

Activity Preparation for Chapter 11

Activity/Investigation	Advance Preparation	Time Required	Other Considerations
<i>Try This!</i> (page 215) (TR page 258)	<ul style="list-style-type: none"> • Several days/weeks before <ul style="list-style-type: none"> – Book the computer lab. – Familiarize yourself with the program students will use. • 1 day before <ul style="list-style-type: none"> – Photocopy BLM 11–2 Virtual Dissection. 	• 45 min	<ul style="list-style-type: none"> • Consider leading students through the first few steps of the virtual dissection.
<i>Find Out: What Organs Does a Frog Have?</i> (page 216) (TR page 260)	<ul style="list-style-type: none"> • Several weeks before <ul style="list-style-type: none"> – Order frogs. – Purchase resealable bags and disinfectant. – Gather the dissection tools. • 1 day before <ul style="list-style-type: none"> – Organize the apparatus and materials. – Photocopy Assessment Master 10 Safety Rubric and Assessment Master 12 Using Tools and Equipment Rubric. 	• 25–30 min	<ul style="list-style-type: none"> • Review the safety precautions. • Carefully explain the clean-up routine. Demonstrate how to safely store the specimens in resealable bags and how to clean the tools and work area using disinfectant.
<i>Find Out: How Does a Frog's Circulatory System Work?</i> (page 218) (TR page 263)	<ul style="list-style-type: none"> • 1 week before <ul style="list-style-type: none"> – Gather plastic rulers and magnifying glasses. • 1 day before <ul style="list-style-type: none"> – Organize the apparatus and materials. – Photocopy BLM 11–3 Compare the Human and Frog Circulatory System and Assessment Master 2 Co-operative Group Work Rubric. 	• 45–50 min	<ul style="list-style-type: none"> • In advance, gather a class set of small clear plastic rulers, possibly made out of overhead transparencies.
<i>Find Out: How Does a Frog's Respiratory System Work?</i> (page 220) (TR page 266)	<ul style="list-style-type: none"> • 1 day before <ul style="list-style-type: none"> – Organize the apparatus and materials. – Photocopy BLM 11–4 Compare the Human and Frog Respiratory Systems. 	• 30–35 min	<ul style="list-style-type: none"> • You might plan to have students do Find Out: How Does a Frog's Respiratory System Work? and Find Out: How Does a Frog's Digestive System Work? on the same day.
<i>Find Out: How Does a Frog's Digestive System Work?</i> (page 222) (TR page 269)	<ul style="list-style-type: none"> • 1 day before <ul style="list-style-type: none"> – Organize the apparatus and materials. – Photocopy BLM 11–5 Compare the Human and Frog Digestive System, as well as Assessment Master 10 Safety Rubric and Assessment Master 12 Using Tools and Equipment Rubric. 	• 40–45 min	<ul style="list-style-type: none"> • Have students reflect on how they used equipment and tools and followed safety procedures during the lab activities. Ask for reflections about what was learned and what might be done differently next time.

Materials Needed for Chapter 11

Activity/Investigation	Apparatus	Materials	Blackline Masters
<i>Try This!</i> (page 215) (TR page 258)	<ul style="list-style-type: none"> • computer (1 per student) 		Recommended BLM 11–2 Virtual Dissection
<i>Find Out: What Organs Does a Frog Have?</i> (page 216) (TR page 260)	<ul style="list-style-type: none"> • dissecting tray • dissection pins • dissection scissors • forceps • probe 	<ul style="list-style-type: none"> • frog (1 per pair of students) • resealable bags (1 per frog) • disinfectant for clean-up 	Recommended Assessment Master 10 Safety Rubric Assessment Master 12 Using Tools and Equipment Rubric Optional Assessment Master 9 Safety Checklist Assessment Master 11 Using Tools and Equipment Checklist
<i>Find Out: How Does a Frog’s Circulatory System Work?</i> (page 218) (TR page 263)	<ul style="list-style-type: none"> • probe • ruler • magnifying glass • dissection scissors • dissection pins 	<ul style="list-style-type: none"> • frog in dissecting tray 	Recommended BLM 11–3 Compare the Human and Frog Circulatory System Assessment Master 2 Co-operative Group Work Rubric Optional Assessment Master 1 Co-operative Group Work Checklist
<i>Find Out: How Does a Frog’s Respiratory System Work?</i> (page 220) (TR page 266)	<ul style="list-style-type: none"> • probe • dissection scissors • magnifying glass 	<ul style="list-style-type: none"> • frog in dissecting tray 	Recommended BLM 11–4 Compare the Human and Frog Respiratory Systems
<i>Find Out: How Does a Frog’s Digestive System Work?</i> (page 222) (TR page 269)	<ul style="list-style-type: none"> • dissection scissors • probe • magnifying glass • ruler 	<ul style="list-style-type: none"> • frog in dissecting tray • coloured pencil 	Recommended BLM 11–5 Compare the Human and Frog Digestive System Assessment Master 10 Safety Rubric Assessment Master 12 Using Tools and Equipment Rubric Optional Assessment Master 9 Safety Checklist Assessment Master 11 Using Tools and Equipment Checklist

CHAPTER 11 Frog Dissection

(page 214)

SUGGESTED TIMING

25 min
45 min for Try This!

