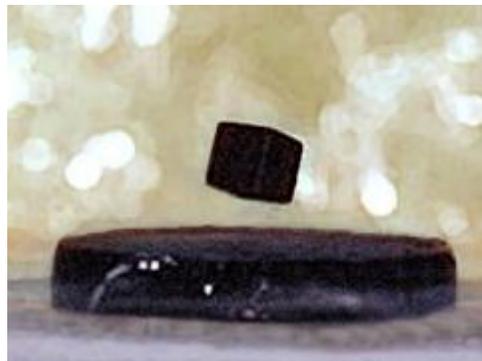


Magnetism – Hot and Cold Magnets

How does temperature affect magnetic force?

Materials:

- Freezer
- Kitchen tongs
- Thermometer
- Gloves
- Container of boiling hot water
- Paper clips or small finishing nails
- Ice water
- Neodymium (Rare Earth) or Ceramic magnet



Procedure: (Remember to have your parent's permission and have them watch and help you.) As gaussmeter measures the strength or flux density of magnets. But a good test of magnetic strength is to simply count the number of paper clips it will attract.

- At room temperature (about 22°C). See how many paper clips or small nails you can get to stick to your magnet. Attach the clips/nails end-to-end. Record your result and the temperature
- Place your magnet in the container of ice water for 15 minutes. Use the thermometer to record the temperature of the freezer (about 0°C). Using gloves to hold the magnet see how many clips/nails will stick end-to-end.
- Place your magnet in the freezer (or outside in winter) for 15 minutes. Use the thermometer to record the temperature of the freezer (about -5 to -18°C). Using gloves to hold the magnet see how many clips/nails will stick end-to-end.
- Now place the magnet in boiling water and leave it there for 15 minutes. Record the temperature. (about 100°C). Using the tongs to hold the magnet see how many clips/nails will stick end-to-end.

What's Happening:

Magnets strength increases the colder it gets. At absolute zero some materials turn into a magnet. If you subjected your magnet to extreme heat such as propane torch to above what is called its Curie Temperature; it will permanently stop being a magnet.

There are four classes of strong permanent magnet materials; Neodymium Iron Boron (NdFeB or NIB or rare earth), Samarium Cobalt (SmCo), Alnico (cow magnet), Ceramic or Ferritel (embedded ferrous particles) but only Neodymium's and Ceramic's change in flux density as a function of temperature is relatively great.

Extension:

You can also repeat this experiment for a very cold temperature if you have access to dry ice (solid carbon dioxide -78°C).

This activity is based on our Magnetism kit. The source for this lab was: <http://www.coolmagnetman.com/magstren.htm>. 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. Please consider volunteering as a classroom guest speaker or allow your business as a field trip location.

Lorne Cooper, Regional Executive Director

PRAXIS, "Making Science Fun". Contact Praxis at praxis@praxismh.ca, www.praxismh.ca, Tweet or follow us @PraxisMedHat, or friend us on Facebook. Address: c/o 200 7th Street S.W., Medicine Hat, AB, T1A 4K1 Phone: 403-527-5365, Fax: 403-527-6570.