Activity Preparation for Chapter 8

Activity/Investigation	Advance Preparation	Time Required	Other Considerations
What's Going On? Blown Away! (page 143) (TR page 175)	• 1 day before – Collect the apparatus. – Check that all apparatus is working. – Photocopy any assessment masters you decide to use.	• 40 min	• You may wish to have students create a circuit diagram for your approval before they build their circuits.
Find Out: Plan Your Wiring (page 150) (TR page 180)	• 1 day before – Set groups. – Photocopy **OHT B–15 Plan Your Wiring** and any assessment masters you decide to use. • Day of – Review rules for wiring.	• 75 min	• Each student should have a copy of **OHT B–15 Plan Your Wiring**. • Students should take care that all lines are drawn with rulers.

Materials Needed for Chapter 8

Activity/Investigation	Apparatus	Materials	Blackline Masters
What's Going On? Blown Away (page 143) (TR page 175)	• 2 – 1.5 V batteries in holders • 3 V bulb in holder • 1 A fuse • 4 wires with alligator clips		**Optional** Assessment Master 11 Using Tools and Equipment Checklist Assessment Master 12 Using Tools and Equipment Rubric
Find Out: Plan Your Wiring (page 150) (TR page 180)		• paper • markers or pencil crayons • rulers	**Recommended** OHT B–15 Plan Your Wiring **Optional** Assessment Master 1 Co-operative Group Work Checklist Assessment Master 2 Co-operative Group Work Rubric Assessment Master 7 Scientific Communication Checklist Assessment Master 8 Scientific Communication Rubric

CHAPTER 8 Making Connections to Your Home (page 138)

SUGGESTED TIMING
20 min

Overall Expectations

PECV.01 – describe the characteristics of electrical circuits
PECV.02 – investigate simple electrical circuits, using safe practices
PECV.03 – analyze the practical uses of electrical circuits and their impact on daily life
SILV.01 – illustrate how science is a part of daily life
SILV.02 – use appropriate scientific skills, tools, and safety procedures to investigate problems
SILV.03 – examine the connections between science and activities in daily life
CPMV.01 – explain the characteristics and classification of common materials, using appropriate scientific terminology
CPMV.02 – investigate the physical and chemical properties of common materials through laboratory activities
CPMV.03 – analyze how the use of various materials is based on their physical and chemical properties
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

Activity Planning Notes

Lead a discussion about the graphic on page 138. Ask students what the usual power source is in a home. Have them identify where the wires for most of the circuits are located in the home, and why this graphic is unrealistic.

Check Your Understanding Answers (page 138)

1. to **3.** Accept all reasonable descriptions of potential hazards. For example:
- Short circuits cause wires to heat up and start a fire.
- Damaged wiring creates a shock hazard.
- Safety devices, such as outlet covers, are removed or damaged.
- Too many devices are connected on the same circuit.

Alternative Activity

- Students could create their own cartoons that show unsafe or unrealistic use of electricity and electric devices. They can use ideas from the electric safety checklist on page 119 to get them started.

Technology Links

- For more information and activities on electric safety, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Electric Safety Activities.

8.1 Home Electric Wiring (page 139)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
45 min	• traveller's electric conversion kit (optional)	BLM 8–1 Know Your Current

Specific Expectations

PEC1.02 – demonstrate an understanding that electrical energy can be converted into other forms of usable energy within electrical circuits
PEC1.03 – identify how household and workplace electrical devices operate by converting energy to another form
PEC1.04 – use a variety of symbols to represent different components in electrical circuits
PEC2.05 – extract and interpret information from instructions and manuals for circuits and electrical devices
PEC3.01 – identify circuits and their components in household and workplace settings
SIL1.01 – describe how the procedures, skills, and tools employed in different areas of science are also evident in daily life
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
SIL3.03 – demonstrate an understanding of how problem-solving and decision-making activities in the workplace use scientific process skills
BSA2.04 – extract and interpret information from a variety of sources
BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats
BSA3.01 – analyze how specific equipment and safe practices are used to protect personal health and safety at home and in the workplace

Key Terms Teaching Strategies

The new terms can be added to the word wall. Break up "central electric panel" and "power transmission grid" into individual words and discuss the meaning of each. Students may have prior knowledge of the term "transformer" to share, and they can predict what function a transformer might have in the field of electricity.

Reading Icon Answers (page 141)

3.

4. Students should highlight "what kinds of appliances will be used in the home" and "where these appliances will be used."

