UNIT C Staying Alive (page 160)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
30–40 min including brainstorming and Protect Your Body by Working Safe	• chart paper and markers	OHT 9 Work Safe OHT C–1 Body Systems and Staying Alive

Overall Expectations

SILV.01 – illustrate how science is a part of daily life
SILV.03 – examine the connections between science and activities in daily life
BSAV.01 – explain the systems and processes required by simple and complex organisms to sustain life
BSAV.03 – analyze how personal health and safety in everyday life and in the workplace are protected through the proper use of equipment and safety practices

Answers to Reading Icon Questions (page 161)

1. There should be a circle around all pictures except the one of the girl washing hands.

2. There should be a box around the picture of the girl washing hands.

Activity Planning Notes

Have students brainstorm body functions connected to staying alive. Ask them to connect each body function with a body system. Students can fill out the concept map on page 160, and then share them. Consider producing a class map using **OHT C–1 Body Systems and Staying Alive**.

Have students complete and then discuss the activity on page 161. Invite students to share their experiences working in a kitchen.

Consider extending the activity by having students work in groups to brainstorm safe practices at home or in a workplace that they choose. Students can present their list of safe practices to the class.

Consider using the following overhead transparencies:
- **OHT 9 Work Safe**
- **OHT C–1 Body Systems and Staying Alive**

Diagnostic Assessment

Brainstorming with the class should give you a sense of students' general understanding of body systems and awareness of safety practices. Students may already have discussed many of these concepts in previous science classes and in Health class. Some things to consider include
- What body systems do students already know? What organs do they list?
- What health and safety practices are students already aware of?
- What health and safety practices do they need to be made aware of?

Making Connections Answers (page 161)

3. a) Encourage students to share what they know about health and safety from their experiences.

b) Checklists will vary but should include safety practices relevant in a kitchen. For example,
- Wear gloves when cutting meat or vegetables.
- Cover any open cuts.
- Use soap and water to wash hands frequently.
- Avoid inhaling fumes from a fryer. Make sure that fryers are properly ventilated.
- Wear protective clothing and gloves when working with hot oil.
- Always unplug electric appliances before submerging them in water.
- Read the labels on cleaning products. Wear protective gloves when using strong cleaning products.

Activity Preparation for Chapter 9

Activity/Investigation	Advance Preparation	Time Required	Other Considerations
Try This! (page 163) (TR page 195)	• 2 to 3 days before – Gather materials. • 1 day before – Photocopy recommended blackline masters. • Day of – Set out materials.	• 20–25 min	• Caution students not to apply masking tape directly to skin.
Find Out: Lens Power (page 165) (TR page 200)	• 2 to 3 days before – Gather materials. • Day of – Set out materials.	• 10–15 min	• Remind students to be cautious with lenses.
Find Out: Magnification (page 168) (TR page 203)	• Day of – Set out microscopes.	• 10–15 min	
Try This! (page 169) (TR page 204)	• 2 to 3 days before – Gather materials. • Day of – Set out wire and pencils.	• 10 min	• Consider making the hand lens in advance.
Find Out: Viewing Slides (page 171) (TR page 204)	• 2 to 3 days before – Gather materials. • 1 day before – Photocopy recommended assessment masters. • Day of – Set out microscopes and prepared slides.	• 20–30 min	• Reinforce the importance of using equipment correctly by distributing and reading together **Assessment Master 11 Using Tools and Equipment Checklist**. • Consider the ability of students to sketch when offering them slides to view.
Try This! (page 172) (TR page 206)	• Several days/weeks before – Book the computer lab.	• 5–10 min	
Find Out: Preparing a Dry Mount Slide (page 173) (TR page 206)	• 2 to 3 days before – Gather materials. • Day of – Set out microscopes and slides.	• 20–30 min	• You may wish to set up lab stations with a different sample at each station to avoid overcrowding.
Test It! Who Did It? (page 176) (TR page 207)	• 2 to 3 days before – Collect different coloured human hair from friends, or visit a salon. • 1 day before – Prepare hair samples for each group. Store samples in labelled resealable plastic bags. • Day of – Set out materials.	• 45 min	• Prepare enough hair samples for each group to have one sample from each suspect. To make it easy to keep the hairs separate, place the hair from each suspect in a different resealable plastic bag. Label each bag as A, B, C, or Crime Scene.
Find Out: Preparing Wet Mount Slides (page 181) (TR page 213)	• 2 to 3 days before – Gather materials. • Day of – Set out materials.	• 15–20 min	• Make sure to use coloured newsprint instead of coloured ink from a printer.
Find Out: Viewing Plant Cells (page 182) (TR page 214)	• 1 to 2 days before – Purchase onions; gather or purchase water plants. – Photocopy the assessment masters you decide to use. • Day of – Set out the materials in stations.	• 25–30 min	• You may wish to set up lab stations around the classroom with the materials for a different specimen at each station. • Discuss safety precautions.
Find Out: Viewing Unicellular Animals (page 186) (TR page 218)	• 2 weeks in advance – Order amoebas and euglenas for delivery. • 2 to 3 days before – Gather materials. – Photocopy the assessment masters you decide to use. • Day of – Set out materials.	• 25–30 min	• Consider using a quieting solution (e.g., methyl cellulose) to slow down movement for easier viewing. Alternatively, project the slides on a TV for everyone to see.

Materials Needed for Chapter 9

Activity/Investigation	Apparatus	Materials	Blackline Masters
Try This! (page 163) (TR page 195)	• shoes with laces (1 pair per group) • blindfold (1 per group) • ear plugs (1 per group) • heavy gloves (1 pair per group) • tongue depressors (1 per group) • stopwatch or timer that counts in seconds (1 per group)	• masking tape	**Recommended** BLM 9–1 What Is It Like to Be a Robot? Assessment Master 1 Co-operative Group Work Checklist Assessment Master 2 Co-operative Group Work Rubric
Find Out: Lens Power (page 165) (TR page 200)	• magnifying glasses (at least 2 per group)	• objects to view (e.g., writing samples, pens, erasers, rocks, leaves, flowers, insects) • lens paper	
Find Out: Magnification (page 168) (TR page 203)	• microscope (1 per group) • calculators (optional)		
Try This! (page 169) (TR page 204)	• piece of fine wire (1 per student) • pencil (1 per student)	• water • cup (1 per student) • newspaper (1 piece per student)	
Find Out: Viewing Slides (page 171) (TR page 204)	• microscope (1 per student/group) • prepared slides of insect parts (e.g., wings, eyes, legs)	• lens paper	**Recommended** Assessment Master 11 Using Tools and Equipment Checklist Assessment Master 12 Using Tools and Equipment Rubric
Try This! (page 172) (TR page 206)	• computers		
Find Out: Preparing a Dry Mount Slide (page 173) (TR page 206)	• piece of Plexiglas™ (optional) • microscope (1 per student or group) • slides (2 per student or group)	• samples (e.g., eyelashes, hair, sawdust, dryer lint, sugar/salt, fabric)	
Test It! Who Did It? (page 176) (TR page 207)	• microscope (1 per group) • slides (4 per group) • tweezers (1 per group)	• human hair samples (1 set per group) • resealable plastic bags	
Find Out: Preparing Wet Mount Slides (page 181) (TR page 213)	• piece of Plexiglas™ • overhead transparency • turkey baster • tweezers (1 per student) • slide (1 per student) • medicine dropper (1 per student) • cover slip (1 per student) • microscope (1 per student)	• black marker • sample of coloured newsprint • water	
Find Out: Viewing Plant Cells (page 182) (TR page 214)	• slides (2 per student) • tweezers (1 per student) • cover slips (2 per student) • microscope (1 per student) • medicine dropper (1 per student)	• leaf from a water plant such as elodea, hornwort, or cabomba • water • onion skin • iodine solution • lens paper	**Recommended** Assessment Master 8 Scientific Communication Rubric **Optional** Assessment Master 7 Scientific Communication Checklist
Find Out: Viewing Unicellular Animals (page 186) (TR page 218)	• medicine droppers (1 each for amoeba and euglena container; 1 for salt water) • slides (2 per student) • cover slips (2 per student) • microscope (1 per student)	• amoebas • salt water • euglenas	**Recommended** Assessment Master 10 Safety Rubric **Optional** Assessment Master 9 Safety Checklist

