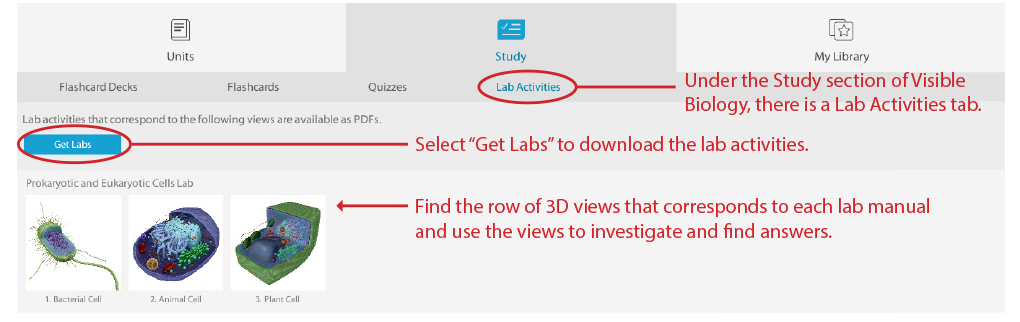


This lab manual is intended for use with the [Visible Biology](http://www.visiblebiology.com) product.

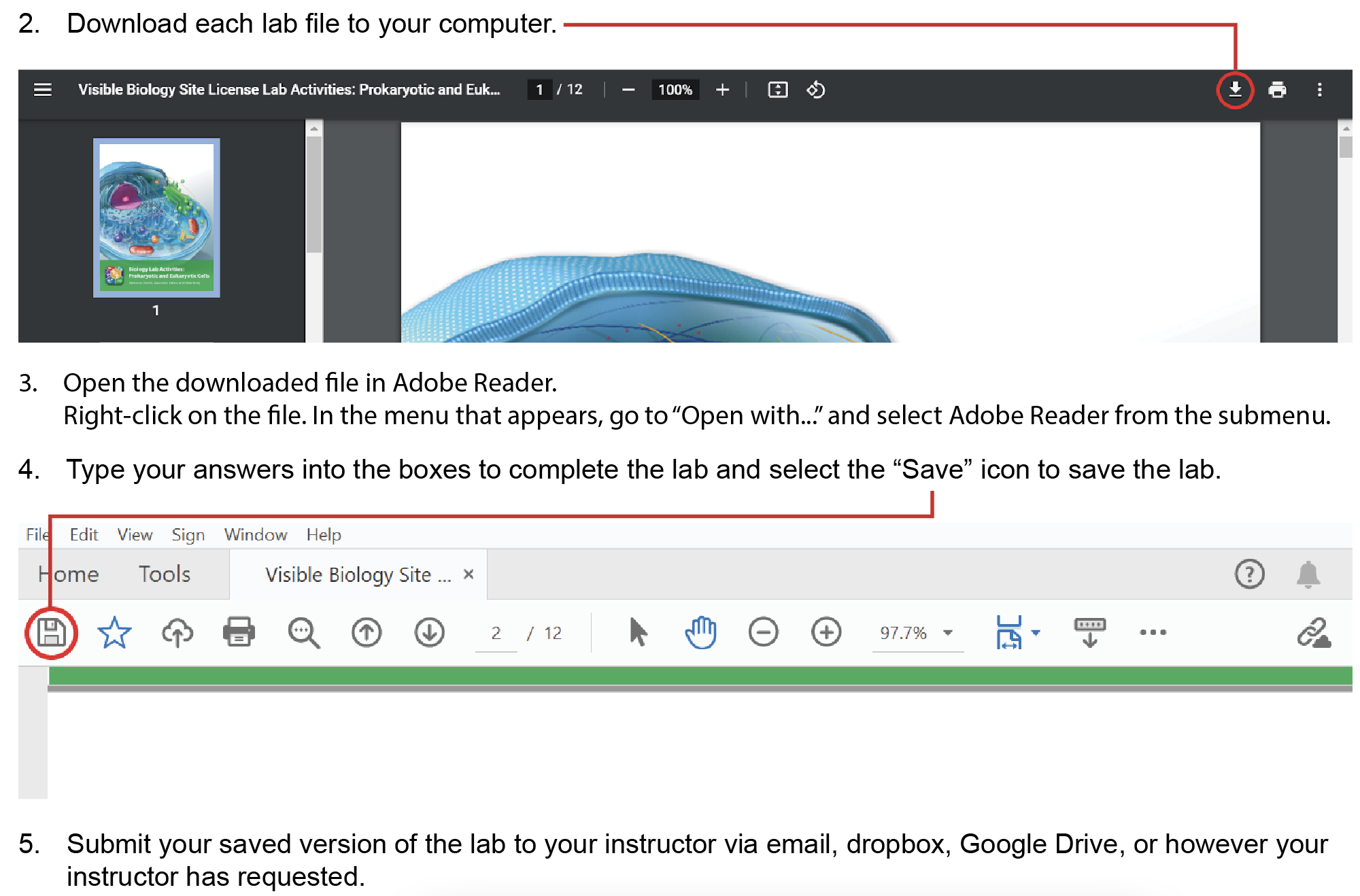
**Where to find 3D models**

**How to save answers**

1. Have Adobe Reader installed on your computer.

Windows:<https://get.adobe.com/reader/>

Mac: <https://helpx.adobe.com/acrobat/kb/install-reader-dc-mac-os.html>



**Any questions?** [visiblebiology.com](http://visiblebiology.com)



Name: Date:

Biology Lab Activities: Animal Respiratory Comparison

*Last updated: 5/3/2023*

# Background Questions

Based on what you’ve learned in class, in your textbook, and from using Visible Biology, answer the following questions about the respiratory structures and functions of the sea star, earthworm, frog, and pig.

1. Sea stars, earthworms, frogs, and pigs all have respiratory structures that allow them to exchange gases with the environment around them.
   1. Sea stars, earthworms, frogs, and pigs take in \_\_\_\_\_\_\_\_\_\_\_\_ from the air or water around them and pass \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ back into the surrounding environment.
   2. For sea stars, earthworms, and frogs, their \_\_\_\_\_\_\_\_\_\_ has respiratory functions. They exchange gases with their environment via a process called \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   3. Like pigs, frogs also have \_\_\_\_\_\_\_\_\_\_, which allow them to breathe on land.
2. Animals have evolved to breathe in a variety of ways. In 3–5 sentences, describe the different ways these four animals receive gases from their environments and the structures they use to do so.

Name: Date:

Lab 1: Respiratory Structures

# Activity 1: Label the sea star’s respiratory structures

1. Launch the view
   * Launch Visible Biology.
   * Navigate to Study/Lab Activities, and find the Evolution: Animal Diversity Lab section.
   * Select view 13. Sea Star, Respiratory.
2. Label the image below
   * Explore the 3D model of the sea star to find the structures you need to label.
   * Fill in the blanks to label the structures from the list below.

Word List

Carbon dioxide

Oxygen

Skin (epidermis)

