Activity Preparation for Chapter 12

Activity/Investigation	Advance Preparation	Time Required	Other Considerations
Test It! Root Growth (page 228) (TR page 278)	• 1 month before – Order seeds from a supplier. • 1 day before – Gather materials. – Photocopy **BLM 12–1 Root Growth**, **Assessment Master 8 Scientific Communication Rubric**, and optional blackline masters (if using).	• 20 min to set up • 5–10 min per observation	• Purchase rapid-growing radish or bean seeds. • Provide time at the beginning or end of class over the following week for students to make observations.
Find Out: Stem Growth (page 230) (TR page 280)	• 1 month before – Order or purchase plants. • 1 week before – Obtain grow lights (if using). • Day of – Set out plants. – Photocopy **Assessment Master 8 Scientific Communication Rubric**.	• 5 min to set up • 5 min per observation	• Provide time at the beginning or end of class over the following week for students to make observations.
Try This! (page 231) (TR page 281)	• 1 month before – Order or purchase touch-sensitive plants. • Day of – Set out plants.	• 5–10 min	• Consider purchasing non-native plants such as Venus flytraps or mimosa plants. • If you have a limited number of plants, consider doing a teacher-led demonstration.
Find Out: Plant Respiration (page 233) (TR page 283)	• 1 month before – Order or purchase plants. • 1 day before – Gather materials.	• 10 min to set up • 5 min for observation after several days	• You might consider providing students with small plants that can be sealed in resealable bags. • If space for plants is limited, consider doing a teacher-led demonstration using one plant. • Provide time for students to make observations after several days.
Try This! (page 234) (TR page 286)	• Several days before – Purchase or gather food samples. • 1 day before – Organize food samples in containers.	• 10–15 min	• Starches include rice, pasta, wheat flour, cornstarch, and bread. Iodine will not produce a reaction with foods such as fresh vegetables (e.g., cucumbers, celery), sugar, salt, or oil. • You may want to set up lab stations with a different sample at each station to avoid overcrowding.
Try This! (page 235) (TR page 287)	• 1 week before – Order or purchase leafy plants. • 1 day before – Gather materials. – Photocopy **BLM 12–2 Making Food**.	• 10–15 min to set up • 5–10 min for observation after a week	• You may have students do the first part of the activity before beginning Section 12.3.
Try This! (page 239) (TR page 293)	• 1 week before – Purchase African violet plants. • 1 day before – Gather materials. • Day of – Set out materials.	• 15 min to set up • 5 min for observation after several weeks	• Alternatively, consider propagating spider plants. Ideally, allow a young plant to root while it is still attached to the mother plant by setting the pot filled with potting soil within reach of a young plant. After the young plant develops roots a week or so later, cut off its ties with the mother plant.
Find Out: Dissect a Flower (page 242) (TR page 295)	• 1 day before – Purchase or gather fresh flowers. • Day of – Gather the apparatus and materials. – Photocopy **Assessment Master 12 Using Tools and Equipment Rubric** and **Assessment Master 11 Using Tools and Equipment Checklist** (optional).	• 20–30 min	• Review the rules and tools for dissection before beginning the lab. • Alstromeria flowers are readily available and show flower parts clearly.

Materials Needed for Chapter 12

Activity/Investigation	Apparatus	Materials	Blackline Masters
Test It! Root Growth (page 228) (TR page 278)	• glass or plastic jar (1 per group) • tray (1 per group, optional)	• paper towels • water • seeds (5 per group) • masking tape	**Recommended** BLM 12–1 Root Growth Assessment Master 8 Scientific Communication Rubric **Optional** Master 1 Centimetre Grid Paper Assessment Master 7 Scientific Communication Checklist
Find Out: Stem Growth (page 230) (TR page 280)	• grow lights (optional)	• young plants that have started to grow (1 per group)	**Recommended** Assessment Master 8 Scientific Communication Rubric
Try This! (page 231) (TR page 281)		• touch-sensitive plants such as Venus flytraps or mimosas (1 per group)	
Find Out: Plant Respiration (page 233) (TR page 283)		• potted plant (1 per group) • water • clear plastic bag (1 per group) • masking or duct tape	
Try This! (page 234) (TR page 286)	• medicine dropper	• white potato (1 piece per group) • samples of food (some that contain starch; some that do not) (1 of each sample per group) • iodine solution	
Try This! (page 235) (TR page 287)	• scissors • paper clips	• plant with lots of leaves (1 per group) • black construction paper	**Recommended** BLM 12–2 Making Food
Try This! (page 239) (TR page 293)	• paring knife • pot	• leaves of an African violet plant (1 per group) • potting soil • water	
Find Out: Dissect a Flower (page 242) (TR page 295)	• dissecting tray (1 per group) • probe • forceps (1 per group) • dissection scissors (1 pair per group) • magnifying glass (1 per group) • 15 cm ruler (1 per group)	• flower from an alstromeria, lily, or other garden plant with clearly visible flower parts (1 per group)	**Recommended** Assessment Master 12 Using Tools and Equipment Rubric **Optional** Assessment Master 11 Using Tools and Equipment Checklist

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CHAPTER 12 Plant Systems (page 226)

SUGGESTED TIMING	MATERIALS
15 min	• several types of plants (optional)

Overall Expectations

BSAV.01 – explain the systems and processes required by simple and complex organisms to sustain life

Science Background

The purpose of the introductory section is to engage students in a discussion about adaptations that plants make to survive in harsh environments.