CHAPTER 9 Staying Alive! (page 162)

SUGGESTED TIMING
10–15 min

BLACKLINE MASTERS
OHT C–2 Compare a Robot to a Human Being

Overall Expectations

BSAV.01 – explain the systems and processes required by simple and complex organisms to sustain life
BSAV.02 – investigate, through laboratory activities, the processes which simple and complex organisms use to sustain life

Science Background

The purpose of the introductory section is to engage students in discussion about what makes something alive by making comparisons between humans and robots. The activity asks students to think about similarities and differences between humans and robots.

You might introduce the topic of robotics by providing some background information about RoboCup. In 1992, a computer-science expert at the University of British Columbia designed robots to play soccer. In 1997, the first RoboCup match took place. Worldwide and regional events have taken place each year since. In Canada, Victoria and Edmonton have hosted Robocup matches. By 2050, the RoboCup scientists and engineers plan to develop a team of robots that can beat the human world champion soccer team.

To do this, robots must be able to perform many complex tasks, and must think and work together as a team. For example, they must be able to react quickly to each other and to other players. The robots must create game plans, assess them, and change them during the game. They must be able to communicate the changes in plans to each other.

Robots have many useful applications, such as working in dangerous situations (e.g., bomb threats), searching for life on Earth (e.g., in volcanoes and oceans) as well as on other planets and moons (e.g., Mars, Titan).

Robots have some characteristics of living things. The following life functions show that something is living: moving the organism or its parts; producing or obtaining food; building and repairing body parts; making new cells or a new organism; responding to changes in the surroundings; breathing, digesting, and eliminating wastes; and directing cell activities to create needed substances.

Science and Literacy Link (page 162)

Is it Alive or Not?

Activity Planning Notes

Find out from students what they already know about robots. What can robots do? What will they be able to do in the future? After reading the introductory paragraphs, you may want to share information about RoboCup to stimulate discussion.

As a class, have students brainstorm how a robot is like a human being, as a lead-in to questions 1 and 2 on page 162. Alternatively, have students work with a partner or in small groups. You may wish to review how to complete a double bubble organizer, before assigning the questions.

Consider using the following overhead transparency:

- **OHT C–2 Compare a Robot to a Human Being**

This opener can be used as a lead-in to Section 9.1.

Accommodations

- Provide students who need more space to record their answer to question 1 with a photocopy of **OHT C–2 Compare a Robot to a Human Being**. Remind students to put their name on it.

Check Your Understanding Answers (page 162)

1. **a)** and **b)** Answers will vary. Students should use wording similar to the following:

Robot Differences: made of metal, run by computer

Similarities: arms, legs, head, walk and talk

Human Being Differences: need to eat to stay alive, can reproduce

2. Many students may say that a robot is not alive. Some may say that robots share some of the same characteristics as living things. Explanations will vary depending on students' past experience, but may include some life functions of living things. Accept any reasonable explanation.

Alternative Activity

- Find a piece of coral or a rock. Have students discuss and determine if it is living or non-living.

Technology Links

- For more information on RoboCup, an international joint project to promote AI and robotics using soccer, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Robocup.

9.1 Alive or Not? (page 163)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
10–15 min 20–25 min for Try This!	• chart paper and markers	BLM 9–1 What Is It Like to Be a Robot? OHT 10 What Is Alive? Assessment Master 1 Co-operative Group Work Checklist Assessment Master 2 Co-operative Group Work Rubric

Specific Expectations

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

SIL1.01 – describe how the procedures, skills, and tools employed in different areas of science are also evident in daily life

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.

Reading Icon Answers (page 168)

3. Students should circle the cat, tree, and human. There should be a square around the rock, rain cloud, and robot.

4. Answers will vary depending on students' experience. Look for characteristics that living things share, such as moving itself or its parts; eating or producing food; building and repairing body parts; making new cells or a new organism; responding to changes in the surroundings; breathing, digesting and eliminating wastes; control centre that directs cell activities.

Activity Planning Notes

After reading the introductory paragraph on page 163 as a class, have students complete and then discuss the questions. Alternatively, you might address the questions as a class activity.

Discuss which items are living or non-living. Use the discussion as a springboard for students to share what they know about the characteristics that living things share. On chart paper, you might list basic life functions they mention.

Encourage students to realize that it is difficult to define life in a definite way.

Explain that the discovery of the microscope allowed scientists to find out that all living things are made up of cells. If robots are not made of cells, ask what conclusion they can make about whether robots are alive.

Use The Try This! activity as a follow-up to the Science and Literacy Link on page 162.

Consider using the following blackline master and overhead transparency:
- **BLM 9–1 What Is It Like to Be a Robot?**
- **OHT 10 What Is Alive?**

Try This! Activity (page 163)

Purpose

- Students simulate a robot's ability to tie shoes.
- Students gain an appreciation of the complexity involved in carrying out movements taken for granted, and the challenges scientists face in creating artificial life capable of moving itself or its parts.

Science Background

To date, scientists have not been successful in their attempts to artificially create life. Living organisms, even unicellular ones, are very complex and difficult to recreate. Scientists continue to refine non-living things, such as computer systems that process information like a human being and prosthetics that look and respond like real limbs.

There are limits to what a robot can do. In this activity, students analyze tying shoes from the perspective of a robot. Blindfolds, ear plugs, and gloves are used to limit sensory information, and tongue depressors are used to limit the number of moving joints.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 to 3 days before	• Gather materials.
1 day before	• Photocopy **BLM 9–1 What Is It Like to Be a Robot?** and **Assessment Master 1 Co-operative Group Work Checklist.**
Day of	• Set out materials.

APPARATUS	MATERIALS
• shoes with laces (1 pair per group) • blindfold (1 per group) • ear plugs (1 per group) • heavy gloves (1 pair per group) • tongue depressors (1 per group) • stopwatch or timer that counts in seconds (1 per group)	• masking tape

Suggested Timing

20–25 min

Safety Precautions

- Caution students not to apply masking tape directly to their skin.
- Have students wash their hands and clean up the work area at the end of the activity.

Activity Planning Notes

Distribute copies of **BLM 9–1 What Is It Like to Be a Robot?** to students. Begin by reading through the directions with students and making sure they understand what to do.

Have students get the materials needed and begin. You might have students discuss their experience after each variation.

As you circulate, ensure that students are using equipment properly and staying on task.

Accommodations

- Students with physical disabilities could be teamed with those without disabilities, and use their partner's results to answer the questions.
- Students with attention difficulties may go off task. You might supervise such students more closely, and/or chunk the activity.