Activity Planning Notes

Most students know that their electricity comes from a power station that may be located a fair distance away from their home and community. Students may identify that large cables seen in the city and countryside are part of the power transmission grid. They may incorrectly say that the wires "hum" due to the electricity flowing through them. In actual fact, electricity is silent. The humming sound comes from the wind blowing across the wires, setting them in motion.

Point out that the electricity comes from many power stations across the province and all stations are interconnected. The electricity coming to students' homes may come from a variety of sources. The electricity leaving the station reaches many intermediate stations on the grid where transformers step down the voltage from a very high voltage (hundreds of thousands of volts) to the 120 volts used in homes.

The electric power enters a house through a breaker panel or fuse box, depending on the age of the wiring in the house. An electrician should be the only person to make modifications to this panel or fuse box since it carries a large current. The electric wiring distributes the electricity throughout the house and can be accessed through outlets or hard-wired devices such as lights.

The discussion on page 140 is a good opportunity for students from other countries to share their life experiences. Many European and Asian students will have noticed that the electric outlets in Canada are different from the outlets in their home countries. Consider bringing in a traveller's conversion kit for electricity. These kits can be purchased from various travel outlets or electronics stores.

Some students might know that a stove requires a special outlet. The outlet is needed because a stove has a large energy requirement. Most devices that students use on a day-to-day basis require much less than 120 V but more than what a battery could provide. Transformers step down the voltage so that the correct voltage is given to an appliance. Many students call these transformers "adapters" and know that these must be present in order for devices such as laptop computers and some CD players to work while plugged into a wall outlet. The technological studies department may have examples of household electric outlets (120 V and 240 V) as well as transformers.

Introduce page 141 by reminding students that connecting many devices together can affect the performance of the devices. Students have seen that a circuit can be made that has one bulb, then two bulbs, and finally three bulbs in series. The effect observed was seen in Chapter 7 and can now be tied in to how much current is drawn from the power source. Note that in Chapter 7 all bulbs were identical. In this chapter students will consider devices that draw different amounts of current. Adding together the current of the individual branches yields the total current. **BLM 8–1 Know Your Current** provides students with more examples of calculating current.

Accommodations

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

Consider using the following blackline master:

- **BLM 8–1 Know Your Current**

Check Your Understanding Answers (page 139)

4. a) If too many electric devices are connected in series, the current in the circuit will decrease and none of the devices will work properly.

b) If too many electric devices are connected in parallel, the current in the circuit will increase and could damage devices or wires, or could create a fire hazard.

Check Your Understanding Answer (page 140)

1. A device requires a transformer when it operates at a voltage that is different from the voltage provided by the source.

Making Connections Answer (page 140)

2. The different-shaped outlets are a safety feature designed to ensure that a device that requires 240 V cannot be plugged into a 120 V outlet, and vice versa. This helps protect the device, the circuit, and the home.

Check Your Understanding Answer (page 141)

5. 3 A + 3 A + 3 A+ 3 A = 12 A

Technology Links

- For more information and activities about electric appliances, go to **www.mcgrawhill.ca/books/Se9** and follow the links to How Do Electric Appliances Work?

Alternative Activity

- Use some or all of the activities in the following Physics *ActiveFolders*: Energy, and the Law of Conservation of Energy.

8.2 Fuses and Circuit Breakers (page 142)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
40 min 40 min for What's Going On?	• several types and sizes of circuit breakers and fuses	BLM 8–2 Fuses BLM 8–3 Safe or Overloaded? Assessment Master 11 Using Tools and Equipment Checklist Assessment Master 12 Using Tools and Equipment Rubric

Specific Expectations

PEC1.01 – use scientific terminology during investigations to describe basic electrical concepts and related units of measure
PEC1.04 – use a variety of symbols to represent different components in electrical circuits
PEC2.02 – design, build, and test an electrical circuit to investigate the chosen question, using appropriate safety procedures
PEC2.03 – conduct investigations, using electrical materials, tools, and equipment safely
PEC2.05 – extract and interpret information from instructions and manuals for circuits and electrical devices
PEC2.06 – communicate plans and results of investigations about electrical circuits, using a variety of oral, written, and graphic formats
PEC3.01 – identify circuits and their components in household and workplace settings
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
SIL3.03 – demonstrate an understanding of how problem-solving and decision-making activities in the workplace use scientific process skills
CPM2.03 – organize and record the observations of the investigations, using appropriate formats
CPM2.04 – interpret and communicate the results of investigations
BSA2.04 – extract and interpret information from a variety of sources
BSA2.05 – communicate observations, interpretation of results, and information through appropriate formats
BSA3.01 – analyze how specific equipment and safe practices are used to protect personal health and safety at home and in the workplace

Key Terms Teaching Strategies

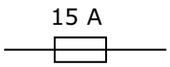
Add key terms with their meanings to the word wall. You might add pictures to the definitions to help remind students of each device. **BLM 8–2 Fuses** may be useful sources of pictures for the definitions.