Golden Barrel Cactus: This cactus lives in harsh environments with extreme temperatures and little water. A thick, waxy skin reduces water loss. Its body has flutes or nipples that help provide shade. When it rains, the flutes expand to absorb large amounts of water; during dry periods, the flutes contract. Unlike most plants, the cactus opens its pores during the night when the air is cooler. This helps plant cells retain water and concentrate carbon dioxide needed for photosynthesis. The spines serve several purposes: protect it from animals; provide shade; serve as a windbreak from winds; and help trap warm air close to the plant. The root system, which is very close to the soil surface, allows it to take advantage of any rainfall.

Venus Flytrap: The flytrap does make its own food like other plants through the process of photosynthesis. However, plants need other key nutrients to survive. The Venus flytrap, which lives in bogs where the soil is acidic and nutrients are scarce, has the ability to trap insects that provide missing nutrients.

Activity Planning Notes

You may wish to bring in several different plants. As a class, have students brainstorm how their structures help plants adapt to the environment. Or, you might assign a different plant to each group of students and ask them to brainstorm features that help the plant survive. Have students share their ideas with the class.

Read the Science and Literacy Link on page 226 together and answer the questions. This opener can be used as a lead-in to Section 12.1.

Accommodations

- For question 2 on page 226, consider providing students with a blank organizer that has space for three similarities and one difference.
- Have students observe a plant that grows in their neighbourhood. Have them do the following:
  – Write its name.
  – Explain whether it grows in wet or dry conditions.
  – Describe some special features that help it survive.

Technology Links

- For information about adaptations of some unusual plants, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Unusual Plants.

Check Your Understanding Answers (page 226)

1. waxy coating; spines
2. Answers will vary. Students should write a paragraph that discusses three similarities and one difference. For example:

A Venus flytrap is like other plants in several ways. Venus flytraps have roots, stems, and leaves. It lives in soil. It can make its own food using energy from the Sun. The Venus flytrap is different from most plants because it captures, kills, and digests insects.

12.1 Plant Responses (page 227)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
20–30 min 20 min to set up; 5–10 min per observation for Test It! 5 min to set up; 5 min per observation for Find Out 5–10 min for Try This!	• touch-sensitive plant (optional)	Master 1 Centimetre Grid Paper BLM 12–1 Root Growth OHT 21 The Tomato Plant OHT C–18 Root Growth 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
BSA2.01 – formulate questions and plan simple experiments to investigate how simple and complex organisms respond to environmental stimuli
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
SIL2.05 – 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

Science Background

Gravitropism is a turning movement by a plant in response to gravity. Both roots and stems respond to gravity. Roots demonstrate positive gravitropism and stems show negative gravitropism. Although it is not necessary for students to know this term, it is important for them to realize that roots grow downward in the direction of gravitational pull while stems grow upward in the opposite direction.

Key Terms Teaching Strategies

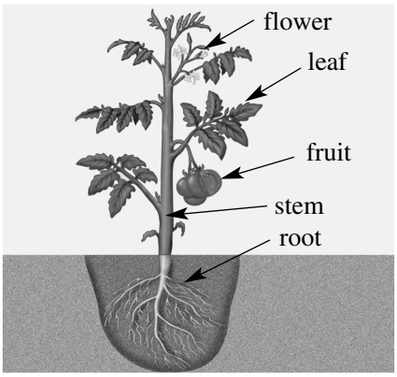
Have students complete some or all of the following activities to help them learn and remember the key terms:

- 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 227)

3.



4. Many students will highlight the root. Accept either roots or stem.

Reading Icon Answer (page 230)

1. Students should highlight these titles:
- Stem Response to Light
- Plant Response to Touch

Activity Planning Notes

You might explain that roots respond because hormones direct them to grow down. Hormones are special chemicals that plants and animals make and use to control their own systems.

After reading the introductory paragraphs on page 227 as a class, have students complete and then discuss the questions.

Have students do the Test It! activity on page 228.

Introduce stem response to light by reading and discussing the information on page 230. Then have students do the related Find Out activity.

Introduce response to touch by reading and discussing the information on page 231. You might demonstrate the response of a touch-sensitive plant before having students complete and discuss the answer to question 5.

Consider using the following overhead transparencies:
- **OHT 21 The Tomato Plant**
- **OHT C–18 Root Growth**

Accommodations

- Provide students who need more space to record the answer to question 3 on page 227 with a photocopy of **OHT 21 The Tomato Plant**. Remind students to put their name on it.

Check Your Understanding Answers (page 227)

5. support the plant; absorb water

6. Wording will vary. For example: Roots respond to gravity.

Making Connections Answer (page 227)

7. Wording will vary. The roots might have been damaged or severed. Without roots to support it and absorb water, the plant can't survive.

Making Connections Answer (page 231)

5. Wording will vary. A plant that depends on insects to survive needs to respond quickly.

Test It! Activity (page 228)

Root Growth

Purpose

- Students learn that roots grow down after a seedling is turned upside down.

Science Background

Plant hormones continue to direct the root to grow toward gravity after a seedling is turned upside down.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 month before	• Order seeds from a supplier.
1 day before	• Gather materials. • Photocopy **BLM 12–1 Root Growth**, **Assessment Master 8 Scientific Communication Rubric**, and optional blackline masters (if using).

