

COOL MAGNET

DEMOS TO DO AT

HOME!

- Graduate Association of
Physicists -

Step into STEM

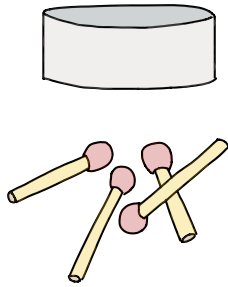
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Georgia Tech

MAGNETS ATTRACT BURNT MATCHES

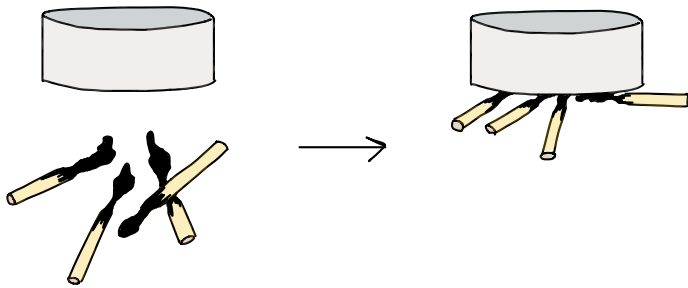
- Materials:
- Matches (with the red tip)
 - Neodymium magnet

If you hold a magnet over unburnt matches



nothing happens.

BUT! If you burn the matches, then hold the magnet over them



they stick to the magnet!

WHY DOES THIS HAPPEN?

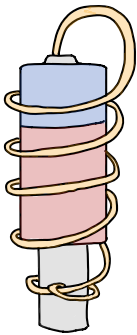
The head of the match is made of iron oxide and carbon.

When it burns, the iron oxide turns to iron, which is what causes the magnet to attract the match!

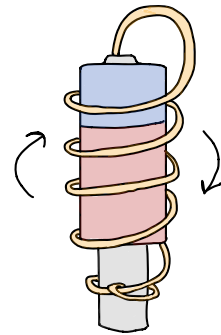
HOMOPOLAR MOTOR

- Materials:
- AA battery
 - Copper wire
 - Neodymium magnets

Put the battery on top of the magnet, and wrap the copper wire around the battery, as seen in the diagram below (wrapping the wire around a marker may be helpful).



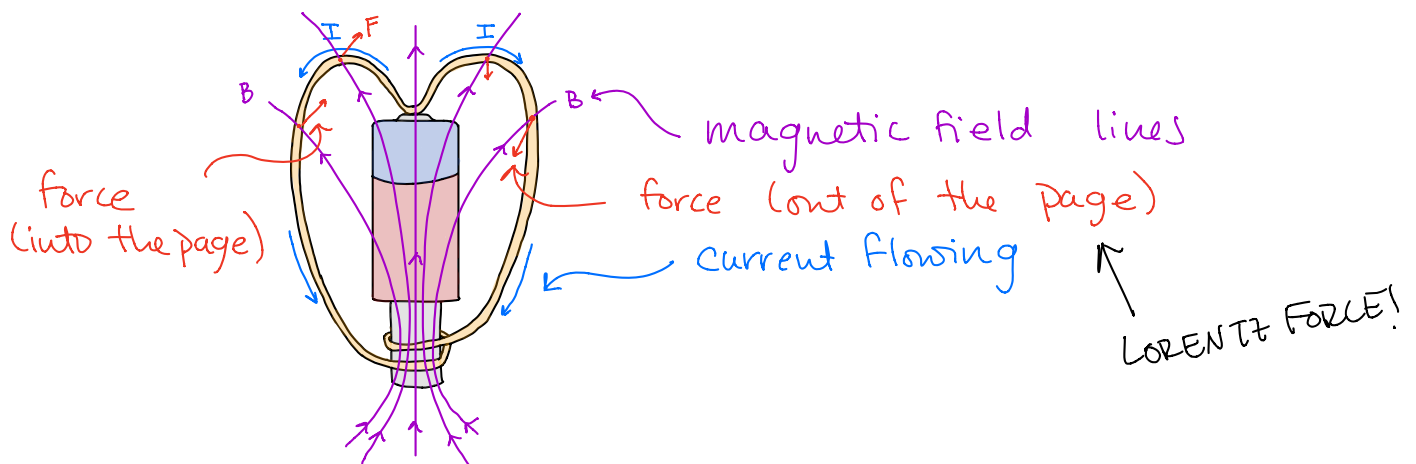
Once everything is connected, the coil will spin!



WHY DOES THIS HAPPEN?

Current flows through the battery, through the wire, to the magnet attached to the other end of the battery, creating a closed circuit.

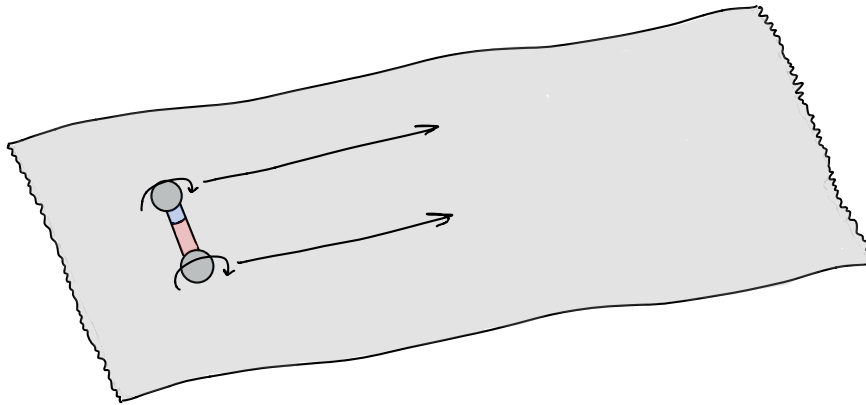
The Lorentz force, a force which acts on moving charges in the presence of a magnetic field, is what causes the coil to turn!



