

## Comparing Organs

### Grade-Level Expectations

The exercises in these instructional tasks address content related to the following science grade-level expectation:

**LS-H-F1** Compare structure to function of organs in a variety of organisms (GLE 33)

### Contents

- These instructional tasks contain a set of document- or resource-based exercises about *making comparisons among structure and function of organs of various phyla*.
- Teachers may choose to use or modify the tasks as part of an instructional lesson or as a formative or summative assessment.
- The printable student version excludes teacher directions.

	Objective(s)
<a href="#">Scaffolding Exercise 1</a>	<ul style="list-style-type: none"> <li>· Research circulatory systems to build background knowledge</li> <li>· Synthesize information to describe open and closed circulatory systems</li> </ul>
<a href="#">Scaffolding Exercise 2</a>	<ul style="list-style-type: none"> <li>· Research human and frog structures</li> <li>· Compare structures of organs in various animals</li> </ul>
<a href="#">Culminating Exercise</a>	<ul style="list-style-type: none"> <li>· Compare structures of an organ from four different animal classes</li> <li>· Explain functional adaptations or benefits among organ structures</li> </ul>
<a href="#">Scoring Rubric</a>	
<a href="#">Scoring Notes</a>	
<a href="#">Printable Student Version</a>	

# Scaffolding Exercise 1

## Teacher Directions:

Have students research the circulatory systems of the following organisms, fill in the chart, and respond to the prompts below.

Organism	Number of Chambers in Heart	Number of Circuits in System	Closed or Open System	Separation of Oxygenated/Deoxygenated Blood (yes or no)
Fish				
Grasshopper				
Alligator				
Pelican				
Human				

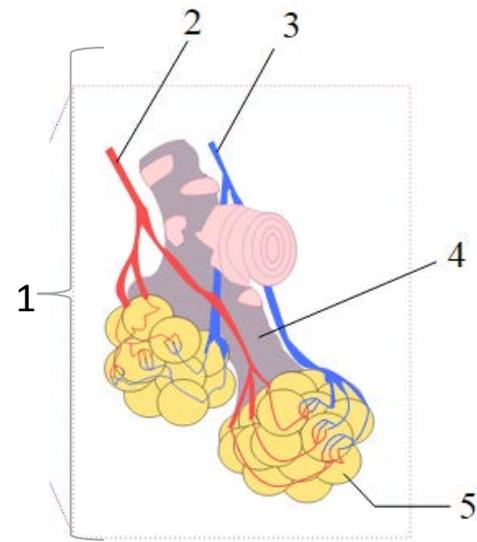
Respond to the following based on your research.

- Why do pelicans and humans require a more complex heart?
- What is the benefit of a closed circulatory system to the internal organs of an organism?
- How is the flow of blood in an open circulatory system like the flow of water in an outdoor fountain?

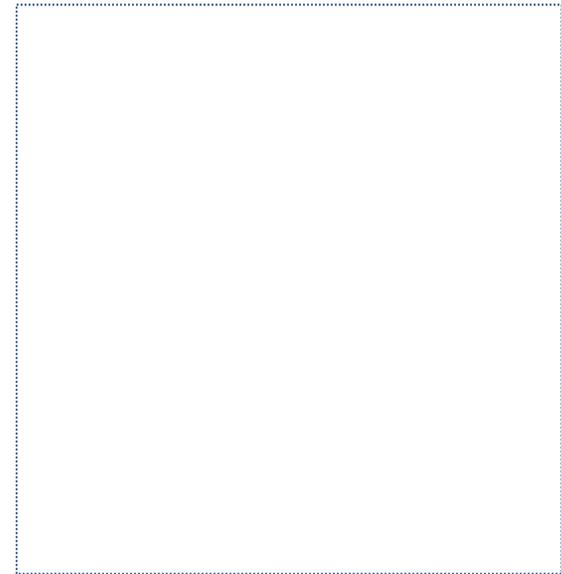
# Scaffolding Exercise 2

## Teacher Directions:

Have students research human alveoli and label the diagram. Describe the functions of each part.



Have students research frog alveoli, draw a diagram, and label parts. Describe the functions of each part.