APPARATUS	MATERIALS
• glass or plastic jar (1 per group) • tray (1 per group, optional)	• paper towels • water • seeds (5 per group) • masking tape

Suggested Timing

20 min to set up; 5–10 min per observation

Safety Precautions

- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

For this activity, purchase rapid-growing radish or bean seeds.

Have students make predictions about what will happen before they begin.

Ensure that students use enough paper towels so the seeds do not fall or shift over time. Consider placing an object such as a large sponge in the middle of the jar to save on paper towels.

Provide time at the beginning or end of class over the following week for students to make observations.

Accommodations

- Consider providing detailed oral instructions about what to do. Fold a paper towel so that it is the same height as the jar. Form the folded towel into a cylinder and place it in the jar so that it lines the inside surface of the jar. Crumple a second towel and put it in the centre of the jar. It will hold the folded towel against the walls of the jar. Add some water to the jar and soak the towels. Pour off any

excess water. Plant the seeds by putting them about halfway from the top of the jar between the inside surface of the jar and the outside of the folded paper towel. Keep the towels moist.
- Students with visual impairments could be paired with other students to make observations of root growth.
- Students who have difficulties drawing might use a digital camera and take a picture of root growth each day.
- ESL and LD Learners could be paired with students who have stronger language skills.
- Provide support to students who have difficulty making the graph. Have them use **BLM 12–1 Root Growth**. Provide those who need more space to record their graph with **Master 1 Centimetre Grid Paper**.

Activity Wrap-up

- You might have students complete **Assessment Master 7 Scientific Communication Checklist** to help prompt them to record their work.
- Have students compare their observations with those of their peers and predict which of their seedlings might develop into strong plants.
- Have students complete and then discuss question 9 on page 229. Use **OHT C–18 Root Growth** and record data about root growth that students will need to answer the question. Or, distribute **BLM 12–1 Root Growth** so students can interpret the data table and plot root length.

Test It! Answers (pages 228–229)

1. Roots grow down.

2. Answers will vary but should indicate that the root will begin to grow downward.

5. Sketches will vary depending on root growth.

7. Answers may vary. Students should observe roots beginning to grow downward.

8. a) Answers will vary depending on how students answered question 2 and what actually happened. For example:
What happened is the same as what was predicted. When the seedling was turned upside down, the root began to grow downward.

b) Conclusions may vary but should indicate that roots respond to gravity. For example:
Roots always try to move to the centre of Earth.
Explanations may vary but should indicate that the conclusion was based on experimental evidence.

9. a) See answer for **BLM 12–1 Root Growth**.

b) Approximately 20 mm. Encourage students to estimate the difference in length between Days 6 and 8.

c) Seed 2. Answers may vary. For example:
The root of Seed 2 is growing very quickly. Plants with long roots are more able to absorb water and nutrients, and grow into a strong plant.

Alternative Activity

- If time is limited, set up the experiment in advance. Prepare a set of pictures of the results of root growth for three seedlings. Use the pictures as overheads in a class discussion of the results. Have students answer the questions in the student resource.

Technology Links

For an on-line demonstration of how roots contribute to weathering and erosion, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Root Power.

Find Out Activity (page 230)

Stem Growth

Purpose

- Students observe what happens to the stem when a plant is placed near a source of light.

Science Background

Some plants have a strong response to light. In such plants, hormones encourage growth on the side of the stem opposite the light. The additional growth on one side of the stem causes the plant to bend toward the light.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 month before	• Order or purchase plants.
1 week before	• Obtain grow lights (if using).
Day of	• Set out plants. • Photocopy **Assessment Master 8 Scientific Communication Rubric**.

APPARATUS	MATERIALS
• grow lights (optional)	• young plants that have started to grow (1 per group)

Suggested Timing

5 min to set up; 5 min per observation

Activity Planning Notes

Consider using bean plants because they are easy to grow and respond strongly to light. If it is not possible to make observations of a plant over several days, consider providing a series of pictures over time of a plant stem bending toward a light source, which students can use to complete the data table. In this case, take up and discuss the answers to questions 3 and 4 as immediate follow-up.

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

You may wish to have students brainstorm the plan for observing plants before they record it.

Encourage students to modify the table on page 229 to reflect observations taken every second day for a week. Provide time at the beginning or end of class over the following week for students to make observations.

Accommodations

- ESL and LD Learners could be paired with students who have stronger language skills.

What to Do Answers (page 230)

1. Checklists may vary. For example:
- Place the plant near a light source. Observe and sketch the plant on Day 1.
- Observe and sketch the plant on Day 3.
- Observe and sketch the plant on Day 7.

2. Observation tables will vary but should be titled. For example:

Stem Growth		
Day 1	**Day 3**	**Day 7**

Sketches will vary depending on what students observe.

What Did You Observe? Answer (page 231)

3. The plant grew toward the light.

What Did You Discover? Answers (page 231)

4. a) Students should draw a light on the right side of the plant.

b) Answers may vary. For example: Turn the plant away from the light.

Activity Wrap-up

- Have students complete and then discuss questions 3 and 4.

Try This! Activity (page 231)

Purpose

- Students observe a plant responding to touch.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 month before	• Order or purchase touch-sensitive plants.
Day of	• Set out plants.