ROLLING BATTERY

- Materials:
- AA Battery
 - Neodymium magnetic disks OR Spheres
 - Aluminum foil

This one is easy! Lay some aluminum foil out on a flat surface. Now put the magnets at each end of the battery, and place on the foil, and watch it roll!



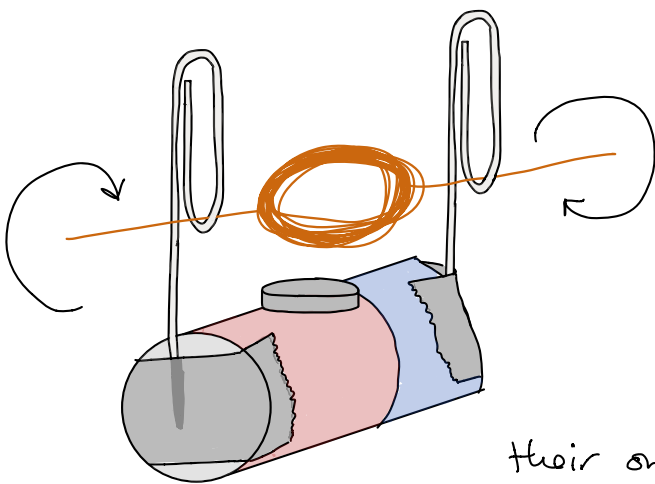
WHY DOES THIS HAPPEN?

This happens for the same reason as the homopolar motor, but now the battery is turned on its side, and the foil acts as the wire!

ELECTRIC MOTOR

- Materials:
- Copper wire
 - 2 paper clips
 - Sand paper
 - duct tape
 - D battery
 - magnet

This demo is quite simple, but requires a bit of set up. Tape the paper clips to each end of the D-battery. (You don't need to use paper clips, you can use safety pins or copper wire with a loop at the end - you just need some metal to support the coil) Roll the wire into a circle with two ends sticking out. Sand the two ends down so all the enamel is removed. This ensures the circuit will be complete. Put both ends in the supports created by the paper clip. Now put the magnet under the loop, and watch it spin!



WHY DOES THIS HAPPEN?

By connecting all these pieces, we have created a closed circuit. Current flows through the wire, and into the loop. Loops of wire create

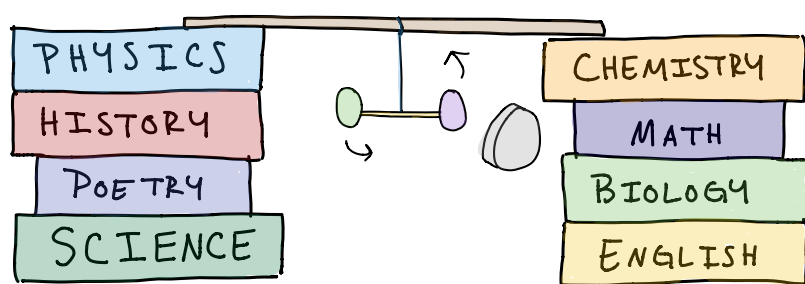
their own magnetic field. This magnetic

field now interacts with the magnet on top of the battery, causing the coil to spin!

PUSH GRAPES WITH A MAGNET

- Materials:
- 2 large grapes
 - A thin wooden rod (toothpick)
 - Strong magnet
 - string
 - long wooden dowel

Stick your two grapes on either end of your thin wooden rod. Then tie your string to the middle of that rod. Tie the other end of the string to the wooden dowel, and balance this between two tall objects, so that the grapes are hanging freely. Make sure the grapes are not affected by any moving air! Hold the magnet up to one of the grapes, and watch them spin!



use your favorite school books to balance the grapes!

WHY DOES THIS HAPPEN?

The water in the grapes is diamagnetic. This means that it is repelled by both the north and the south

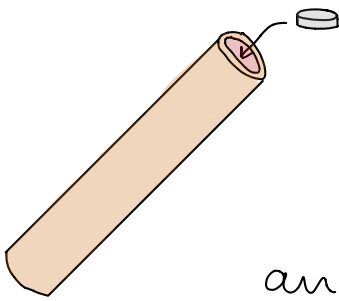
poles of a magnet! So when the magnet is held close to the grape, the grape wants to get away from the magnet!

MAGNETS FALL SLOWLY IN COPPER TUBES

Materials:

- Copper tube
- Magnet that can fit inside the tube.

Drop the magnet down the copper tube. The magnet falls very slow!



WHY DOES THIS HAPPEN?

When the magnet falls through the tube, the changing field creates an electric field in the metal, which creates its own magnetic field, opposite to the magnet in the tube. This is called Lenz's Law. Because of these opposite fields, the tube now attracts the magnet, causing the magnet to fall slower.

How DO MAGNETS WORK?

Magnets are special materials that produce invisible magnetic fields. The pieces that make up the magnet, the molecules, are all aligned such that the electrons spin is in the same direction. Since electrons have charge, they produce a magnetic field.

One magnet is strong, but many magnets are really strong!