Universität Basel

Swiss Nanoscience Institute

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EINE INITIATIVE DER UNIVERSITÄT BASEL UND DES KANTONS AARGAU

Fun with magnets I

There are some really great experiments you can do with magnets. It is important to distinguish between permanent magnets and electromagnets. Permanent magnets exert a constant magnetic force, and attract ferromagnetic materials: iron, nickel, cobalt and their alloys. These simple experiments illustrate the properties and behavior of magnets.

What you'll need

- various magnets, e.g. kitchen magnets, horseshoe magnet, bar magnet
- magnetic coins (e.g. 5 eurocent coins)
- a ruler
- various metallic and non-metallic objects

Fishing for metallic objects

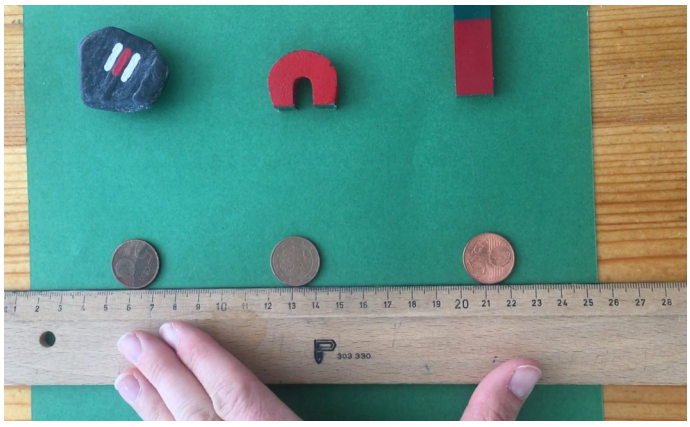
1. Place various metallic and non-metallic objects on the table in front of you.
2. Using a horseshoe magnet, for example, attached to a piece of string, "catch" as many objects as you can.

Which ones are magnetic?

Magnet competition

1. Line up the magnets on the table around 10 cm apart.
2. Arrange some magnetic coins in a row parallel to the magnets.
3. Using the ruler, slowly push the coins toward the magnets.

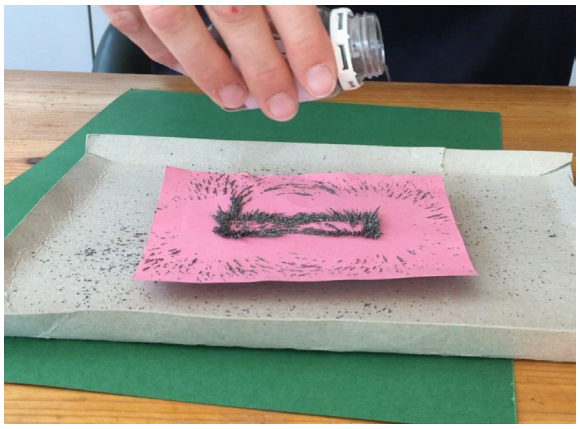
Some magnets will exert a stronger pull on the coins than others.

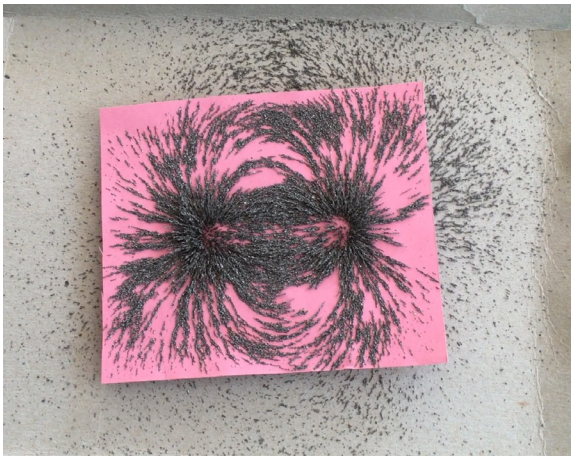


Did you know? There is a special kind of magnet known as a super-magnet. It is made of a special alloy of the rare-earth element neodymium, iron and boron and has a very strong magnetic field – hence the name. Super-magnets are so strong that you could be injured if you were caught between two of them.