APPARATUS	MATERIALS
	• touch-sensitive plants such as Venus flytraps or mimosas (1 per group)

Suggested Timing

5–10 min

Activity Planning Notes

If you have a limited number of plants, consider doing a teacher-led demonstration.

Expect the leaf of a Venus flytrap to close shut when a pencil touches it. Expect the leaves of a mimosa plant to contract when a pencil touches along the inside of the stem.

Accommodations

- Students with dexterity problems could be teamed with those without such difficulties.

Activity Wrap-up

- As a class, discuss what part responds to touch.
- You might ask students to share what they know about native carnivorous plants such as pitcher plants and sundews.

Alternative Activities

- Show a video called *Private Life of Plants 1: Branching Out* (PBS, BBC, and Turner Broadcasting, 1995), which uses time-lapse photography to show plant responses to the environment.
- Show plant root development by planting seeds in a container similar to a Root-Vue Farm™. Have students make observations as roots develop.
- Have students plant a seed (e.g., pea, morning glory, scarlet bean) in a pot. Add a craft stick. Have students observe the stem as it grows up and around the stick.

Ongoing Assessment

- Use the Making Connections question on page 227 as a formative assessment for knowledge of plant root functions.
- Use **Assessment Master 8 Scientific Communication Rubric** to assess the quality of student work in Test It! Root Growth and Find Out Stem Growth.

Technology Links

- For information about an experiment to explore the effects of acid rain on plant growth, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Plants and Acid Rain.

12.2 Plant Respiration (page 232)

SUGGESTED TIMING

15 min for introduction
10 min to set up; 5 min for observation after several days for Find Out

BLACKLINE MASTERS

OHT 11 Plant Cell
OHT 15 Respiratory System
OHT C–19 Respiration and Photosynthesis

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
BSA2.04 – extract and interpret information from a variety of sources
BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats
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

Science Background

Respiration has two common meanings. In this chapter, respiration refers to the chemical reaction that releases energy. The mitochondria are the organelles responsible for this life function.

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.

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

Reading Icon Answers (page 232)

1. Wording may vary.

a) photosynthesis; process by which plants make their own food

b) respiration; process by which food is changed into energy that cells can use

Activity Planning Notes

Students learn how making food and releasing energy from food are connected with gas exchange in plants. You might briefly mention photosynthesis before focussing on respiration in this section.

Stress that both plants and animals exchange gases during respiration. Use **OHT 15 Respiratory System** to help students recall how animals exchange gases in the lungs before explaining how plants exchange gases. Consider using **OHT 11 Plant Cell to** help explain that the mitochondria present in the plant's leaves are responsible for respiration.

As a class, read one paragraph at a time and ask questions to check for understanding.

Consider using the following overhead transparencies:
- **OHT 11 Plant Cell**
- **OHT 15 Respiratory System**
- **OHT C–19 Respiration and Photosynthesis**

Accommodations
- Post the formula and diagram for respiration as a visual cue.
- Some students may need additional reinforcement to process the information.
- ESL and LD Learners could be paired with students who have stronger language skills.

Check Your Understanding Answer (page 233)

2. The following order is correct.

1. During respiration, glucose is broken down into energy that cells can use.

2. Plants need oxygen to release the energy in glucose.

3. As it gets used, glucose breaks down to make carbon dioxide and water.

4. Carbon dioxide and water vapour is released into the air.

Find Out Activity (page 233)

Plant Respiration

Purpose

- Students observe plant respiration.

Science Background

When the stomata open, oxygen and water vapour are released. The water vapour collects and condenses on the plastic bag surrounding the plant.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 month before	• Order or purchase plants.
1 day before	• Gather materials.

APPARATUS	MATERIALS
	• potted plant (1 per group) • water • clear plastic bag (1 per group) • masking or duct tape

Suggested Timing

10 min to set up; 5 min for observation after several days

Activity Planning Notes

You might consider providing students with small plants that can be sealed in resealable bags. If space for plants is limited, consider doing a teacher-led demonstration using one plant.

Read through the directions together and make sure everyone understands what to do.
Remind students to water the plant before sealing it inside plastic.

Provide time for students to make an observation after several days.

Accommodations

- Students with dexterity problems could be teamed with those without such difficulties.

Activity Wrap-up

- Have students complete and then discuss questions 3 and 4. Afterward, discuss why it might be damper in a forest when a nearby field is dry.

What Did You Observe? Answers (page 233)

3. a) water droplets

b) Wording may vary but should indicate that as the plant carries out respiration, it releases water and carbon dioxide.

Making Connections Answer (page 233)

4. Wording may vary but should indicate that as the plants in a greenhouse carry out respiration, they release water and carbon dioxide.

Ongoing Assessment

- Use the Making Connections question on page 233 as a formative assessment for knowledge about what happens during respiration.

Alternative Activity

- Have students view stomata under the microscope and sketch what they see. Have them answer these questions.
  – What part of the body works like the stomata on a leaf (i.e., lungs)?
  – How are stomata adapted for the job they do?