MATERIALS

- set of dissection tools
- frog model (optional)
- chart paper and markers

BLACKLINE MASTERS

BLM 11–1 Respect for Life Contract
BLM 11–2 Virtual Dissection
OHT 19 The Frog
OHT C–11 Dissection Tools

Overall Expectations

BSAV.02 – investigate, through laboratory activities, the processes which simple and complex organisms use to sustain life

SILV.02 – use appropriate scientific skills, tools, and safety procedures to investigate problems

Science Background

The purpose of the introductory section is to engage students in discussion about the purpose and merits of studying animal and plant systems. Dissection provides students with hands-on experience with the organ systems of a frog. Students can use their observations to compare frog and human organ systems, and gain understanding about human organ systems.

Ethical Concerns: Students may have ethical concerns about doing an animal dissection. Let students know that frogs for dissection are bred for such purposes and are not obtained from a general pet store or the wild. Students who do not wish to participate in a hands-on dissection should not be forced to do so. Provide a choice for students to achieve the objectives of the course by using web-based interactive programs or computer simulations of dissection.

Dissection: Consider having students dissect double-injected frog specimens, which show the difference between veins and arteries. These are available from on-line suppliers and are relatively inexpensive (approximately \$4.00 to \$8.00 per frog).

Preserved frogs are packaged in three different ways by suppliers such as Boreal: vacuum-packed, pail-packed, and freeze dried. Vacuum-packed specimens are vacuum-packed in plastic bags that keep specimens fresh until needed. The pail-packed specimens are packed in a plastic pail containing a holding solution for preserved specimens, which allows for long-term storage before, during, and after dissections. Freeze-dried specimens have been preserved by freezing them and extracting the water. Rehydrating frogs involves placing them in a container containing an alcohol solution for 24 hours. You may use the alcohol solution to store rehydrated specimens for up to two months without deterioration.

During the course of dissection (approximately 3.5 classes), consider storing frogs in resealable plastic bags securely sealed to prevent drying out, at room temperature in a dry location. It is not necessary to refrigerate specimens.

Technology Links

- For a discussion about the debate over dissection, go to www.mcgrawhill.ca/books/Se9 and follow the links to Dissection.
- For an annotated list of studies about attitudes to dissection, go to www.mcgrawhill.ca/books/Se9 and follow the links to Attitudes to Dissection.

Address concerns about odour by purchasing preserved frogs that are formaldehyde-free for approximately \$2.00 to \$3.00 more per frog, depending on the size of specimens.

Frog External Parts: A frog’s body consists of a head, a short neck, and a trunk. The head contains the brain, mouth, eyes, ears, and nose. Vision appears to be movement-based. Frogs have no external ear. The ear canal is covered by round, flat skin called the tympanum. The short neck limits movement of the head. The trunk contains a single body cavity called the coelom, which houses all the internal organs including the heart, lungs, and digestive organs. Humans have three cavities (i.e., chest, abdomen, pelvis), which contain the internal organs. A diaphragm separates the chest from the abdomen. Frogs do not have a diaphragm.

A skeleton supports and protects the frog’s body. Frogs do not have ribs.

Key Terms Teaching Strategies

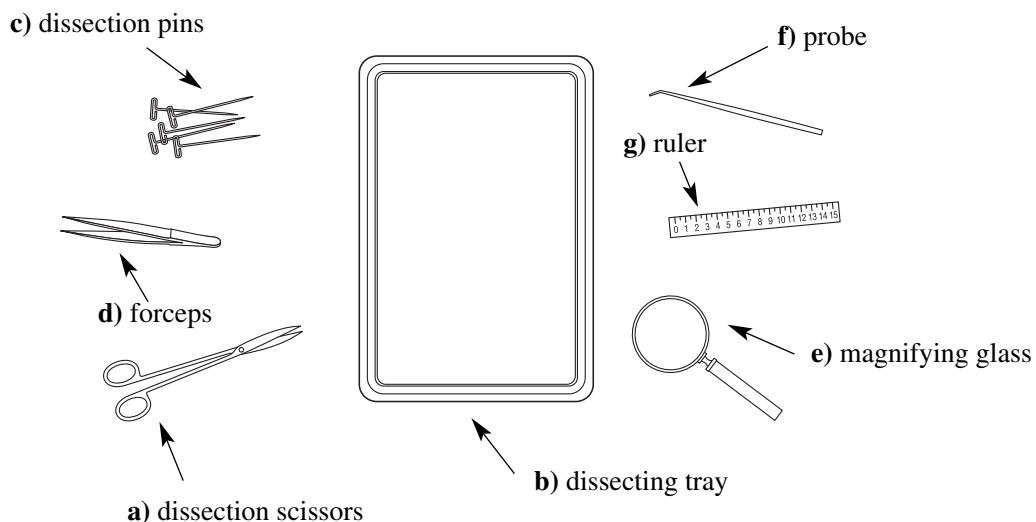
Have students complete some or all of the following activities to help them learn and remember the key terms:

- Write definitions for these terms in their Science Log. You may wish to have students keep a glossary at the back of their Science Log.
- Write a paragraph that contains the key terms.

Help students remember the key terms by posting them on a science word wall.

Reading Icon Answer (page 215)

2.



Activity Planning Notes

After reading the introductory paragraphs on page 214 as a class, use the following questions as a lead-in to an oral discussion about the purposes and merits of dissection, and the importance of respecting life when doing dissections.

- Why do dissections? (Scientists examine structures found within organisms; scientists learn more about how organs and systems work and compare them with human body systems.)
- Under what conditions should they be done? (Under supervision and with a clear set of goals and purposes.)
- How do dissections help people? (People gain understanding about human organs and systems and how systems are connected; in research, people gain understanding about the effects of environment on health, and extrapolate to human health.)

Discuss ethical concerns about dissection that students raise before assigning the Making Connections question on page 214.