Reading Icon Answer (page 142)

1. Students should highlight "when too many devices are connected in parallel" and "a short circuit can also cause a circuit to overload."

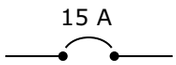
Reading Icon Answer (page 144)

1.



Reading Icon Answer (page 145)

3.



Activity Planning Notes

The lesson could begin with a discussion of the key terms. Some students may have seen fuses and breakers. They may have also had to change a fuse in their homes or reset a breaker. Display pictures of or actual fuses and circuit breakers of different types and sizes. **BLM 8–2 Fuses** may be useful for this purpose.

You may wish to use **BLM 8–3 Safe or Overloaded?** as an overhead projection, and work through the solutions together as students complete **BLM 8–3 Safe or Overloaded**?

Review the need for safety when dealing with electricity. Students must be made aware that overloaded circuits can be dangerous and cause fires.

After completing the introductory material, have students do the What's Going On? activity, Blown Away!

On page 144, have students add the energy requirements next to the devices in the top diagram. Each lamp needs 3 A of current. The television and DVD player need 2 A each. Have students total the current. A total of 10 A is flowing through the circuit. This makes a 15A fuse adequate for this circuit.

Refer to the illustrations of the fuses and fuse box so students have an idea of what these devices look like. You may wish to use **BLM 8–2 Fuses** as an overhead projection. Review the need for safety when dealing with electricity. Overloaded circuits can be dangerous and cause fires.

Lead a discussion on the text portion of page 145. Some students may have seen breakers and a circuit panel. They may have also had to reset the breaker when it tripped. Refer to the pictures of the breaker and circuit panel so students have an idea of what these devices look like. Consider taking students to view a circuit breaker within the school.

Make sure students know that overloaded circuits can be dangerous and cause fires.

Consider using the following blackline masters in this section:
- **BLM 8–2 Fuses**
- **BLM 8–3 Safe or Overloaded?**

Accommodations
- ESL and LD Learners can work with another student with stronger language skills.

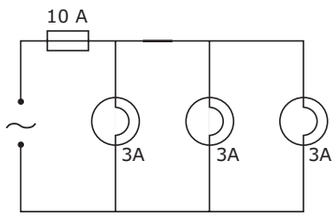
Check Your Understanding Answers (page 142)

2. a) safe: 3 A + 3 A + 2 A + 2 A = 10 A, which is less than the maximum 15 A current for the circuit.

b) unsafe: 3 A + 3 A + 2 A + 2 A + 6 A = 16 A, which is more than the maximum 15 A current for the circuit.

Check Your Understanding Answers (page 144)

2. a)



b) The total current in the circuit increases to 3 A + 3 A + 3 A + 12 A = 21 A. This is more than the fuse can carry. The fuse blows, opening the circuit. No current flows.

Check Your Understanding Answers (page 145)

4. Accept answers that demonstrate an understanding of the key function of fuses and circuit breakers, such as:
A circuit breaker is like a fuse in that both devices open a circuit if the current in the circuit exceeds a safe level.

5. Accept answers that demonstrate an understanding of the different design of fuses and circuit breakers, such as:
A circuit breaker is different from a fuse because a circuit breaker can be reset and used again, while a blown fuse must be replaced with a new fuse.

What's Going on? Activity (page 143)

Blown Away!

Purpose

- Students discover how a fuse or circuit breaker works to prevent overloaded circuits from overheating and causing a fire.

Science Background

Fuses and circuit breakers provide protection against overloading and overheating. Fuses contain a link made of a lead-tin alloy with a very low melting point. When the current is too high, the link melts and breaks the circuit. A circuit breaker performs the same function. A bimetallic strip or electromagnet trips the breaker and interrupts the flow of current when the current exceeds the specified amount. Circuit breakers can be reset when they trip and this is an advantage because they do not have to be replaced. Fuses, on the other hand, have to be replaced because they are "burnt out" when there is an overload in the circuit.

When too many appliances are plugged into the same outlet or two outlets fed by the same circuit, the fuse may blow or the breaker may trip. Replacing the fuse or breaker with one of a larger rating should never be done. The only safe way to rectify the problem is to distribute the appliances over several circuits.

Note that if other bulbs or power sources are used, the current should be calculated or measured in advance in order to choose an appropriate fuse. Electricians usually do this when they are providing a new circuit.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 day before	• Collect the apparatus. • Check that all apparatus is working. • Photocopy any assessment masters you decide to use.