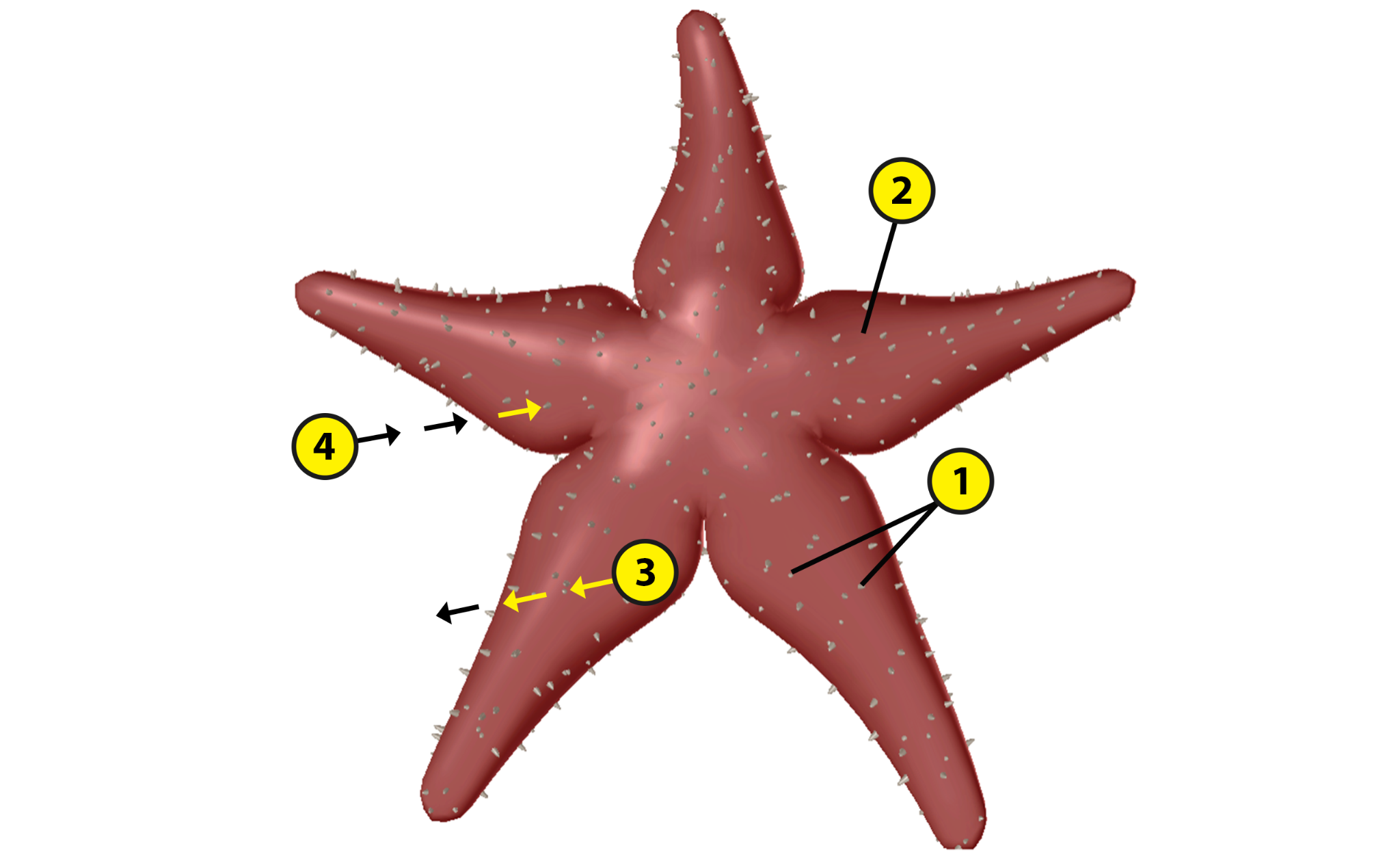
Skin gills

\_\_\_

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\_\_\_



Name: Date:

Lab 1: Respiratory Structures

# Activity 2: Label the earthworm’s respiratory structures

1. Launch the view
   * Launch Visible Biology.
   * Navigate to Study/Lab Activities, and find the Evolution: Animal Diversity Lab section.
   * Select view 14. Earthworm, Respiratory.
2. Label the image below
   * Explore the 3D model of the earthworm to find the structures you need to label.
   * Fill in the blanks to label the structures from the list below.

Word List:

