Name: _____ Date: _____

Student Exploration: Frog Dissection

Vocabulary: anatomy, appendix, diaphragm, dissect, fertilize, heart, large intestines, lungs, lymph vessels, ovary, oviduct, ovisac, rectum, sternum, testis, vasa efferentia, vertebrae

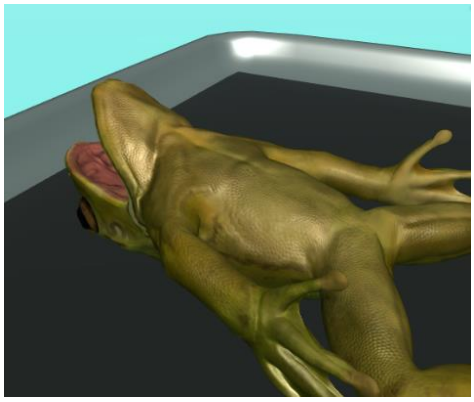
Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

1. Name some of the organs humans use to digest food. _____

2. Do you think frogs have the same or different organs? Explain. _____

Gizmo Warm-up

Scientists **dissect** (cut up) other organisms to learn more about their **anatomy**, or body structure. In doing so, scientists can also learn more about human anatomy. In the *Frog Dissection* Gizmo, you will complete a virtual dissection of a female and male frog.

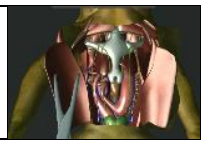


First, select the **Female** frog. Then click on the **rotate** button ( ). With the **rotate** button selected, click and drag on the frog to rotate it. Observe what the female frog looks like.

Now select **Show male** at the bottom left to switch to the male frog. Rotate around the male frog to observe what it looks like. Click **Show male** and **Show female** to toggle back and forth between the two frogs.

1. Do you notice any differences between the male and female frog? _____

2. Describe any differences you see. _____

Activity A: **Female frog anatomy**	Get the Gizmo ready: • Select **Show female** (if not already selected). • Click **Reset female**.	

Introduction: Inside the frog's torso are organs that allow the frog to move, breathe, circulate blood, digest food, excrete waste, reproduce, respond to stimuli, and fight off infections. You will dissect a female frog and identify the organs involved in these processes.

Question: How do you dissect a frog?

1. Dissect: Select the **Scalpel** tool and click on the frog. What happens? _____

   _____

2. Dissect: Select the **Forceps** tool. Click on the skin and muscles a few times.

   What happens? _____

3. Dissect: Pause for a few seconds. What happens to the skin and muscles? _____

   _____

   Pins are needed to hold the skin and muscles in place or else they might fold back onto the body. Use the forceps to pull the skin and muscles open again and then use the **Pins** tool to pin the skin and muscles down. (After selecting **Pins**, click on the skin and muscle flaps.)

4. Identify: Take a look at the **Skeletal system** diagram at the right side of the Gizmo. Find the outline of the **sternum**.

   Do you see an organ in the frog's chest on the left that looks like the sternum? _____

5. Dissect: Select the **Forceps**. Click on and drag the sternum from the frog to the **Skeletal system** diagram. If you have dragged it into the correct position, the feedback below the diagram will say so. If there is a red outline, try again.

6. Dissect: Carefully dissect all of the organs out of the frog's chest and place them in the correct positions in the organ system diagrams on the right.

   Click on the **Right** and **Left** arrows at the top of the **Skeletal system** diagram to switch to other body system diagrams. Continue dissecting until you have filled in all of the diagrams.

   Hint: Don't worry if you can't complete an organ system diagram right away. Some organs are hidden behind other organs. If you place an organ in the incorrect position three times, a hint in the Gizmo will tell you which organ system the organ belongs to.

Activity B: **Organs in the female frog**	Get the Gizmo ready: • If necessary, dissect the female frog. • Fill in all the female organ system diagrams.	

Introduction: If you are doing this after completing activity A, you should have finished dissecting the female frog. If not, do that now. (See activity A for instructions.)

Question: What is the anatomy of a female frog?

1. Match: Go to the skeletal system diagram. Click on the different labels to read about the bones. Match each bone to its description.

____ Sternum	A. A bone that is part of the shoulder. This bone is much smaller in humans.
____ Coracoid	B. The long bone at the end of the spinal column.
____ Scapula	C. The hip bone.
____ Urostyle	D. A bone in the middle of the chest that protects the heart.
____ Vertebrae	E. Bones that surround and protect the spinal cord.
____ Sacral vertebra	F. A bone that connects the spinal column to the ilium.
____ Ilium	G. A shoulder bone that connects the torso to the arm.