APPARATUS	MATERIALS
• 2 – 1.5 V batteries in holders • 3 V bulb in holder • 1 A fuse • 4 wires with alligator clips	

Suggested Timing

40 min

Safety Precautions

- Check that all wires and clips are safe, with the insulation intact.
- Students should not close their circuits until you have checked them.
- Make sure that students clean up the work area, put away all equipment, and wash their hands at the end of the activity.

Activity Planning Notes

You may wish to have students create a circuit diagram for your approval before they build their circuits.

Accommodations

- Students can work in pairs or small groups.

What Did You Find Out? Answers (page 143)

4. Students' tables should be similar to the following:

Step	Observation
Step 1. fuse before test	wire inside fuse is intact; casing is clear
Step 2. circuit with one battery	bulb lights up
Step 3. circuit with two batteries	fuse blows; bulb goes out
Step 4. fuse after test	wire inside fuse is broken; casing is cloudy

5. The bulb went out.

6. The fuse blew. The wire inside the fuse melted.

7. When the current in the conductor increased over 1 A, the wire in the fuse melted. This opened the circuit so that no current would flow until the problem could be fixed.

Activity Wrap-up

- Discuss the observations and have students share their answers with each other.
- Reinforce safety with students, and the need to have qualified electricians deal with any problems with a circuit panel or fuse box. Make sure that students are aware that damaged fuses or breakers must be replaced.
- You may wish to have students complete **Assessment Master 11 Using Tools and Equipment Checklist**.

Ongoing Assessment

- You may wish to use **Assessment Master 12 Using Tools and Equipment Rubric** to assess students during the What's Going On? activity.

Technology Links

- For more information on how wires, fuses, and connectors work, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Safety Devices.

8.3 You're Grounded! (page 146)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
75 min 75 min for Find Out	• markers or coloured pencils • three-prong plug and outlet • two-prong plug and outlet • GFI outlet • household electric wires stripped at the ends to show the component wires—red, black, and white	OHT B–14 You're Grounded OHT B–15 Plan Your Wiring Assessment Master 1 Co-operative Group Work Checklist Assessment Master 2 Co-operative Group Work Rubric Assessment Master 7 Scientific Communication Checklist Assessment Master 8 Scientific Communication Rubric

Specific Expectations

PEC1.01 – use scientific terminology during investigations to describe basic electrical concepts and related units of measure

PEC1.02 – demonstrate an understanding that electrical energy can be converted into other forms of usable energy within electrical circuits

PEC1.04 – use a variety of symbols to represent different components in electrical circuits

PEC2.05 – extract and interpret information from instructions and manuals for circuits and electrical devices

PEC2.06 – communicate plans and results of investigations about electrical circuits, using a variety of oral, written, and graphic formats

PEC3.01 – identify circuits and their components in household and workplace settings

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

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

SIL3.03 – demonstrate an understanding of how problem-solving and decision-making activities in the workplace use scientific process skills

CPM1.04 – describe the physical properties of common materials, using appropriate scientific terminology

CPM2.03 – organize and record the observations of the investigations, using appropriate formats

CPM2.04 – interpret and communicate the results of investigations

CPM3.03 – present a recommendation based on the results of the investigation and the research of the product, appropriate for someone interested in using the product

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

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

BSA3.01 – analyze how specific equipment and safe practices are used to protect personal health and safety at home and in the workplace

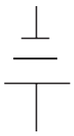
BSA3.02 – examine case studies of common workplace environments to develop a checklist of safety practices necessary to sustain systems and processes critical to life

Key Terms Teaching Strategies

Add the new terms to the word wall. Students will likely have stories to share about the experience of being grounded. Focus the discussion on what "grounded" means (not able to go somewhere else) and tie it in with the meaning in the electric sense of the word.

Reading Icon Answers (page 146)

1. Students should highlight the hot wire in red or black, and the ground wire in green. The neutral wire should be left white.

2. 

Activity Planning Notes

Students are familiar with the idea that large antennae (like the CN Tower) are grounded. They know that this provides some safety to the tower. From their personal experiences and pictures seen in textbooks, they may also know that a "ground" connects live electricity, such as a lightning strike, to Earth's surface.

Students should have an understanding that touching or coming close to live wires is extremely dangerous. This is an opportunity to show how to wire an electric box or have a technological studies teacher come into your class to demonstrate how repairs to wires are made. Proper safety should always be enforced, such as cutting power to the circuit.

Students will learn about this section more readily if they have opportunities to practise. They may have seen an adult replace an electric outlet and may be enthusiastic about trying to do this in class.