Carbon dioxide

Cuticle

Oxygen

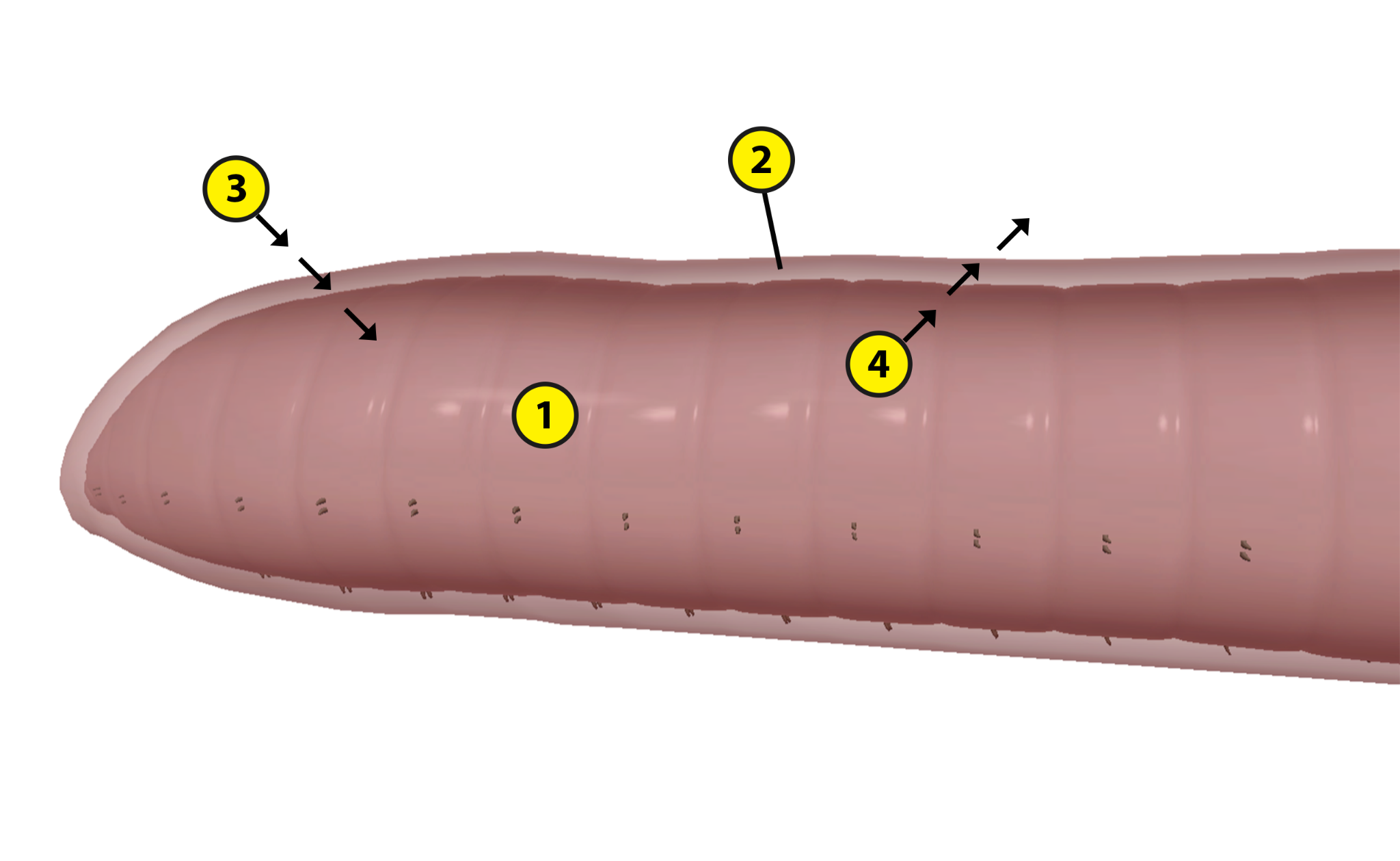
Skin (epidermis)

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Name: Date:

Lab 1: Respiratory Structures

# Activity 3: Label the frog’s respiratory structures

1. Launch the view
   * Launch Visible Biology.
   * Navigate to Study/Lab Activities, and find the Evolution: Animal Diversity Lab section.
   * Select view 15. Frog, Respiratory.
2. Label the image below
   * Explore the 3D model of the frog to find the structures you need to label.
   * Fill in the blanks to label the structures from the list below.

Word List:

Carbon dioxide

Glottis

Larynx

Lungs

Nostrils

Oxygen

Skin (epidermis and dermis)

