

Build an Electromagnet



You'll Need:

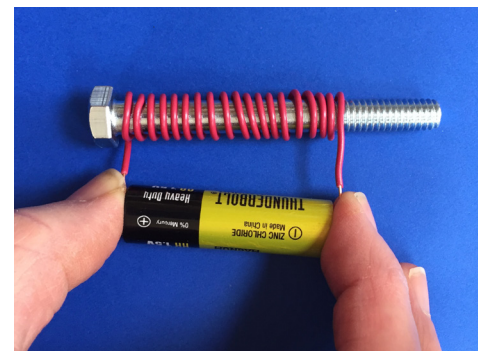
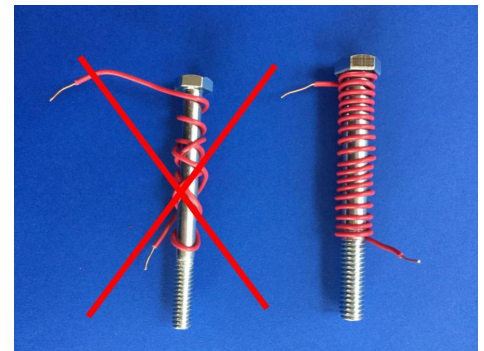
- Wire: 2 feet of 22 gauge insulated wire
- Metal bolt
- Battery
- Pencil
- Paper clips
- Aluminum foil
- Optional: Other metal items (a penny, key, silverware, etc.)

IMPORTANT: DO NOT EVER LEAVE THE WIRE CONNECTED TO THE BATTERY.

Both the wire and the battery would get very hot if they are connected for a long period of time.

Instructions:

1. Wrap the wire around the metal bolt. Try to do this as evenly and tightly as possible. Leave a few inches of wire free at each end. Make it look like the one on the right, not the left!
2. Touch the end of the bolt to the paper clips. What happens?
3. Hold one end of the wire on the flat end of the battery. Touch the other end of the wire to the other end of the battery.
4. Touch the metal bolt to the paper clips while the wire is connected to the battery. What happens?
5. Carefully remove the bolt from the wire coil and replace it with the pencil.
6. Touch the pencil to the paper clips. What happens?
7. Again touch the ends of the wire to opposite ends of the battery. Touch the pencil to the paper clips. What happens?



Questions:

1. Did the metal (bolt) or the wood (pencil) become magnetic when there was electricity in the wire?
2. Can you find anything else in your home that is attracted to the electromagnet? Remember to disconnect the wire from the battery each time after you use it! Test it out, and record it below.

In this experiment, we used electricity to make a magnet. This also works in reverse: a magnet can be used to make electricity. If you start with a magnet and move it through a coil of wire, you generate, or make, electricity in the wire. A generator uses mechanical energy to move magnets, which in turn generates the electricity that comes to your home!

The mechanical energy to turn a generator can come from burning coal, wind, falling water or more. Sources of energy like coal are non-renewable, which means that we can't make more of them. Sources of energy like wind, water, and sunlight are renewable, which means that we won't use them up.

Here is a picture of the magnets that are inside a generator that is used to make our electricity here in Los Alamos. Note the size of the people near the magnet! This generator is part of a hydroelectric power plant that uses the energy in falling water to rotate and generate electricity.



Extension:

Can you make an electromagnet with any metal?

- Fold the piece of aluminum foil in half and roll into a long tube. Put it inside the coil instead of the bolt. Does the aluminum become magnetic if you attach the wires to the battery?

Can you change the strength of your electromagnet?

- Go back to your steel bolt. Try wrapping the wire more loosely or with less turns of wire. Can you still attract a paperclip?
- How do you think the number of coils around the bolt affects the strength of the magnet?