You can use **OHT B–14 You're Grounded** both as an overhead projection and as a blackline master. Students can colour in the wires following the instructions on page 146.

Have several types of plugs and outlets on hand for students to examine. Students may have noticed that some plugs fit in an outlet only one way. This type of plug is a polarized plug. Polarized plugs are used to connect the most exposed part of an appliance to the ground wire. An electric shock would be prevented if you were accidentally touching the ground and the exposed part of an appliance.

Many students have seen three-prong plugs. They may have seen three-prong plugs from which the ground prong has been removed. Discuss the dangers of adapting this kind of plug so that it may fit into a regular two-prong outlet.

Students may not have noticed that all outdoor electric plugs are of the three-prong variety. They may have noticed that some plugs are not only three-pronged but also polarized. On a polarized plug, the round prong is larger.

Accommodations

- Be sure students have a chance to see and handle the plugs and outlets. You may wish to have some students explain to you individually why certain plugs do not work with certain outlets, and the importance of the ground wire.
- There is a lot of reading on pages 146 to 149. Consider pairing students with weaker reading skills with those with stronger skills, or meet with some students as a small group and read aloud and discuss the material together.

Ground Fault Interrupter (GFI) outlets monitor the difference of the current in the "hot" wire and the "ground" wire. If the currents differ by as little as 5 mA, the outlets break the circuit in as little as 0.025 seconds. A GFI outlet should be brought in so students can see a real one. It should be noted that GFI outlets are not infallible. They offer a measure of safety but may fail. Under modern regulations, GFI outlets are necessary for all bathroom outlets. Discuss the importance of this regulation.

Consider using the following overhead transparency:
- **OHT B–14 You're Grounded**

Check Your Understanding Answers (page 146)

3. a) hot wire

b) ground wire

c) neutral wire

Check Your Understanding Answers (page 147)

4. a) A ground wire carries unsafe current away from a faulty electric device, so it will not harm a person who touches the device.

b) A ground wire completes a circuit. The current in the circuit will be high enough to trip the circuit breaker or blow the fuse, so no current will flow through the circuit until the faulty device is removed.

Check Your Understanding Answers (page 148)

1. Answers will vary. Accept answers that demonstrate understanding of the purpose of GFI and ground wires, such as:
A GFI outlet is like a ground wire because both protect people against electric shock hazard from ground faults.

2. Answers will vary. Accept answers that demonstrate understanding of the design of GFI and ground wires, such as:
A GFI outlet does not need to be connected to the ground wire in a device, while a ground wire only works when the ground wire in the device is connected to the ground wire in the outlet.

Check Your Understanding Answers (page 149)

3. Dad's idea will overload the circuit. Either the devices will not work, or the unsafe wiring could be a fire hazard.

4. Removing the ground wire prong means that the ground wire in the cord of the saw can no longer connect to the ground wire of the building wiring. Margo has no protection if the wiring in her saw is damaged and electric current flows through the saw case.

Find Out Activity (page 150)

Plan Your Wiring

Purpose

- Students investigate a real-life electric circuit problem.

Science Background

Usually, appliances that heat something up (e.g., a coil in a stove or in a toaster) draw a larger current than other appliances. Outlets in kitchens have the top plug and the bottom plug of each outlet on a separate circuit. This allows a toaster and a kettle to be used at the same time without overloading the circuit. This real-life requirement need not be incorporated into this activity.

A GFI outlet should be present whenever an electric outlet is near a water source. All other outlets can be 120 V.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 day before	• Set groups. • Photocopy **OHT B–15 Plan Your Wiring** and any assessment masters you decide to use.
Day of	• Review rules for wiring.

APPARATUS	MATERIALS
• markers or pencil crayons • rulers	

Suggested Timing

75 min

Activity Planning Notes

Each student should have a copy of **OHT B–15 Plan Your Wiring**. The rules for wiring should be discussed prior to beginning the activity.

Discuss how to make a good diagram using the following points. You might post the list on the chalk board. Expect students to emulate real-life electric circuit diagrams, which use only straight lines.

- Use a ruler to draw straight lines.
- Make lines thin and neat.
- Lines should not cross each other, but pass over one another.
- Lines can indicate junctions.
- Lines should follow walls.
- Colour code lines that are on the same circuit. Use a different colour for each circuit.
- Make a legend.

You might point out features of a poor diagram. On chart paper, you could draw some circuit diagrams that do not meet the criteria for an acceptable diagram. Ask students to explain what is wrong with each diagram.

Encourage discussion until everyone is clear about what they are to do.