Activity Wrap-up

- Have students complete and then discuss the questions on the blackline master. Discuss what effect limiting sensory information (e.g., blindfolds, ear plugs, gloves) had on the time it took to tie shoes. Then, ask what effect using tongue depressors had (i.e., limited mobility).
  Ask students to defend their position for question 9. It would be very difficult, if not impossible, for a robot to tie shoes. Discuss that robots have only a few sensors and are limited in their movement. Robots are controlled by computers, which would need to be programmed with instructions for each step to tie a shoe.
- You might compare a hand with a "robotic" hand (i.e., student's hand taped to sticks).
  Encourage students to note differences in mobility and sensitivity. Make connections to the earlier discussion about living and non-living things, and the complexity involved in performing basic life functions.
- Have students complete **Assessment Master 1 Co-operative Group Work Checklist** to help assess how well they worked together. Have students discuss how to improve group work.

Ongoing Assessment

- Use **Assessment Master 2 Co-operative Group Work Rubric** to assess how well students worked together.

9.2 The Microscope (page 164)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
30 min 10–15 min for Find Out	• microscopes (e.g., magnifying glass, hand lens, dissecting scope, microscope with camera for TV projection, computerized microscope, binocular compound microscope, picture of an electron microscope) • chart paper and markers • compound microscope • paper headbands • masking tape	OHT C–3 Microscope

Specific Expectations

SIL1.01 – describe how the procedures, skills, and tools employed in different areas of science are also evident in daily life
SIL2.03 – conduct investigations safely, using appropriate lab equipment
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
BSA2.04 – extract and interpret information from a variety of sources
BSA3.01 – analyze how specific equipment and safe practices are used to protect personal health and safety at home and in the workplace

Science Background

In ancient times, people used simple lenses to look at things. By 1590, Janssen and Janssen were able to magnify objects up to 30 times their actual size. In the 1600s, a Dutch merchant named Anton van Leeuwenhoek began making lenses from glass and diamonds to make microscopes that could magnify objects up to 200 times. Van Leeuwenhoek's microscope allowed people to see things that were invisible to the naked eye.

Today, compound light microscopes can magnify objects 500× to 1000× using light to view things as small as protists and bacteria. Electron microscopes were developed due to the limitations of compound microscopes to magnify objects. Electron microscopes work the same as light microscopes except that they use a focused beam of electrons instead of light to view even smaller organisms such as viruses. Electron microscopes are very expensive and are usually found only in research facilities such as hospitals and universities.

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 mentions all the key terms.
- Play a game called "Headbands" either as a class or in teams. In advance, prepare the headbands, each labelled with a key term that is printed large enough to be read from a short distance. Use masking tape to attach a headband to a volunteer without letting the volunteer see the key term. The object of the game is for the volunteer to guess the word on the headband by asking questions of team members. The team can respond to questions only with a yes or no.

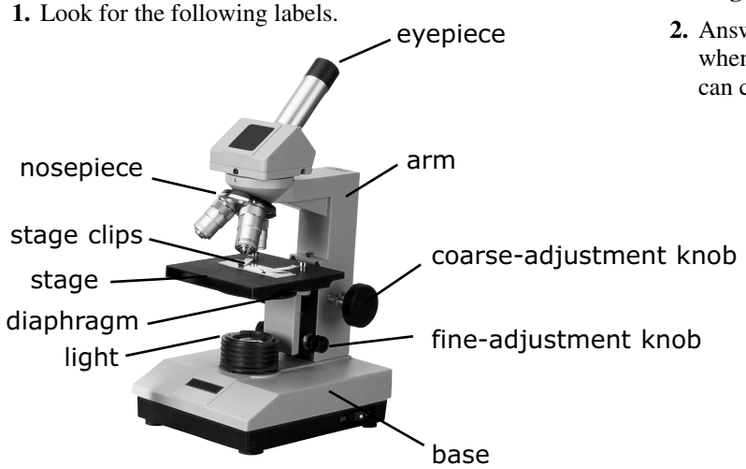
Help students remember the key terms by posting them on a science word wall.

Reading Icon Answer (page 164)

1. Students should highlight doctor's offices, hospital labs, and crime scenes.

Reading Icon Answer (page 166)

1. Look for the following labels.



Note: The arrow to the diaphragm is in the incorrect place in the first printing of the student resource. It is correct in the related blackline master and overhead transparency.

Reading Icon Answer (page 167)

2. Answers will vary. For example: Be cautious when handling glass because it breaks easily and can cause cuts.

Activity Planning Notes

Show students the different types of microscopes you collected. Emphasize that each microscope allows people to magnify or see objects larger than they are. You might demonstrate magnification using a magnifying glass or by projecting magnified objects onto a TV or computer screen.

Discuss various ways microscopes are used (e.g., diagnose disease — analyze blood/stool samples, view tissues in biopsies; solve crimes — match bullets to guns, match fibres with clothing; analyze writing). Brainstorm a list of workplaces where a microscope might be used and for what purpose (e.g., gemologists identify gemstones and grade them for clarity using microscopes).

You might record the ideas on chart paper.
Instruct students to read question 1 on page 164 before reading the rest of the page.
Have students complete and then discuss the questions on page 164.

After students have completed Find Out Activity Lens Power, use a compound microscope to point out its lenses and the distance between lenses that allows the viewer to focus on an object. As you point out each lens, use its name (ocular, objective — low power, medium power, high power). Then, point out each of the other parts of the microscope to the class. If there are several different models of compound microscopes in your class set, be sure to show each model and point out its parts.

Have students complete and then discuss the question on page 166.

Point out the glass parts on a microscope, and then ask students to share what they know about handling glass. Have them complete question 2 on page 167.

Demonstrate how to care for and handle a microscope. Consider having students role-play how to care for and handle a microscope before assigning questions 3 and 4 on page 167.

Consider using the following overhead transparency:
- **OHT C–3 Microscope**

Accommodations

- Have students who have difficulty writing work with someone who can help record their answers.

Making Connections Answer (page 164)

2. Answers will vary and may include

a) vet lab; bacteria or worms in animal feces, blood cells

b) health protection lab; bacteria in water samples, cells infected with disease

c) science lab; different minerals in a rock, impurities in a manufactured product

Check Your Understanding Answers (page 167)

3. a) nosepiece

b) stage clips

c) coarse-adjustment knob

d) fine-adjustment knob

e) diaphragm

4. Answers may vary. Look for the following ideas.
- Carry the microscope using two hands.
- Clean microscope lenses with lens paper only.
- Put the microscope on low power before you put it away.

Find Out Activity (page 165)

Lens Power

Purpose

- Students learn that using two lenses instead of one increases magnification.
- Students gain understanding about how scientists used this idea to create the compound microscope.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 to 3 days before	• Gather materials.
Day of	• Set out materials.

APPARATUS	MATERIALS
• magnifying glasses (at least 2 per group)	• objects to view (e.g., writing samples, pens, erasers, rocks, leaves, flowers, insects) • lens paper

Suggested Timing

10–15 min

Safety Precautions

- Remind students to be cautious with lenses.

Activity Planning Notes

In advance, you may wish to set up lab stations with a different sample at each station to avoid overcrowding. If you don't have access to enough magnifying glasses, use binoculars or magnifying eyeglasses.

Begin by reading through the directions with students and making sure they understand what to do.

As you circulate, check that students are using lenses properly and safely.

Accommodations

- Students with visual impairments could be teamed with other students.

What Did You Observe? Answers (page 165)

3. The object is blurry.

4. 2 lenses

Activity Wrap-up

- Have students complete and then discuss questions 3 and 4.
- Lead in to a discussion of tools that use two lenses to magnify objects (e.g., compound microscopes, binoculars, telescopes).

Ongoing Assessment

- Check student answers to question 2 on page 164 to assess understanding of how microscopes are evident in daily life.
- Check that students have labelled the diagram of the microscope correctly. Use student work as a formative assessment.
- Use the Check Your Understanding questions to assess how well students understand the parts and functions of a compound microscope, and its proper use and care.