Revealing magnetic field lines

For this experiment, you need fine iron filings, such as those created when grinding metallic objects. Alternatively, you can buy them online at www.betzold.ch or www. supermagnete.ch. You also need one or two sheets of paper to work on, and a bar or horseshoe magnet.



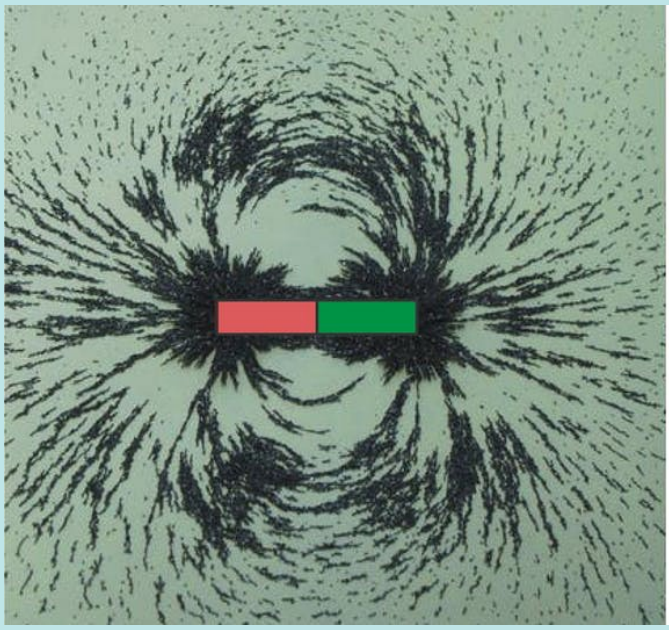


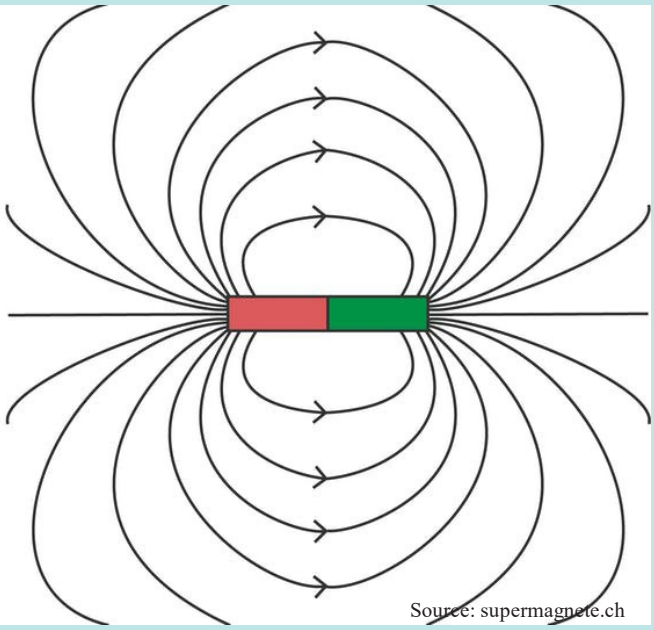
Instructions

1. Place the magnet on a large sheet of paper, and cover it with another piece of paper or card (this makes it easier to collect the filings again later).
2. Slowly scatter the iron filings on top.
3. Watch what happens when the magnet comes into direct contact with the iron filings.

Would you like to know more?

A magnet has two opposite poles – a north and a south pole. Both poles attract ferromagnetic materials such as iron, cobalt and nickel. This attraction is also known as the Lorentz force. A magnet generates a magnetic field within and around itself. The forces (Lorentz forces) at work in a magnetic field can be represented by magnetic field lines. They are determined by the metals' atomic structure. Each iron particle exhibits the properties of a tiny electromagnet, with its own north and south pole.





Source: supermagnete.ch