Distribute **BLM 11–1 Respect for Life Contract** and have students summarize the discussion and sign the contract before beginning any dissection activity.

Use a set of dissection tools to demonstrate the appropriate and safe use of each tool. You might ask students to sketch each dissection tool. Have students complete and then discuss the Reading Icon question on page 215.

Before beginning the dissection activities, discuss the external parts of a frog using a model of a frog. You might compare external parts of frogs and human beings. Use chart paper to record the similarities and differences between the two vertebrates.

Consider having students do a virtual dissection in the Try This! on page 215 as preparation for doing an actual dissection. The virtual dissection will help students become familiar with dissection techniques and the insides of a frog.

Consider using the following blackline master and overhead transparencies:

- **BLM 11–1 Respect for Life Contract**
- **OHT 19 The Frog**
- **OHT C–11 Dissection Tools**

This opener can be used as a lead-in to section 11.1.

Accommodations

- ESL and LD Learners could be paired with students who have stronger language skills.
- Provide students who need more space to record the answer to question 2 on page 215 with a photocopy of **OHT C–11 Dissection Tools**. Remind students to put their name on it.

Making Connections Answer (page 214)

1. Students should express an opinion for or against dissection. Accept any reasonable supporting argument. For example,
 - For dissection — People learn more about organ systems through hands-on real experiences.
 - Against dissection — People need to respect animals' right to life.

Try This! Activity (page 215)

Purpose

- Students use an interactive web site to dissect a frog.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
Several days/weeks before	<ul style="list-style-type: none"> • Book the computer lab. • Familiarize yourself with the program students will use.
1 day before	<ul style="list-style-type: none"> • Photocopy BLM 11–2 Virtual Dissection.

APPARATUS	MATERIALS
<ul style="list-style-type: none"> • computer (1 per student) 	

Suggested Timing

45 min

Activity Planning Notes

Read the Try This! together and make sure everyone understands what to do.

Direct students to the interactive web site that allows them to dissect a frog on-line. After ensuring that students have logged onto their computers properly, consider leading them through the first few steps of the virtual dissection. Point out the audio narration button and the video button that allows them to watch the dissection first before they try it themselves. There are also buttons that lead to interesting facts and glossary terms. After some initial guidance, allow students to continue the dissection on their own.

Accommodations

- Students who are hesitant about using a computer program may be paired with someone who is more computer literate.

Activity Wrap-up

- Have students complete and discuss the answers to **BLM 11–2 Virtual Dissection**. Alternatively, you might have students who decide not to do an actual dissection complete this blackline master while other students complete the Find Out activity in section 11.1.
- Have students list or draw the organs they examined virtually, and write the function of each organ.

Technology Links

- For an activity in which students view actual photographs of frog organs and complete a visual quiz, go to www.mcgrawhill.ca/books/Se9 and follow the links to Frog Organs.

Alternative Activity

- Have students do a virtual dissection lab using Boreal Digital Dissection: Frog CD-ROM (order number WW7700011). Students use virtual dissection tools to do the dissection. The control panel allows students to view dissections step by step or in movie mode, use hint buttons and video clips, and complete a quiz.

11.1 Beginning the Dissection (page 216)

SUGGESTED TIMING

10 min
25–30 min for Find Out

MATERIALS

- chart paper and markers

BLACKLINE MASTERS

BLM 11–2 Virtual Dissection
OHT 19 The Frog
OHT C–12 Expose the Organs
Assessment Master 9 Safety Checklist
Assessment Master 10 Safety Rubric
Assessment Master 11 Using Tools and Equipment Checklist
Assessment Master 12 Using Tools and Equipment Rubric

Specific Expectations

SIL2.03 – conduct investigations safely, using appropriate lab equipment

SIL2.04 – observe and record data, using a variety of formats, including the use of SI units, where appropriate

SIL2.06 – communicate plans, observations, and results using a variety of oral, written, and graphic representations, and including the use of SI units, where appropriate

BSA2.03 – examine the relationship between the circulatory, respiratory, and digestive systems in complex organisms by performing dissections or using a computer-simulated dissection

BSA2.04 – extract and interpret information from a variety of sources

BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats

Key Terms Teaching Strategies

Have students complete some or all of the following activities to help them learn and remember the key terms:

- Write definitions for these terms in their Science Log. You may wish to have students keep a glossary at the back of their Science Log.
- Write a sentence that contains the two key terms.

Help students remember the key terms by posting them on a science word wall.

Activity Planning Notes

As a class, develop a set of safety precautions to follow during dissections. Safety precautions might include the following:

- Tie back long hair and roll up long sleeves.
- Wear safety glasses and a lab apron.
- Be cautious with sharp objects.
- Use dissection tools as directed. Use the right tool for the job.
- Protect your feet by wearing closed shoes in the lab.
- Move around carefully. Do not make sudden moves.
- Report any accident to the teacher immediately.

Record the list on chart paper and display it in the classroom.

Consider having students who are doing a virtual dissection complete **BLM 11–2 Virtual Dissection**, while the other students complete the Find Out activity.

Consider using the following blackline master and overhead transparencies:

- **BLM 11–2 Virtual Dissection**
- **OHT 19 The Frog**
- **OHT C–12 Expose the Organs**

Find Out Activity (page 216)

What Organs Does a Frog Have?

Purpose

- Students practise dissection techniques to cut open a frog, and examine the organs inside.