Accommodations

- Students with physical difficulties may be paired with students who do not have motor skills difficulties. Different-coloured stickers may be used with students who have serious motor skills difficulties. These students may use the stickers to indicate the circuit that the appliance is connected to.

What Did You Find Out? Answers (page 151)

7. Answers will vary. Accept answers that demonstrate an understanding of the wiring rules provided.

8. Answers will vary. Accept answers that demonstrate an understanding of the use of fuses or circuit breakers, GFI outlets, and ground wires.

9. a) and **b)** Answers will vary. Plans should be similar in that they are consistent with the wiring rules. For example, the electric stove and the refrigerator will always be on separate circuits. Plans will differ in the specific circuits designed by students.

Activity Wrap-up

- Finishing a basement is a project that many homeowners decide to tackle. This activity allows students to apply their knowledge to a real-life scenario. Students should take some time to survey their house or apartment looking for the location of GFI outlets. You may need to discuss that many older buildings are not up to modern wiring standards.
- Students could complete **Assessment Master 1 Co-operative Group Work Checklist** and/or **Assessment Master 7 Scientific Communication Checklist**.

Alternative Activity

- Students might consider investigating becoming an electrician or appliance repairperson as a possible career path. They could list the qualities that a person who works with electricity should possess, as well as the high school and other courses that are required.

Ongoing Assessment

- Collect and assess the plans completed in the Find Out activity.
- You may wish to use **Assessment Master 2 Co-operative Group Work Rubric** and/or **Assessment Master 8 Scientific Communication Rubric** to assess students' performance in the Find Out activity.
- As an ongoing assessment for the whole section, you may wish to meet with students individually and ask them the Check Your Understanding questions from this section. Use **Assessment Master 8 Scientific Communication Rubric** to help assess their answers.

Technology Links

- For more information on careers in electricity, go to **www.mcgrawhill.ca/books/Se9** and follow the links to Careers in Electricity.

Chapter 8 Review (page 152)

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 8–4 Label the Picture
BLM 8–5 Chapter 8 Practice Test
BLM 8–6 Chapter 8 Test

Accommodations

- 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 8–5 Chapter 8 Practice Test** can be customized to produce extra reinforcement questions.

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 **BLM 8–4 Label the Picture**. Once the Chapter Review is completed and taken up, assign **BLM 8–5 Chapter 8 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	8.1	Know Your Voltage (page 140)
2	8.3	You're Grounded! (page 146)
3	8.3	You're Grounded! (page 146)
4	8.3	You're Grounded! (page 146)
5	8.3	Not My Fault! (page 148)
6	8.2	You're Grounded! (page 146)
7 a)	8.2	How a Circuit Breaker Works (page 145)
7 b)	8.3	Not My Fault! (page 148)
7 c)	8.1	Know Your Voltage (page 140)
7 d)	8.1	Know Your Voltage (page 140)
8	8.3	You're Grounded! (page 146)
9 a)	8.2	Fuses and Circuit Breakers (page 142)
9 b)	8.2	Fuses and Circuit Breakers (page 142)
10	8.1	Know Your Current (page 141)
11 a)	8.3	Not My Fault! (page 148)
11 b)	8.3	Not My Fault! (page 148)

Chapter 8 Review Answers (pages 152–153)

1. **f)** transformer

2. **b)** hot wire

3. **a)** neutral wire

4. **c)** ground wire

5. **e)** ground fault

6. **d)** GFI outlet

7. **a)** F. One difference between a fuse and a circuit breaker is that a circuit breaker can be used more than once. Or, One difference between a fuse and a circuit breaker is that a fuse can be used only once.

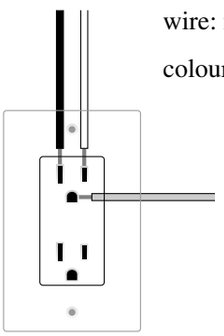
b) T

c) F. Most outlets in a home carry 120 V.

d) F. A stove, freezer, and clothes dryer are not likely to be connected together on one circuit. Or, A stove, freezer, and clothes dryer are likely to be on separate circuits.

8. wire: hot wire

colour code: red or black



wire: neutral wire

colour code: white

wire: ground wire

colour code: green or bare copper

9. **a)** Unsafe. 8 A + 8 A + 5 A = 21 A, which is higher than the 20 A maximum.

b) Safe. 3 A + 3 A + 3 A + 1 A = 10 A, which is less than the 15 A maximum.

10. 4 A + 4 A + 4 A + 4 A = 16 A. This is higher than the 15 A fuse can carry. The fuse will blow. No current will flow in the circuit, and all the lights will go off. No current will flow until the problem is fixed and the fuse is replaced.