Alternative Activity

- Have students compare several types of microscopes you show them (e.g., dissecting scope, microscope with camera for TV projection, computerized microscope, binocular compound microscope, electron microscope).

9.3 Using the Microscope (page 168)

SUGGESTED TIMING

20–30 min including Show You Know!
10–15 min for Find Out Magnification
10 min for Try This! on page 169
20–30 min for Find Out Viewing Slides
5–10 min for Try This! on page 172
20–30 min for Find Out Preparing a Dry Mount Slide
45 min for Test It! Who Did It?

MATERIALS

- compound microscope
- chart paper and markers
- calculator (optional)

BLACKLINE MASTERS

OHT C–4 What Part is Being Used? Why?
OHT C–5 Microscope Checklist
Assessment Master 11 Using Tools and Equipment Checklist
Assessment Master 12 Using Tools and Equipment Rubric

Specific Expectations

SIL1.01 – describe how the procedures, skills, and tools employed in different areas of science are also evident in daily life
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
SIL2.05 – assess data to make inferences and conclusions and to answer questions and refine procedures
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
BSA2.04 – extract and interpret information from a variety of sources
BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats

Reading Icon Answer (page 168)

1. objective lens and ocular lens

Activity Planning Notes

Review the lenses on a microscope and explain magnification to prepare students for the Find Out activity that follows. Using a microscope, show where to find the number written on each lens. Note that there may be several numbers written on a lens. The magnification is usually distinguished in some way (e.g., first number, larger print). Ask a volunteer to read the number on the ocular and low-power objective lens that is facing the stage. Using chart paper, ask a volunteer to record the two numbers and multiply them together to get the total magnification. If necessary, provide a calculator. Emphasize multiplying the numbers, as students may tend to add them.

After students have completed the Find Out and the Try This! on pages 168 and 169, use a microscope and demonstrate how to focus properly. On some

microscopes, the coarse- and fine-adjustment knobs move the body tube instead of the stage. In this case, caution students to move the lens upward when focussing to avoid breaking slides. If they have microscopes in which the stage moves, caution students to move the stage downward when focussing.

As a class, read the information on page 170. You might ask a volunteer to repeat your earlier demonstration and say each step (coarse adjustment on low power; fine adjustment on low power; fine adjustment on medium power; fine adjustment on high power), before assigning and then discussing the Check Your Understanding questions.

Show You Know! Microscope Certification can be used after students have completed the Find Out Viewing Slides and Preparing a Dry Mount Slide, and the Try This! activities. Before students begin, have them briefly discuss certification requirements in workplaces and why certification is important. For example, welders need to know about ventilation and apply what they know to protect their own health and the health of others. Emphasize that some workers periodically get recertified for first aid or WHMIS. Reinforce the importance of care and safety when handling tools.

Ask why it might be important for students to be certified for using a microscope.

Have students complete and then discuss the questions on pages 174 and 175.

Discuss with students that handling microscopes and collecting samples properly are critical in forensics investigations such as the Test It! they will do.

Consider using the following overhead transparencies:
- **OHT C–4 What Part Is Being Used? Why?**
- **OHT C–5 Microscope Checklist**

Accommodations

- Students who have difficulty writing could be paired with someone who can record their answers, or provide answers orally.

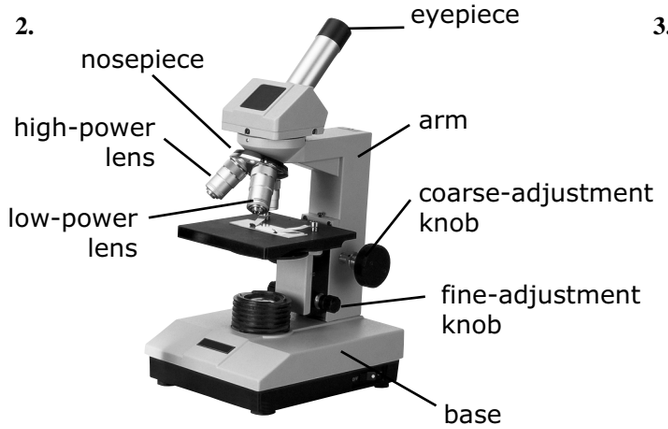
Check Your Understanding Answers (page 170)

1. Low power. Answers may vary, but should include the importance of always starting on low power since the coarse-adjustment knob allows for quickly focussing on an object.
2. Coarse-adjustment knob. Answers may vary, but should include using the coarse-adjustment knob only on low power.
3. Fine-adjustment knob. Answers may vary, but should include using the fine-adjustment knob to finish focussing.

Show You Know! Answers (pages 174–175)
Microscope Certification

1. compound microscope

2.



3. Answers are in italics.
- Always start on *low power*.
- Use the coarse-adjustment knob only on *low power*.
- Plug in your microscope and turn on the *light*.
- Turn the *nosepiece* until the *low-power objective* lens faces the stage.
- Put the slide on the *stage*.
- Secure it in place using the *stage clips*.
- Use the *coarse-adjustment* knob to bring the lens as close as it will go to the stage.
- Look in the *eyepiece*.
- Turn the *fine-adjustment* knob to get the best focus possible.

Find Out Activity (page 168)

Magnification

Purpose

- Students calculate total magnification for each power level on a compound microscope.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
Day of	• Set out microscopes.

APPARATUS	MATERIALS
• microscope (1 per group) • calculators (optional)	

Suggested Timing

10–15 min

Activity Planning Notes

You might need to review calculating magnification (i.e., multiply the magnification of the ocular lens by the magnification of the objective lens to get the total magnification).

Then read through the directions together and make sure everyone understands what to do. Remind students about how to properly handle the microscope before they use it to answer question 1.

Accommodations

- Allow students to use calculators.
- Students with visual impairments could be paired with someone who can help.

What to Do Answers (pages 168–169)

Note that answers may vary depending on the microscope used.

1. a) 10 **b)** 4 **c)** 10 **d)** 40

2. b) 10×; 10×; 10× 10 = 100×

c) 10×; 40×; 10× 40 = 400×

What Did You Observe? Answers (page 169)

3. High

4. Low

Activity Wrap-up

- Have students complete and then discuss the questions on page 169.

Technology Links

For an interactive tutorial that explores the effect of increasing magnification on the ability to resolve features in a sample, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Virtual Microscopy.

Try This! Activity (page 169)

Purpose

- Students find out how a drop of water can act as a magnifier.

Science Background

A drop of water can be used to make a magnifying glass because a drop of water is a plano-convex lens (i.e., one surface flat and one surface curved out).

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 to 3 days before	• Gather materials.
Day of	• Set out wire and pencils.

APPARATUS	MATERIALS
• piece of fine wire (1 per student) • pencil (1 per student)	• water • cup (1 per student) • newspaper (1 piece per student)

Suggested Timing

10 min

Activity Planning Notes

Begin by reading through the directions with students and making sure they understand what to do. You might demonstrate making the lens with wire and a pencil, dipping the loop into a cup half-filled with water, and holding the loop over a piece of newspaper.

Have students observe what happens to the size of the letters.

Accommodations

- Consider making the hand lens in advance for students who need help.
- Students with visual impairments could be paired with someone who can help.

Activity Wrap-up

- Discuss what happened to the size of letters when viewed through the hand lens (i.e., letters magnified).

