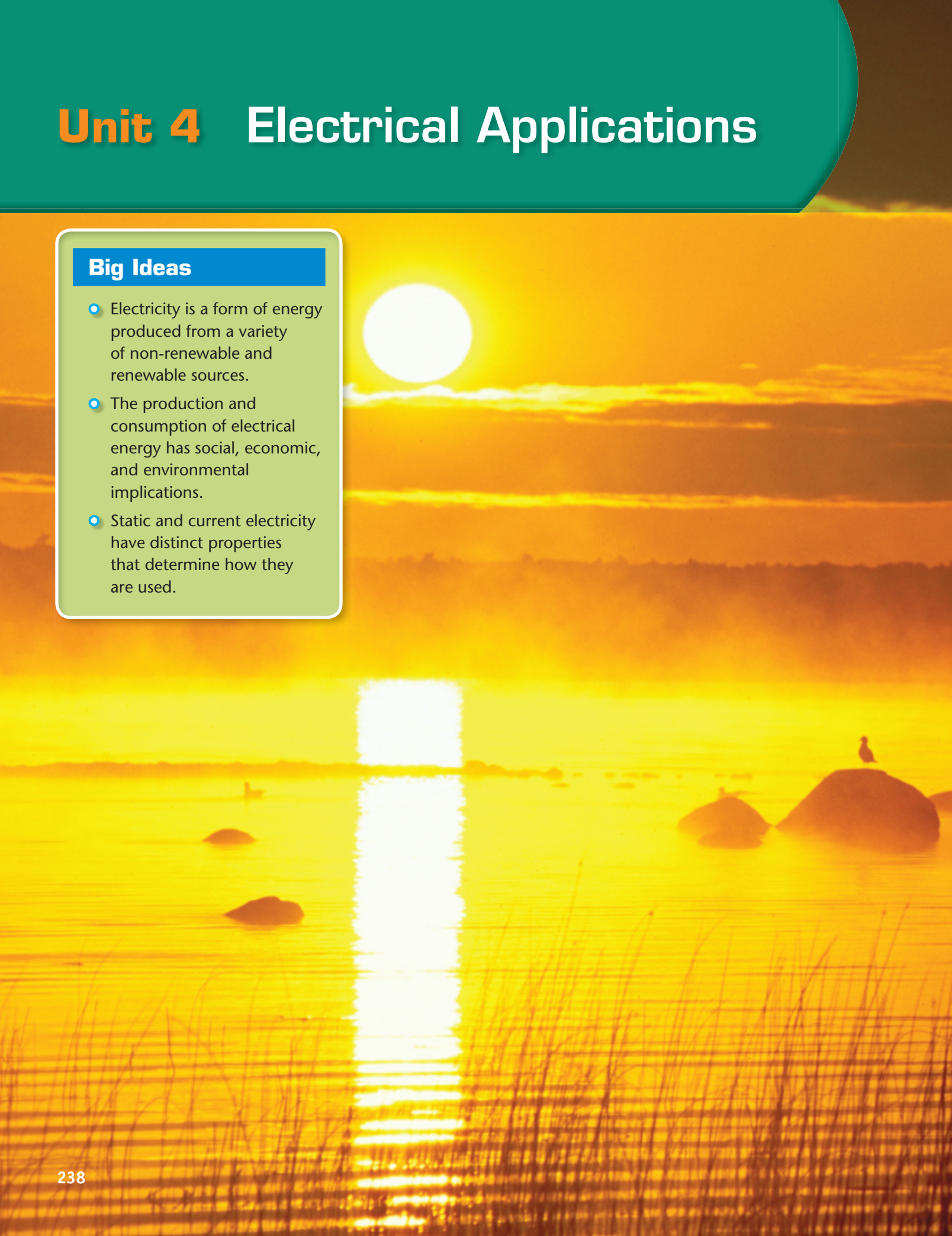
Unit 4 Electrical Applications



Big Ideas

- Electricity is a form of energy produced from a variety of non-renewable and renewable sources.
- The production and consumption of electrical energy has social, economic, and environmental implications.
- Static and current electricity have distinct properties that determine how they are used.

"Electricity"
by Orchestral Manoeuvres In The Dark

Our one source of energy
The ultimate discovery
Electric blue for me
Never more to be free
Electricity
Nuclear and HEP
Carbon fuels from the sea
Wasted electricity

Our one source of energy
Electricity
All we need to live today
A gift for man to throw away
The chance to change has nearly gone
The alternative is only one
The final source of energy
Solar electricity

Our Sun is a potential source of all the electrical energy people could ever need.

What challenges must be overcome for the Sun to be a practical source of electrical energy?

Unit 4 At a Glance

In this unit you will learn that electricity is a form of energy that can be produced from a variety of non-renewable and renewable sources. You will also learn that the uses of static and current electricity are determined by their properties and that the production and consumption of electrical energy has social, economic, and environmental implications.

Topic 4.1: How do the sources used to generate electrical energy compare?

Key Concepts

- Different sources of energy can be converted into electrical energy.
- Renewable and non-renewable energy sources have advantages and disadvantages.

Topic 4.7: How can we conserve electrical energy at home?

Key Concepts

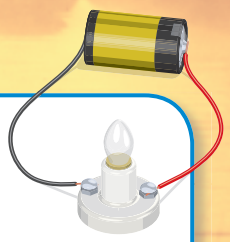
- Conserving energy at home requires an understanding of how energy is measured.
- People can conserve energy by making informed choices.

