

Magnetism – Nailed It!

Let's experiment with electromagnets.

Materials:

- 15 cm steel nail
- 3 m 22 gauge insulated copper wire
- 1.5 volt battery
- Paperclips
- Compass
- Elastic band or tape
- Wire stripper or knife



Procedure: (Remember to have your parent's permission and have them watch and help you.)

- Remove some of the insulation from both ends of the wire.
- Wrap the wire around nail 10 times leaving a length of wire on both ends free.
- Attached the exposed copper wire to each end of the magnet. Hold it in place using the elastic band or tape.
- Use the paperclips to test for strength and the compass to determine polarity (the North pointer on your compass will point to the South end of your electromagnet and vice versa).
- Reserve the wires on the battery and retest your electromagnet's strength and poles.
- Try wrapping the wire around the nail as many times as you can while still leaving enough wire free to attach it to the battery.
- Retest your electromagnet's strength and poles.

What's Happening:

Electricity creates a magnetic field. The more wire wraps around the nail, the stronger your magnet. If you wrap some of the wire around the nail in one direction and some of the wire in the other direction, the magnetic fields from the different sections fight and cancel each other out.

The higher the voltage of your battery, the stronger your electromagnet. Caution! Too much current can be dangerous as some energy is lost as heat. If you double the current passing through a wire, the heat generated will increase 4 times! Triple the current and the heat will increase 9 times! Careful or you'll burn yourself.

The direction of a magnet field depends on the direction of the flow of electric current. Changing which pole you attach the wires to on the battery will reverse your magnet's polarity.

Extension:

Try experimenting with different kinds of core. A thicker core might make a more powerful magnet. Just make certain that the material you choose can be magnetized or it won't work.

This activity is based on our Magnetism kit. The source for this lab was: <http://weirdsciencekids.com/electromagnet.html>. Our teaching kits (described on our website) are loaned out FREE to provide classroom teachers and parents of home schooled children an opportunity to explore Science in interesting ways. Visit the Praxis display at SEATAC. Please consider volunteering as a classroom guest speaker or allow your business as a field trip location.

Lorne Cooper, Regional Executive Director

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