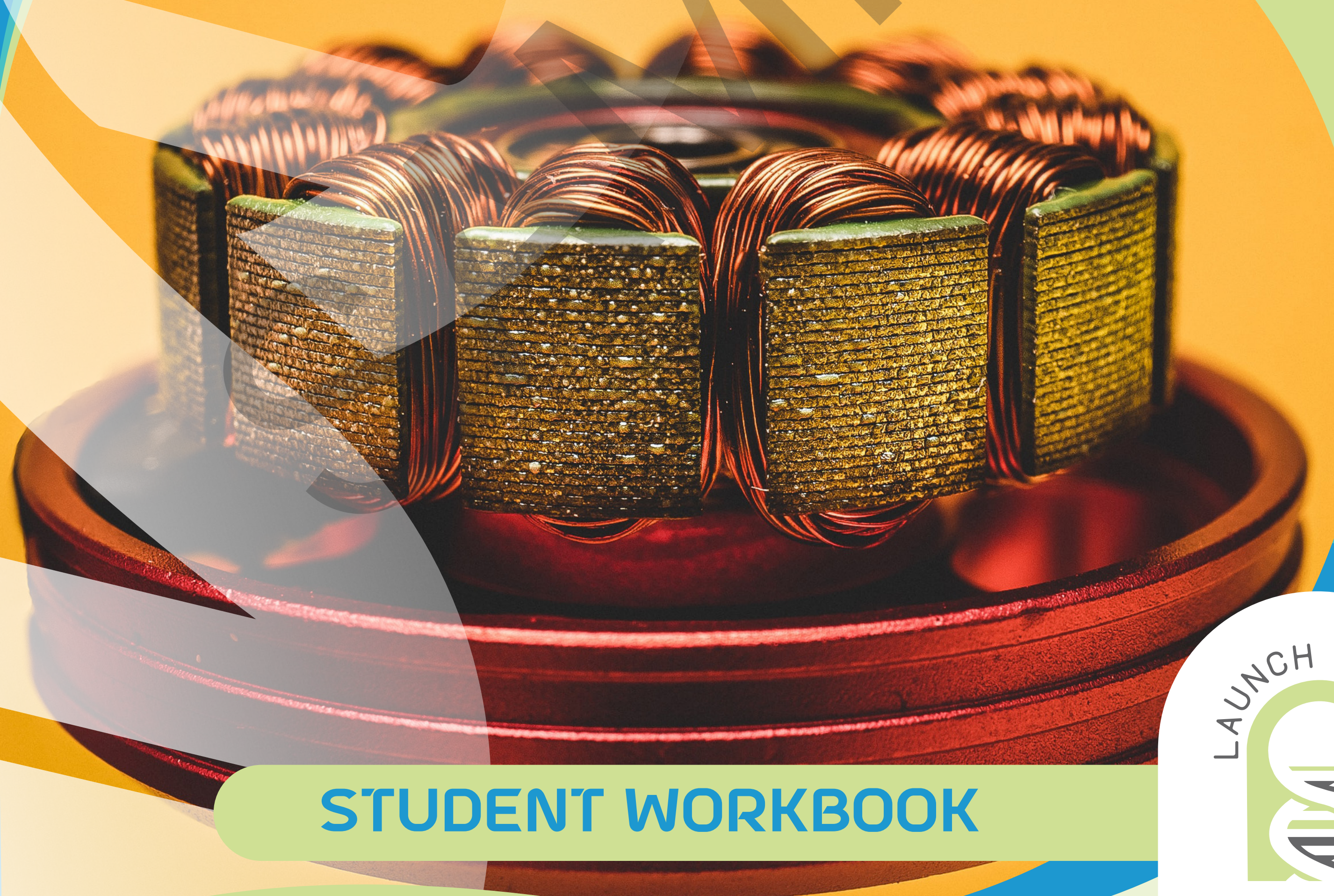
MAGNETIZE ME



STUDENT WORKBOOK

ACTIVITY 1 MOTOR ROLLER

Have you ever wondered how batteries power electronic devices? Or how magnets attract or repel each other? In this kit, you will explore these concepts and more. To begin, you will make a self-propelled cart.

I BATTERY-POWERED WHEELS

WHAT YOU NEED:

FROM THE KIT:

- 2 neodymium magnets
- Aluminum foil
- Battery, AAA
- Ruler
- Sheet of drawing paper

SAFETY!

WARNING! CHOKING HAZARD - Small parts. Not for children under 3 years.

WARNING! Batteries can be dangerous. Store away from metal objects. Only use with an adult's supervision.

