MAGNETIZE ME

TEACHER GUIDE

PLANNING

Here's a suggested schedule for this kit! The activities are designed to be completed in order, but you can decide when to do them over time. Required times are estimated.

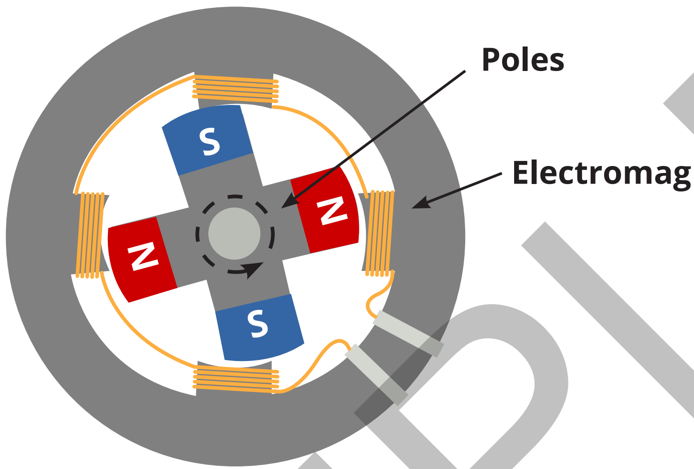
ACTIVITY INFORMATION	SECTION(S)	TIME REQUIRED	DAY/ LESSON
ACTIVITY 1: MOTOR ROLLER Combine magnets and a battery for a device that moves on its own. **Time required: 45 min**	☐ Battery-Powered Wheels	45 minutes	Day 1
ACTIVITY 2: IT'S ELECTRIFYING! Investigate the magnetic forces created by electrical energy. **Time required: 2 h 15 min**	☐ Motoring Along	45 minutes	Day 2
	☐ All Wound Up	90 minutes	Day 3
ACTIVITY 3: IT'S MAGNETIC! Learn about the mathematical relat… between voltage, current…	☐ O…		

charges, causing electromagnetic forces. They should not be confused with force diagrams, which show the amounts and directions of the forces acting on an object.

  - A common comparison is the gravitational field of Earth. As objects with mass approach planetary bodies, the gravitational field lines indicate how the object will move, but the amount of force depends on the mass of the two objects.

• The experiment in Activity 1 is an example of a homopolar motor, or a motor powered with an electric current and two magnetic poles.

  - Homopolar motors are different from traditional electric motors because the polarity of this motor did not change as it moved along the foil.
  - More commonly, electric motors have multiple positive and negative poles propelling the motor as the poles rotate through a magnetic field.



THINK ABOUT IT!

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

Answer:

• Answers will vary based on the student's prior knowledge.

• The negative charges flow through the magnets and travel through the aluminum foil, making a circuit. The flow of electricity through the foil creates a magnetic field that repels the magnets, causing the battery to roll in one direction.

How to Help: *The student is not expected to know the answer to this question, as this content will be explained throughout the kit.*

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

Answer:

• Answers will vary.

• The magnetic field from the magnets is repelled against the flow of electrons through the aluminum foil.

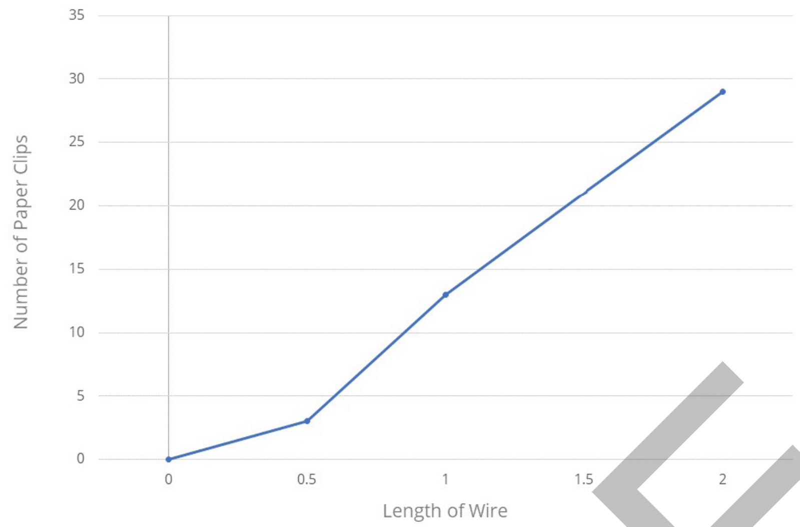
• The shape of the magnetic field causes motion in a particular direction.

How to Help: *The student is not expected to know the answer to this question, as this content will be explained in the next activity.*

3 ALL WOUND UP

PREPARATION AND SUPERVISION

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



How to Help:

• *Help the student establish the units represented on the x/y-axis before graphing.*
• *Check their data plots according to the results in the experiment. The example graph above may differ from their results.*

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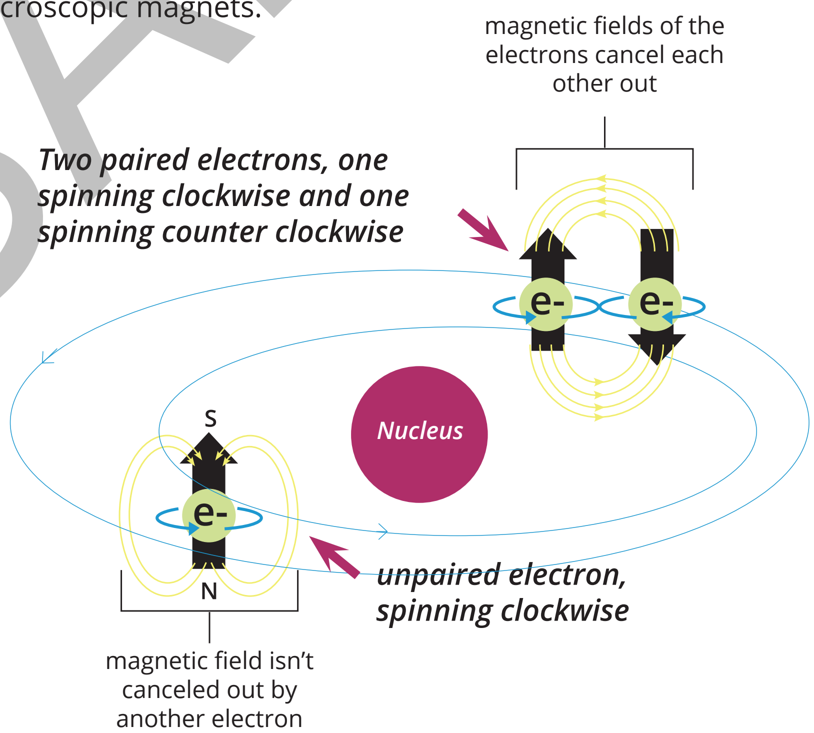
Winding Up Strength

• In this subsection, the student will learn about the magnetic fields created by the flow of current in the context of electromagnetic force.
• The vocabulary terms current, electromagnetic force, magnetic field, and magnetic force are defined.
• This subsection highlights the interaction between electricity and magnetism that powered the homopolar motor in Activity 1.
  – The student will learn more about the direction of these magnetic fields in Activities 3 and 4.
• Magnetic domains are determined at the particle level, by the motion of electrons. Electrons rotate rapidly, clockwise or counterclockwise. In many atoms, the opposing motion of electrons creates a pair.
  – In magnetic materials, the electrons do not pair up, so the atoms become microscopic magnets.



LAUNCH

SCIENCE UNLOCKED

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