MAGNETIZE ME

STUDENT WORKBOOK

LAUNCH®

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
- ☐ 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.

3. Place one magnet at each end of the battery.

4. Hold one end of the battery in each hand, using your fingers to carefully center the magnets.

5. Place the battery gently on its side, in the middle of the foil. Note any motion after releasing the battery.

***Note:** If the battery does not move, reverse one of the magnets, leaving it on the same end of the battery. Repeat Steps 4–5.*

6. Move the battery off the foil and onto the sheet of paper. Note any motion after releasing the battery.

7. Place the battery back on the foil and make note of which direction the battery moves. Then, reverse both of the magnets, leaving them on the same ends of the battery on which they started.

8. Repeat Steps 4–5.

9. Remove the magnets from the battery and store the components separately to avoid draining the battery. You will use all of these materials later in this kit.

***Note:** If you have difficulty getting the battery to move, remove the magnets and start the procedures again.*

THINK ABOUT IT!

1. Why do you think the battery moved or did not move when the magnets were in contact with certain materials?

2. Why do you think the magnets need to be in a particular orientation to cause motion?

In this experiment, you observed the battery rolling when the magnets were in one position but not the other. This is the basic concept behind a magnetic levitation, or maglev, train. Electricity flows through the magnetic tracks, which attract and repel the base of the train, causing motion. The train accelerates to speeds over 500 kilometers per hour (300 miles per hour).

As you observed in the experiment, if the magnets were not aligned correctly, then the battery did not roll. The flow of electricity propelled the battery forward, while reversing the magnets caused the battery to roll in the opposite direction. Maglev train operators control the speed of the train by reversing the flow of electricity. In this kit, you will learn more about the interactions between electricity and magnets.

GLOSSARY

Compass – an instrument that contains a magnetic needle, showing the direction of magnetic north.

Circuit – a path through which electricity flows.

Conductivity – the property of a material which lets electricity flow through it.

Current – the rate at which electrical charge moves through a circuit.

Energy – ability to make something move or change.

Electrical energy – the energy of moving electrons.

Electron – a negatively charged part of an atom.

Electromagnet – an object that is not normally magnetic but becomes magnetic when electricity flows through it.

Electromagnetic force – the interaction between positive and negative charged particles that generates electrical and magnetic fields.

Lorentz force – the force exerted on a charged particle by an electric and magnetic field.

Magnetic field – the pattern of magnetic force around a magnet.

Magnetic force – the ability of a magnet to attract or repel.

Motor – a device that changes one type of energy, such as electricity, to the energy of motion.

Ohm's Law – the mathematical relationship between voltage, current, and resistance, showing that current is directly proportional to voltage and inversely proportional to resistance.

Point charge (q) – an electric charge that does not have a volume or size.

Resistance – a measurement of a material's opposition to the flow of electric current.

Solenoid – a coil of wire which carries electricity and acts like a magnet.

Voltage – the potential energy between two points in a circuit, causing electrons (electric charge) to move from one point to another.

Torque – the rotational force that produces a change in the rotational motion of an object.

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Instructions	IN-MAGNMES
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