11. **a)** GFI outlets are usually located in areas that are close to water. Examples are kitchen counters, bathrooms, and outdoor areas.

b) The GFI outlet has sensors that can detect a ground fault. If a ground fault is detected, the GFI outlet works like a circuit breaker to open the circuit so no current flows.

Summative Assessment

- Have students complete **BLM 8–6 Chapter 8 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**.

Activity Preparation for Unit B Task

Activity/Investigation	Advance Preparation	Time Required	Other Considerations
Test It! Build Your Own Electric Device (page 154) (TR page 186)	• 1 week before – Help students do advance preparation and planning for materials. Help them gather materials, or gather materials for them. • 1 day before – Photocopy **Master 2 Safety Precaution Symbols**, **BLM B–1 Build Your Own Electric Device Rubric**, **Assessment Master 8 Scientific Communication Rubric**, and any other assessment masters you decide to use.	• 90–120 min	• Make sure that students understand the need for advance preparation, and that you need to know their plans to help them plan how to gather materials.

Materials Needed for Unit B Task

Activity/Investigation	Apparatus	Materials	Blackline Masters
Test It! Build Your Own Electric Device (page 154) (TR page 186)	various, depending on projects, such as: • lights (such as Christmas lights) • wires • switches • peg board • scissors • batteries	various, depending on projects, such as: • cardboard • paper • felt pens • glue	**Recommended** Master 2 Safety Precaution Symbols BLM B–1 Build Your Own Electric Device Rubric Assessment Master 8 Scientific Communication Rubric **Optional** Assessment Master 1 Co-operative Group Work Checklist Assessment Master 2 Co-operative Group Work Rubric Assessment Master 7 Scientific Communication Checklist Assessment Master 9 Safety Checklist Assessment Master 10 Safety Rubric Assessment Master 11 Using Tools and Equipment Checklist Assessment Master 12 Using Tools and Equipment Rubric

Unit B Task: What Can You Build?

(page 154)

SUGGESTED TIMING

90–120 min for Test It!
20–30 min for Science and Literacy Link

BLACKLINE MASTERS

Master 2 Safety Precaution Symbols
BLM B–1 Build Your Own Electric Device Rubric
BLM B–2 Energy Conservation Communication Rubric
Assessment Master 1 Co-operative Group Work Checklist
Assessment Master 2 Co-operative Group Work Rubric
Assessment Master 7 Scientific Communication Checklist
Assessment Master 8 Scientific Communication Rubric
Assessment Master 9 Safety Checklist
Assessment Master 10 Safety Rubric
Assessment Master 11 Using Tools and Equipment Checklist
Assessment Master 12 Using Tools and Equipment Rubric

Specific Expectations

PEC1.02 – demonstrate an understanding that electrical energy can be converted into other forms of usable energy within electrical circuits
PEC1.03 – identify how household and workplace electrical devices operate by converting energy to another form
PEC1.04 – use a variety of symbols to represent different components in electrical circuits
PEC2.01 – formulate scientific questions about circuits and create a simple plan to carry out an investigation, including safety procedures
PEC2.02 – design, build, and test an electrical circuit to investigate the chosen question, using appropriate safety procedures
PEC2.03 – conduct investigations, using electrical materials, tools, and equipment safely
PEC2.06 – communicate plans and results of investigations about electrical circuits, using a variety of oral, written, and graphic formats
SIL1.01 – describe how the procedures, skills, and tools employed in different areas of science are also evident in daily life
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
SIL3.01 – develop and investigate research questions about an everyday science-related topic of personal interest
SIL3.02 – evaluate the investigation of the topic they selected and suggest possible refinements
SIL3.03 – demonstrate an understanding of how problem-solving and decision-making activities in the workplace use scientific process skills
BSA3.01 – analyze how specific equipment and safe practices are used to protect personal health and safety at home and in the workplace

Test It! Activity (page 154)

Build Your Own Electric Device

Purpose

- Students design and build their own electric device.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 week before	• Help students do advance preparation and planning for materials. Help them gather materials, or gather materials for them.
1 day before	• Photocopy **Master 2 Safety Precaution Symbols**, **BLM B–1 Build Your Own Electric Device Rubric**, **Assessment Master 8 Scientific Communication Rubric**, and any other assessment masters you decide to use.

