Chapter 9: Circuits are designed to control the transfer of electrical energy.
Series Circuits

• There is only one path for the current to travel.
• bulbs connected in series; when one goes out, they all go out.
• As you add more bulbs, the brightness of the bulbs decreases. (voltage is affected)
• Adding more bulbs increases the resistance thereby decreasing the total current in the circuit.
Ex. Christmas lights
Parallel Circuits

- A circuit with several different paths.
- Bulbs connected in parallel; when one goes out, the others are unaffected.
• As you add more bulbs, the brightness is unaffected. (voltage is unaffected)
• Resistance does not increase.
• No current is created or destroyed only split up.
• Adding resistors in parallel will decrease the total resistance. This will increase the total current leaving the battery.
<table>
<thead>
<tr>
<th></th>
<th>Series Circuit</th>
<th>Parallel Circuit</th>
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</thead>
<tbody>
<tr>
<td># of Pathways</td>
<td></td>
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<tr>
<td>Effect of removing a load</td>
<td></td>
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<tr>
<td>Voltage drop</td>
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<tr>
<td>Current</td>
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<tr>
<td>Resistance</td>
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<tr>
<td>Connecting cells to form a battery</td>
<td></td>
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</tbody>
</table>
Core Lab Activity
Resistors in Series and Parallel

Figure 4

pg. 300-1
Series vs. Parallel Circuits

**Series**
Flashlight:
\[ V = I \]

**Parallel**
Lighthouse:
\[ \text{lifespan} \]
\[ = \]
\[ \text{maintenance} \]
Technologies for Safe Use of Electricity
• Circuit Breakers
Act as a switch that can cut off all power coming in to your house.
• Fuses
Contains a metallic conductor that melts when excessive current heats it up.
• **Grounding terminals**
  Allows excess current to flow in to the ground instead of giving you a shock.
Electrical Energy

• The ability to do work
• Measured in Joules (J)
Electrical Power

• The rate of change in electrical energy
• The rate at which work is done or energy is transformed.
• Measured in Watts (W)
Electrical Energy Costs

Depend on 3 factors:
1. Voltage drop
2. Electrical current
3. Time
Power Rating

- A measurement of how much electrical energy an electrical device consumes for every second it is in use.
Calculating Energy Consumption

\[ E = \text{energy transferred (J)} \]
\[ P = \text{power (W)} \]
\[ t = \text{time (s)} \]
Energy Consumption
Pg. 308
Paying for Electricity

Power is measured in kW•h

Complete 9-2 B pg. 310
Careers related to Electricity

- Electrician
- Photocopier technician
Electrical Efficiency

Electrical energy may be converted to other forms such as:

1. Light
2. Heat
3. Sound
**Efficiency** is the % of energy that is converted to a useful form.

Efficiency = \( \frac{\text{useful energy output}}{\text{total energy input}} \times 100 \)

*Complete practice problems pg. 318*
EnerGuide Labels

- Details how much energy an appliance uses in a year and compares to other appliances.
Reducing Electrical Consumption

• Improve insulation of home
• Turn off lights when not in use
• Use energy efficient light bulbs
• Air dry clothes when possible
CORE STSE

“Electricity Conservation: The New Trend”
Energy Generators

• Electrical generator (made up of a coil of wire and a magnet)
Electrical Generating Stations

1. Hydroelectric
2. Thermal
3. Nuclear

See pg. 327
Getting Power...

*Transformers are electrical devices that change voltage so that it can be used by homes. (120 V and 240V)
Problems?

1. Safety
2. Cost of production
3. Degree of environmental impact
Alternate Energy Sources

- Wind generators
• Solar energy
• Fuel cells
Constraints to New Technologies

1. Cost
2. Availability of materials
3. Properties of materials

See pg. 330-4