Electrical Applications

Topic 4.6: What features make an electrical circuit practical and safe?

Key Concepts

- Practical wiring for a building has many different parallel circuits.
- Circuit breakers and fuses prevent fires by opening a circuit with too much current.
- Higher-voltage circuits, larger cords and cables, and grounding help make home circuits safe.



Topic 4.5: What are series and parallel circuits and how are they different?

Key Concepts

- The current in a series circuit is the same at every point in the circuit.
- The current in each branch in a parallel circuit is less than the current through the source.
- The sum of the potential differences across each load in a series circuit equals the potential difference across the source.
- The potential difference across each branch in a parallel circuit is the same as the potential difference across the source.

Topic 4.2: What are charges and how do they behave?

Key Concepts

- Negative charges are electrons, and positive charges are protons.
- Opposite charges attract each other, and like charges repel each other.
- Negative charges can move through some materials but not others.

Topic 4.3: How can objects become charged and discharged?

Key Concepts

- Objects can become charged by contact and by induction.
- Charged objects can be discharged by sparking and by grounding.

Topic 4.4: How can people control and use the movement of charges?

Key Concepts

- A constant source of electrical energy can drive a steady current (flow of charges).
- An electric current carries energy from the source to an electrical device (a load) that converts it to a useful form.
- A source, load, and connecting wires can form a simple circuit.
- Meters can measure potential difference and current.
- Potential difference and resistance affect current.

Looking Ahead to the Unit 4 Project

At the end of this unit, you will do a project. The **Inquiry Investigation** involves planning a way to reduce energy consumption in a room of your home. The **Issue to Analyze** challenges you to find out which power companies in Ontario use "greener" energy sources. Read pages 328–329 With tips from your teacher, start your project planning folder now.

Get Ready for Unit 4

Concept Check

1. Using the words below, complete each sentence in your notebook.

current	series	transformed
parallel	static	

a) Electrical energy can be changed into other forms of energy. What is another word for "changed?"

b) What type of electrical energy is the build-up of an electrical charge on the surface of an object?

c) What type of electrical energy can be described as the movement of electrical charges?

d) In which type of circuit is there a single path for charges to flow?

e) In which type of circuit are there two or more paths for charges to flow?

2. Examine the picture below. Identify materials that are either insulators or conductors of electricity. Record your answers in a two-column chart with the headings "Insulating Materials" and "Conducting Materials."

3. Electrical energy can be converted into other forms of energy. These include mechanical energy, sound energy, light energy, and heat. Sometimes an electrical device converts electrical energy into more than one form of energy. Use the phrases in the box below to answer the questions about energy conversion in some common electrical devices. Write your answers in your notebook.

mechanical energy	sound energy	light energy
		heat

a) In an MP3 player, into what form of energy is electrical energy converted?

b) Into what forms of energy is electrical energy converted in a toaster oven?

c) Into what forms of energy is electrical energy converted in a TV set?

d) You turn on a blender to make a milkshake. Into what forms of energy is electrical energy converted?

Inquiry Check

4. Plan You predict that a rubber balloon will allow a static charge to build up on it, if the balloon is rubbed with another object. Design a test you could perform to show the balloon's ability to hold a static charge.

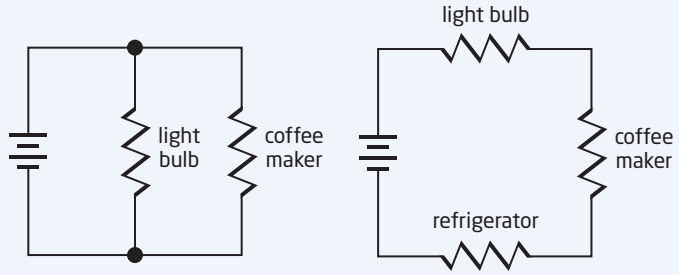
5. Analyze Use the circuit diagrams below to complete each sentence in your notebook.

a) Which circuit, A or B, is a series circuit?

b) Which circuit has two loads (electrical devices)?

c) One of the circuits shows how electrical eenrgy flows in our homes. Identify this circuit.

d) In which circuit will all loads (electrical devices) stop working if one of the loads burns out?



Circuit A Circuit B

Numeracy and Literacy Check

7. Analyze The Ontario Energy Board sets the price of electricity in Ontario based on the time of day.

Electricity Use Pricing in Ontario (2008)

Day	Time	Use	Price Rate (cents per kW•h)
Weekends and holidays	All day	Non-peak	0.04
Summer weekdays (May 1st-Oct 31st)	7 A.M.–11 A.M.	Non-peak	0.07
	11 A.M.–5 P.M.	Peak	0.08
	5 P.M.–7 A.M.	Non-peak	0.05
Winter weekdays (Nov 1st-Apr 30th)	7 A.M.–11 A.M.	Peak	0.08
	11 A.M.–5 P.M.	Non-peak	0.07
	5 P.M.–8 P.M.	Peak	0.08
	8 P.M.–7 A.M.	Non-peak	0.05

a) When are the most expensive times for electricity use?

b) When are the least expensive times for electricity use?

8. Writing Write a one-minute school PA announcement encouraging students and staff to reduce their daily electricity use.