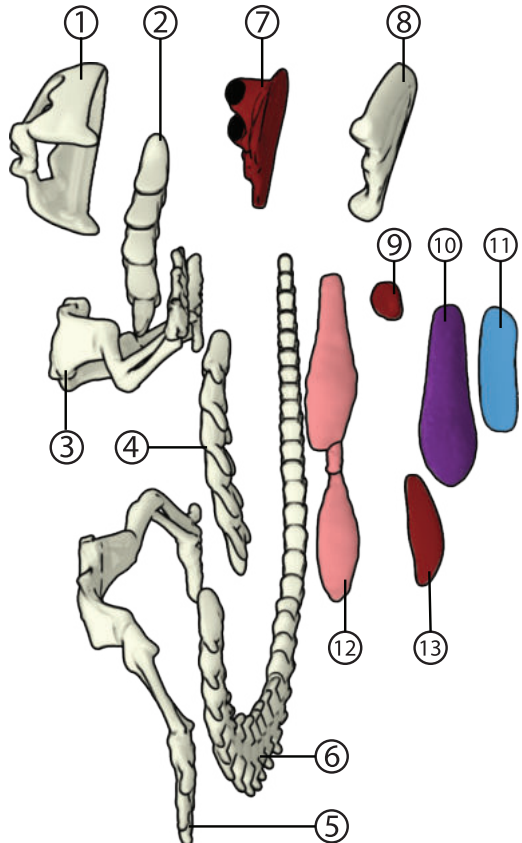


**TWEEZER.**

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

## Assembly

- ① **SKULL** - Snaps onto 2.
- ② **NECK** - Snaps onto 1 and 3
- ③ **ARMS** - Snaps onto 2 and 4.
- ④ **SPINE** - Snaps onto 3 and 5.
- ⑤ **LEGS** - Snaps onto 4 and 6.
- ⑥ **TAIL** - Snaps onto 5.
- ⑦ **BRAIN** - Snaps onto 2.
- ⑧ **JAW** - Snaps onto 1.
- ⑨ **HEART** - Snaps onto 12.
- ⑩ **LIVER** - Snaps onto 12.
- ⑪ **LUNG** - Snaps onto 12.
- ⑫ **STOMACH + INTESTINES** - Snaps onto 4.
- ⑬ **KIDNEY** - Snaps onto 12.



# Getting Started

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

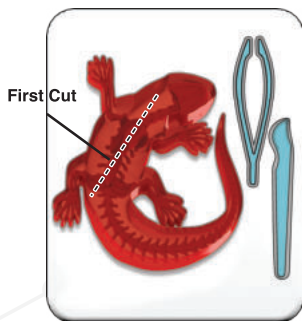
Simply peel off the plastic film, remove the frog from the mold, and place it with the belly facing up on to the dissecting table (see figure below).

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

## First Cut

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

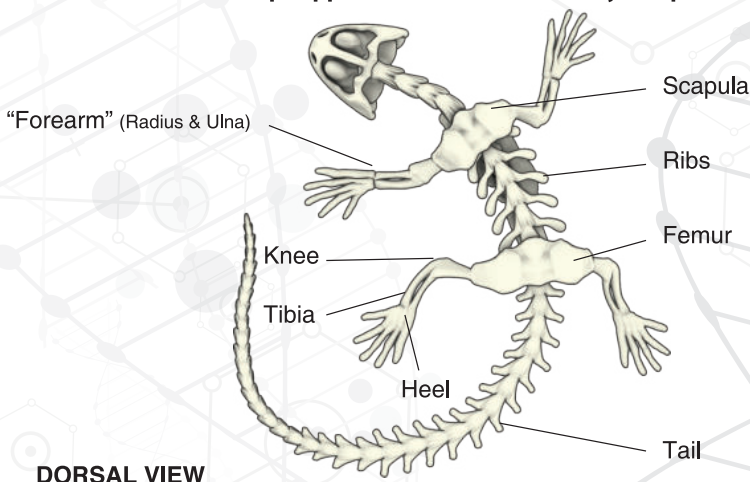
We recommend reading the manual as you dissect your salamander so you can learn about exciting facts about salamander anatomy.



# The Anatomy

## Skeleton

Here are the major bones of the salamander which you will encounter during your "dissection." The bones help support the salamander's body and protect the vital organs.