\_\_\_

\_\_\_

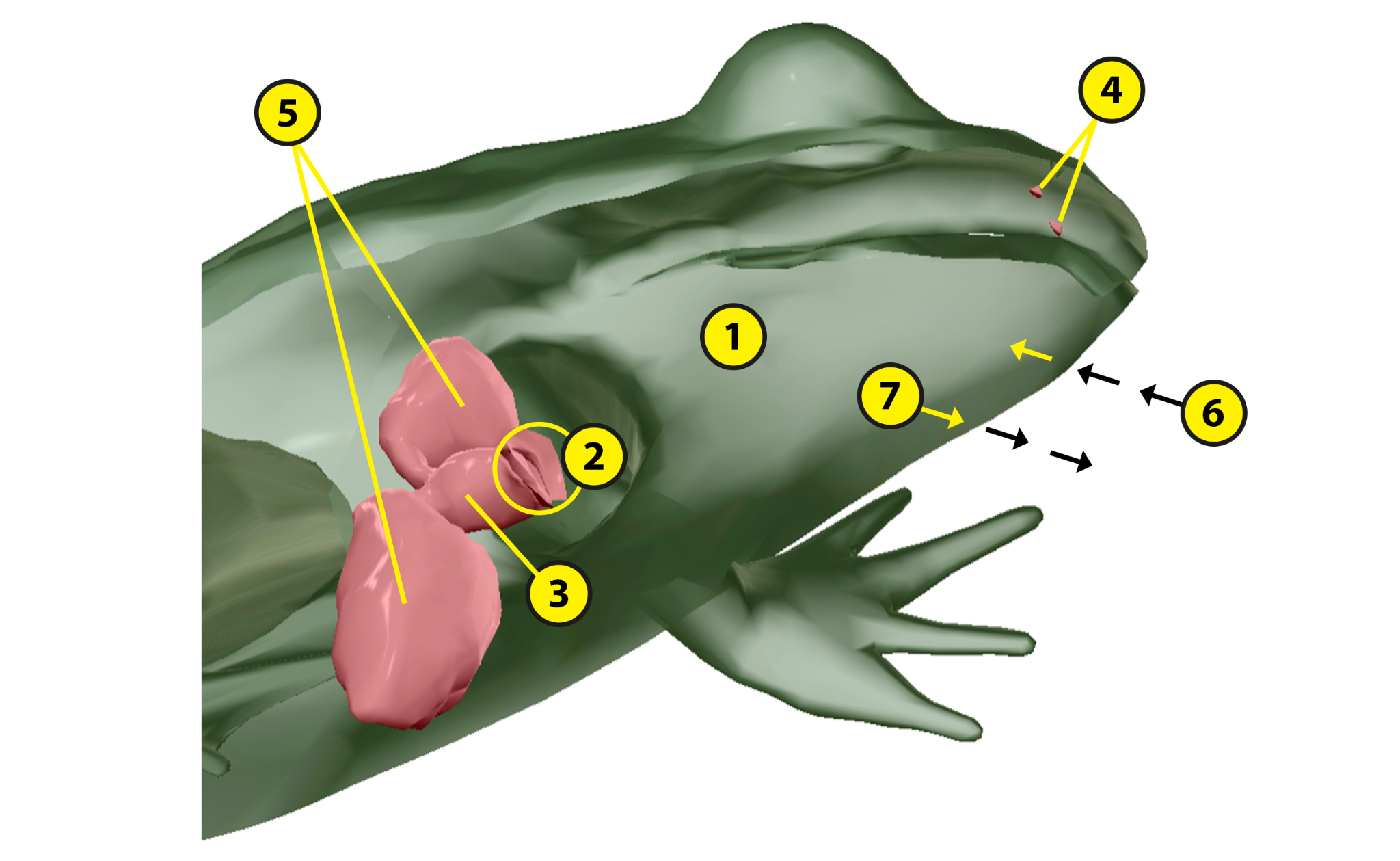
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Name: Date:

Lab 1: Respiratory Structures

# Activity 4: Label the pig’s respiratory structures

1. Launch the view
   * Launch Visible Biology.
   * Navigate to Study/Lab Activities, and find the Evolution: Animal Diversity Lab section.
   * Select view 16. Pig, Respiratory.
2. Label the image below
   * Explore the 3D model of the pig to find the structures you need to label.
   * Fill in the blanks to label the structures from the list below.

