



California State University of Bakersfield, Department of Chemistry

## Homopolar Motor



### Standards:

3-PS2-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

### Introduction:

*A homopolar motor is one of the simplest motors built due to the fact that it uses direct current to power the motor in one direction. The magnet's magnetic field pushes up towards the battery and the current that flows from the battery travels perpendicularly from the magnetic field. This causes the creation of a force perpendicular to both the magnetic field and current. This force, known as the Lorentz force, is exerted on the copper wire (the conductor) causing it to spin (see Figure 2).*

### Materials:

- AA Batteries
- Copper Wire
- Pliers
- Neodymium Magnet (ideal size: 12mm diameter x 6mm thick)

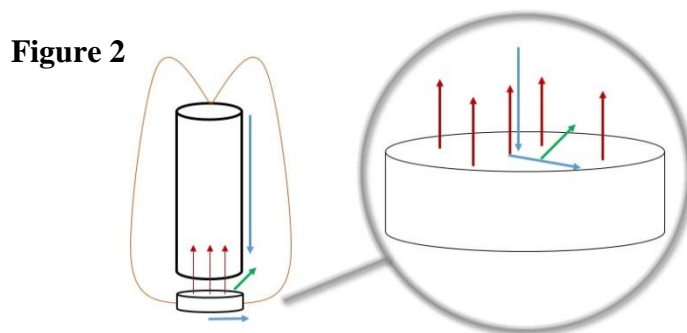
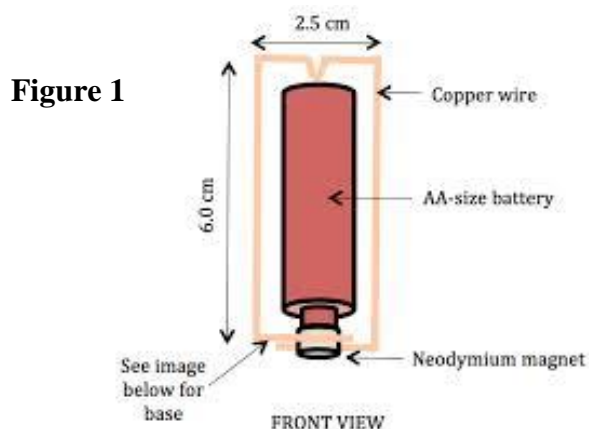
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### Safety:

- Always have an adult with you to help you during your experiment.
- Always wear eye protection and gloves when doing chemistry experiments.

### Procedure:

1. Bend the copper wire into as many shapes as you would like, just make sure to follow the model shown in Figure 1 below.
2. Place the neodymium magnet on the negative side of the battery.
3. Set the copper wire shape on the battery and wait for it to start spinning.



### Data and Observations:

### Questions:

1. What shape works best depending on the shapes you made? Why?
2. What happens when you turn the magnet over? Does it affect the rotation of the copper wire?

### References:

1. What is a homopolar motor and how does one work? First 4 Magnets.  
<http://blog.first4magnets.com/what-is-a-homopolar-motor-and-how-does-one-work/>  
(Accessed: July 29, 2014).
2. Homopolar Motor 1. Physics Lens: Same World. Different Perspective.  
<http://physicslens.com/homopolar-motor/> (Accessed: August 4, 2014).

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