CHAPTER 7 Content Outline for Teaching

Electricity

Underlined words and phrases are to be filled in by students on the Note-taking Worksheet.

Section 2 Electric Current

A. The flow of charges through a wire or conductor is called **electric current**.

1. Current is usually the flow of electrons.
2. Electric current is measured in amperes (A).
3. Charges flow from high voltage to low voltage.
   a. A **voltage difference** is the push that causes charges to move.
   b. Voltage difference is measured in volts (V).
4. For charges to flow, the wire must always be connected in a closed path, or **circuit**.

B. Sources of electricity:

1. A dry cell battery produces a voltage difference between its zinc container and its carbon suspension rod, causing current to flow between them.
2. A wet cell battery contains two connected plates made of different metals in a conducting solution.
3. Wall sockets have a voltage difference across the two holes of an electrical outlet, and a generator at a power plant provides this voltage difference.

C. **Resistance**—the tendency for a material to oppose the flow of electrons, changing electrical energy into thermal energy and light

1. All materials have some electrical resistance.
2. Resistance is measured in ohms (Ω).
3. Making wires thinner, longer, or hotter increases the resistance.

D. **Ohm's law**—the current in a circuit equals the voltage difference divided by the resistance

Discussion Question

What property of electric current causes lightbulbs to give light? Resistance. As electrons flow through the filament, the filament resists their flow and changes electrical energy into thermal energy and light.

END

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Section 3 Electrical Circuits

A. Circuits rely on generators at power plants to produce a voltage difference across the outlet, causing the charge to move when the circuit is complete.

1. Series circuit—the current has only one loop to flow through

a. The parts of a series circuit are wired one after another, so the amount of current is the same through every part.

b. Open circuit—if any part of a series circuit is disconnected, no current flows through the circuit

c. Example: strings of holiday lights

2. Parallel circuit—contains two or more branches for current to move through

a. Individual parts can be turned off without affecting the entire circuit.

b. Example: the electrical system in a house

B. Household circuits use parallel circuits connected in a logical network.

1. Each branch receives the standard voltage difference from the electric company.

2. Electrical energy enters your home at the circuit breaker or fuse box and branches out to wall sockets, major appliances, and lights.

3. Guards against overheating electric wires:

a. Electric fuse—contains a small piece of metal that melts if the current becomes too high, opening the circuit and stopping the flow of current

b. Circuit breaker—contains a small piece of metal that bends when it gets hot, opening the circuit and stopping the flow of current

C. Electrical energy is easily converted to mechanical, thermal, or light energy.

TURN

Electricity (continued)

1. **Electrical power**—the rate at which electrical energy is converted to another form of energy
   - **a.** Electrical power is expressed in watts (W).
   - **b.** Power = current × voltage difference
   - **c.** P (watts) = I (amperes) × V (volts)
2. To calculate the amount of energy an appliance uses:
   - **a.** The unit of electrical energy is the kilowatt-hour, which equals 1000 watts of power used for one hour.
   - **b.** Energy = power × time
   - **c.** E (kWh) = P (kW) × t(h)

Discussion Question

Does your home have a fuse box or a circuit breaker? Why is it there? How does it work? It is there to make sure the electrical wires in our home do not get too hot and start fires. If the wires get too hot, they melt the piece of metal in the fuse or bend the piece of metal in the circuit. This opens the circuit and stops the flow of current. If we have a fuse box, we have to replace the melted fuse with a new one. If we have a circuit breaker, we only need to unplug some appliances and then flip the switch.

END