Science Background

The dissection of a frog begins with making three incisions through its thin skin as follows: down the middle of the frog, between the front legs, and between the hind legs. Next, the skin is peeled back and pinned to the dissecting tray before repeating the same three incisions through the muscle layer. After the muscle layer has been pinned back, the organs will be in view. Some organs will be hidden behind or beneath others in the body cavity.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
Several weeks before	<ul style="list-style-type: none"> • Order frogs. • Purchase resealable bags and disinfectant. • Gather the dissection tools.
1 day before	<ul style="list-style-type: none"> • Organize the apparatus and materials. • Photocopy Assessment Master 10 Safety Rubric and Assessment Master 12 Using Tools and Equipment Rubric.

APPARATUS	MATERIALS
<ul style="list-style-type: none"> • dissecting tray • dissection pins • dissection scissors • forceps • probe 	<ul style="list-style-type: none"> • frog (1 per pair of students) • resealable bags (1 per frog) • disinfectant for clean-up

Suggested Timing

25–30 min

Safety Precautions



- Have students tie back long hair and roll up any long sleeves.
- Remind students to be cautious with sharp objects.
- Review the safety precautions the class developed.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

Read through the directions together and make sure everyone understands what to do.

Review the safety precautions. You might distribute copies of **Assessment Master 9 Safety Checklist** to emphasize the importance of following safety practices in the lab. Consider displaying each dissection tool needed before inviting students to retrieve tools and specimens for their work area.

Before students proceed with the dissection, you might have students review the external parts of the frog.

Direct students to check off each step as they complete it. Remind them to use the diagrams for reference. As you circulate, coach students who experience difficulties.

Since this is the first of three dissection activities, take time to carefully explain the clean-up routine. Demonstrate how to safely store the specimens in resealable bags and how to clean up the tools and work area using disinfectant. Remind them to wash their hands with soap and water.

Accommodations

- Students with dexterity problems could be paired with someone without such difficulties.
- Students who are uncomfortable with making incisions can be paired with someone who is comfortable. Assign such students to roles such as reading the instructions.
- Provide students who need more space to colour the organs on page 217 with a photocopy of **OHT C-12 Expose the Organs**. Remind students to put their name on it.

Alternative Activities

- Show a video called *Boreal Frog Dissection* (Boreal Dissection Video #72361-02), which illustrates proper dissection techniques using close-up photography and narration.
- Have students use modelling clay to build a model of the frog's body after it is opened up. They might use **OHT C-12 Expose the Organs** for reference.
- Have students use frog models from a science supplier to explore organ systems.

What Did You Observe? Answers (page 217)

3. Answers will vary but should include some of the following organs: heart, lungs, esophagus, stomach, small intestine, large intestine.
4. Do not accept an answer such as, "I have no questions." Coach students to pose questions that reflect what they already know about human organ systems. For example:
 - Do frogs have the same number of organs as humans?
 - Does a frog's heart work in the same way as a human heart?
 - Do frogs digest food in the same way as humans?

Activity Wrap-up

- Have students complete and then discuss questions 3 and 4 on page 217.
- Consider having students complete **Assessment Master 11 Using Tools and Equipment Checklist**.

Technology Links

- For an activity in which students dissect a frog on-line, go to www.mcgrawhill.ca/books/Se9 and follow the links to Demos.

Ongoing Assessment

- Use **Assessment Master 10 Safety Rubric** to assess students' safety practices during the dissection.
- Use **Assessment Master 12 Using Tools and Equipment Rubric** to assess student use of tools and equipment during the dissection.
- Use question 3 on page 217 to assess student ability to identify frog organs.

Technology Links

- For information about how to build a model of a frog, go to www.mcgrawhill.ca/books/Se9 and follow the links to Model Frogs.

11.2 The Circulatory System (page 218)

SUGGESTED TIMING

15 min
45–50 min for Find Out

MATERIALS

- class set of blue and green coloured pencils
- 3-D model of the frog heart (optional)
- chart paper and markers

BLACKLINE MASTERS

BLM 11–3 Compare the Human and Frog Circulatory System
OHT 16 Circulatory System
OHT C–13 Frog Heart and Human Heart
Assessment Master 1 Co-operative Group Work Checklist
Assessment Master 2 Co-operative Group Work Rubric

Specific Expectations

SIL2.03 – conduct investigations safely, using appropriate lab equipment

SIL2.04 – observe and record data, using a variety of formats, including the use of SI units, where appropriate

SIL2.06 – communicate plans, observations, and results using a variety of oral, written, and graphic representations, and including the use of SI units, where appropriate

BSA1.01 – describe the basic life-sustaining processes of organisms, including single-celled and complex organisms, using appropriate scientific vocabulary

BSA1.02 – relate structures involved in life-sustaining processes to their function

BSA2.03 – examine the relationship between the circulatory, respiratory, and digestive systems in complex organisms by performing dissections or using a computer-simulated dissection

BSA2.04 – extract and interpret information from a variety of sources

BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats

Science Background

Oxygen-rich and oxygen-poor bloods are present in the ventricle of the frog heart all the time, but the bloods do not mix. Mixing is prevented because the right atrium dips downward into the ventricle, instead of sitting on top of it. It causes the oxygen-poor blood that enters the right atrium to go to the bottom of the ventricle. The oxygen-rich blood that enters from the left atrium is held up by the pool of oxygen-poor blood at the bottom of the ventricle.

Key Terms Teaching Strategies

Have students complete some or all of the following activities to help them learn and remember the key terms:

- Write definitions for these terms in their Science Log. You may wish to have students keep a glossary at the back of their Science Log.
- Label a diagram of the frog heart using the key terms.

Help students remember the key terms by posting them on a science word wall.