2. Investigate: Switch to the lymphatic system and read the description of the **lymph vessels**.

   What does the lymph system do? _____

3. Match: Switch to the digestive system diagram. Click on the different labels to read about the organs. Match each organ to its description.

____ Esophagus	A. A long, thin organ that digests food and absorbs nutrients.
____ Small intestine	B. A large organ that stores and helps to digest food.
____ Liver	C. An organ that produces enzymes that aid in digestion.
____ Pancreas	D. A tube that connects the mouth to the stomach.
____ Gallbladder	E. An organ that absorbs water, electrolytes, and nutrients from digested food and pushes waste out of the body.
____ Stomach	F. An organ that filters blood and removes toxins.
____ Large intestine	G. An organ that releases bile into the small intestine to aid in digestion.

(Activity B continued on next page)

Activity B (continued from previous page)

4. Match: Switch to the circulatory and respiratory systems diagram. Click on the different labels to read about the organs. Match each organ to its description.

____ Lungs	A. A muscle that pumps blood through the body.
____ Heart	B. Organs that transfer oxygen and carbon dioxide between the blood and air.
____ Spleen	C. Vessels that carry blood from the body to the heart.
____ Veins	D. Vessels that carry blood from the heart to the body.
____ Arteries	E. An organ that filters blood and removes old red blood cells.

5. Compare: What do the lymphatic and circulatory systems have in common? _____

_____

6. Investigate: Look at the female frog's reproductive system.

   A. In which organs are eggs produced? _____

      After leaving the **ovaries**, eggs travel through the **oviducts** to the **ovisacs** before being released through the cloaca.

   B. What do you notice about the location of fat in the frog? _____

      _____

      In a frog, fat bodies are considered a part of the reproductive system because they help warm the sex cells and also provide energy for mating.

7. Match: Switch to the urinary system diagram. Click on the different labels to read about the organs. Match each organ to its description.

____ Kidney	A. A tube that caries urine from the kidneys to the bladder.
____ Adrenal gland	B. An organ that removes waste from the body.
____ Ureter	C. An organ that stores urine until it is released from the body.
____ Bladder	D. An organ that produces hormones.

8. Investigate: Switch to the nervous system diagram and read the description of each organ.

   What is the function of the nervous system? _____

   _____

Activity C: **Male frog anatomy**	Get the Gizmo ready: • Do this activity after dissecting the female frog. • Select **Continue**. • Under Choose frog, select **Male**.	

Introduction: While male and female organisms share many of the same organs, they also have differences that define their sex.

Question: How is the anatomy of a male frog different from that of a female frog?

1. Hypothesize: Which internal organs do you think are different in the male frog versus the female frog? _____

2. Dissect: As you did with the female frog, dissect the male frog. Which organ system appears to be different from that of the female frog? _____

3. Compare: When you are done filling in the diagrams, click **Continue**. Then click **Compare**.

   A. Compare the diagrams of the external anatomy. What three differences can you use to tell the male and female frog apart? _____

   _____

   B. Use the arrows to compare the other organ systems. Which organ system is different in the male and female frogs? _____

   C. What reproductive organs does the male frog have that the female frog does not?

   _____

   D. What reproductive organs does the female frog have that the male frog does not?

   _____

   E. Why do frogs have these different organs? _____

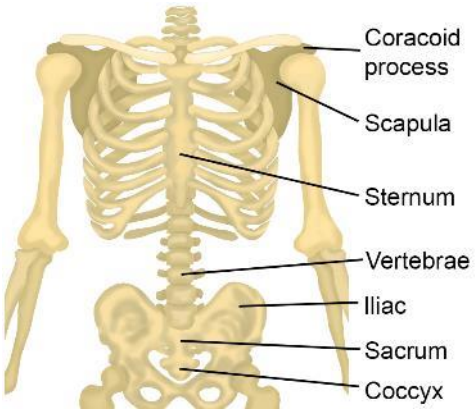
   _____

   _____

   In male frogs, sperm cells produced in the **testis** are transported through the **vasa efferentia** and out of the frog's body. In female frogs, eggs produced in the ovary are transported through the oviduct to the ovisac for storage. Male sperm cells **fertilize** the eggs after they are released from the female. Only fertilized eggs produce offspring.