Find Out Activity (page 171)

Viewing Slides

Purpose

- Students practise focusing slides under the microscope.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 to 3 days before	• Gather materials.
1 day before	• Photocopy **Assessment Master 11 Using Tools and Equipment Checklist**.
Day of	• Set out microscopes and prepared slides.

APPARATUS	MATERIALS
• microscope (1 per student/group)	• prepared slides of insect parts (e.g., wings, eyes, legs) • lens paper

Suggested Timing

20–30 min

Safety Precautions

- Remind students to be careful with microscope slides. Point out the container for broken glass, and remind them to inform you about any glass breakage.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.
- Demonstrate how to unplug the microscope.

Activity Planning Notes

Reinforce using equipment correctly by distributing and reading **Assessment Master 11 Using Tools and Equipment Checklist**.

Have students discuss parts of insects they can see with the naked eye. Ask what difference viewing through a microscope might make.

On low power, students should use the coarse-adjustment knob first before moving to the fine-adjustment knob. Remind them not to use the coarse-adjustment knob at higher powers because they take the object back out of focus when they do.

As you circulate, troubleshoot for students that lose sight of an object when viewing it at high power: go back to low power; centre the object in the middle of the view; and try high power again.

If students are using a microscope that requires moving the stage in order to switch from medium to high power, they will be unable to get the slide in focus on high power. In such an event, the student should stop at medium power.

Collect in advance additional slides (e.g., hydras, flower parts, planarians) and invite students to view them.

Accommodations

- Provide visually impaired students with a microscope that can project images onto a TV screen, if available.
- Consider the ability of students to sketch when offering them slides to view. Provide slides with less complicated details to students with limited drawing abilities.

What Did You Observe? Answers (page 172)

9. a) More. Answers may vary, but should indicate that as magnification is increased, the object is seen in more detail.

b) Less. Answers may vary, but should indicate that as magnification is increased, less of the whole object is seen.

Activity Wrap-up

- Have students complete and then discuss the questions on page 172. Clarify any confusions students might have.

Alternative Activity

- As a group activity, have students view slides using a TV or computer, and sketch what they see.

Try This! Activity (page 172)

Purpose

- Students use a web site to view objects at different powers of magnification.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
Several days/weeks before	• Book the computer lab.

APPARATUS	MATERIALS
• computers	

Suggested Timing

5–10 min

Activity Planning Notes

Read the information together and then direct students to the interactive web site that allows students to view the head of a pin at different powers of magnification. Have students view other objects (e.g., human hair, dust mite, red blood cell).

You might explain that an electron microscope generated the images beyond 1000×, which is the limit for a compound microscope.

Accommodations

- Allow students who have difficulty navigating on a web site to work with a partner who can help.
- Students with visual impairments could be paired with someone who can help.

Activity Wrap-up

- Have students discuss what they observed in moving to higher magnifications. Reinforce the idea that they saw more detail but less of the object being observed.

Find Out Activity (page 173)

Preparing a Dry Mount Slide

Purpose

- Students prepare a dry mount slide and view it under the microscope.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 to 3 days before	• Gather materials.
Day of	• Set out microscopes and slides.

APPARATUS	MATERIALS
• piece of Plexiglas™ (optional) • microscope (1 per student or group) • slides (2 per student	• samples (e.g., eyelashes, hair, sawdust, dryer lint, sugar/salt, fabric)

Suggested Timing

20–30 min

Safety Precautions 

- Caution students to be careful with microscope slides.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.
- Check that students are unplugging microscopes properly.

Activity Planning Notes

In advance, you may wish to set up lab stations with a different sample at each station to avoid overcrowding.

You might do a class demonstration of how to prepare a dry mount using a piece of Plexiglas™ and a sample you choose. Explain that in putting the slide under the microscope, care is needed to make sure the sample doesn't move around on the slide.

Read through the directions together and make sure everyone understands that they are to make two dry mount slides and sketch what they see under the microscope.

Consider having students practise mounting other samples. They can get a piece of paper to sketch and label what they observed with the high-power lens.

Accommodations

- Provide visually impaired students with a microscope that can project images onto a TV screen, if available.

What Did You Observe? Answers (page 173)

2. and **3.** Sketches will vary depending on the sample viewed. Look for a label and magnification 400×.

Activity Wrap-up

- Have students complete the sketches on page 173.

Test It! Activity (page 176)

Who Did It?

Purpose

- Students find out how the microscope can be useful in solving crimes.

Science Background

Hair has three layers: the inside medulla, the surrounding cortex, and the outer cuticle. When hair samples are found at a crime scene, forensic scientists must first identify whether the hair belongs to a human or an animal. Then the hair samples found at the crime scene are compared to those of the suspects.

There are three patterns of the medulla — continuous, interrupted, or fragmented — that help scientists figure out the source of the hair. If the hair is human, scientists can identify other characteristics such as race.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 to 3 days before	• Collect different-coloured human hair samples from friends, or visit a salon.
1 day before	• Prepare enough hair samples for each group to have one sample from each suspect. To make it easy to keep the hairs separate, place the hair from each suspect in a different resealable plastic bag. • Label each bag as A, B, C, or Crime Scene.
Day of	• Set out materials.

APPARATUS	MATERIALS
• microscope (1 per group) • slides (4 per group) • tweezers (1 per group)	• human hair samples (1 set per group) • resealable plastic bags

Suggested Timing

45 min

Safety Precautions

Activity Planning Notes

Make sure students have done Find Out Preparing a Dry Mount Slide *before* starting this activity. Briefly review the procedures for making a dry mount.

In advance, you may wish to set up lab stations with a different hair sample at each station to avoid overcrowding.

Consider personalizing the activity by making the suspects people that students know (e.g., teachers, EA, principal). Consider setting the stage with a fake newspaper article. Read the information together as a class. Then, read through the directions and make sure everyone understands what to do.

After students develop the checklist, direct them to observe and sketch one sample at a time. Tell students to use a minimum of 100× magnification. For finer hair, 400× will provide better clarity. Then, students should compare their observations of the three samples taken from suspects with the sample found at the crime scene.

Accommodations

- Students can use slides you have prepared in advance.
- Provide visually impaired students with a microscope that can project images onto a TV screen, if available.
- Some students may need additional reinforcement to process the information and instructions.

Test It! Answers (pages 176–177)

1. Answers will vary depending on which suspect's sample is found at the crime scene.
2. Answers will vary. Make sure students refer to being careful with microscope slides, cleaning up the work area and washing hands, and unplugging the microscope properly.
3. Answers may vary, but should indicate a logical order of the task. For example:
   - Make a slide of hair from Suspect A.
   - Make a slide of hair from Suspect B.
   - Make a slide of hair from Suspect C.
   - View each slide of hair under medium power.
   - Draw a sketch of each slide.
   - Make a slide of hair found at the crime scene. Draw a sketch.
   - Match the hair from the crime scene with the hair of one of the suspects.
4. Answers may vary, but should include starting on low power and using the coarse-adjustment knob, before moving to medium power and using the fine-adjustment knob.
5. Look for a sketch of four samples of hair, each indicating the magnification at 100×. The sample from the crime scene should match with one of the suspects.
6. Answers will depend on which suspect's hair sample matched the one found at the crime scene.
7. No. Accept any reasonable explanation. For example,
   - The method might give investigators a lead for who might be guilty of a crime, but it is not scientifically conclusive. DNA testing provides more accurate and scientific evidence.
   - Special circumstances could explain why a suspect's hair was at the crime scene even though the person did not commit the crime.

Activity Wrap-up

- Have students compare their observations with their peers, before completing and discussing questions 6 and 7. In a class discussion, ask students who they think committed the crime. Ask if the method is foolproof and why or why not.