Reading Icon Answer (page 218)

1. 4 chambers

Activity Planning Notes

Read the information about the frog and human circulatory system together as a class.

On the heart diagrams, stress the location of the right and left side of the heart. Have students complete the diagram on page 218.

If available, consider using a 3-D model of the heart to show its chambers and the route that blood takes.

Consider using **OHT 16 Circulatory System** and **OHT C-13 Frog Heart and Human Heart** to help students compare the frog and human heart. The frog heart has oxygen-rich and oxygen-poor bloods together in the ventricle all the time, but the heart is designed to reduce the amount of blood that mixes together. The human heart has two ventricles, which keep oxygen-rich and oxygen-poor blood separate.

Summarize the similarities in the ways human and frog hearts function. In both frogs and humans,

- Arteries carry oxygen-rich blood away from the heart.
- Veins return oxygen-poor blood to the heart.

You might use chart paper and list the similarities and differences students mention in preparation for the organizer you will develop together later.

Consider using the following overhead transparencies:

- **OHT 16 Circulatory System**
- **OHT C-13 Frog Heart and Human Heart**

Ongoing Assessment

- Use **Assessment Master 2 Co-operative Group Work Rubric** to assess how well students worked together.
- Use question 1 on page 219 and your observations to assess students' ability to identify the organs in the circulatory system.
- Use student work in **BLM 11-3 Compare the Human and Frog Circulatory System** to assess how well they understand the frog and human circulatory systems.

Find Out Activity (page 218)

How Does a Frog's Circulatory System Work?

Purpose

- Students examine the frog's circulatory system.
- Students compare the frog and human circulatory systems.

Science Background

The organs in the frog's circulatory system include the heart, arteries, and veins. The triangular-shaped heart is located in the first layer of organs directly beneath the muscle layer. In a double-injected preserved frog, the arteries appear red and the veins blue.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 week before	<ul style="list-style-type: none"> • Gather plastic rulers and magnifying glasses.
1 day before	<ul style="list-style-type: none"> • Organize the apparatus and materials. • Photocopy BLM 11-3 Compare the Human and Frog Circulatory System and Assessment Master 2 Co-operative Group Work Rubric.

APPARATUS	MATERIALS
<ul style="list-style-type: none"> • probe • ruler • magnifying glass • dissection scissors • dissection pins 	<ul style="list-style-type: none"> • frog in dissecting tray

Suggested Timing

45–50 min

Safety Precautions

- Remind students to tie back long hair and roll up any long sleeves.
- Remind students to be cautious with sharp objects. Read the precautions in the student resource and make sure they understand them.
- Discuss the safety precautions the class developed.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

In advance, gather a class set of small clear plastic rulers, possibly made out of overhead transparencies.

Read through the directions together and make sure everyone understands what to do.

Direct students to answer each question as they proceed. Remind them to use the diagrams for reference.

As you circulate, coach students who experience difficulties. You might provide a hint to students about looking for very small tubes when they search for arteries and veins.

Accommodations

- Students with dexterity problems could be paired with someone without such difficulties.
- Students who have difficulties drawing might use a digital camera and take a picture of the heart.

- Provide students who need support for question 6 with **BLM 11–3 Compare the Human and Frog Circulatory System**.

What to Do Answers (page 219)

1. Students should have checked off the arteries, heart, and veins.
2. Answers may vary but should indicate the heart is located between the front legs and the front end of the liver. The lungs are hidden beneath the heart.
3. Measurements may vary slightly but should be fairly accurate. For example, for a frog about 20 cm in length:
Heart length: 3.5 cm
Heart width: 3 cm
4. The descriptions of arteries and veins may vary. Students may say that arteries and veins look like thin lines or tiny tubes.
5. b) Sketches of the heart will vary but should generally reflect its triangular shape and size.

What Did You Observe? Answer (page 219)

6. **Frog Differences:** 3 chambers; gets oxygen-rich blood from skin
Similarities: heart, arteries, veins; gets oxygen-rich blood from lungs
Human Difference: 4 chambers

Activity Wrap-up

- As a class, complete and then discuss question 6. Post a completed organizer on chart paper for reference. Consider providing students with **BLM 11–3 Compare the Human and Frog Circulatory System** to complete their own organizer and write a paragraph.
- Consider having students complete **Assessment Master 1 Co-operative Group Work Checklist** to assess how well they worked together. Have students discuss how to improve group work.

11.3 The Respiratory System (page 220)

SUGGESTED TIMING

10–15 min
30–35 min for Find Out

MATERIALS

- chart paper and markers
- thin straw or hand aspirator (optional)
- preserved frog

BLACKLINE MASTERS

BLM 11–4 Compare the Human and Frog Respiratory Systems
OHT 15 Respiratory System
OHT 20 How Frogs Breathe
OHT C–7 The Circulatory System and Respiratory System Connect
OHT C–14 The Frog’s Respiratory System

Specific Expectations

SIL2.03 – conduct investigations safely, using appropriate lab equipment

SIL2.04 – observe and record data, using a variety of formats, including the use of SI units, where appropriate

SIL2.06 – communicate plans, observations, and results using a variety of oral, written, and graphic representations, and including the use of SI units, where appropriate

BSA1.01 – describe the basic life-sustaining processes of organisms, including single-celled and complex organisms, using appropriate scientific vocabulary

BSA1.02 – relate structures involved in life-sustaining processes to their function

BSA1.03 – outline how a complex organism functions through the basic interactions between organ systems

BSA2.03 – examine the relationship between the circulatory, respiratory, and digestive systems in complex organisms by performing dissections or using a computer-simulated dissection

BSA2.04 – extract and interpret information from a variety of sources

BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats

Science Background

The frog’s three respiratory surfaces in order of importance are the skin, the membranes lining its mouth, and the lungs. Frogs are covered by a thin, moist skin, which supplies the frog with oxygen for breathing and gas exchange, when it is in wet environments. When submerged in water, oxygen passes through the frog’s skin directly into its blood vessels. Frogs also breathe through lungs. Air enters through the nostrils and/or mouth, passes through the windpipe, and into a pair of lungs.