## Skin

Try cutting through the artificial skin. The skin of salamanders is similar to most amphibians: thin, permeable to water, and has no scales. It is much thinner than that of reptiles, birds or mammals, and acts as a respiratory membrane. The salamander skin has many glands.

From time to time, the salamander takes off its skin and replaces it with a new one. The skin starts to break around the mouth forming a gap. Then the body moves forwards through this gap to get rid of the old skin. It uses its limbs to push away the old skin. At the final stage the salamander rubs its tail with the ground and then it will often eat the old skin.

## Glands

Glands are small organs that produce important chemical substances (similar to your sweat glands). For salamanders, glands on their skin produce mucus which keeps the skin moist, and helps in skin respiration and keeping the body temperature stable. This sticky layer has many other functions: it protects the salamander from bacterial infections and molds; helps it in swimming; and makes it slippery and more difficult for predators to catch.

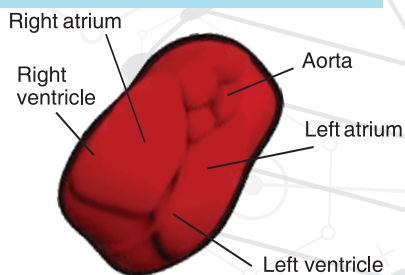
Some other glands produce smelly and sometimes poisonous secretions. These are found on the upper surface, mainly the head, back, and tail. The toxins in some salamanders, like newts are very powerful. Handling the newts does no harm, but eating a tiny piece of their skin could be deadly.

## The Nervous System

The nervous system of a salamander is very similar to all vertebrates; with a central brain, a spinal cord, and nerves all over the body. The brain is like a computer that controls the body's functions, and the nervous system is like a network that relays messages to parts of the body.

## Heart

The heart of a salamander has three chambers, one ventricle and two atria. The blood is pushed from the ventricle to the lungs and skin to take in oxygen. Blood carrying oxygen goes back to the heart which sends it to the whole body. In the ventricle, deoxygenated and oxygenated blood are mixed before being pumped out of the heart. This is not very effective compared to our hearts.

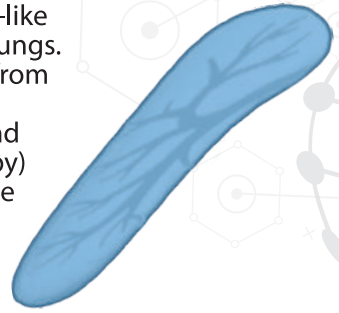


## Pancreas

The pancreas is a thin, flat, ribbon-like organ that lies between the stomach and the small intestine. It produces enzymes that are released into the small intestine to help with digestion.

## Lung

The lungs of a salamander are simple and have a sac-like shape. They are different from our complex spongy lungs. The lungs receive a large amount of the total blood from the heart of an adult salamander. Most species of salamanders take in oxygen from gills, lungs, skin, and the membranes of the mouth and throat. Larval (baby) salamanders breathe mainly through their gills. Those gills have an outer feathery shape. The salamander takes water from the mouth and passes it out from gill opening. Some species keep their gills all of their lives, but most species lose them as adults.



## Gall Bladder

The gall bladder is a small greenish-brown sac filled by bile. Bile is a digestive juice produced by the liver. It helps the body to absorb fat into the bloodstream. The salamander stores bile until the body needs some to digest fats.

## Cloaca

It is a part of the digestive, excretory, and reproductive system. Feces from the intestine, urine from the kidneys, and eggs and sperm from the reproductive organs all exit the body through this one opening.

## Liver

The liver is the largest organ in the salamander's body. The liver takes toxins (substances in the body that are harmful) out of their blood. It also stores energy in the form of a sugar.



## Kidney

The kidneys are flat, oval-shaped organs on the lower part of the salamander's body cavity. They filter the blood and excrete excess water.



## Stomach

The salamander has a simple stomach. It receives food, and secretes acid and enzymes that digest food. The stomach has an inner mucus layer to protect it from acids and enzymes used to digest food. The organ has a muscular lining which helps it move food in and out through fast contraction and expansion.