Alternative Activity

- Show a video called *Secret Life of 118 Green Street* (Stamford, CT: Capital Cities/ABC Video, 1993. ISBN: 1569490376). The film follows a family through a typical day and highlights the activities going on at the microscopic level that they are unaware of.

Ongoing Assessment

- Use the Check Your Understanding questions on page 170 as a formative assessment for how well students understand focussing a microscope.
- Use your observations during Find Out Activity Viewing Slides to assess students' use of microscopes. Use **Assessment Master 12 Using Tools and Equipment Rubric** to record results.
- Show You Know! can be used as a summative assessment of the parts of a microscope and its proper use.

Technology Links

- For an activity in which students complete an on-line fill-in-the-blanks exercise about using the microscope, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Using the Microscope.
- For an activity in which students practise identifying microscope parts, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Microscope Parts.

9.4 The Cell (page 178)

SUGGESTED TIMING

45–50 min
15–20 min for Find Out Preparing Wet Mount Slides
25–30 min for Find Out Viewing Plant Cells

MATERIALS

- coloured pencils or markers
- paper headbands
- masking tape

BLACKLINE MASTERS

OHT 11 Plant Cell
OHT 12 Plant Cells Work Together
Assessment Master 7 Scientific Communication Checklist
Assessment Master 8 Scientific Communication Rubric

Specific Expectations

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
BSA2.02 – make accurate observations of structures, using microscopes, and relate them to functions of systems and processes of simple and complex organisms
BSA2.04 – extract and interpret information from a variety of sources
BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats
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

Science Background

Plant Cell: Plant cells tend to have a rectangular shape due to the rigid cell wall. The cell wall contributes strength and rigidity to a plant.

Most plant cells have a single vacuole that takes up most of the cell. When the vacuole inside the plant cell is full, it places pressure on the cell wall to hold its shape. The vacuole stores food, water, and waste. The cell membrane, which is inside the cell wall, regulates which materials can enter and exit the cell.

The chloroplasts, which contain chlorophyll, are found in all parts of the plant where photosynthesis occurs. The mitochondria convert glucose produced during photosynthesis into energy the plant can use.

The nucleus contains DNA, which stores information used to build proteins in the cell. The endoplasmic reticulum transports materials throughout the cell. Cytoplasm is the jelly-like material in which all the organelles are suspended. Other organelles found in plant cells include the nucleolus, nucleoplasm, nuclear membrane, ribosomes, and Golgi bodies. It is not necessary for these students to know and identify these organelles.

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 their own glossary at the back of their Science Log.
- Sketch and label a diagram of the plant cell using all of the key terms in this section.
- Play "Headbands" either as a class or in teams. In advance, prepare the headbands, each labelled with a key term that is printed large enough to be read from a short distance. Use masking tape to attach a headband to a volunteer without letting the volunteer see the key term. The object of the game is for the volunteer to guess the word on the headband by asking questions of team members. The team can respond to questions only with a yes or no.

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

Reading Icon Answers (pages 178–179)

1. Answers will vary. Accept any three reasonable statements about cells. For example,
- All living things are made of cells.
- Cells are too small to see without using a microscope.
- There are two main kinds of cells — animal and plant cells.

2. **a**) and **b)** Check that each organelle in the diagram is coloured according to the code beside its corresponding description. The chloroplast should be green.

Activity Planning Notes

Prompt students to recall what they know about cells before they respond to the Reading Icon question 1.

Discuss the difference between unicellular and multicellular organisms. You might show some pictures of some unicellular protists. Tell students they will observe protists under a microscope during an upcoming activity.

Before presenting plant cell organelles, use the analogy of the human body that is made up of organs to explain that cells are made up of organelles.

Have students complete and then discuss the questions on pages 178 and 179. To help students identify the different parts and reinforce their knowledge, encourage them to colour each type of organelle in the diagram a different colour. Tell students that cells may contain more than one of the same organelle. When discussing the parts of the cell, downplay the term "endoplasmic reticulum." Students may refer to endoplasmic reticulum as "ER."

Explain how cells work together to keep a plant alive. For example, use a wilted piece of celery to explain the connection between the vacuole and the cell wall (i.e., if a vacuole lacks water, the stem will wilt).

The purpose of the Making Connections question on page 180 is to help students learn plant organelles and functions by using familiar analogies. You might begin by having students brainstorm how a cell is like a city. Students might mention some of the following ideas:

- city hall (nucleus) — directs all activities
- power plant (mitochondrion) — produces energy
- water reservoir/sewage treatment centre (vacuoles) — stores water; recycles waste products
- greenhouses (chloroplasts) — produce food
- transportation system (endoplasmic reticulum) — transports materials
- city gates (cell membrane and cell wall) — control what comes in and what goes out

Discuss how a cell is *not* like a city. Students might say a city is not alive.

Have students complete and then discuss question 1. You may decide to ask students to form groups and develop their own analogies, which could then be shared with the rest of the class.

Consider using the following overhead transparencies:

- **OHT 11 Plant Cell**
- **OHT 12 Plant Cells Work Together**

Accommodations

- Students with visual impairments could explore 3-D or relief models of plant and animal cells ordered from a science supplier, or from plaster of Paris models made in an art class.
- Have students who have difficulty writing work with someone who can help record their answers.

Check Your Understanding Answers (page 179)

3. Chloroplast

4. Cell wall

Making Connections Answer (page 179)

5. Answers may vary. Check for three of the following organelles and a description of their function.
- cell wall; supports and protects the cell
- cell membrane; controls what goes in and out of the cell
- nucleus; controls the activities in the cell
- chloroplast; makes food for the plant
- mitochondrion; produces energy in the cell
- vacuole; stores food, water, and waste in the cell
- endoplasmic reticulum (ER); transports food, water, and waste around the cell
- cytoplasm; holds all the organelles in place

Making Connections Answers (page 180)

1. Answers are in italics.

a) Engine; *produces energy*; *mitochondrion*

b) Computer, control centre; *nucleus*

c) Trunk; *stores materials*; *vacuole*

d) Body; *supports and protects*; *cell wall*

e) Fuel system; moves materials; *endoplasmic reticulum*

f) Car frame; holds parts in place; *cytoplasm*

g) Exhaust system; moves wastes; *endoplasmic reticulum* or *controls what goes out*; *cell membrane*

Find Out Activity (page 181)

Preparing Wet Mount Slides

Purpose

- Students prepare a wet mount slide and view it under the microscope.

Science Background

What appears to be a solid colour when viewing a sample of coloured newsprint with the naked eye is actually a series of different-coloured dots, which can be seen when viewing the same sample under a microscope.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 to 3 days before	• Gather materials.
Day of	• Set out materials.

APPARATUS	MATERIALS
• piece of Plexiglas™ • overhead transparency • turkey baster • tweezers (1 per student) • slide (1 per student) • medicine dropper (1 per student) • cover slip (1 per student) • microscope (1 per student)	• black marker • sample of coloured newsprint • water

Suggested Timing

15–20 min

Safety Precautions

- Caution students to handle microscope slides carefully. You may wish to use plastic cover slips instead of glass ones.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

You might do a class demonstration of how to prepare a wet mount. Use a piece of Plexiglas™, an overhead transparency, and a turkey baster. Demonstrate how to remove air bubbles. Show students what air bubbles look like under the microscope by projecting the image onto a TV screen. Or, use an overhead to show a circle with a thick black edge.

Make sure to use coloured newsprint instead of coloured ink from a printer.

If students make more wet mount slides, ensure that they get your approval before going ahead. Do not allow slides of blood or body fluids.