Word List

Bronchi

Larynx

Lungs

Nasal cavity

Nostrils

Pharynx

Trachea

\_\_\_

\_\_\_

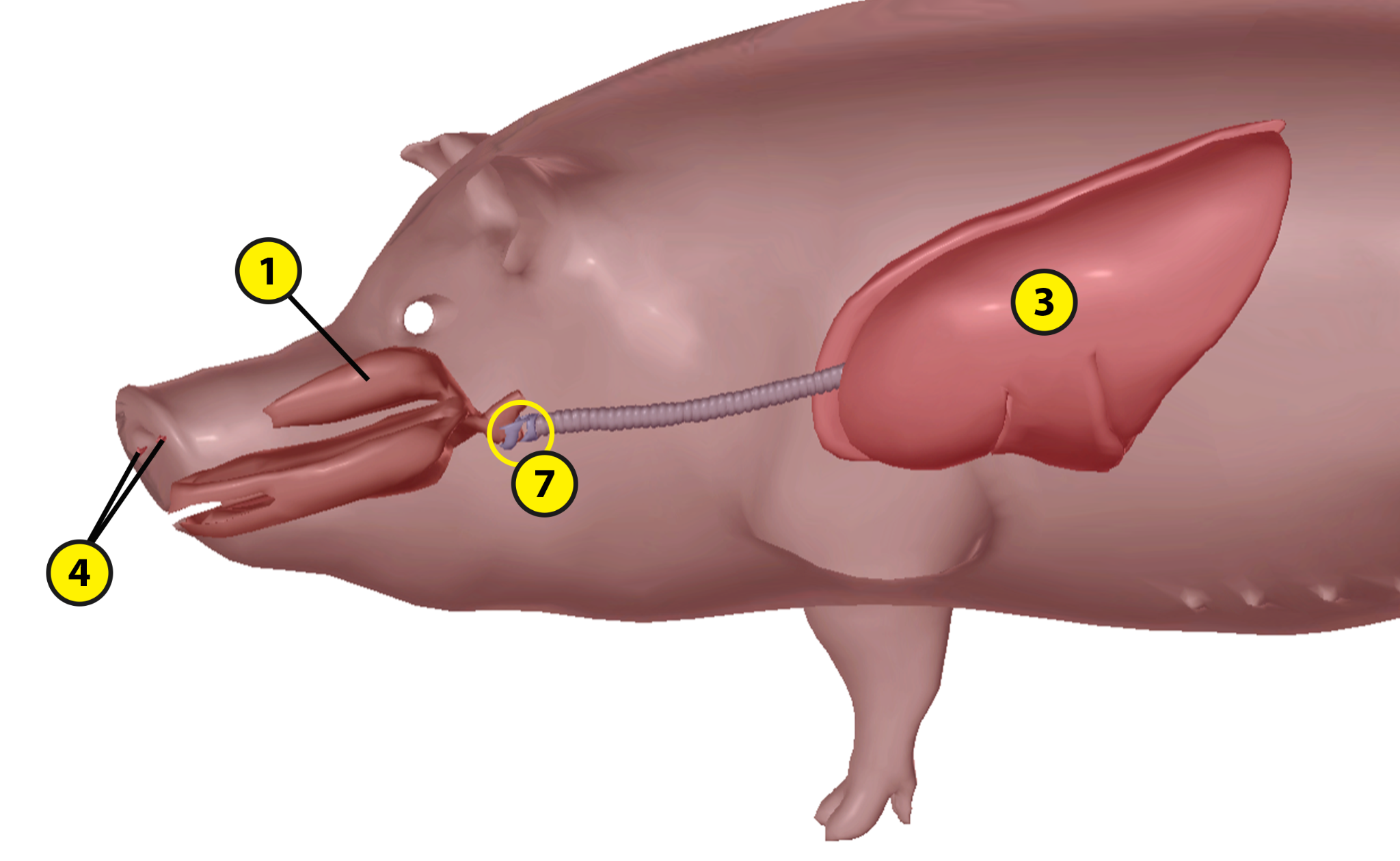
\_\_\_

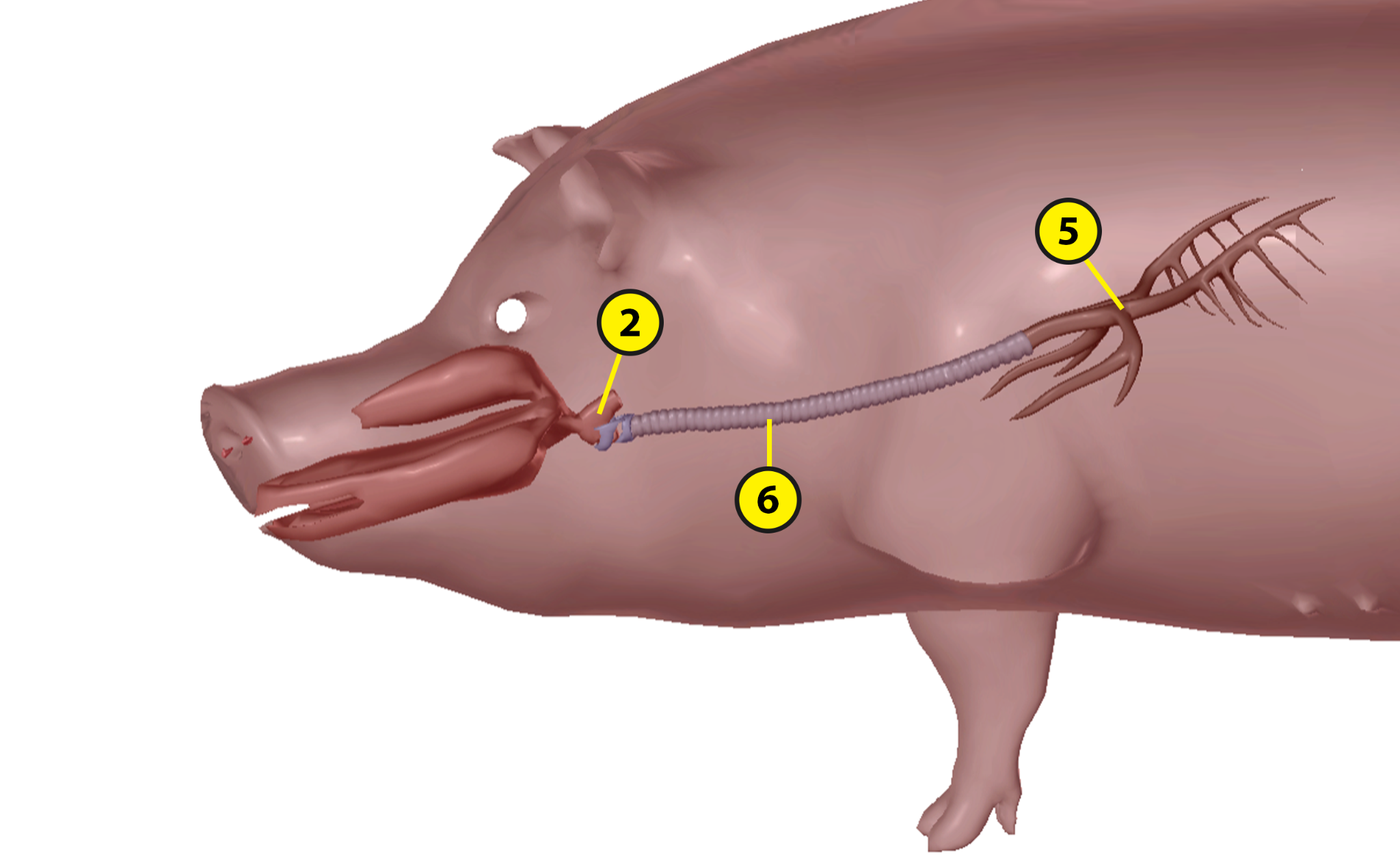
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Name: Date:

Lab 2: Respiratory Functions

# Activity 1: Explore the respiratory structures of the sea star and their functions

Refer to your labeled sea star image from Lab 1, Activity 1 and the content in Visible Biology. Based on what you’ve learned, match each of the following structures with the brief description of its function.

Structures:

1. Skin (epidermis)
2. Skin gills

Descriptions:

\_\_\_ These structures exchange oxygen and carbon dioxide with the water surrounding the sea star.

\_\_\_ This structure diffuses oxygen from the surrounding water into the sea star’s body.

Name: Date:

Lab 2: Respiratory Functions

# Activity 2: Explore the respiratory structures of the earthworm and their functions

Refer to your labeled earthworm image from Lab 1, Activity 2 and the content in Visible Biology. Based on what you’ve learned, match each of the following structures with the brief description of its function.

Structures:

1. Cuticle
2. Skin (epidermis)

Descriptions:

\_\_\_ This structure helps the earthworm exchange gases with its environment.

\_\_\_ This structure diffuses oxygen into capillaries just below its surface.