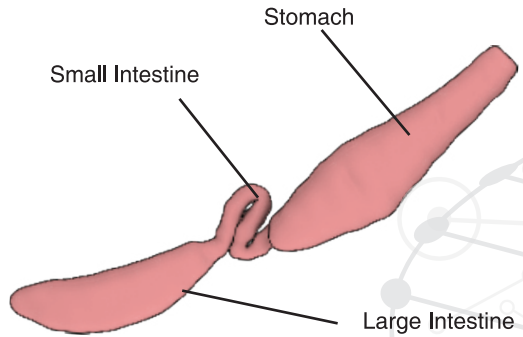


## Small Intestine

Intestines are shaped like long tubes. The stomach connects to the small intestine. The first section is straight, but the rest of the intestine is coiled and stays in place by a blood-vessel-filled membrane. Food enters the small intestine after it leaves the stomach. At this time the food is in the form of a thick liquid. It breaks down the food into simple chemical substances. These substances then pass into the bloodstream through the walls of the small intestine.

## Large Intestine

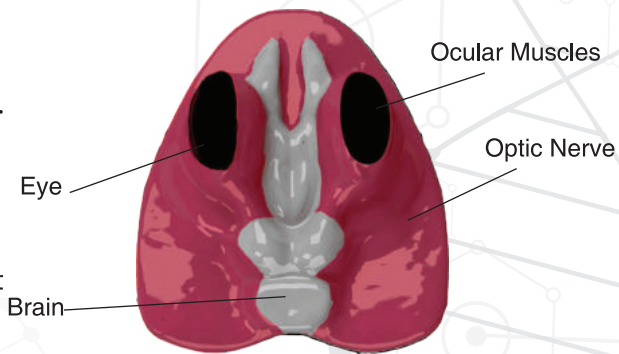
The small intestine narrows to the point where it meets the shorter, broader large intestine. The large intestine removes wastes from the body. Any food material that cannot be used by the body passes from the small intestine into the large intestine. Tiny living organisms called bacteria in the large intestine help to turn the food material into feces, or solid waste. The feces are stored in the large intestine until they pass from the body.



## Brain

The amphibian brain is less well developed than that of reptiles, birds, and mammals and is similar to that of a fish. Salamander brains have some parts similar to ours.

The optic nerve helps in stereopsis and binocular vision. Stereopsis means that the two separate images from two eyes combine into one image in the brain.

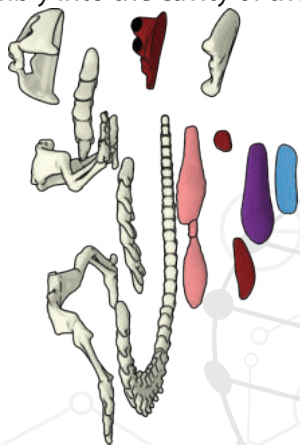


The brain regulates respiration, digestion, heartbeat, and other automatic functions. It is the control system which regulates the pituitary gland, the 'master gland' of the body. The pituitary gland makes and releases hormones that tell many parts of a body how and when to do their jobs. Hormones are little messengers that carry instructions. The brain sends these hormones into the bloodstream so that they can travel around the body in the blood.

# Molding a New Salamander

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

1. Prepare the bones and organs by cleaning off any excess gel material from your last salamander.
2. Now assemble the salamander skeleton system and organs as shown in the sequence in the drawing below. After you have assembled the skeleton and internal organs, place the assembly into the cavity of the clear plastic salamander mold. Be sure to place the skeleton-organ assembly so that the underside of this assembly faces upwards in the salamander mold.



3. Then place the clear plastic salamander mold with the internal structure assembly inside onto 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.
5. Mixing the salamander 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 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 salamander mold. Stop pouring once the material has reached the first lip of the salamander mold, as pictured below. Store in refrigerator for one hour or until solid.



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

# Salamander Facts

The name 'salamander' comes from the Greek word for Fire Lizard. This name came about when salamanders came running out of the logs they had been hiding in when those logs were thrown on a fire. A mistaken belief that salamanders could walk through flames without getting injured came after that. Salamanders are amphibians, so they hatch from eggs that are laid near or in water. There are about 500 different species of salamanders. They live in water and on land.

## Shape

They look rather like lizards, with four legs and a tail. Like all amphibians, salamanders have four limbs and they do not have any hair, feathers, or claws.