12.3 Photosynthesis (page 234)

SUGGESTED TIMING

15–20 min for introduction
10–15 min for Try This! on page 234
10–15 min for set up; 5–10 min for observation after a week for Try This! on page 235

MATERIALS

- chart paper and markers
- class set of red and green coloured pencils

BLACKLINE MASTERS

BLM 12–2 Making Food
OHT 11 Plant Cell
OHT C–19 Respiration and Photosynthesis

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
BSA1.03 – outline how a complex organism functions through the basic interactions between organ systems
BSA2.01 – formulate questions and plan simple experiments to investigate how simple and complex organisms respond to environmental stimuli
BSA2.04 – extract and interpret information from a variety of sources
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

Science Background

The chloroplasts are responsible for photosynthesis and the mitochondria are responsible for respiration. Both of these organelles are present in the plant's leaves.

Key Terms Teaching Strategies

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

- Write a definition for the term in their Science Log. You may wish to have students keep their own glossary at the back of their Science Log.
- Have students share what else they know about starch.

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

Reading Icon Answer (page 234)

1. Students should circle the word "leaves."

Activity Planning Notes

Consider using **OHT 11 Plant Cell** to help students recall that chloroplasts are responsible for photosynthesis. Have them recall that chloroplasts are found in a plant's leaves.

Consider using chart paper to draw a diagram similar to the plant on page 234, and record the reactants and products of photosynthesis.

As a class, present the information about the connection between respiration and photosynthesis. You might have students colour key parts of the visual on page 235 as follows:
- Shade the arrows to the reactants and products of photosynthesis green.
- Shade the arrows to the reactants and products of respiration red.

Consider using the following overhead transparencies:
- **OHT 11 Plant Cell**
- **OHT C–19 Respiration and Photosynthesis**

Accommodations
- Post the formula and diagram for photosynthesis as a visual cue.
- Some students may need additional reinforcement to process the information.
- ESL and LD Learners could be paired with students who have stronger language skills.

Check Your Understanding Answers (page 234)

2. carbon dioxide; water; energy

3. glucose; oxygen

Check Your Understanding Answers (page 235)

4. a) carbon dioxide + water + energy → glucose + oxygen

b) glucose + oxygen → carbon dioxide + water + energy

Try This! Activity (page 234)

Purpose
- Students test foods for the presence of starch.

Science Background
Starch turns blue when it comes in contact with iodine.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
Several days before	• Purchase or gather food samples.
1 day before	• Organize food samples in containers.

APPARATUS	MATERIALS
• medicine dropper	• white potato (1 piece per group) • samples of food (some that contain starch; some that do not) (1 of each sample per group) • iodine solution

Suggested Timing
10–15 min

Safety Precautions  
- Remind students that iodine will stain clothes and skin. Care must be taken to avoid any accidents.
- Have students clean up the work area and wash their hands at the end of the activity.

Activity Planning Notes

Consider providing students with samples of starches such as rice, pasta, wheat flour, cornstarch, and bread.

Iodine will not produce a reaction with foods such as fresh vegetables (e.g., cucumbers, celery), sugar, salt, or oil.

You may want to set up lab stations with a different sample at each station to avoid overcrowding.

Accommodations

• Students with dexterity problems could be teamed with those without such difficulties.

Activity Wrap-up

- As a class, share the results. You might list foods that do/do not contain starch. Afterward, you might discuss where plants store starch. Different plants use different parts (e.g., roots — carrots, potatoes; seeds — corn, peas, wheat).

Try This! Activity (page 235)

Purpose

- Students observe what happens to plant leaves deprived of light.

Science Background

Without access to sunlight, leaves cannot carry out photosynthesis and the leaves do not turn green. The green colour is due to the chlorophyll used in photosynthesis. If all the leaves of a plant were covered for a long time, the plant would die.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 week before	• Order or purchase leafy plants.
1 day before	• Gather materials. • Photocopy **BLM 12–2 Making Food**.

APPARATUS	MATERIALS
• scissors • paper clips	• plant with lots of leaves (1 per group) • black construction paper

Suggested Timing

10–15 min to set up; 5–10 min for observation after a week

Safety Precautions

- Caution students to be careful when handling scissors.

Activity Planning Notes

You may have students do the first part of the activity just before beginning Section 12.3.

Have students cover different areas of several leaves with pieces of paper, and use paper clips to hold the paper in place. Leave the plant in the light for a week before having students remove the paper.

Accommodations

- Some students may have difficulties understanding how to do the activity. **BLM 12–2 Making Food** breaks down the steps. Use the questions to help check students' understanding.
- Students with dexterity problems could be teamed with those without such difficulties.

Activity Wrap-up

- After students have shared their observations, have them complete and then discuss questions 3 and 4 on **BLM 12–2 Making Food**.

Alternative Activities

- Print the reactants and products of the formula for photosynthesis on green cards. Give these cards to students and have them wait outside the door. Put a green light bulb in a classroom lamp to create the atmosphere of an imaginary voyage into the leaf of a plant. Bring the students into the room and have them assemble into reactants and products to create the formula for photosynthesis. They could use choral speaking to chant the formula.
- Print the reactants and products of the formula for cellular respiration on red cards. Give these cards to students and have them wait outside the door. Put a red light bulb in a classroom lamp to create the atmosphere of an imaginary voyage into a plant leaf. Bring the students into the room and have them assemble into reactants and products to create the formula for cellular respiration. They could use choral speaking to chant the formula.

Ongoing Assessment

- Use the Check Your Understanding question on page 235 as a formative assessment for how well students understand the reactants and products of photosynthesis and respiration.