Key Terms Teaching Strategies

Have students complete some or all of the following activities to help them learn and remember the key terms:

- Write definitions for these terms in their Science Log. You may wish to have students keep a glossary at the back of their Science Log.
- Write a sentence using the two key terms.

Help students remember the key terms by posting them on a science word wall.

Reading Icon Answer (page 220)

1. The lungs are filling with air.

Accommodations

- Provide students who have difficulty interpreting diagrams A and B on page 220 with additional visual support. Make a separate overhead transparency of each diagram. Then overlap the transparencies on the overhead projector to highlight the changes in the position of the mouth floor, glottis, and lungs as the frog inhales.

Ongoing Assessment

- Use question 1 on page 221 and your observations to assess students' ability to identify the organs in the respiratory system.
- Use student work in **BLM 11–4 Compare the Human and Frog Respiratory Systems** to assess how well they understand the frog and human respiratory systems.

Activity Planning Notes

Read the information about the respiratory system together as a class.

Consider using **OHT 15 Respiratory System** and **OHT 20 How Frogs Breathe** to help students compare the frog and human respiratory systems. You might use chart paper and list the similarities and differences students discuss in preparation for the organizer you will develop together later.

Discuss how the frog's circulatory and respiratory systems connect during gas exchange. Begin by reviewing how oxygen and carbon dioxide exchange between the air and the blood in humans. You might use **OHT C–7 The Circulatory System and Respiratory System Connect**. Then compare gas exchange in frogs and humans.

- Frogs have three areas that help with gas exchange: skin, thin membranes around the mouth, and lungs. Since the lungs in frogs are poorly developed, frogs depend on their skin and membranes around the mouth to exchange gases between the air and the blood vessels in the skin and membranes.
- Humans depend on their lungs for gas exchange.

Consider doing a demonstration in which you insert a thin straw through a preserved frog's mouth into the glottis. Use it to inflate the lungs. Have students observe how much larger a lung is when it is filled with air. Students could sketch the lung before and after inflation.

Consider using the following overhead transparencies:

- **OHT 15 Respiratory System**
- **OHT 20 How Frogs Breathe**
- **OHT C–7 The Circulatory System and Respiratory System Connect**
- **OHT C–14 The Frog's Respiratory System**

Find Out Activity (page 220)

How Does a Frog's Respiratory System Work?

Purpose

- Students examine the frog's respiratory system.
- Students compare the frog and human respiratory systems.

Science Background

The organs in the frog's respiratory system include the glottis, windpipe, and lungs. The frog has neither ribs nor a diaphragm to aid in respiration. Instead, the frog lets air move into its windpipe by lowering and then raising the floor of the mouth while respectively opening and closing the nostrils.

Frogs can also breathe through their skin when they are in damp places. The oxygen in the water passes through the frog's skin directly into the bloodstream.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 day before	<ul style="list-style-type: none"> Organize the apparatus and materials. Photocopy BLM 11–4 Compare the Human and Frog Respiratory Systems.

APPARATUS	MATERIALS
<ul style="list-style-type: none"> probe dissection scissors magnifying glass 	<ul style="list-style-type: none"> frog in dissecting tray

Suggested Timing

30–35 min

Safety Precautions

- Remind students to tie back long hair and roll up any long sleeves.
- Remind students to be cautious with sharp objects. Read the precautions in the student resource and make sure they understand them.
- Discuss the safety precautions the class developed.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

You might plan to have students do Find Out: How Does a Frog’s Respiratory System Work? and Find Out: How Does a Frog’s Digestive System Work? on the same day.

Read through the directions together and make sure everyone understands what to do. Direct students to answer each question as they proceed. Remind them to use the diagrams for reference.

Have students use a probe to move aside the lobes of the liver to expose the lungs in order to extract them.

As you circulate, coach students who experience difficulties.

Accommodations

- Students with dexterity problems could be paired with someone without such difficulties.
- Students who have difficulties drawing might use a digital camera and take a picture of the lungs.
- Provide students who need support for question 4 with **BLM 11–4 Compare the Human and Frog Respiratory Systems**.

What to Do Answer (page 221)

- Students should have checked off the glottis, windpipe, and lungs.

What Did You Observe? Answers (page 221)

- Sketches of the lungs will vary but should generally reflect their shape and size. Descriptions of the lung will vary. For example,
 - The lungs have thin walls and are spongy, not smooth.
- Frog Differences:** has a glottis; breathes through skin
Similarities: windpipe lungs; breathes in oxygen; breathes out carbon dioxide
Human Differences: has a diaphragm; stronger lungs

Activity Wrap-up

- As a class, complete and then discuss questions 3 and 4 on page 221. Post a completed organizer on chart paper for reference. Consider providing students with **BLM 11–4 Compare the Human and Frog Respiratory Systems** to complete their own organizer and write a paragraph.

