University of Maryland

Department of Physics Education and Outreach

Physics At Home Activities

Let's Build an Electromagnet!

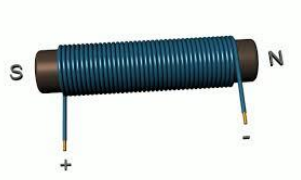
Learning Objective: Electromagnets can be found all around us. In this activity, you will learn about how an electromagnet works and build one of your own!

Materials:

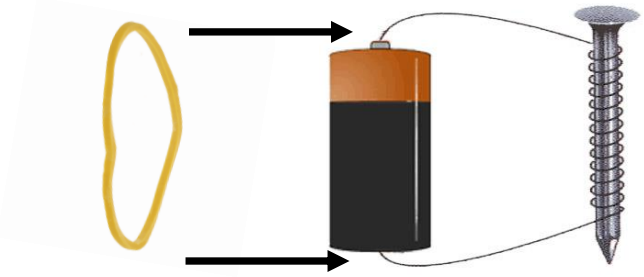
- D or C-Cell Battery
- Insulated copper wire (1-1.5 ft)
- Rubber band
- Large screw or nail (3 inch if possible, not made of aluminum)
- Handful of metal paper clips (x10)

Instructions:

1. Coil the wire around the battery approximately **5 times**, leaving enough wire on each end of the coil to reach the battery leads (-/+).



2. Using the rubber band, connect each end of the wire to either end on the battery.



3. You now have a functioning electromagnet! Using your thumb and pointer finger, pinch each end of the wire against the batter and pick up the electromagnet.
   *****Do not leave wire connected to battery for more than a 10 seconds, it will get hot!**

4. Touch your electromagnet to the paperclips and **observe what happens**!

Experiment: Can you make your electromagnet stronger by changing the number of coils?

Between each trial, disconnect the wire from the battery! This will prevent wasting energy when your electromagnet is not in use.

	# of coils	# of paper clips attracted	Which is strongest?
Trial 1	5		
Trial 2	10		
Trial 3	15		
Trial 4	20		

What is an electromagnet?

An electromagnet is a "temporary magnet," which is created when an electric current passes through a coil, producing a magnetic field! Electromagnets can be powered by a variety of energy sources and are found in motors, cell phones, computers, clocks, and used in countless other technologies. In our electromagnet, the battery is the energy source. As the battery's current flows through the coil of wire it produces a magnetic field! The electricity flowing through the coil arranges the molecules in the nail so they attracted to certain metals. This magnetic attraction is what allows your electromagnet to pick up the paper clips!

Why did the number of coils change the strength of our electromagnet?

The strength of the magnetic field is directly related to the amount of current available. This means, the more coils, the more current, and the more opportunity for the electric charge to produce magnetism. Each turn of the wire in the coil has its own magnetic field. Adding more turns to the coil of wire increases the strength of the field. Increasing the amount of current flowing through the coil also increases the strength of the magnetic field.

For more on the physics of an electromagnet, visit: https://lecdem.physics.umd.edu/highlight-electromagnet.html***!***

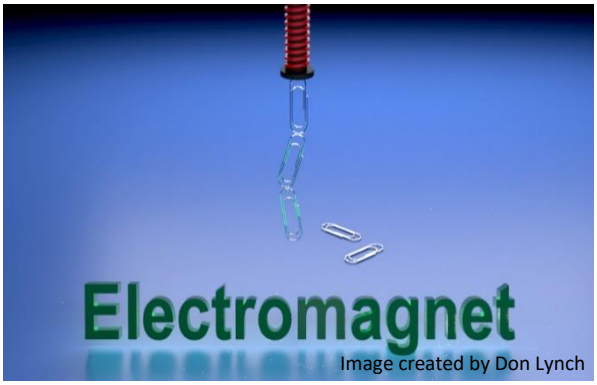


Image created by Don Lynch