Accommodations

- Provide visually impaired students with a microscope that can project images onto a TV screen, if available.
- Students who lack fine-motor skills to eliminate air bubbles can be paired with someone who can help.

What Did You Observe? Answer (page 181)

4. Students should see coloured dots.

Activity Wrap-up

- Have students complete and then discuss question 4 on page 181.
- You might discuss advantages and disadvantages of using dry mount instead of wet mount slides.
  Advantage: viewing a sample that is not distorted by water
  Disadvantage: samples can move around on the slide, since they are not secured

Technology Links

For an on-line animation of how to prepare a wet mount slide properly, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Wet Mounts.

Find Out Activity (page 182)

Viewing Plant Cells

Purpose

- Students identify plant cell organelles under the microscope.

Science Background

Many plant cell organelles are too small to be seen using a compound light microscope. The organelles you can expect to see are the cell wall, cytoplasm, and nucleus. If viewing the green part of a plant, it is also possible to see chloroplasts.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 to 2 days before	• Purchase onions; gather or purchase water plants. • Photocopy the assessment masters you decide to use.
Day of	• Set out the materials in stations.

APPARATUS	MATERIALS
• slides (2 per student) • tweezers (1 per student) • cover slips (2 per student) • microscope (1 per student) • medicine dropper (1 per student)	• leaf from a water plant such as elodea, hornwort, or cabomba • water • onion skin • iodine solution • lens paper

Suggested Timing

25–30 min

Safety Precautions

- Caution students to handle microscope slides carefully. You may wish to use plastic cover slips instead of glass ones.
- Remind students not to eat anything in the science lab.
- Explain to students that iodine will stain their clothes and their skin. It can also damage the equipment. Care must be taken to avoid any accidents.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

You may wish to set up lab stations around the classroom with the materials for a different specimen at each station. Give students time at each station to make their observations.

Make sure students do Find Out Preparing Wet Mount Slides *before* starting this activity. Briefly review the procedures for making a wet mount.

When viewing slides of aquatic plants and onion skin, advise students to look at the thinnest possible section of the material. Some students will try to look through three or four layers of cells and have difficulties. Demonstrate how to peel the leaf and onion samples to make them as thin as possible (i.e., one layer in thickness).

Demonstrate how to make a stained sample using onion skin and iodine solution. The stain will help them to see organelles. Explain that since iodine can stain, they should use lens paper to soak up any surplus solution on the onion slide.

Read through the directions together and make sure everyone understands that they are to make two wet mount slides. Before students begin, point out that they will not see all of the plant organelles shown in the text. A very high-powered compound microscope is necessary to see mitochondria, for example.

Students may wish to use one of the circles on page 183 for a rough draft of what they see before drawing a good copy in the second one. Many students will need more than one try at this.

You might extend the activity by providing thin pieces of celery and having students follow the same steps as in Part 1 to view a slide they prepare. Students should sketch and label three or four rectangular cells on a separate piece of paper.

Accommodations

- Wet mounts of living tissues can be hard for some students to do, and frustrating. If your students have difficulty making their own slides, do this activity with prepared slides.
- Provide visually impaired students with a microscope that can project images onto a TV screen, if available.

Activity Wrap-up

- Have students complete and then discuss question 5. You might have students complete **Assessment Master 7 Scientific Communication Checklist**.
- Have a classroom discussion about which organelles were identified and any problems students encountered. Explain that there are no chloroplasts in onion skin, since food is not made in this part of the onion. The onion stores food. Ask what colour the onion would be if it did have chloroplasts.
- Encourage students to share their sketches to identify where their observations were similar and different. Sketches of onion skin should show transparent rectangles and a stained nucleus. Discuss why these differences occurred.

What Did You Observe? Answers (pages 182-183)

2. Sketches will vary, but should show labels for organelles such as cell wall, cytoplasm, nucleus, and chloroplasts, as well as a label for magnification power.

4. Sketches will vary, but should show labels for organelles such as cell wall, cytoplasm, and nucleus, as well as a label for magnification power.

What Did You Learn? Answers (page 183)

5. Answers will vary. For example,
- Cell wall, cytoplasm, nucleus
- Shape and size of organelles helps with identification

Alternative Activities

- Have students brainstorm meaningful analogies for the cell and its parts. Students can work in small groups to develop an analogy they choose (e.g., how a cell is like a factory). Have students use a chart similar to the one on page 180 to fill in jobs and organelles.
- Show images of prepared plant cell slides.
- Show a video that illustrates cell processes, such as *Visualizing Cell Processes 3rd Edition*, which features concepts and vocabulary of cell biology. There is an accompanying interactive learning guide (BioMEDIA Associates, DVD ISBN: 1-930527-17-9; Learning Guide CD ISBN: 1-930527-19-5).

Ongoing Assessment

- Use the Making Connections question on page 180 as a formative assessment for knowledge about plant organelles and functions.
- Use **Assessment Master 8 Scientific Communication Rubric** to assess the quality of student work in Find Out Viewing Plant Cells.

9.5 Animal Cells (page 184)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
30–45 min 25–30 min for Find Out	• prepared bingo cards and markers • coloured pencils or markers • paper	BLM 9–2 Compare Plant and Animal Cells OHT 13 Animal Cell OHT C–6 Compare Plant and Animal Cells Assessment Master 9 Safety Checklist Assessment Master 10 Safety Rubric

Specific Expectations

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
BSA2.01 – formulate questions and plan simple experiments to investigate how simple and complex organisms respond to environmental stimuli
BSA2.02 – make accurate observations of structures, using microscopes, and relate them to functions of systems and processes of simple and complex organisms
BSA2.04 – extract and interpret information from a variety of sources
BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats
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

Science Background

Animal cells do not contain cell walls or chloroplasts. Animal cells do have a skeleton, however, which provides support and connections between organelles and cell membranes. Not having a rigid cell wall allowed animals to develop a greater range of specialized cell types, such as those that make up nerves and muscles.

Other organelles found in animal cells, including the nucleolus, nucleoplasm, nuclear membrane, ribosomes, Golgi bodies, centrioles, and lysosomes, are not introduced to students.

Key Terms Teaching Strategies

The key terms in this section duplicate the key terms in 9.4.
- You might review the key terms by playing bingo using the names of organelles. In advance, prepare bingo cards with 25 boxes (5 by 5 with a free space in the middle). Write the name of an organelle in each box or have

students do so. To play, have a caller call out an organelle function. Students must have the matching organelle in order to mark it off on their card. The winner is the first to mark off a row. The row can be vertical, horizontal, or diagonal.

Reading Icon Answers (page 184)

1. a) cell membrane
nucleus
mitochondrion
vacuole
endoplasmic reticulum (ER)
cytoplasm

b) Check that each organelle in the diagram is coloured according to the code beside its corresponding name in the table.

Activity Planning Notes

Present the organelles in an animal cell. Point out that animal cells share many of the same organelles as plant cells, but that they lack a cell wall and chloroplasts. Emphasize that animal cells are surrounded only by a cellular membrane, while plant cells also have a cell wall. Cell walls give strength and rigidity to the structure of the plant. Ask what supports animals' bodies (i.e., skeleton). Ask what chloroplasts do in a plant cell, before asking what *not* having chloroplasts means for an animal cell (animal cells can't make their own food).

Have students complete and then discuss the questions on pages 184 and 185. As students work on question 1, remind them that cells may contain more than one of the same organelle.