11.4 The Digestive System (page 222)

SUGGESTED TIMING

10 min
40–45 min for Find Out

MATERIALS

- chart paper and markers

BLACKLINE MASTERS

BLM 11–5 Compare the Human and Frog Digestive System
OHT 18 Digestive System
OHT C–8 The Circulatory System and Digestive System Connect
OHT C–15 The Frog’s Digestive System
Assessment Master 9 Safety Checklist
Assessment Master 10 Safety Rubric
Assessment Master 11 Using Tools and Equipment Checklist
Assessment Master 12 Using Tools and Equipment Rubric

Specific Expectations

SIL2.03 – conduct investigations safely, using appropriate lab equipment

SIL2.04 – observe and record data, using a variety of formats, including the use of SI units, where appropriate

SIL2.06 – communicate plans, observations, and results using a variety of oral, written, and graphic representations, and including the use of SI units, where appropriate

BSA1.01 – describe the basic life-sustaining processes of organisms, including single-celled and complex organisms, using appropriate scientific vocabulary

BSA1.02 – relate structures involved in life-sustaining processes to their function

BSA2.03 – examine the relationship between the circulatory, respiratory, and digestive systems in complex organisms by performing dissections or using a computer-simulated dissection

BSA2.04 – extract and interpret information from a variety of sources

BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats

Science Background

The human and frog digestive systems have the same basic organs, although the human digestive system is more complex and the organs are longer. Humans and frogs share the same digestive processes: mechanical digestion, chemical digestion, and absorption.

The frog’s sticky tongue, normally folded backward to the throat, is used to flick out quickly from its folded position and grasp prey. The frog’s small teeth, which are present only in the upper jaw, help to hold prey and are not used for chewing. Frogs swallow prey whole by moving the eyeballs deeper into their sockets.

Activity Planning Notes

Read the introductory paragraph together as a class.

Prompt students to recall what they remember about the organs in the human digestive system. Consider using **OHT 18 Digestive System** and **OHT C–15 The Frog’s Digestive System** to help students compare the frog and human digestive systems. You might use chart paper and list the similarities and differences students discuss in preparation for an organizer they will develop later.

Consider using the following overhead transparencies:

- **OHT 18 Digestive System**
- **OHT C–8 The Circulatory System and Digestive System Connect**
- **OHT C–15 The Frog’s Digestive System**

Find Out Activity (page 222)

How Does a Frog’s Digestive System Work?

Purpose

- Students examine the frog’s digestive system.
- Students compare the frog and human digestive systems.

Science Background

The organs in the frog’s digestive system include the mouth, esophagus, stomach, small intestine, and large intestine. The liver, pancreas, and gall bladder also play crucial roles in the digestive process.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 day before	<ul style="list-style-type: none"> • Organize the apparatus and materials. • Photocopy BLM 11–5 Compare the Human and Frog Digestive System, as well as Assessment Master 10 Safety Rubric and Assessment Master 12 Using Tools and Equipment Rubric.

APPARATUS	MATERIALS
<ul style="list-style-type: none"> • dissection scissors • probe • magnifying glass • ruler 	<ul style="list-style-type: none"> • frog in dissecting tray • coloured pencil

Suggested Timing

40–45 min

Safety Precautions

- Remind students to tie back long hair and roll up any long sleeves.
- Remind students to be cautious with sharp objects. Read the precautions in the student resource and make sure students understand them.
- Discuss the safety precautions the class developed.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

Read through the directions together and make sure everyone understands what to do. Direct students to answer each question as they proceed and remind them to use the diagrams for reference.

Tell students to use the probe and move organs aside in order to see all of the organs of the digestive system.

Explain that the tip of the tongue is usually folded backward to the throat. Describe how the frog uses its tongue to grab prey. Discuss how the tongue is shaped (i.e., curved at the end) to avoid blocking the glottis and allow a clear path for air to enter the windpipe.

Consider asking students to use a magnifying glass and look at the surface of the tongue. Ask if it has bumps like human tongues do.

Ask students if they can see blood vessels in the thin, clear tissue surrounding the small intestine. Consider using **OHT C-8 The Circulatory System and Digestive System** Connect to help students recall what job these blood vessels do.

Accommodations

- Students with dexterity problems could be paired with someone without such difficulties.

Activity Wrap-up

- As a class, complete an organizer that compares the frog and human digestive systems. Post a completed organizer on chart paper for reference. Consider providing students with **BLM 11-5 Compare the Human and Frog Digestive System** to complete their own organizer and write a summary paragraph.
- Have students reflect on how they used equipment and tools and followed safety procedures during the lab activities. Ask for reflections about what was learned and what might be done differently next time. You might refer students to **Assessment Master 9 Safety Checklist** and/or **Assessment Master 11 Using Tools and Equipment Checklist** to help them.

What to Do Answers (pages 222–223)

1. On the diagram, students should trace the path that food takes through the digestive system. They should have checked off the mouth, esophagus, stomach, small intestine, and large intestine.
2. a) The teeth are small.
b) The sketch of the tongue should be reasonably accurate. The “X” should be marked near the glottis, but not covering it.
c) Wording will vary but should indicate that the eye sockets move inward to help push food into the esophagus.
3. The esophagus leads to the stomach.
4. a) Look for the idea that the stomach walls have ridges.
b) Wording will vary but should include the idea that the stomach has strong muscles to squeeze food, mix it with chemicals, and break it down.
5. Measurements may vary slightly but should be fairly accurate. The small intestine is typically four to six times the length of the frog’s body. For example:
Small intestine length: 60 cm
Frog length: 15 cm
6. a) Wording will vary but should compare the size and shape of the large and small intestine. For example:
The large intestine has a larger diameter but a shorter length.
b) Sketches of the large intestine will vary but should generally reflect its shape and size.

