W 407

WHAT'S FLOWING?

An Introduction to Electrical Circuits

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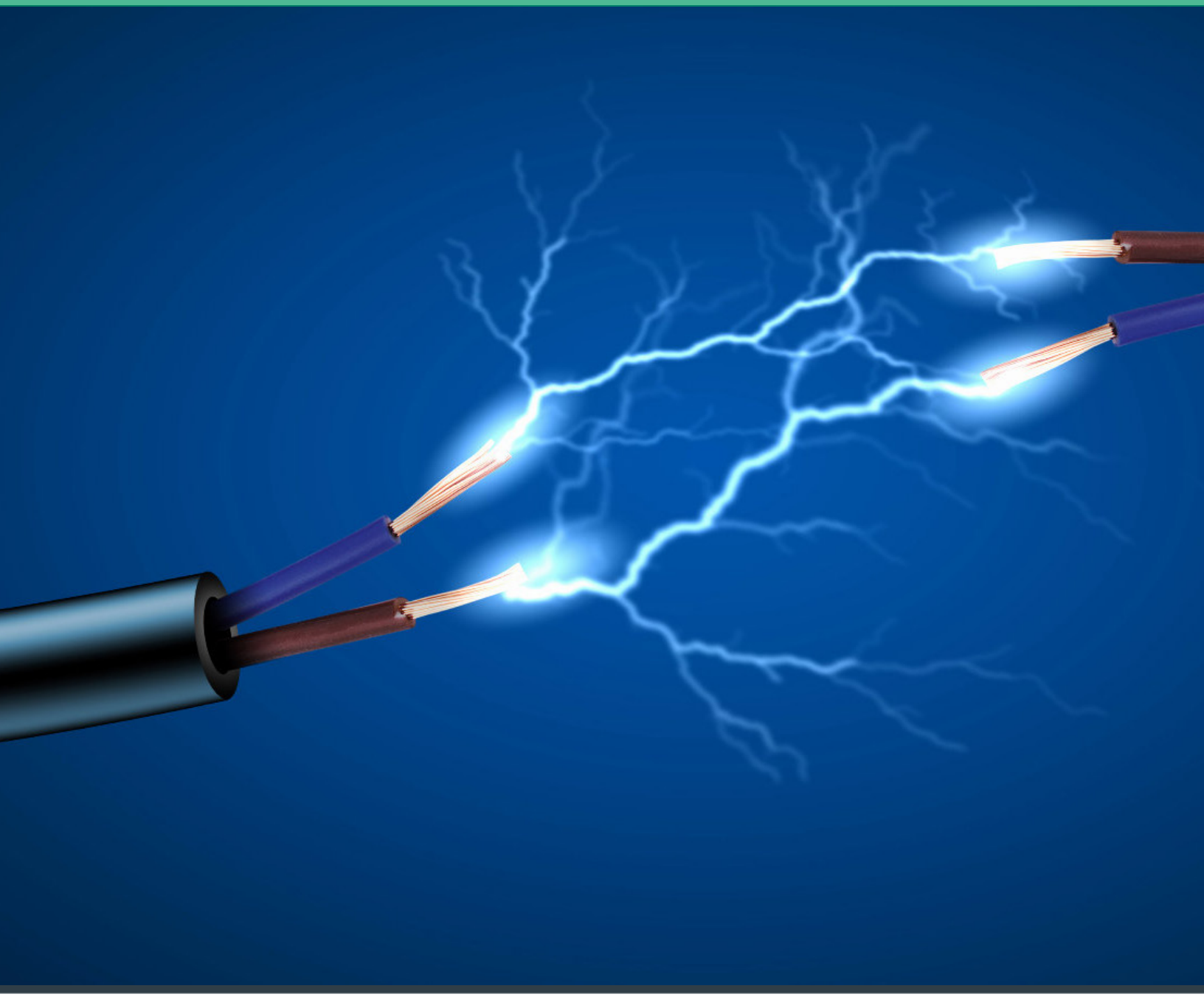

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An Introduction to Electrical Circuits

Skill Level
Intermediate

Learner Outcomes
The learner will be able to:

- Describe the logic associated with electrical circuits.
- Identify electrical circuits in their lives.
- Model an electrical circuit with various components.

Educational Standard(s) Supported

Success Indicator
Learners will be successful if they:

- Wire a functional electrical circuit.
- Explain how electricity flows in a circuit.