Name: Date:

Lab 2: Respiratory Functions

# Activity 3: Explore the respiratory structures of the frog and their functions

Refer to your labeled frog image from Lab 1, Activity 3 and the content in Visible Biology. Based on what you’ve learned, match each of the following structures with the brief description of its function.

Structures:

1. Glottis
2. Larynx
3. Lungs
4. Nostrils
5. Skin (epidermis and dermis)

Descriptions:

\_\_\_ These structures take in oxygen from the air surrounding the frog.

\_\_\_ These structures allow the frog to breathe while on land.

\_\_\_ This structure opens into the larynx and allows air to flow between the mouth and the lungs.

\_\_\_ This structure diffuses oxygen into the frog’s body when it is under water.

\_\_\_ Air from the mouth moves through the glottis and this structure on its way to the lungs.

Name: Date:

Lab 2: Respiratory Functions

# Activity 4: Explore the respiratory structures of the pig and their functions

Refer to your labeled pig images from Lab 1, Activity 4 and the content in Visible Biology. Based on what you’ve learned, match each of the following structures with the brief description of its function.

Structures:

1. Bronchi
2. Larynx
3. Lungs
4. Nasal cavity
5. Nostrils
6. Pharynx
7. Trachea

Descriptions:

\_\_\_ Air moves through this cartilaginous and membranous structure to the lungs.

