

Lesson 2: Simple circuits

Duration

75 minutes

Lesson overview

Students learn about circuits by exploring the different parts of circuits and how they work. They build simple circuits using hands-on materials and measure voltage to develop their understanding of electricity. Finally, students continue tracking their personal use of electricity.

Objectives

Students will be able to:

- generate questions regarding electricity
- draw and build simple circuits
- measure voltage in simple circuits
- analyze the components and characteristics of simple circuits
- collect data using the personal electricity tracker

What you'll need

- Electricity Concepts Teacher Backgrounder from Lesson 1
- computer, projector, and screen
- Circuit Concepts Slideshow and Slideshow Notes
- Circuit Concepts Notes Student Handout
- circuit building materials from the Circuit Challenges Kit (for groups of three students)
 - dry cells (batteries)
 - battery holders
 - wires
 - light bulbs
 - switches
- multimeter or voltmeter and ammeter (shared)
- Simple Circuits Student Handout
- Curricular Competency Self-Assessment
- Personal Electricity Tracker Student Handout



Preparation

- If not done so already, email EnergyLeaders@fortisbc.com to order your Circuit Challenges Kit (allow three weeks for delivery). The materials will be needed for this lesson.
- Review the relevant sections of the Electricity Concepts Teacher Backgrounder and the Word List Definitions found in the Grade 9 Electricity Module Overview in Lesson 1.
- Review the Circuit Concepts Slideshow and Circuit Concepts Slideshow Notes.
- Prepare the necessary circuit building materials from the Circuit Challenges Kit and find multimeters for students to share.
- Photocopy the Circuit Concepts Notes Student Handout, the Simple Circuits Student Handout and the Curricular Competency Self-Assessment (one of each per student).

Lesson notes

The circuit building activity provides a safe and hands-on, inquiry-based approach to exploring circuits, their components and the relationships among the concepts involved. The Circuit Challenges Kit provided with this module includes the materials needed to support students, working in small groups, with these explorations. Circuit challenges suggested for this lesson address basic concepts related to circuits, voltage and current, and can be adapted or modified to meet the needs and abilities of students. Note that you may wish to provide a hands-on circuit building opportunity prior to presenting the slideshow.

Prior to teaching the lesson, become familiar with all the components of the Circuit Challenges Kit. We have provided guidelines in the Electricity Concepts Teacher Backgrounder to help you ensure the circuits work properly, safely and are measured accurately.

Since safety is a key consideration, the following guidelines should be observed at all times:

- Keep all circuit materials away from sources of water or other liquids.
- Ensure the circuit materials are not damaged (i.e. frayed or exposed wires).
- Ensure the circuit is open (i.e. switched off) before touching any metal parts of the circuit.
- Don't overload the circuit by linking too many dry cells together. Too much voltage or current can lead to overheating, fire or an explosion.

Students will be provided with the Curricular Competency Self-Assessment in this lesson to start thinking about how they are demonstrating competencies throughout the module. Students aren't expected to reflect on all of the curricular competencies. The handout lists key grade 9 Science curricular competencies related to the module with the intention that teachers will support student reflection on their growth and learning in the curricular competencies.

Word list

ammeter	load
circuit	multimeter
connecting wires	power source
current	switch
dry cell	voltage
electricity	voltmeter



Lesson activities

Activity 1: Simple circuits review (5 minutes)

- Ask students what a circuit is and what the different parts of a circuit could be. Have them share their ideas with a partner. Discuss as a class.
- Discuss real world applications of electrical circuits with the students. Ask them to think about where different circuits might be found in the following places:
 - their home
 - at school
 - a local business
 - a local sports arena

Activity 2: Circuit concepts (20 minutes)

- Distribute the Circuit Concepts Notes Student Handout. Show the Circuit Concepts Slideshow using the Circuit Concepts Slideshow Notes.
- Have students take notes on their Circuit Concepts Notes Student Handout.

Activity 3: Building simple circuits (40 minutes)

- Distribute and review the Simple Circuits Student Handout.
- Introduce the Circuit Challenges Kit and look at the materials as a class. Review safety considerations when working with circuit materials.
 - Allow time for students to explore with the materials.
- Demonstrate how to safely build a simple circuit in front of the class by connecting all the components together and lowering switch (thus making it a “closed circuit”). Next, demonstrate how to measure voltage and current by connecting the ammeter and voltmeter (or multimeter) to the circuit.
- Have students look at the Simple Circuits Student Handout and review the questions, materials and challenges involved.
- Form groups of three students and distribute kit materials to each group.
- Ask students to complete the circuit-building challenges and fill in their Simple Circuits Student Handout as they complete the circuit-building activities.
- Review learnings and any questions with students. Clean up kit materials.

Activity 4: Tracking our personal electricity use (10 minutes)

- Have students take out their Personal Electricity Tracker Student Handout (from Lesson 1) and update their personal electricity consumption.
- Give each student a copy of the Curricular Competency Self-Assessment and review. Explain they will be completing the self-assessment later in the module.

Assessment

- Observe and assess student ability to build simple circuits using hands-on materials.
- Review students’ Simple Circuits Student Handout and assess their ability to draw and build simple circuits, measure current and voltage and analyze the components and characteristics of simple circuits.
- Review students’ Personal Electricity Tracker Student Handout and assess their ability to collect accurate data about their personal electricity use.



Extensions

- Have two groups combine Circuit Challenges Kit materials to create more elaborate circuits.
- Explore the difference between insulators and conductors. Safely include other classroom items into the circuit to test their conductivity. Examples include: paper clips, coins, aluminum foil, etc.
- Explore circuit simulations on the Internet.

