Frog Anatomy

In this section, students will learn about frogs' skeletal, digestive, circulatory, respiratory and reproductive systems. In doing so, students will compare frog systems to human systems. And, because frog skin is very specialized for the environments in which they live, an activity on skin permeability is also included.

This lesson includes the following activities:

• **Make a Frog Sandwich**, in which students learn, label or draw frogs' skeletal, digestive, respiratory, urinary and reproductive systems.

• **Frog Dissection**, in which students dissect a real or virtual frog.

• **Osmosis and Diffusion**, in which students perform an experiment designed to illustrate how frogs breathe and drink through their skin.

• **Big Picture Questions**, in which students tie it all together by comparing frog anatomy, form and function to that of humans, looking for similarities, differences and possible connections.

To get started, list the following questions on big pieces of butcher paper:

1. How are amphibians adapted for aquatic life?
2. How are amphibians adapted for terrestrial life?
3. How are frogs and humans alike?
4. How are frogs and humans different?
5. If amphibians have lungs, why do they also breathe through their skin?
6. Of the thousands of amphibians discovered, only one lives in the ocean. Toads in southeast Alaska have been observed swimming in the ocean, though they don't live there. Why don't most amphibians live or use ocean environments?

Now invite students to add their own questions.

These questions will guide students as they investigate the external and internal anatomies of frogs, and provide good jumping off points for the following lessons.

Science Activity: **Make a Frog Sandwich**

Introduction:

In this activity, students will use the instructions and illustrations provided, along with other models, posters, books, journals or web-based resources, to label and color the organs and major systems of a frog's anatomy.

Objectives:

1. Students will label and color the skeletal, circulatory, nervous, digestive, urinary and reproductive systems of a frog.

2. Students will compare and contrast frog anatomy to human anatomy, noting similarities and differences.

3. Students will use the completed Frog Sandwich for reference during frog dissection.

Materials:

1. Frog Sandwich Student Booklet with figures (included)
2. Frog Sandwich Teacher's Key (included)
3. Student Instructions (included)
4. colored pencils or crayons
5. assorted books, posters and models illustrating frog anatomy

Procedure:

1. Give each student a complete Make a Frog Sandwich booklet and Student Instructions.

2. Encourage students to use Instructions and other resource materials to label and color organs, systems and other anatomical features as they assemble their frog sandwich.

3. Encourage students to consult, challenge and inform one another as they work.

4. Allow students to exchange completed Frog Sandwiches to check, correct, and sign off on one another's work.

Assessment:

1. Frog Sandwiches are completed correctly (colored, labeled and assembled).
2. Students are able to compare and contrast frog anatomy to human anatomy.
3. Students are able to describe similarities and differences between frog and human systems.

National Science Education Standards:

Content Standard C:

- Develop an understanding of structure and function in living systems

Alaska Content Standards:

Science (C2)

Juneau School District Core Content:

Life and Human Biology(6th-8th):

Systems: How can we understand a complex world through its systems?

- Describe the parts and functions of the major human body systems.

Extension:

Copy Frog Sandwich pages onto transparencies to create a see-through Frog Sandwich.

References:

Make a Frog Sandwich. Access Excellence @ the National Health Museum Activities Exchange. 16 March 2004 <http://www.accessexcellence.org/AE/AEC/AEF/1996/bowersox_frog.html>.

MAKE A FROG SANDWICH

Student Instructions

To make your Frog Sandwich, you will need to label and color the organs, bones and major systems of a frog. You will then need to cut parts out and glue them together. All the information you need is in this packet and in the other resource materials provided.

Although you must do – and be responsible for – your own work, feel free to consult, challenge and question other students. Good scientists collaborate and so should you!

Let's get started.

Frog Body / Dorsal View:

The frog body consists of a ***head***, ***trunk***, ***forelimbs*** and ***hind limbs***. The dorsal view (**Figure 1**) shows what a frog looks like laying on its stomach. Label and color these parts of a frog's body:

1. eye
2. nictitating membrane
3. nostril
4. tympanic membrane
5. head
6. trunk
7. forelimb
8. hind limb

Skeleton:

Frog skeletons consist of ***bones***, ***cartilage*** and ***connective tissue*** all of which function like our skeletons to protect internal organs, support our bodies and allow to move. Find **Figure 2**, and label and color these parts of the skeleton:

1. upper jaw
2. braincase
3. phalanges (forelimbs)
4. metatarsal bones (forelimbs)
5. humerus (forelimbs)
6. radioulna (forelimbs)
7. phalanges (hind limbs)
8. metatarsal bones (hind limbs)
9. tarsal bones (hind limbs)
10. tibiofibula (hind limbs)
11. atlas, dorsal and sacral vertebrae and urostyle, found in the trunk

Nervous System:

The nervous system (**Figure 3**) has two major functions – to inform frogs about their internal and external environments (also known as stimuli) and to help frogs respond to those stimuli (also known as motor response). Label and color these parts of the nervous system:

1. olfactory lobe
2. cerebrum
3. optic lobe
4. cerebellum
5. medulla oblongata
6. olfactory, optic, facial and auditory nerves, also known as ***cranial nerves***
7. hypoglossal, brachial plexus and sciatic nerves, also known as ***spinal nerves***

Circulatory System:

A frog's circulatory system consists of its ***heart*** – a muscular pump – and the ***arteries***, ***capillaries*** and ***veins*** – the network of vessels through which its blood flows. Label and color these parts of the heart and circulatory system (arterial) on **Figure 4**:

1. left atrium
2. right atrium
3. ventricle
4. carotid arch
5. pulmocutaneous arch
6. systemic arch
7. dorsal aorta
8. urogenital artery
9. common iliac artery

Now cut out the circulatory system – veins diagram (**Figure 5**) and glue it onto the next ventral view of your frog (**Figure 6**). Now label and color these veins:

1. femoral
2. pelvic
3. abdominal
4. pulmonary
5. musculocutaneous
6. external jugular
7. internal jugular

Digestive System:

The digestive system includes the ***alimentary canal*** which runs from the mouth – also called the ***buccal cavity*** – all the way to the ***cloaca***. This system processes food and waste, and includes a variety of parts.

The ***tongue*** is used to catch prey. ***Vomerine teeth*** are used for holding prey until pressure – supplied in part by eyes turned inside out – can push food down a frog's throat. The ***esophagus*** conducts food through the body cavity on its way to the ***stomach***, a saclike receptacle used for storing food, although some digestion does take place there.

The stomach narrows to become the ***small intestine***, which digests food further, before merging with the ***large intestine***, which absorbs water and packages fecal material. The large intestine opens into the ***cloaca***, which empties wastes from the body. The ***liver*** receives nutrients from the intestines, then stores and releases them as needed. The liver also produces bile, a substance which allows fats to be digested. ***Bile*** is stored in the ***gall bladder***. Other enzymes in the ***pancreas*** also assist in the chemical digestion – or breakdown – of fats, proteins and sugars. The ***spleen*** breaks down old red blood cells and produces new ones.

Cut out the digestive system (**Figure 7**) and oral cavity (**Figure 8**) and glue these parts onto the next ventral view of your frog (**Figure 9**). Now label and color these parts:

1. tongue
2. maxillary teeth
3. vomerine teeth
4. internal nostril and auditory orifice
5. pharynx
6. glottis
7. esophagus
8. stomach
9. small intestine
10. large intestine
11. cloaca
12. liver
13. gall bladder
14. pancreas
15. spleen

Urinary System / Male Reproductive System:

The urinary system filters out chemical wastes the body can't use. Made up of thousands of tiny tubes, or tubules, the ***kidneys*** filter fluid waste, or ***urine***, from the blood. Tubules deliver urine to the ***bladder***, which stores it until it is released to the ***cloaca***, which empties it from the body.

In the male reproductive system, the ***testes*** produce sperm, which are also discharged from the ***cloaca***.

Cut out the urinary system male reproductive system (**Figure 10**) and glue it onto the next ventral view of your frog (**Figure 11**). Label and color these parts:

1. kidney
2. bladder
3. cloaca
4. testes

Urinary System / Female Reproductive System:

In the female reproductive system, the ***ovaries*** hold eggs, which migrate through the ***oviducts*** to the ***uterus*** where they are stored. Eggs are released from the uterus to the ***cloaca*** where they are discharged from a female's body to be fertilized by a male's sperm.

Cut out the urinary system and female reproductive system (**Figure 12**) and glue it onto the next ventral view of your frog (**Figure 13**). Now label and color the following parts:

1. kidney
2. bladder
3. ovary / eggs
4. oviduct
5. uterus
6. cloaca

You now have a completed, colored and labeled FROG SANDWICH!

Exchange your sandwich with a partner, compare and check your work.