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## Synopsis: World's Simplest Electric Motor

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In this activity we build a very simple electric motor that is able to translate electric energy into motion using an electromagnet and a permanent magnet.

### Standards

#### *4<sup>th</sup> Grade*

**1c.** Students know electric currents produce magnetic fields and know how to build a simple electromagnet.

**1d.** Students know the role of electromagnets in the construction of electric motors, electric generators, and simple devices, such as doorbells and earphones.

**1g.** Students know electrical energy can be converted to heat, light, and motion.

#### *9-12<sup>th</sup> Grade*

**5f.** *Students know* magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources.

### Driving Questions

- 1.) How can you utilize electric energy?
- 2.) How does an electric motor work?

### Learning Objectives

- 1.) Students will build a simple electric motor to learn how electromagnets can be used to convert electrical energy into motion.

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## World's Simplest Electric Motor

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### Procedure

Work independently.

#### *Part A: Build the Motor. . .*

1. Use the direction on the back of your kit to build an electromagnetic motor. Once you have the motor together, you may need to give the wire loop a little tap to get it started.
2. Take a few moments to observe how wire coil spins when the motor is running. Record your observations in your notebook.
3. Draw a sketch of the electric motor in your notebook. Be sure to label all the essential elements.

#### *Part B: Investigate the Motor. . .*

1. Use a compass to investigate the magnetic field around the wire loop as it spins. Do you see any evidence of a magnetic field?
2. Stop the motor. Flip the permanent magnet. Get the motor started again. Did flipping the magnet change anything about the motor? Write any observations in your notebook.
3. Stop the motor. Flip the battery. Get the motor started again. Did flipping the magnet change anything about the motor? Write any observations in your notebook.

#### *Thought questions:*

1. How might this electric motor be related to the Finding Poles activity or the Magnetic Muscles activity?
2. How might this electric motor be related to the Compass Tweak activity?
3. List some of the practical limitations of using this simple motor to “do work”.

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## Instructor Notes: World's Simplest Electric Motor

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This activity is fun, easy to get to work and is a VERY simple and elegant example of how electrical energy can be converted into mechanical motion. The Worlds Simplest Motor kits are relatively inexpensive (<\$5) and similar kits are available from a number of sources.

### *Safety*

This activity has no risk associated with it.

### **Materials**

- Worlds Simplest Motor kit
- D battery

### **Notes**

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