12.4 Circulation in Plants (page 236)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
20–25 min	• class set of blue and yellow coloured pencils	OHT 22 Xylem and Phloem OHT C–20 Respiration, Photosynthesis, and Circulation Connect

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
BSA1.03 – outline how a complex organism functions through the basic interactions between organ systems
BSA2.04 – extract and interpret information from a variety of sources

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 carrot using the two key terms.

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

Reading Icon Answer (page 236)

1. Students should highlight xylem and phloem tubes.

Activity Planning Notes

Help students recall the parts of the animal circulatory system before describing the plant circulatory system.

Have students colour key parts of the diagram on page 236 as follows:
- Shade the arrows that indicate xylem tubes blue.
- Shade the arrows that indicate phloem tubes yellow.
- Include a colour key in the margin.

As a class, read the information about the connection between respiration, photosynthesis, and circulation.

Have students complete and then discuss the organizer on page 237.

Consider using the following overhead transparencies:
- **OHT 22 Xylem and Phloem**
- **OHT C–20 Respiration, Photosynthesis, and Circulation Connect**

Accommodations

- ESL and LD Learners who have difficulty with fill-in-the-blanks questions may need some coaching to help them complete the organizer on page 237.
- Provide students who need more space to complete the organizer on page 237 with a photocopy of O**HT C–20 Respiration, Photosynthesis, and Circulation Connect**. This could be glued onto one of the blank pages at the back of the student resource.

Making Connections Answer (page 236)

2. The tree will lose some phloem tubes, which means that the supply of food to the damaged parts will be cut off. The damaged parts as well as the part of the tree below the damage will die.

Organizer Answers (page 237)

Answers are in italics.
How? Plants take in water through *roots*.
How? Water moves to the leaves through *xylem tubes*.
How? Leaves make food during *photosynthesis*.
How? Food made in the leaves is transported by *phloem tubes*.
How? The plant releases energy from food during *respiration*.

Check Your Understanding Answer (page 237)

3. Wording will vary. For example:
- Before photosynthesis, the xylem tubes transport water to the leaves.
- After photosynthesis, the phloem tubes transport food made in the leaves to all parts of the plant.

Ongoing Assessment

- Use the organizer on page 237 as a formative assessment for knowledge about the connection between the circulatory system, photosynthesis, and respiration.
- Use the Check Your Understanding question as a summative assessment for how well students understand the role of the circulatory system in plants.

Technology Links

- For an activity in which students use a virtual microscope to explore phloem and xylem, go to **www.mcgrawhill.ca/books/Se9** and follow the links to The Virtual Microscope.

Alternative Activities

- Have students view xylem and phloem under a microscope and sketch what they see.
- If dandelions are in season, have students look down the hollow stem to find water droplets.
- Demonstrate or have students do an activity to show how water moves in plants by putting a flower stem in coloured water. Use two test tubes, two different colours of food colouring, a test tube rack, and a white carnation. Use a knife to cut the stem of the carnation down its centre, making the cut long enough so that one part of the stem sits in one test tube and the other half in the other test tube. Fill each test tube with different-coloured water. After up to 24 hours, students should observe that water moved up the stem of the plant into the flower. Explain that splitting the stem proves that the xylem tubes in the stem go all the way from the stem to the petals in the flower.

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12.5 Plant Reproduction (page 238)

SUGGESTED TIMING

40–45 min
15 min to set up; 5 min for observation after several weeks for Try This!

MATERIALS

- paper headbands
- masking tape
- coloured pencils or markers
- sample of a plant that reproduces from each of roots, stems, and leaves (optional)
- samples of seeds spread in different ways (e.g., fruit and burrs) (optional)

BLACKLINE MASTERS

BLM 12–3 Compare Asexual and Sexual Reproduction
OHT C–21 The Flower

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
BSA2.04 – extract and interpret information from a variety of sources
BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats
SIL2.04 – observe and record data, using a variety of formats, including the use of SI units, where appropriate

Science Background

In sexual reproduction, the new plants are genetically different except when identical twins are produced. In asexual reproduction, all plants are genetically identical.

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.
- Play a game called "Headbands" either as a class or on 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 key term be seen by the volunteer. 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 238)

1. Students should highlight asexual reproduction and sexual reproduction.

Reading Icon Answers (page 240)

1. Accept any two flowering plants. For example, apples, tomatoes, strawberries.

2. a) and **b)** Check that students have shaded the flower part that corresponds to each label.

c) Students should draw a line that extends from pollen grains to the stigma and down into the ovary.

Activity Planning Notes

Read the information about asexual and sexual reproduction together as a class.

If possible, display an example of a plant that reproduces from each of roots, stems, and leaves.

Read the information about grafting together. Invite students who have worked in a nursery to share their experiences propagating plants.

Consider having students develop an organizer comparing asexual and sexual reproduction. Afterward, have them write a summary paragraph. They can use **BLM 12–3 Compare Asexual and Sexual Reproduction**.

Accommodations

- Some students may need additional reinforcement to process the information about asexual and sexual reproduction.
- ESL and LD Learners could be paired with students who have stronger language skills.
- Provide students who need more space to answer question 2 on page 240 with a photocopy of **OHT C–21 The Flower**. Remind students to put their name on it.