Extension: **Frogs vs. humans**	Get the Gizmo ready: • Begin with a fully dissected male or female frog.	

Question: What are the similarities and differences between frog and human anatomy?



1. Compare: Compare the human skeletal system on the right to the frog skeletal system in the Gizmo.

   A. In humans, the sternum and ribs protect the heart and lungs.

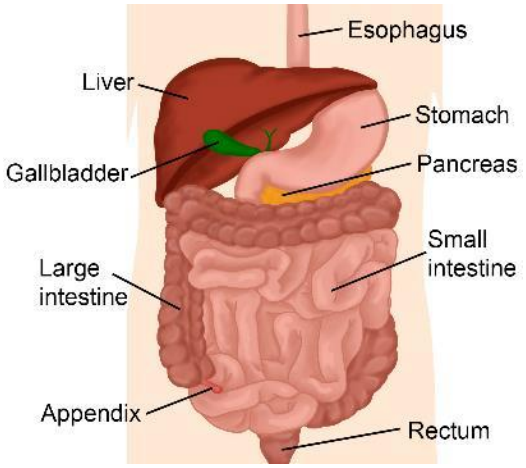
      Do frogs have a sternum? _____

      Do frogs have ribs? _____

   B. How are the hip bones in a frog different from the human pelvis?_____

      _____

      While human hips and legs are optimized for walking, frog hips and legs are optimized for leaping. The fog's pelvis can slide up and down during jumping. The hinge connecting the frog's ilium to its legs allows the frog to jump with accuracy.



2. Compare: Compare the human digestive system on the right to the frog digestive system.

   A. What do you notice? _____

      _____

   B. Which organs do the frog and human digestive systems have in common?

      _____

      _____

   C. Which organs do humans have that frogs do not? _____

      The **appendix** is a small pouch at the end of the **large intestine** in humans. The appendix stores good bacteria in the body. The **rectum** is the final section of the large intestine and connects to the anus, where solid waste is eliminated. Frogs eliminate all waste (solid and liquid) through the cloaca.

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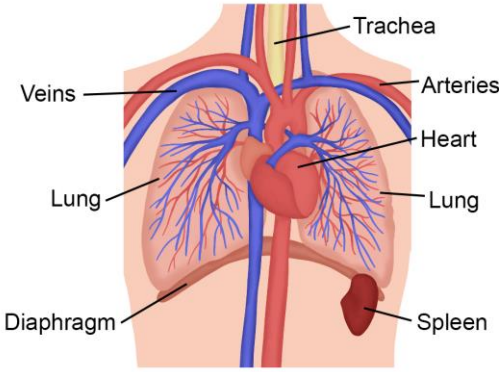


3. Compare: Compare the human circulatory and respiratory system on the right to the frog circulatory and respiratory system.

   A. Which organs do the frog and human have in common?

   _____

   _____

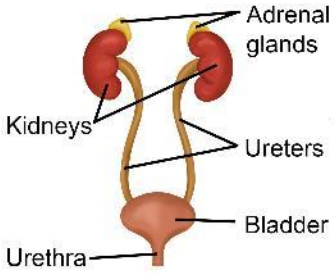
   B. Which organ does a human have that frogs do not? _____

   In humans, the **diaphragm** is a muscle that contracts (flattens) when you inhale, creating a vacuum effect that pulls air into the **lungs**. Frogs don't have a diaphragm. They use muscles in the throat to pull air in. Frog can also breathe through their skin!

   C. Human hearts have four chambers. Read the description of the frog **heart**. How do frog hearts differ from human hearts?

   _____

   A human heart has two ventricles, while a frog heart only has one ventricle. In the frog's ventricle, oxygen-rich blood from the lungs mixes with oxygen-poor blood from the body. This makes frog hearts less efficient than human hearts.



4. Compare: Compare the human urinary system on the right to the frog urinary system.

   Which frog organ is missing in humans? _____

   Which human organ is missing in frogs? _____

   Frog and human urinary systems are very similar. The main difference is that humans excrete liquid waste, or urine, through a tube called the urethra. (Solid waste is excreted from the rectum). Frogs excrete both liquid and solid waste through an opening called the cloaca.

5. Discuss: Why do you think frog anatomy is so similar to human anatomy? If possible, discuss your answer with your classmates and teacher.

   _____

   _____

   _____