Time Needed
30 Minutes

Materials List
1 index card per student
The following items are needed **for each pair** of students:

- Insulated Wire (2 per group)
- Flashlight bulbs
- D-Cell Batteries

Introduction to Content

This lesson gives an introduction to electrical circuits and how they work. In this lesson, students will model how electrons flow in a circuit and will then have the opportunity to construct their own circuit using a battery, wire and flashlight bulb.

Introduction to Methodology

This hands-on lesson begins with a pre-assessment of students' knowledge of electricity. There is a demonstration of how electricity flows in a circuit, and the lesson concludes with students constructing their own simple circuit.

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Terms and Concepts Introduction

Electricity — A form of energy resulting from the flow of charged particles, known as either protons or electrons.
Electron — A negatively charged particle in an electrical circuit.
Electrical Circuit — A closed loop through which electrons can flow and generate electricity.
Electrical Current — The amount of energy created by flowing electrons.

Setting the Stage and Opening Questions

Begin by sharing the following with the students: *"Electricity — we depend on it every minute of every day. And yet to many of us, electricity seems a mysterious and even magical force. Before Ben Franklin did his famous and very dangerous kite flying experiment, electricity was thought to be a type of fire. In 1847, the year Thomas Edison was born, most people considered electricity to be some sort of dangerous fad. By the time Edison died in 1931, entire cities were powered by electricity.*

Although it has been used as an energy source for over 100 years, many people don't understand the basic principles of electricity. In this lesson, we will begin to gain knowledge related to electricity and electrical circuits."

After sharing with the students, ask them the following questions to determine what prior knowledge they have related to electricity and electrical circuits. The answers to these questions have been given in the terms and concepts introduction.

- *What is electricity?*
- *What is an electrical circuit?*
- *What is electrical current?*

Tips for Engagement

Some groups may have difficulty in constructing their circuit. If this is the case, ask them to think back to the way the circuit was modeled at the beginning of the lesson. What were the important parts, and how were they connected?

In the apply section, some students may have a hard time identifying electrical circuits. Some good prompts to get them thinking are a light switch turning on an overhead light, a hair dryer being plugged into an outlet, or plugging a computer in and turning it on.

Experience

Begin the experience by explaining to the students that they will be modeling an electrical circuit. Ask them to form a circle, and distribute an index card to each student. After all students have an item, say the following, *"We are now all part of an electrical circuit. I represent the battery, and you all are part of the insulated wire. The index cards you are holding all represent electrons that will flow within our circuit. As the battery, I have a positive (left side) and negative (right side) pole. Our electrons are negatively charged, meaning they will be drawn toward the positive side, and repelled from the negative side. To model the electricity flowing, we will all pass our index cards to the right. This represents the electrical current in our circuit. Each person can only hold one electron at a time, and you can only pass electrons to the person directly beside you."* Begin passing objects around the circle. As you are passing objects, ask a few students to step out of the circle. This represents an open circuit and will stop the flow of electrons around the circuit. This activity should take approximately 5 minutes.

After you have finished modeling the circuit, ask students to pair up and distribute the battery, two wires and flashlight bulb to each pair. Instruct the students that they must use what they learned in the demonstration to make an actual electrical circuit. Students will experiment with different designs and construct a working circuit. Rotate among the groups to help as needed.
After students have completed their circuit, ask them to draw a diagram of the circuit they have constructed.

Share

Ask students the following questions:

- *"What struggles did you have when first trying to construct your circuit?"*
- *"In what order did you connect the parts of your circuit?"*

Process

- *"How did you know that your circuit was assembled correctly?"* The light bulb lit up.
- *"How were the electrons flowing in your circuit?*" The electrons flowed from the negative side of the battery, to the light bulb, and then to the positive side of the battery.

Generalize

"What were some things that could have caused issues in getting the bulb to light?" A break in the wire or a bad connection to the battery or bulb.

Apply

Say to the students *"We are now going to break back into groups and brainstorm some other circuits we deal with on a daily basis. Within your group, list three circuits you encounter on a daily basis and draw a diagram of those circuits."* Allow students to work on this for 5-7 minutes, depending on time, and then have the groups share with the class.

Reference:

Modified From: **http://tnlearn.pbslearningmedia.org/resource/phy03.sci.phys.mfe.lp_electric/electric-circuits**

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