After students have completed the parts of a flower on page 240, cover the labels on **OHT C–21 The Flower** and use the overhead for students to practise identifying flower parts.

Present the information about how pollen is dispersed and how seeds are spread. If possible, display some samples of seeds that are spread in different ways (e.g., fruit and burrs). Mention that some seeds will develop into plants if there is good soil, water, and sunlight.

Consider using the following blackline master and overhead transparency:
- **BLM 12–3 Compare Asexual and Sexual Reproduction**
- **OHT C–21 The Flower**

Check Your Understanding Answer (page 238)

2. asexual reproduction

Check Your Understanding Answers (page 239)

3. roots, stems, leaves, grafting

4. Answers will vary, but should mention that grafted plants combine desirable qualities of two different plants.

Check Your Understanding Answers (page 241)

3. Wording will vary but should include the following points.
- Pollen lands on the stigma of the pistil.
- A pollen tube grows down the pistil into the ovary.
- Inside the ovary, a grain of pollen combines with an egg to produce a seed.

4. eating seeds and carrying seeds

Try This! Activity (page 239)

Purpose

• Students clone a plant from a leaf cutting.

Science Background

The base of an African violet leaf contains cells that have the ability to act as root cells.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 week before	• Purchase African violet plants.
1 day before	• Gather materials.
Day of	• Set out materials.

APPARATUS	MATERIALS
• paring knife • pot	• leaves of an African violet plant (1 per group) • potting soil • water

Suggested Timing

15 min to set up; 5 min for observation after several weeks

Safety Precautions

• Caution students to be careful when handling knives.
• Have students clean up the work area and wash their hands at the end of the activity.

Activity Planning Notes

Consider demonstrating how to plant a leaf cutting before asking students to do so. Emphasize how to pack down the soil properly and how much water to use to avoid over-watering.

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

As you circulate, coach students who experience some difficulties.

Accommodations

• Students with dexterity problems could be teamed with those without such difficulties.

Activity Wrap-up

• Have students compare their sketches.

Alternative Activity

• Have students produce new plants from runners such as from a spider plant. Provide materials (i.e., spider plant, scissors, beaker, water, foam cup, potting soil). Ideally, allow a young plant to root while it is still attached to the mother plant by setting the pot filled with potting soil within reach of a young plant. After the young plant develops roots a week or so later, cut off its ties with the mother plant.

Alternative Activities

• Show a video called *Flowers*, Bill Nye, The Science Guy (Magic Lantern Communication Ltd.).
• Show a video called *Private Life of Plants 3: Birds and Bees* (PBS, BBC, and Turner Broadcasting, 1995), which shows examples of flower pollination and seed dispersal.
• Have students create a script and perform a skit about pollination, in which they take on roles as parts of a flower. For example: "I'm a bee. I have pollen stuck to my feet. I am landing on the stigma."

Ongoing Assessment

• Use the Check Your Understanding question on page 238 to check students' understanding of asexual and sexual reproduction.
• Check completed flower diagrams on page 240 to assess students' understanding of sexual reproduction.
• Use Check Your Understanding question 3 on page 241 to assess students' understanding of sexual reproduction.

12.6 Flower Dissection (page 242)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
10–15 min 20–30 min for Find Out	• magnifying glass (1 per group)	OHT C–21 The Flower Assessment Master 11 Using Tools and Equipment Checklist Assessment Master 12 Using Tools and Equipment Rubric

Specific Expectations

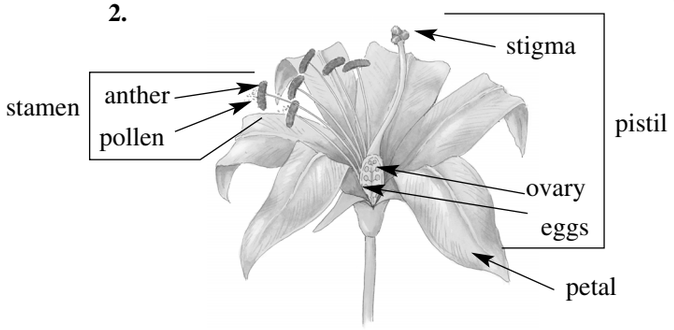
BSA1.01 – describe the basic life-sustaining processes of organisms, including single-celled and complex organisms, using appropriate scientific vocabulary
BSA1.02 – relate structures involved in life-sustaining processes to their function
BSA2.02 – make accurate observations of structures, using microscopes, 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

Reading Icon Answers (page 242)

1. a) Dissection tools from left to right: dissection pins, forceps, dissection scissors, dissecting tray, probe, ruler.

b) Answers will vary depending on the class list of safety precautions. For example:
- 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.

2.



Activity Planning Notes

Review the tools and rules for dissection before beginning the lab. Additionally, provide students with magnifying glasses.

You might consider having students review **Assessment Master 11 Using Tools and Equipment Checklist** to reinforce the importance of using equipment properly.

Consider using the following blackline master and overhead transparency:
- **OHT C–21 The Flower**
- **Assessment Master 11 Using Tools and Equipment Checklist**

Accommodations
- Provide students who need more space to record their answer to question 2 on page 242, with a photocopy of **OHT C–21 The Flower**. Remind students to put their name on it.