Ongoing Assessment

- Use question 1 on page 222 and your observations to assess student ability to identify the organs in the digestive system.
- Use **Assessment Master 10 Safety Rubric** to assess students’ safety practices during the dissection activities.
- Use **Assessment Master 12 Using Tools and Equipment Rubric** to assess student use of tools and equipment during the dissection activities.
- Use student work in **BLM 11-5 Compare the Human and Frog Digestive System** to assess how well they understand the frog and human digestive systems.

Chapter 11 Review (page 224)

SUGGESTED TIMING

75 min to complete and take-up the review, assign the Practice Test, and complete the Technology Link

BLACKLINE MASTERS

- Master 3 Certificate
- Master 4 List of Skills
- BLM 11–6 Dissection Word Puzzle
- BLM 11–7 Chapter 11 Practice Test
- BLM 11–8 Chapter 11 Test
- OHT C–16 Compare the Human and Frog Circulatory Systems
- OHT C–17 Compare the Human and Frog Respiratory Systems

Using the Chapter Review

Depending on your class, students should be able to work through the review at their own pace. In order to have success with the Chapter Review, some students may need to do it in chunks, by completing several questions and then taking them up before continuing. This process will prevent students from completing many questions incorrectly.

Consider using the following overhead transparencies:

- **OHT C–16 Compare the Human and Frog Circulatory Systems**
- **OHT C–17 Compare the Human and Frog Respiratory Systems**

To provide additional reinforcement of key terms, have students complete **BLM 11–6 Dissection Word Puzzle**. Once the review is completed and taken up, assign **BLM 11–7 Chapter 11 Practice Test** for students to answer individually. They may wish to use their completed review to help them.

Review Guide

Question	Section(s)	Refer to
1 to 5	Chapter opener	Dissection Tools (page 215)
6	11.1	Safety Precautions (page 216)
7	11.3 and 11.4	Find Out Activity (page 221) Find Out Activity (page 222)
8	11.2	The Circulatory System (page 218)
9	11.4	The Digestive System and Find Out Activity (page 222)
10	11.2	What Did You Observe? (page 219)
11	11.3	What Did You Observe? (page 221)

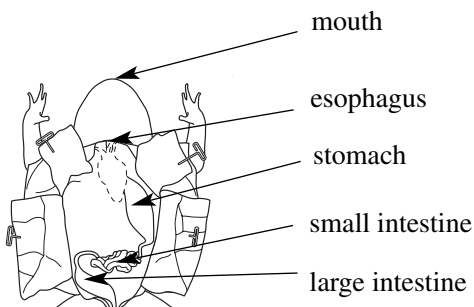
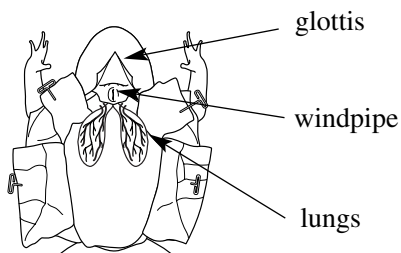
Accommodations

- In advance, prepare flash cards of the key terms for Chapter 11. Provide the cards to students who struggle with vocabulary and spelling during review activities.
- Allow students to make a chapter summary page of the key ideas/skills from the chapter. The back of the student resource provides space to do this. Alternatively, you might develop a chapter summary as an entire class.
- If students have difficulty with a particular review question, use the Review Guide to identify the section they need to review.
- **BLM 11–7 Chapter 11 Practice Test** can be customized to produce extra reinforcement questions. For example, you might provide prompts for summary paragraphs comparing the human and frog circulatory, respiratory, and digestive systems.

Chapter 11 Review Answers (pages 224–225)

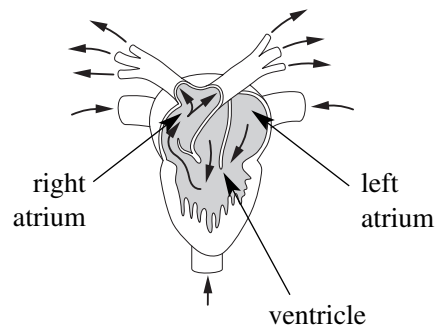
1. e) dissection
2. d) forceps
3. a) probe
4. c) glottis
5. b) muscle
6. Answers will vary. For example:
 - a) Protective glasses protect the eyes from sharp objects and irritating vapours.
 - b) Protective gloves protect skin from contact with specimen preservatives and frog organs.

7.



Note: Have students draw an arrow to the stomach and label it.

8. Sketch should be reasonably accurate. Look for three chambers correctly labelled.



9. Answers will vary but should include the following organs. Food goes from the mouth to the esophagus, stomach, small intestine, and large intestine.

10. Frog Differences: 3 chambers; gets oxygen-rich blood from *skin*

Similarities: *heart, arteries, veins* (organs); gets oxygen-rich blood from *lungs*

Human Difference: 4 chambers

11. Frog Differences: has a *glottis*; breathes through *skin*

Similarities: *windpipe lungs* (organs); breathes in *oxygen*, breathes out carbon *dioxide*

Human Differences: has a *diaphragm*; stronger *lungs*

Technology Links

- For a review of organ systems, go to www.mcgrawhill.ca/books/Se9 and follow the links to Frog Organs.

Summative Assessment

- Have students complete **BLM 11–8 Chapter 11 Test** to assess individual skills.
- You may wish to develop **Master 3 Certificate** to show students what they have learned during this chapter. Cut and paste the related skills from **Master 4 List of Skills**.