

Read About Magnets and Static Electricity

MAGNETS & STATIC ELECTRICITY DEFINITION

Forces can be applied at a distance through magnetism and static electricity. A magnet is an object that can attract some metals like iron. Static electricity can also attract objects without touching them, but it works a bit differently. It can attract and repel due to electrical charges.

To better understand magnets and static electricity...

LET'S BREAK IT DOWN!

All magnets produce a magnetic field.

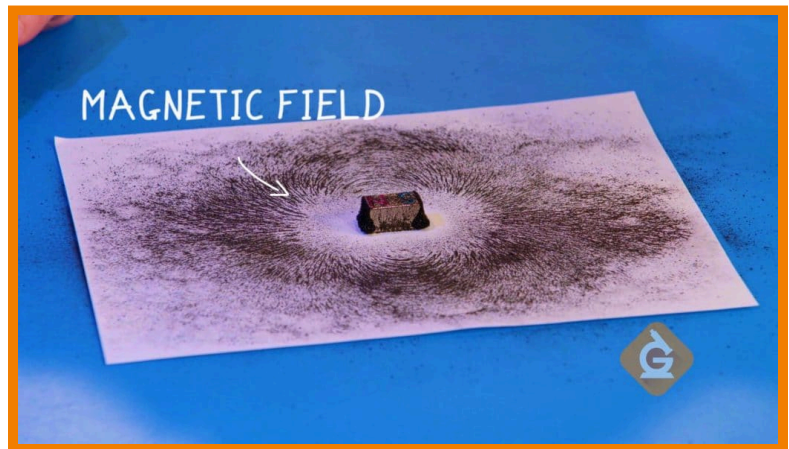
All magnets have a north and south pole. Magnetic poles are the strongest parts of a magnet.

North and south poles of magnets attract each other. The two south poles and the two north poles repel each other.

A *magnetic field* is the area around a magnet that attracts and repels objects. If you place an object inside the magnet's field, it will be attracted to the magnet. The simplest way to see a magnetic field is to sprinkle iron filings around a magnet.

Iron filings are tiny pieces of iron. When sprinkled around a magnet, they reveal the magnetic field.

The Earth also has a magnetic field - it is like a huge magnet. Compasses work because the needle inside the compass is a magnet. One side of the needle is the north pole and the other side of the needle is the south pole. The north pole of the needle is attracted to the North Pole



and the south pole of a needle is attracted to the South Pole.

The closer magnets are, the stronger the force.

Magnetism works over a distance. However, the closer the objects are to each other, the stronger the magnetic force. If you try to pull magnets apart it is very hard because the magnets are so close to each other. Once you get them a little bit apart it is much easier.



Electromagnets can be turned on or off with electricity.

An *electromagnet* is a magnet that uses electricity. The strength of an electromagnet can be changed by changing the amount of electricity that it is connected to.

By taking away the electricity running through the electromagnet, it can be turned off. In the video, Dr.

Jeff used an electromagnet to pick up paper clips. When he pulled the wires off the battery, the paper clips fell off.



Electromagnets are used to power doorbells, construction cranes, and speakers.

Magnets called *permanent magnets* cannot be turned off. These magnets do not need electricity to work.

Static electricity can push or pull things without touching them.

Static electricity is the buildup of the electrical charge in an object when it is rubbed against another object.

Static electricity causes objects to stick together when they have opposite charges and repel when they have the same charge.

Common examples of this include rubbing a party balloon on your head. Electrical charge is transferred between the balloon and your hair. They develop OPPOSITE charges which make the balloon be attracted to your hair.

Also, if you shuffle your feet across the carpet and then touch a doorknob, that is static electricity too. The charges were built up when your feet were rubbing on the carpet, and then the charge was transferred to the metal doorknob.

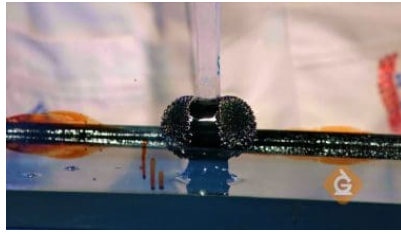


MAGNETS & STATIC ELECTRICITY EXAMPLES

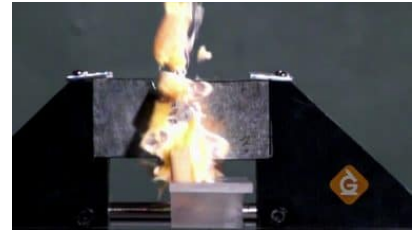


Electromagnets are used in MRI machines.

Electromagnets are commonly used in motors, speakers, and doorbells.



Ferrofluid is a magnetic liquid. Ferrofluid is made of ultra tiny pieces of iron suspended in oil. It makes cool shapes when a magnet comes close to it.



Neodymium magnets are a type of very strong permanent magnet. This magnet is so strong it can smash fruit. You must be very safe when handling large neodymium magnets.

MAGNETS & STATIC ELECTRICITY VOCABULARY

Electromagnet

A type of magnet that can be turned on and off using electricity.

Attract

When magnets with different charges come together we say they "attract" or come together.

Repel

When magnets with the same charges come together we say they "repel" or push each other apart.

Magnet

An object that produces a magnetic field.

Magnetic Field

The invisible space where a magnet can exert its force on another object.

Ferrofluid

A black liquid made up of ultra tiny pieces of iron mixed in oil. It changes shape in the presence of a magnetic field.

MAGNETS & STATIC ELECTRICITY DISCUSSION QUESTIONS

If magnetic fields are invisible, how do we know they are there?

We know they are there because magnets push and pull magnetic materials. We can also visualize magnetic fields using certain materials such as iron filings or ferrofluid seen in the video.

Is an aluminum can magnetic or non-magnetic? Why or why not?

An aluminum can is not attracted to a magnet. We see this during the “magno-board” investigation. Only certain kinds of metal like iron, nickel and cobalt are attracted to a magnet.

Why do the neodymium magnets come together and pulverize the fruit?

The neodymium magnets are set up with opposite poles facing each other so that they are attracted to each other. These types of magnets are VERY strong and when they are pulled together with a lot of force, fruit can be smashed!

How are magnetic force and distance from an object related?

The closer a magnet is to an object, the stronger the force.

How can a nail become an electromagnet and magnetically attract paper clips?

An iron nail wrapped in wire is not magnetic, but when electricity from a battery flows round and round through the coil of wire it creates a magnetic field. When the electricity stops flowing the magnetic field disappears and the nail is no longer magnetized.

Do the balloon and plastic bag used in the levitation device have the same or opposite charges?

The balloon and plastic bag have the same charges. Evidence: they repel each other.