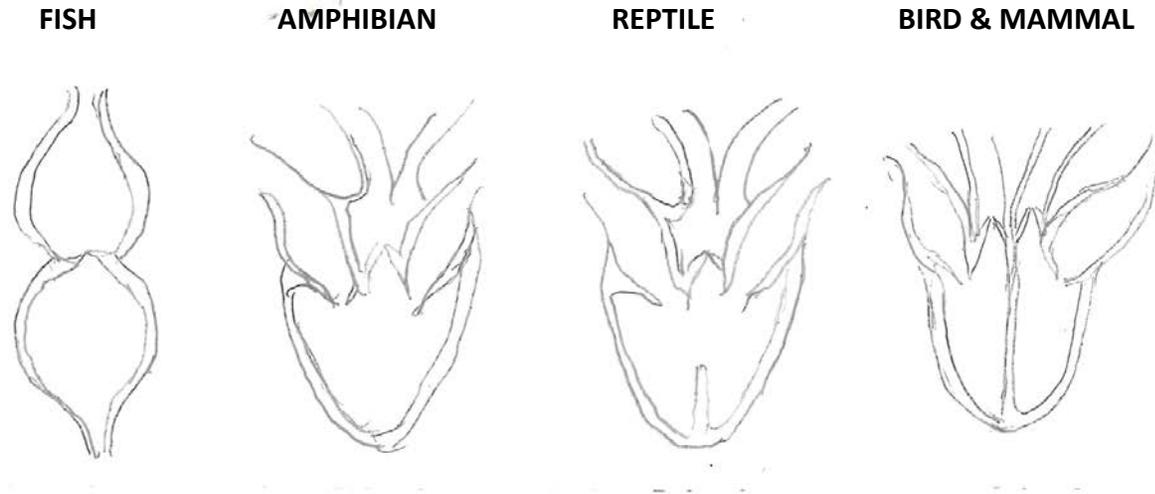
Compare the diagrams of alveoli in a human and a frog.

- How are the alveoli in the human different from the alveoli in the frog?
- How are frogs able to breathe easily despite the difference in the structure of the alveoli?

**Teacher Directions:**

Have students analyze the heart sketches below to compare the structures of the heart.

Consider the animals' needs and the function of the heart in the circulatory system to respond to the prompts.



- A. Compare the amphibian and reptile hearts to clearly describe the differences in structure and function between them.
- B. Describe the function of the upper heart chamber(s) (atria) in all of these animals.
- C. Compare the fish and amphibian hearts in structure and function.
- D. Explain why the hearts of the birds and mammals would be more effective than hearts such as that of the reptile or amphibian?

## Rubric

### Key Elements:

- A** Response correctly explains the differences in structure and function of the amphibian and reptile hearts.
- B** Response correctly describes the function of the upper heart chambers.
- C** Response correctly describes the differences in structure and function of the fish and amphibian hearts.
- D** Response correctly explains why a heart with a fully divided lower chamber is more effective than a three chambered heart.

### 4 Points

Response includes all four key elements.  
Response contains no scientific errors.

### 3 Points

Response includes three of the four key elements.  
Response may include scientific errors.

### 2 Points

Response includes two of the four key elements.  
Response may include scientific errors.

### 1 Point

Response includes one of the four key elements.  
Response may include scientific errors.

## Scoring Notes

*Student responses will not be an exact imitation of the responses below. These are given only as examples.*

- A. The difference between the amphibian and reptile hearts is that the reptile has a partially divided ventricle. Because of the partial partition in the reptile heart, there is less mixing of oxygen rich and oxygen poor blood making the circulatory system (action of the heart) more effective in supplying oxygen to the other body parts and cells.

The three-chambered heart of the amphibian consists of two atria and one undivided ventricle. Blood leaving the ventricle passes through the pulmonary arteries leading to the lungs and through an aorta to the rest of the body. Oxygenated blood returns to the heart from the lungs into the left atrium, while deoxygenated blood returning from the body passes into the right atrium. Both atria empty into the single ventricle, mixing the oxygen-rich blood returning from the lungs with the oxygen-depleted blood from the body tissues. Because the ventricle is partially divided in the reptile, it allows for less mixing of the blood from both sources for more effective circulation of the oxygen-carrying blood.

- B. Upper chambers of the heart receive blood from the body and the lungs and then pump it to the ventricle(s).  
*Alternative wording:* Atria receive blood from the veins and lungs to pump it to the lower ventricles.

- C. The fish have the simplest hearts and a single-circuit circulation. They are made up of two main chambers: an atrium and a ventricle. The atrium pumps the blood into the ventricle, which in turn pumps the blood into the vessels that travel to the gills where it is enriched with oxygen. The oxygenated blood then flows through the body and returns to the atrium. Fish exchange gases in their gills so they do not require as efficient of a heart as land-dwelling animals who exchange gases in lungs.

Amphibians and reptiles have a three-chambered heart. The three-chambered heart consists of two atria and one ventricle. Blood leaves the ventricle and passes through the pulmonary arteries leading to the lungs or through a forked aorta leading to the rest of the body. Oxygenated blood returns to the heart from the lungs into the left atrium, while deoxygenated blood returning from the body passes into the right atrium. Both atria empty into the single ventricle, mixing the oxygen-rich blood returning from the lungs with the oxygen-depleted blood from the body tissues. Because this system assures that some blood always passes to the lungs and then back to the heart, it is more efficient than the two-chambered heart. *Alternative response:* The amphibians exchange gases in their lungs and skin, thus their heart is more complex because it has two atria (3 chambers) and has two separate vessels entering the two atria which keep blood with wastes separate from freshly oxygenated blood. The fish heart is very simple because it exchanges gases in its gills from water, not air. It has only two chambers and one entry vein and one exit artery.

