Real World Investigation 3-A

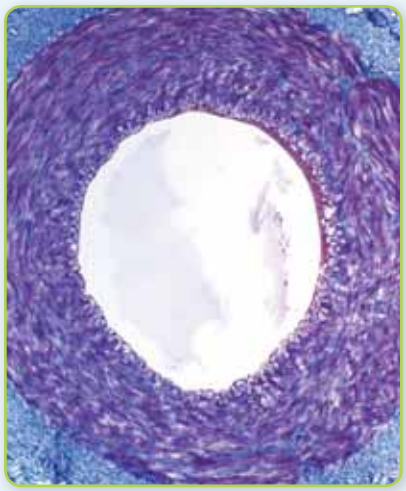
Skill Check

- ✓Initiating and Planning
- ✓Performing and Recording
- ✓Analyzing and Interpreting
- ✓Communicating

Heart Disease: Making the Public Aware

Imagine that the Heart and Stroke Foundation has decided to embark on a new public education campaign to inform people of the risk factors for acquiring cardiovascular disease. Your class has been asked to design educational materials for this campaign.

In a small group, research the risk factors for cardiovascular disease. As part of your research, find out what age group is most at risk for heart attacks and strokes. Consider whether this age group is the prime audience for your communication strategy.



This micrograph shows a cross section of a healthy artery.

This cross section shows an artery with inflammation due to arteriosclerosis. The black area at the center of the artery is the only space left for blood flow.

Question

What are the risk factors for acquiring cardiovascular disease, and how can these risks be communicated to the public effectively?

Organize the Data

Summarize your research. What are the main risk factors for getting heart disease?

Analyze and Interpret

1. Decide what part of the population you will target for your campaign. Write a brief profile of that demographic, including their age, gender, education, lifestyle, and any other factors that may be significant for your campaign.
2. Decide on a method of communication that will best reach this audience (for example, television commercial, radio program, web site, printed pamphlet, podcast).

Conclude and Communicate

3. As a group, prepare an outline or storyboard for your product and have it approved by your teacher.
4. Complete your product and present it to the class.
5. Which medium did you think was most effective in conveying the information? Why?
6. What changes could you make in your own life to decrease your chances of acquiring heart disease?

Extend Your Inquiry and Research Skills

7. **Research** People who recover from heart attacks usually do so only if they receive immediate attention. What kind of attention must they receive?

Inquiry Investigation 3-B

Skill Check

Initiating and Planning

✓ Performing and Recording

✓ Analyzing and Interpreting

✓ Communicating

Safety Precautions

- Extreme care must be taken when using dissecting instruments, particularly scalpels. As much as possible, make cuts away from your body.
- The frogs are preserved in a chemical solution. Wear plastic gloves, goggles, and an apron at all times, and work in a well-ventilated area. If some of the chemical comes into contact with your skin, wash it off immediately.

Materials

- gloves, goggles, and lab apron
- preserved frog
- water
- dissection tray
- pins
- scissors
- forceps
- scalpel
- probe
- paper towels for clean up

Frog Dissection

Follow your teacher's instructions to perform a dissection of a frog, or observe a virtual dissection.

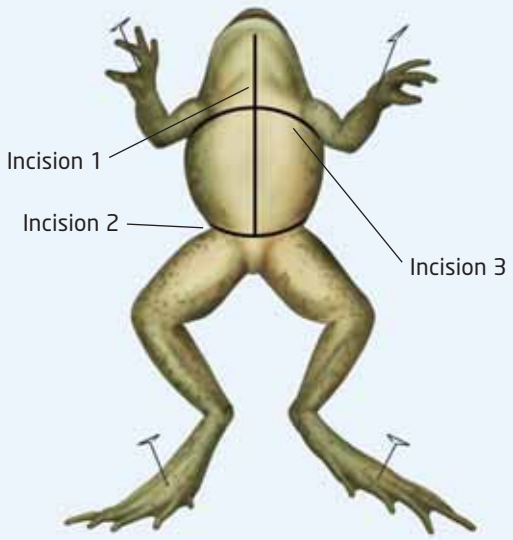
Question

How does the arrangement of a frog's organ systems facilitate their interactions?

Procedure

Part A: Making Incisions

1. Rinse the frog in water.
2. Place it in the dissection tray on its dorsal (back) side and pin its limbs to the tray.
3. Use forceps to lift the frog's skin between the rear legs. Use the scalpel to cut through the lifted skin in order to make the incisions noted in the diagram below. Take care to cut only the skin.



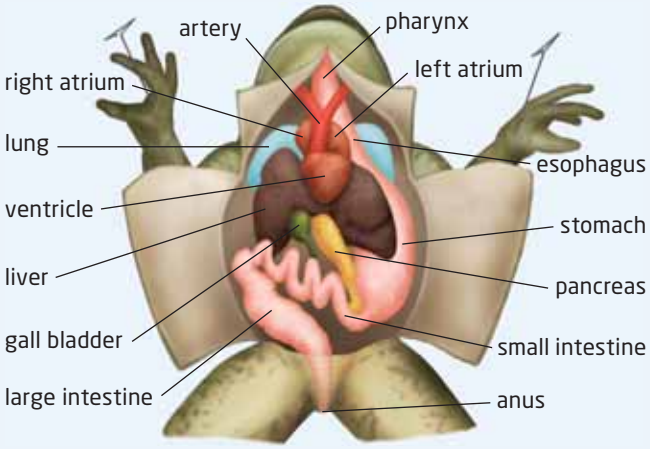
4. Lift one flap of skin with the forceps. Use a scalpel to help separate the skin from the muscle layer below. Pin the flap to the dissection tray. Repeat with the second flap of skin.
5. Make a vertical incision through the abdominal muscle. Begin by using the forceps to lift the muscle layer between the rear legs of the frog. Make a small cut with the scalpel. Using the scissors, continue the incision up the midline to a point just below the front legs.

