



EXPLORE IT!

Build an Electromagnet

Subject: Magnetism, Electricity

An ordinary nail can become a magnet. See how strong of a magnet you can make. What can you do with a magnet you can turn on and off? Experiment with different things to find out.

Materials List

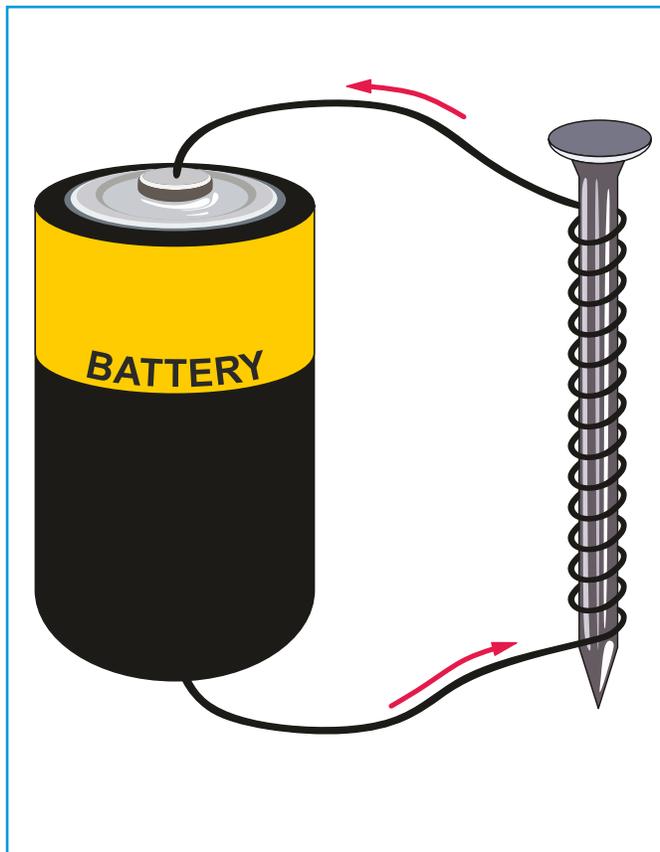
1. approximately 3 feet of thinly coated copper wire
2. large iron nail, approximately 3 inches long
3. new D battery
4. wire strippers
5. tape
6. small magnetic objects, such as paper clips or thumbtacks

Grade: 3rd

Time: 45 minutes

Vocabulary: magnetism, magnetic field, attract, repel, iron, bar magnet, magnet, North and South Pole, opposites, force

NGSS: 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.



Instructions

1. Leave about 8 inches of the copper wire loose, then begin wrapping it around the nail, starting at the head. Wrap the wire tightly without letting it overlap.
2. Leave another 8 inches of wire loose at the other end of the nail when you're finished wrapping.
3. Remove about 1 inch of the plastic coating from each end of the wire, using your wire strippers.
4. Attach the exposed end of wire to the positive terminal of the battery. Attach the exposed end of the other wire to the negative terminal of the battery. Tape the wire to the terminals.

WARNING - The ends of the wire may get hot when they touch the battery terminals, so be careful when taping them down.

5. Place the tip of the nail near small magnetic objects, such as paperclips or thumbtacks. Your electromagnet should attract and pick them up!
6. Disconnect the wires to turn the magnet off when you are done.

See other side

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Background Information

What do a wrecking yard, a rock concert and your front door have in common? They each use electromagnets, devices that create a magnetic field through the application of electricity.

Wrecking yards employ extremely powerful electromagnets to move heavy pieces of scrap metal or even entire cars from one place to another. Your favorite band uses electromagnets to amplify the sound coming out of its speakers. And when someone rings your doorbell, a tiny electromagnet pulls a metal clapper against a bell.

Mechanically, an electromagnet is pretty simple. It consists of a length of conductive wire, usually copper, wrapped around a piece of metal.

Like Frankenstein's monster, this seems like little more than a loose collection of parts until electricity comes into the picture. But you don't have to wait for a storm to bring an electromagnet to life.

A current is introduced, either from a battery or another source of electricity, and flows through the wire. This creates a magnetic field around the coiled wire, magnetizing the metal as if it were a permanent magnet.

Electromagnets are useful because you can turn the magnet on and off by completing or interrupting the circuit, respectively. Now, think of all the things you can do with a magnet you can turn on and off!

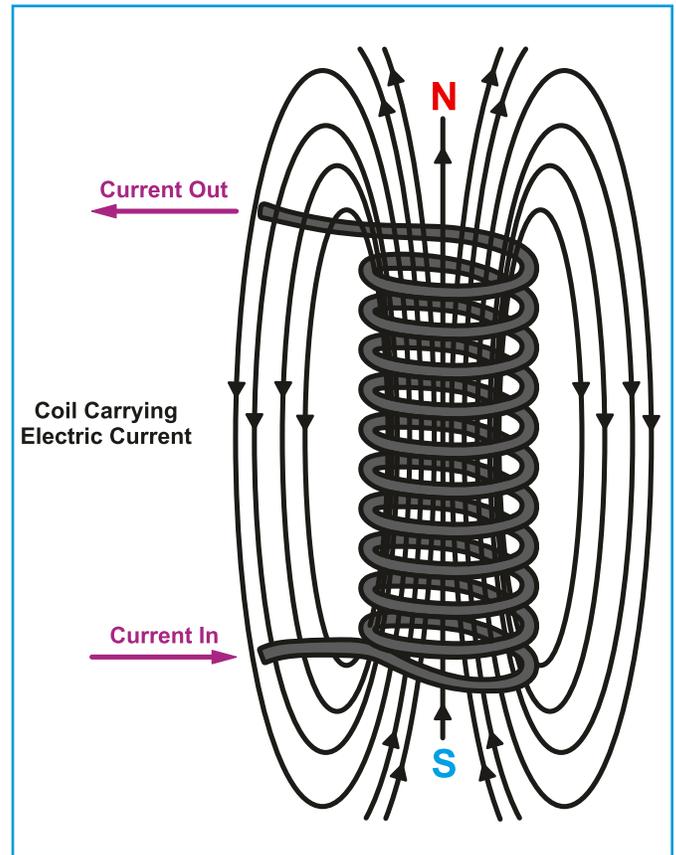


Table Talk

1. Try changing the battery or nail size. Does it make the magnet stronger?
2. What will happen when the battery runs out of energy?