- D. The heart with four chambers is more efficient because it completely separates the blood containing carbon dioxide from the newly oxygenated blood coming back from the lungs so that only blood containing oxygen leaves through the aorta to the rest of the body. The body cells receive only freshly oxygenated blood. *Alternative responses:* (1)The divided lower heart chambers (or four chambered heart) separates blood from the body (carrying CO<sub>2</sub>) from blood returning from the lungs which is rich in oxygen so that the body (cells) receives blood carrying only oxygen rather than a mixture. (2)The four chambered heart provides two parallel pumps to keep the blood carrying CO<sub>2</sub> wastes separate from the blood carrying oxygen which results in the body (cells) receiving only oxygenated blood.

**Printable  
Student Version**

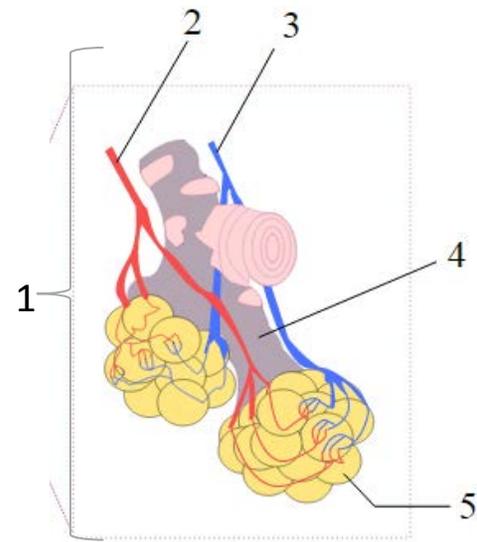
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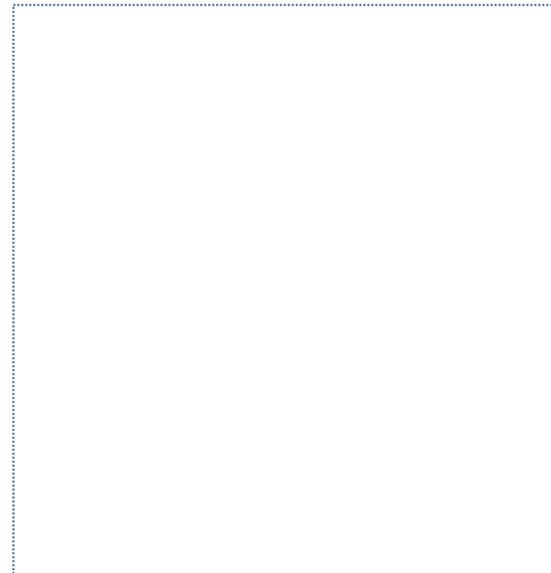
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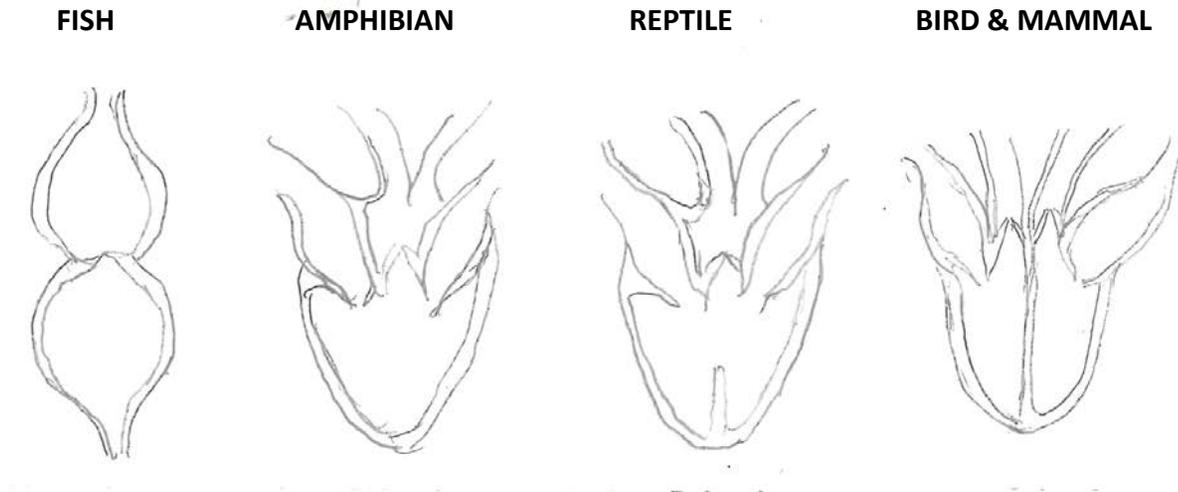


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