6. Use scissors to cut through the chest bones. When you reach the point just below the front legs, turn the scissor blades sideways so you only cut through the bones in the chest. Be careful not to cut too deeply or you might damage the heart or other internal organs. Stop when the scissors reach a point just below the frog's neck.

7. As you did with incisions 2 and 3, use the scalpel to make sideways incisions in the muscle. Again, be careful not to cut too deeply.

8. To separate the muscle flaps from the organs below, use the forceps to pull back and hold the muscle flaps. Use the scalpel to separate the muscle from the organ tissue. Pin the muscle flaps back far enough to allow easy access to the internal organs.

9. Use forceps to pick up the triangular flaps of skin and muscle just above the back legs. Use the scalpel, if needed, to separate the muscle flap from the tissue underneath. Pin the flaps back far enough to allow access to the body cavity.



Internal organs of a frog

Part B: Internal Examination

10. The first organs you will see are the liver and heart. Draw and label them on a diagram of your frog.

11. The heart and liver cover the organs below them. Use the forceps and probe to pick up the liver and hold it to the side. Use the labelled diagram on this page to find the organs of the digestive system. Draw and label as many of these organs as you can see, from the mouth to the anus. Hint: The pancreas is a thin, yellowish ribbon.

12. Trace the path of blood vessels to and from the heart. The vessels going to and from the lungs may be hard to see. Notice that the frog has two atria, as humans do, but only one ventricle.

13. Observe how small arteries are attached to organs of the digestive system.

14. Dispose of your frog properly, according to your teacher's instructions.

15. Rinse and dry all equipment, including the dissecting tray.

16. Put the dissecting tray and tools away.

Analyze and Interpret

1. Where is the frog's heart compared to its lungs? How do the locations of these organs affect interactions between the frog's respiratory and circulatory systems?

2. Describe how the frog's circulatory and digestive systems are physically connected.

Conclude and Communicate

3. Explain why the interaction of the respiratory and circulatory systems is necessary for the frog's survival.

4. Draw and label a diagram to show blood flow into and out of the heart.

Extend Your Inquiry and Research Skills

5. **Inquiry** Cold-blooded animals, such as frogs, are able to deliver blood to their cells once their bodies warm up. Predict when you think frogs are likely to be most active.

Data Analysis Investigation 3-C

Skill Check

Initiating and Planning

Performing and Recording

✓ **Analyzing and Interpreting**

✓ **Communicating**

Who's Stubbing Out?

Physicians for a Smoke-Free Canada calls smoking "the leading cause of preventable death and illness in Canada" and "the most pressing public health concern in our country." The organization says Ontario's health-care costs due to tobacco use are enormous. For example, the cost of hospitalization due to active and passive (second-hand) smoking is more than $800 million a year. The cost of prescription drugs needed as a result of smoking is more than $500 million a year. Smoking has been clearly linked to diseases such as lung cancer, emphysema, and heart disease.

For years, dozens of public health initiatives have targeted smoking-related diseases. These initiatives have included four strategic directions:

- Protection: reducing the number of Canadians exposed to second-hand smoke
- Cessation: supporting and encouraging smokers to quit
- Prevention: preventing young people from taking up smoking
- Harm reduction: mandating changes to tobacco products to reduce their hazards

Specific initiatives have included legislation, media campaigns, pamphlets, posters, support groups, web site support, toll-free help lines, and other measures.

Are the initiatives successful? In this investigation, you will study smoking data for Ontario to identify trends.

You may have seen these kinds of warning labels from cigarette packages. The federal government requires them by law as part of its strategy to educate people about the dangers of smoking.

Prevalence of Smoking in Ontario (percentage of the population from 1999 to 2005)

Age	1999	2000	2001	2002	2003	2004	2005
Total							
15-19	25	25	19	19	13*	16	17
20-24	34	28	31	29	29	21	24
25-44	29	28	21	24	22	22	26
45+	16	17	17	14	14	11	12
Male							
15-24	32	27	26	25	22*	21	23
25+	24	25	23	21	22	22	23
Female							
15-24	27	26	24	23	20*	16	18
25+	20	20	15	17	14*	10	14

* low sampling (six months of data)
Source: Physicians for a Smoke-Free Canada with data from the Canadian Tobacco Use Monitoring Survey

Question

Are rates of smoking decreasing?

Organize the Data

1. Draw a bar graph for the data shown for each age group in the total population for the years 1999 and 2005.
2. Draw a bar graph to compare the percentage of smokers among males and females for ages 15 to 24 in each of the seven years.
3. Draw a bar graph to compare the percentage of smokers among males and females for ages 25 and above in each of the seven years.

Math Skills

Go to **Math Skills Toolkit 3** for information about drawing graphs.

Analyze and Interpret

1. Were males or females of ages 15 to 24 more likely to smoke in 1999 or in 2005?

Conclude and Communicate

2. Does it appear that campaigns to reduce smoking over the years 1999 to 2005 were successful? What assumption do you have to make in order to draw this conclusion?
3. Would you say that the change in smoking rates during this time period was major or minor? Explain your answer.

Extend Your Inquiry and Research Skills

4. **Inquiry** Is there any evidence from the data that public health initiatives have targeted one group more than another? Explain.

Your teacher may ask you to work on this investigation in a small group.