\_\_\_ These lobed structures contain alveoli, which facilitate gas exchange.

\_\_\_ Air moves from the pharynx through this structure to the trachea.

\_\_\_ This structure receives air from both the oral and nasal cavities.

\_\_\_ These structures branch out from the trachea into the lungs, dividing into smaller airways.

\_\_\_ This structure receives air that enters through the nostrils.

\_\_\_ These structures take in air from the surrounding environment.

Name: Date:

Lab 3: Evolutionary Similarities and Differences

Based on what you’ve learned about the respiratory structures of the sea star, earthworm, frog, and pig, answer the following questions about their evolutionary similarities and differences and the adaptations that help them survive in their environments.

1. All animals have respiratory structures that exchange gases with their environments. The sea star, earthworm, frog, and pig have some similarities in their respiratory structures and functions.
   1. All four animals receive \_\_\_\_\_\_\_\_\_\_\_\_ from the air or water around them and pass \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ back into their environments.
   2. Sea stars, earthworms, and frogs can all diffuse gases through their \_\_\_\_\_\_\_\_\_\_. For this structure to carry out its respiratory functions, it must remain \_\_\_\_\_\_\_\_\_\_, either from the surrounding environment or from substances produced by the animal.
   3. Like pigs, frogs also have \_\_\_\_\_\_\_\_\_\_, which allow them to breathe on land. This means that frogs and pigs can both breathe via \_\_\_\_\_\_\_\_\_\_\_\_\_\_ respiration.

1. These animals also have some unique respiratory structures that distinguish them from each other. They developed these unique structures to help them survive in their environments.
   1. What are two unique structures the sea star has that help it exchange gases with the water around it?
   2. What role does the earthworm’s cuticle play in gas exchange?
   3. The frog has some unique respiratory system adaptations that help it survive on land and in water.
      1. When the frog is on land, air enters through the \_\_\_\_\_\_\_\_\_\_\_\_ and passes through the oral cavity and a slit that opens into the larynx, called the \_\_\_\_\_\_\_\_\_\_\_\_, on its way to the lungs.
      2. In addition to breathing through their lungs, frogs can also receive oxygen via \_\_\_\_\_\_\_\_\_\_\_\_\_\_ respiration through the skin. Glands throughout the \_\_\_\_\_\_\_\_\_\_ secrete watery mucus that keeps the skin moist, helping to facilitate gas exchange.
   4. Like humans and other mammals, pigs have a more complex respiratory system. Air enters through the pig’s nostrils and mouth and passes through several structures on its way to the lungs.
      1. Air passes from the nasal and oral cavities into the \_\_\_\_\_\_\_\_\_\_\_\_, a respiratory and digestive structure that connects to the larynx and esophagus. From this structure, air moves over the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the larynx, causing them to vibrate and create the pig’s sounds.
      2. Next, air moves through a cartilaginous and membranous tube, called the \_\_\_\_\_\_\_\_\_\_\_\_, which branches into smaller airways called \_\_\_\_\_\_\_\_\_\_\_\_ and bronchioles.
      3. From these small airways, air moves into the lungs. The pig’s right lung is divided into \_\_\_\_\_\_\_\_\_\_ lobes and its left lung is divided into \_\_\_\_\_\_\_\_\_\_ lobes. The lungs contain the smallest respiratory units, the \_\_\_\_\_\_\_\_\_\_\_\_, which facilitate gas exchange.
2. Match each of the following animals with the description of how it takes in oxygen from its environment.

Animals:

1. Sea star
2. Earthworm
3. Frog
4. Pig

Digestive Adaptations:

\_\_\_ This animal breathes through its nose and mouth, passing air into its lobed lungs, where gas exchange occurs.

\_\_\_ This animal diffuses oxygen through its skin into capillaries below the skin’s surface.

\_\_\_ This animal diffuses oxygen into its body through its skin, skin gills, and tube feet.

\_\_\_ This animal can breathe in the water and on land via its skin and lungs.

1. Based on what you’ve learned by labeling the respiratory structures of these animals in Lab 1 and matching the structures with their functions in Lab 2, put these animals in order, from simplest to most complex *(where 1 has the simplest respiratory system and 4 has the most complex respiratory system)*.

\_\_\_ Earthworm

\_\_\_ Pig

\_\_\_ Sea star

\_\_\_ Frog