APPARATUS	MATERIALS
various, depending on projects, such as: • lights (such as Christmas lights) • wires • switches • peg board • scissors • batteries	various, depending on projects, such as: • cardboard • paper • felt pens • glue

Suggested Timing

90–120 min

Safety Precautions

- Be sure that students check their plans with you before they build, and that you check all circuits before they are closed.
- Check all equipment and apparatus, especially those pieces that students have brought from home.
- Remind students to keep their work area clean, put away all equipment and apparatus after they are finished, and then wash their hands.

Activity Planning Notes

Students are very creative when they are asked to design a device. They will come up with a variety of devices, from lighted signs to games. Keep in mind that if the device is kept simple it will not frustrate students when they actually begin the project.

Students can work in groups to design the device. You should check their design plans. If the design is acceptable, a clear area to work should be assigned to each group. Each group is responsible to keep their work area clean and safe. Each member of the group should be actively involved.

Another way to approach this is as a class project. If this is done, then one design can be used and students can follow the same set of instructions that you create together.

Consider using these blackline masters:

- **Master 2 Safety Precaution Symbols**
- **BLM B–1 Build Your Own Electric Device Rubric**

Accommodations

- To help students understand what you are looking for in the Test It!, photocopy and discuss **BLM B–1 Build Your Own Electric Device Rubric**.
- For further guidance on specific parts of the process, you may wish to use some or all of the following blackline masters:
  - **Assessment Master 1 Co-operative Group Work Checklist**
  - **Assessment Master 7 Scientific Communication Checklist**
  - **Assessment Master 9 Safety Checklist**
  - **Assessment Master 11 Using Tools and Equipment Checklist**

Test It! Answers (pages 154–157)

5. Ensure that students have included all of the relevant safety precautions, including the following points. Students could include safety symbols copied from the last page of the student resource or from **Master 2 Safety Precaution Symbols**.
- Check all the equipment. Replace any damaged equipment.
- Remove all metal jewellery.
- Make sure the work area is clean, dry, and uncluttered.
- Connect loads in order:
  - Connect one end of a wire to the positive terminal of the battery.
  - Connect components one at a time.
  - Complete the circuit by connecting the free end of the last wire to the negative terminal of the battery.
  - If you are connecting one wire to another, use the alligator clips to hold the wires together.
- Face all batteries the same way.
  - If you are connecting batteries together, always connect the positive end of one battery to the negative end of the next battery.
- Keep switches off.
  - Always keep the switch in the off position until the circuit is complete. When you are ready to use your circuit, turn the switch on. Turn it off when you are finished.
- Clean up the work area and wash hands after the activity.

6. – 17. Answers will vary depending on the device students build. Make sure that they pre-plan, get your approval of their plan, build and test their device, make modifications where necessary, consider how they might improve the device, and consider why they might have run into problems.

18. – 19. Expect students to use words and/or visuals to explain what their device is and how it works. You may wish to have them review examples of professional device inserts before doing this part.

20. Answers may vary. Students should mention not using this or any electric device in the presence of water. The device may not be suitable for young children.

Science and Literacy Link (page 158)

Activity Planning Notes

This is an important activity for the students. There are many ways in which information can be imparted to them. The most common is through articles in newspapers or magazines.

You may wish to read the article aloud and add supportive commentary as you read. Another way of approaching this article is to have students read the article first silently and then you can read the article aloud.

Ask leading questions such as, "What was the article about? What words did you see that we used in class in our activities?" as a launching point to answering the questions on page 159.

You may wish to use the following blackline master during this activity:
- **BLM B–2 Energy Conservation Communication Rubric**

Accommodations

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

Ongoing Assessment

- Use **BLM B–2 Energy Conservation Communication Rubric** or **Assessment Master 8 Scientific Communication Rubric** to help you assess students' work in the Science and Literacy Link.

Science and Literacy Link Answers (page 159)

1. Look for the following ideas. All electric energy comes from the natural environment. Producing electric energy affects communities and ecosystems by creating pollution and harmful waste products and by flooding large areas of land.

2. Answers will vary. Look for three examples of conservation such as:

a) Turn off the lights in rooms that no one is in.

b) Put on a sweater instead of turning on the electric heater.

c) Turn off the television when no one is watching it.

3. Opinions will vary. For example:
- Yes — People's energy consumption practices affect the environment.
- No — I need a more specific list of what harm electric energy does and what specific steps I should take to conserve energy.

Summative Assessment

- Use **BLM B–1 Build Your Own Electric Device Rubric** and **Assessment Master 8 Scientific Communication Rubric to** assist you in assessing student work on this task.
- You may also wish to use some of the following assessment masters:
  - **Assessment Master 2 Co-operative Group Work Rubric**
  - **Assessment Master 10 Safety Rubric**
  - **Assessment Master 12 Using Tools and Equipment Rubric**