Consider using the following blackline master and overhead transparencies:
- **BLM 9–2 Compare Plant and Animal Cells**
- **OHT 13 Animal Cell**
- **OHT C–6 Compare Plant and Animal Cells**

Accommodations

- Provide students who need more space to record their answer to question 4 (on page 185) with **BLM 9–2 Compare Plant and Animal Cells**.
- Students who have difficulty with fill-in-the-blanks questions may need some coaching.
- Have students who have difficulty writing work with someone who can help record their answers.

Check Your Understanding Answers (page 185)

2. Cell wall, chloroplasts

3. The plant cell has one large vacuole; the animal cell has several smaller vacuoles.

4. **Similarities**: cell membrane, cytoplasm, endoplasmic reticulum, mitochondrion, nucleus, vacuole

Plant Differences: cell wall, chloroplasts, large vacuole

Answers are in italics.

Plant and *animal* cells have many similarities. They both have the following *six* organelles: *cell membrane*, nucleus, vacuole, endoplasmic reticulum (ER), cytoplasm, and *mitochondrion*. However, there are some differences between plant and animal *cells*. The *cell wall* and *chloroplasts* are found only in plant cells. Plant cells have a large *vacuole* but animal cells have several small *vacuoles*. The *chloroplast* in a plant cell is *green* in colour.

Find Out Activity (page 186)

Viewing Unicellular Animals

Purpose

- Students use the microscope to identify animal cell organelles.

Science Background

Protists are single-celled eukaryotic organisms. They are microscopic and are found in mostly aquatic environments. They are not actually animals but belong to their own kingdom. Since they are eukaryotic and do not perform photosynthesis, they have the same cell structure as animal cells.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 weeks before	• Order amoebas and euglenas for delivery.
2 to 3 days before	• Gather materials. • Photocopy the assessment masters you decide to use.
Day of	• Set out materials.

APPARATUS	MATERIALS
• medicine droppers (1 each for amoeba and euglena container; 1 for salt water) • slides (2 per student) • cover slips (2 per student) • microscope (1 per student)	• amoebas • salt water • euglenas

Suggested Timing

25–30 min

Safety Precautions

- Caution students to handle microscope slides carefully. You may wish to use plastic cover slips instead of glass ones.
- Remind students not to eat anything in the science lab.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

You might begin the lab activity by distributing copies of **Assessment Master 9 Safety Checklist** and reviewing the importance of following safety practices in the lab.

Review what protists are before reading through the directions together and making sure everyone understands what to do. Emphasize that the activity involves two parts: in the first part, they will observe how amoebas respond to salt water; in the second part, they will observe how amoebas and euglenas react to each other.

Caution students to keep the medicine droppers separate for the amoeba and euglena containers to avoid cross contamination. Make sure to clearly label the containers.

Students may have difficulty finding the protists since they move quickly. Consider using a quieting solution (e.g., methyl cellulose) to slow down their movement for easier viewing. Alternatively, you might project the slides onto a TV for everyone to see.

As you circulate, check that students are using apparatus and materials correctly.

Accommodations

- Provide visually impaired students with a microscope that can project images onto a TV screen, if available.
- Some students may become frustrated because the activity requires patience. You might project slides onto a TV for everyone to see.

What Did You Observe? Answer (page 187)

2. Amoebas shrivelled.

What Did You Learn? Answers (page 187)

3. Cell membrane

4. Drinking salt water is not advisable because you will become dehydrated as water begins to leave your cells.

What Did You Observe? Answer (page 187)

6. The amoeba ate the euglena.

Activity Wrap-up

- Have students complete and then discuss the questions on page 187.
- Have students complete **Assessment Master 9 Safety Checklis**t to help them evaluate their safety practices.

Alternative Activities

- Do a hay infusion or collect pond water so students can view protists under a microscope. Have students draw protists they observe and describe how they move.
- Have students identify and sketch organelles in multicellular animals. In advance, collect some prepared slides of multicellular animals, in which students are likely to see at least the cell membrane, cytoplasm, and nucleus.
- Have students develop a 3-D model of a plant and animal cell using candy and icing or soda crackers, spreadable cheese, dried pasta shapes, dried fruits, and sugarless candies to help reinforce the parts and functions of plant and animal cells. Do not conduct the activity in the science lab and remind students not to sample food while working on the activity. Before buying the decorations, find out if any students have food allergies and avoid items such as nuts and peanut butter that pose allergy problems.
- Have students make nonedible cells from modelling clay and found objects around the lab (e.g., stoppers, wire, foil, pipe cleaners).

Ongoing Assessment

- Use Check Your Understanding question 4 on page 185 as a summative assessment for how well students understand plant and animal cell organelles.
- Use **Assessment Master 10 Safety Rubric** to assess students' safety practices during the Find Out activity.

Chapter 9 Review (page 188)

SUGGESTED TIMING

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

BLACKLINE MASTERS

Master 3 Certificate
Master 4 List of Skills
BLM 9–3 Microscope Word Scramble
BLM 9–4 Chapter 9 Word Puzzle
BLM 9–5 Chapter 9 Practice Test
BLM 9–6 Chapter 9 Test

Accommodations

- In advance, prepare an index card that lists the key terms for Unit C. Provide the card 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 9–5 Chapter 9 Practice Test** can be customized to produce extra reinforcement questions. For example, you might provide prompts for a summary paragraph comparing animal and plant cells.

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.

To provide additional reinforcement of key terms, have students complete the organizer and summary paragraph on **BLM 9–2 Compare Plant and Animal Cells**. Additionally, have them complete **BLM 9–3 Microscope Word Scramble** and **BLM 9–4 Chapter 9 Word Puzzle**.

Once the review is completed and taken up, assign the **BLM 9–5 Chapter 9 Practice Test** for students to answer individually. They may wish to use their completed review to help them.

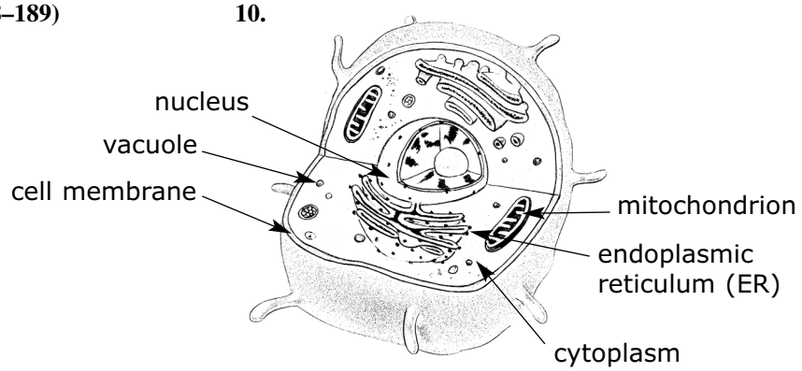
Review Guide

Question	Section(s)	Refer to
1 to 8	9.4	Plant Cells (page 179)
9	9.3	Find Out Activity Magnification (page 169)
10	9.5	Animal Cells (page 184)
11	9.5	Check Your Understanding (page 185)

Chapter 9 Review Answers (pages 188–189)

1. **f)** cytoplasm
2. **a)** endoplasmic reticulum (ER)
3. **b)** vacuole
4. **c)** chloroplast
5. **d)** mitochondrion
6. **e)** nucleus
7. **g)** cell membrane
8. **h)** cell wall
9. C should be circled. C shows the least amount of area of the sample.

10.



11. **Animal Difference**: small vacuoles
Similarities: cell membrane, cytoplasm, endoplasmic reticulum, mitochondrion, nucleus, vacuole
Plant Differences: cell wall, chloroplasts, large vacuole

Summative Assessment

- Have students complete **BLM 9–6 Chapter 9 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**.