Find Out Activity (page 242)

Dissect a Flower

Purpose
- Students dissect a flower to explore its reproductive parts.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 day before	• Purchase or gather fresh flowers.
Day of	• Gather the apparatus and materials. • Photocopy **Assessment Master 12 Using Tools and Equipment Rubric** and **Assessment Master 11 Using Tools and Equipment Checklist** (optional).

APPARATUS	MATERIALS
• dissecting tray (1 per group) • probe • forceps (1 per group) • dissection scissors (1 pair per group) • magnifying glass (1 per group) • 15 cm ruler (1 per group)	• flower from an alstromeria , lily, or other garden plant with clearly visible flower parts (1 per group)

Suggested Timing
20–30 min

Safety Precautions

- Check with students about sensitivity to pollen. If students are sensitive to pollen, encourage them to participate in recording or if possible, provide them with a flower that has no ripe pollen.
- Remind students to be cautious with sharp objects.
- Discuss the safety precautions you and your class developed.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes
Consider using alstromeria flowers, which are readily available and show flower parts clearly. If possible, use flowers that contain pollen.

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

Accommodations
- Some students may need additional reinforcement to process the information and instructions.
- Students with dexterity problems could be teamed with those without such difficulties.
- Provide visually impaired students with a microscope that can project images onto a TV screen, if available.

1. probe, forceps, dissection scissors, magnifying glass, ruler

What to Do Answer (page 243)

3. Check that students have checked off each step.

What Did You Observe? Answer (page 243)

4. Answers will vary. Look for the idea that pollen grains are easily carried by wind or insects, and many do not reach their destination. Eggs are relatively well-protected inside the ovary.

Evaluating Your Technique Answer (page 243)

5. Answers will vary. Do not accept an answer such as, "I wouldn't improve anything." Techniques can be improved by using different tools, modifying some of the steps in the instructions, or improving the accuracy in measurements.

Activity Wrap-up

- Have students complete and then discuss the questions on page 243.
- Encourage students to make inferences about how the length of the stamen and the pistil might help a plant reproduce. Highlight the idea that longer stamens make it easier for pollen to be moved by wind or contacted by insects.
- Ask why a plant might wait to open its stigma until all of its pollen has been released. Highlight the idea that some plants depend on cross-pollination, in which pollen from one plant travels to the stigma of another plant.

Technology Links

For teaching notes about flower parts and functions, and a diagram that students can label, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Flower Parts.

Ongoing Assessment

- Use the completed diagram of the flower as a summative assessment for knowledge about male and female parts.
- Use **Assessment Master 12 Using Tools and Equipment Rubric** to assess students' use of dissection tools during the Find Out activity.

Chapter 12 Review (page 244)

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 12–3 Compare Asexual and Sexual Reproduction
BLM 12–4 Plant Systems Word Puzzle
BLM 12–5 Chapter 12 Practice Test
BLM 12–6 Chapter 12 Test
OHT C–22 Compare Sexual and Asexual Reproduction

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 transparency:
- **OHT C–22 Compare Sexual and Asexual Reproduction**

To provide additional reinforcement of key terms, have students complete the organizer and summary paragraph on **BLM 12–3 Compare Asexual and Sexual Reproduction**. Additionally, have them complete **BLM 12–4 Plant Systems Word Puzzle**.

Once the review is completed and taken up, assign **BLM 12–5 Chapter 12 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 7	12.5	How Sexual Reproduction Happens (page 240)
8	12.1	Root Response to Gravity (page 227); Stem Response to Light (page 230); Plant Response to Touch (page 231)
9 to 12	12.2 and 12.3	Plant Respiration (page 232); Photosynthesis (page 234)
13	12.4	Circulation in Plants (page 236)
14	12.1	Plant Responses (page 227)
15	12.5	Plant Reproduction (page 238)

Accommodations

- In advance, prepare flash cards that list the key terms for Chapter 12. 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 12–5 Chapter 12 Practice Test** can be customized to produce extra reinforcement questions. For example, you might provide prompts for a summary paragraph comparing asexual and sexual reproduction.

Chapter 12 Review Answers (pages 244–245)

1. f) anther

2. d) stamen

3. g) eggs

4. e) pollen

5. a) pistil

6. b) stigma

7. c) ovary

8. Sketches will vary but should show how each plant part responds to the environment. The labels should clarify each response. For example:

a) Root response to gravity — Sketch shows roots growing down.

b) Stem response to light — Sketch shows stem growing upward and toward light.

c) Leaf response to touch — Sketch shows a leaf snapping shut on an insect.

9. b) respiration

10. b) photosynthesis

11. a) plants take in oxygen and release carbon dioxide

12. c) plants take in carbon dioxide and release oxygen

13. a) Xylem tubes carry water and nutrients from the roots to the stems and leaves.

b) Phloem tubes carry food made in the leaves to all other parts of the leaves.

14. Wording may vary. Answers are in italics.

a) leaf; *carries out photosynthesis*

b) *root*; holds the plant and takes in water

c) flower; *has male and female sex organs*

d) *fruit*; grows around seeds

15. Look for one similarity and two differences. For example:
Asexual Differences: 1 parent; offspring are clones; new plants grow from roots, stems, or leaves
Similarity: produce offspring
Sexual Differences: 2 parents; offspring different from parents; new plants grow from seeds

Summative Assessment

- Have students complete **BLM 12–6 Chapter 12 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**.