WARNING! Never put magnets in your mouth or any other part of your body. Keep magnets away from electronic devices.

WHAT TO DO:

1. Lay the sheet of foil flat on a table. Use the long edge of the ruler to gently flatten the texture of the foil. Be careful not to push so hard that the ruler tears the foil.

2. Separate the two magnets by sliding the two discs in opposite directions. Use a flat surface to slide apart.

THINK ABOUT IT!

1. Using information from this section, describe the motion of the motor from Activity 1 in terms of positive and negative charges.

2. What role do you think the magnets played in this flow of electrons?

ALL WOUND UP

3

Wind Up Magnet

In this experiment, you will test an **electromagnet**, an object that is not normally magnetic but becomes magnetic when electricity flows through it. The electromagnet in this experiment is a **solenoid**, a coil of wire which carries electricity and acts like a magnet. You will test the strength of the magnet by picking up paper clips.

WHAT YOU NEED:

FROM THE KIT:

- 2 AAA batteries
- 3 nails
- Aluminum wire
- Electrical tape
- Paper clips
- Rubber band (thick)
- Ruler

OTHER ITEMS:

- Scissors

SAFETY!

WARNING! Sharp objects can cause injury. Don't cut or poke yourself.

Ohm’s law can be used to determine the amount of voltage powering a device. Let’s assume that a AAA battery is powering a 3-Ω (ohm) resistor with 0.5 A (amps) of current.

$$V = IR$$
$$V = 3\ \Omega \times 0.5\ A$$
$$V = 1.5\ V$$

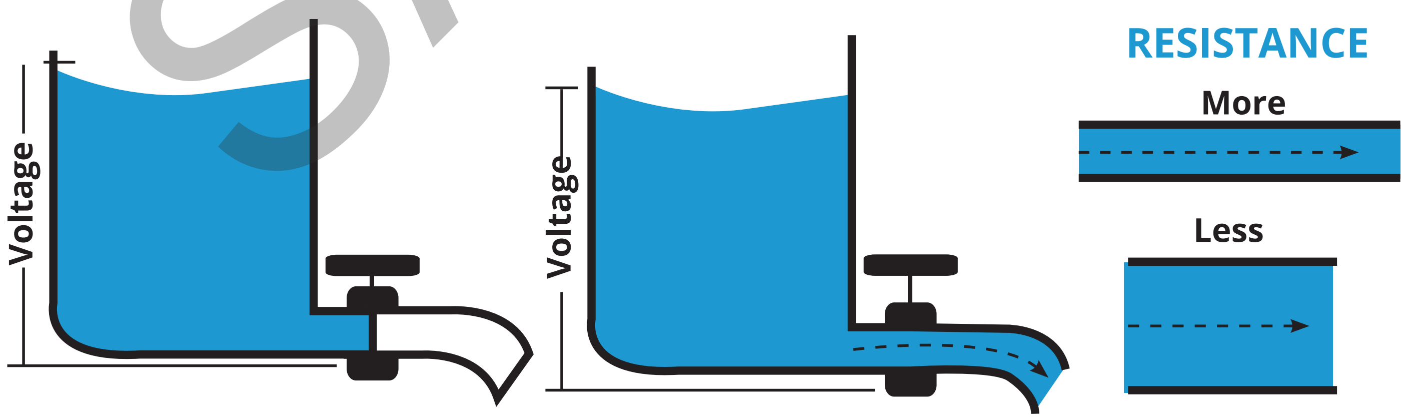
The AAA battery provides 1.5 V of voltage, which is a standard voltage for AAA batteries.

Ohm’s Law can also be used to solve for other variables within the system of an electrical circuit. If a 9-V battery is used to power a small light emitting diode (LED), there is a 0.5-Ω resistance from the LED bulb.

$$V = IR$$
$$9\ V = I \times 0.5\ \Omega$$
$$9\ V/\ 0.5\ \Omega = I$$
$$18\ A = I$$

Now, a current of 18 A is far too much for an LED, which is designed for less than 1 A and it will burn out. You noticed that the wire was hot during the electromagnet tests in Activity 2. If the resistance is very low, as it is when the circuit is not powering any devices, then the current overpowers the circuit. Electrical energy is transformed into thermal energy, which heats the wire.

The potential difference across a circuit is often compared to water flowing from a tank. The tank stores potential energy that can flow from the tank and similarly, a battery has voltage whether or not it is connected to a circuit. The flow of water represents the current, while the diameter of the pipes would provide more or less “resistance” in the circuit.



LAUNCH

SCIENCE UNLOCKED

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Kit	SU-MAGNME
Instructions	IN-MAGNMES
Revision Date	6/2022