Some salamanders have funny nicknames like 'mud puppy' and 'water dog.' Though they don't look like dogs, most have a tail that looks like they borrowed it from a lizard and skin that looks like it was stolen from a frog.



## Feeding

Most adult salamanders hide by day and feed by night. Some remain hidden underground until the breeding season, occasionally coming out only when levels of moisture and temperature are good.

## Size

The size of most salamanders ranges from about 2 to 6 inches long.

However, some salamanders can grow to be quite large. For example, The Chinese Giant Salamander can grow to be over 6 feet long making it taller than the average human! Check out a size comparison in the diagram to the right.



Chinese Giant Salamander Average Human

## Predators

In the wild, salamanders have many predators including large reptiles, birds, amphibians, and mammals on land. Additionally, fishes in water count as possible predators of them.



## Movement

Salamander legs are very short. Their bellies drag on the ground when they walk. Salamanders are carnivores meaning they eat other organisms. They move slowly so they can only catch slow-moving prey like worms or snails.

## Habitat

Salamanders live everywhere except in Australia and Antarctica. If you want to see a salamander in person, North America is the place to do it because it has the most salamanders on Earth. Salamander neighborhoods include ponds, streams, swamps, rivers, and wet forests. Salamanders swim around in the water when they are young. When they grow up, some live on land, hanging out in the shade where the dirt is moist and there is water nearby.



Some love the water so much that they never leave, the way you don't like to get out of the pool when it's time to go home. They all have to keep their skin wet, however, so they don't dry up like a raisin and die.

## Reproduction

Male salamanders perform a special type of dancing in the water, a habit which precedes mating. By moving his head and tail, he sends chemical signals to alert the female that he is ready for the mating. If the dance attracts the female, she will join him in dance. Female salamanders can lay up to 450 eggs at once. Many salamanders are good moms. They stay with their eggs or even wrap each egg in a leaf to protect it.

Baby salamanders (larvae) often look like tadpoles when they're born. They slowly develop their front and back legs and tail which gets longer once they reach adulthood.

## Regeneration

Salamanders are the only tetrapod able to grow limbs and body parts completely after losing them. Salamanders routinely regenerate complex tissues. Within only a few weeks of losing a piece of limb, a salamander perfectly reforms the missing structure.

Salamanders can drop their tail to escape predators. The tail will drop off and twist around for a little while, and the salamanders will either run away or stay still enough to not be noticed while the predator is distracted.

## Metamorphosis

Metamorphosis in biology means the process of change from a young form to an adult form. In typical amphibian development, eggs are laid in water and larvae are adapted to an aquatic lifestyle with external gills. Afterwards, salamander larvae start a predatory lifestyle. The importance of metamorphosis is clear when you know the size of eggs and adults. An adult amphibian can reach 6 feet (2 meters) long, and weigh over 211 lbs (96 kg). The female produces over 100,000 eggs each time, and the resulting larvae are quite tiny. They cannot live like the adults, which are more or less top predators. The larvae cannot even swim against the current. Therefore they must live a different kind of life before they can live as the adults do.

## Sensitivity to Pollution

Salamander skin is highly sensitive to environmental pollution because toxins easily pass through the skin and reach inner organs. By tracking the number of salamanders in the wild, scientists can estimate whether the environment is healthy or not. If there is a large population of salamanders that means that the environment is clean.

## Life Span

Salamanders can live a very long period of time. Various species of salamander have various periods of living. Most salamanders live for about 20 years. Some species like the Chinese Giant Salamander, can live up to 55 years.

## Life Cycle

Most amphibians hatch from eggs. After they hatch, their bodies are still in the larvae stage. In this stage they are very fish like. They have gills to breathe under water and fins to swim with. As they grow older, their bodies undergo metamorphosis. They grow lungs to breathe air and limbs for walking on the ground. The transformation isn't the same in all amphibians, but most species go through some sort of metamorphosis.

In salamanders, the larvae have external gills in wing-like forms attached to either side of their heads, just where they should have their necks. With time, as the tadpoles grow and metamorphose into salamanders, their external wing-like structure shreds off.





# But wait...

## There's more to explore!

### Check out our other Dissection Kits



Visit [www.topsecrettoys.us](http://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.



#### 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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