

Name:

# Electricity & Magnets (Teacher Version)

## Static vs Current Electricity

**Static electricity** is build up of electric charge. **Current electricity** moves through wires or some other medium.

Can you determine if these everyday examples of electricity are **static** or **current** electricity?

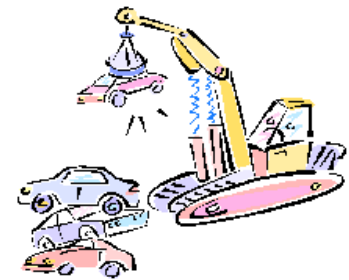


Clockwise from top left: Current, Current/Static (electric ink adhesion), Current, Static, Current, Static

## Easy Electromagnet!

### Materials:

- Scissors
- Wire
- Screwdriver
- Ruler
- 4.5-volt batter
- Metal paper clips



### Instructions:

1. Cut a piece of wire about 5 times as long as the metal part of the screwdriver. If the wire has a coating, scrape it off.

2. Wrap the metal tightly around the screwdriver, leaving about 6 inches of wire on each end.

3. Wrap one end around a battery terminal, and try to pick up the paperclips with the screwdriver. What happens?

4. Wrap the free end around the other battery terminal, and try to pick up the paperclips again. What happens?

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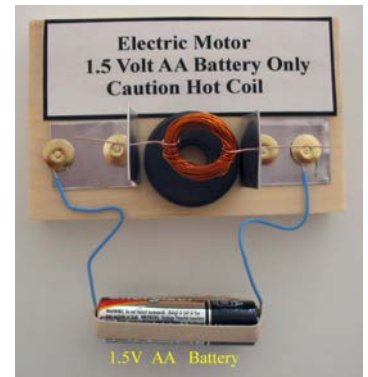
## Talk About It!

1. What happened when you connected both ends of the battery? *The paperclips were attracted to the screwdriver.*
2. Why do you think this happened? *Electricity and magnetism are very closely related. When the electrical circuit was completed, you rearranged tiny parts of the screwdriver and made it become an electromagnet.*

## Motors

Electromagnets can also be used to make motors, as see here and in the demo video.

Where do you have motors in your house?



## Station Relation

Outside of our houses, electromagnets are everywhere!

**Electromagnetic Trains:** Travellers to Pudong Airport in China can ride at 430 kph on a train with no wheels. Electromagnets lift and propel the train forward, giving riders a smooth ride as the train floats above the magnetic guideway.

**Scrapmetal Sorting:** Electromagnets make it easy to handle scrap metal. When the current is switched on, it creates strong magnetism that picks up a load of different steels. To drop the metal, the current is simply switched off.

**Rollercoaster Rides:** Some rollercoasters use the same idea as the electromagnetic train above. This makes the ride smoother for riders, but still offers a lot of speed, twisting, and turning!



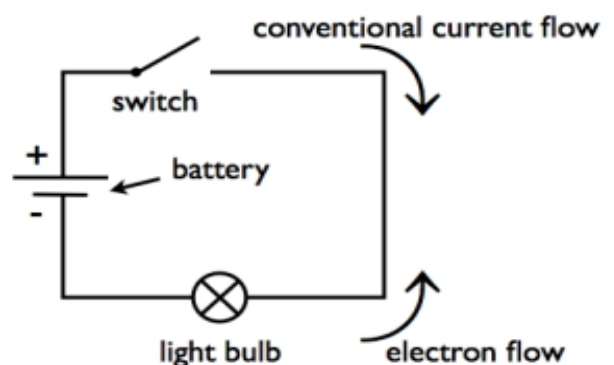
## Circuits

Can you identify the different parts of this circuit?

Why do you need a switch to be closed for a circuit to work? *Otherwise the electrons have no path to follow.*

What sort of **loads** can you put in a circuit? *A fan, lightbulb, doorbell, radio, any sort of appliance...*

Based on your experience with electromagnets, write a brief description of how they work: *When the circuit is completed, electrons travel through the wire, around the metal of the screwdriver and generate a magnetic field by creating a North and a South end on the metal.*



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## Image Sources:

### Static vs Current Electricity:

1. How Stuff Works: <http://science.howstuffworks.com/electricity9.htm>
2. Explain That Stuff!: <http://www.explainthatstuff.com/electricity.html>
3. Icon Archive: <http://www.iconarchive.com/show/dragon-soft-icons-by-artua/Printer-icon.html>
4. Cell Phone MD: <http://www.cellphonemdusa.com/game-consoles/>
5. ChaCha: <http://www.chacha.com/gallery/5680/what-are-the-biggest-rumors-about-the-iphone-5s>
6. National Geographic: <http://environment.nationalgeographic.com/environment/natural-disasters/lightning-profile/>

### Easy Electromagnet:

1. Best Clip Art Blog: <http://bestclipartblog.com/23-scissors-clip-art.html>
2. Lynx Media: <http://www.lynx-india.com/index.php?productID=19843>
3. Pioneer Batteries: <http://www.pioneerbatteries.com/3lr12-45v-battery-6l-p.asp>
4. CoolClips: [http://dir.coolclips.com/Industry/Trades/Heavy\\_Equipment/Cranes/magnetic\\_crane\\_with\\_car\\_in\\_the\\_junk\\_yard\\_vc014781.html](http://dir.coolclips.com/Industry/Trades/Heavy_Equipment/Cranes/magnetic_crane_with_car_in_the_junk_yard_vc014781.html)
5. OMJ Electrical Services: <http://www.crawleyelectricians.com/index.php>
6. 4Vector: <http://4vector.com/free-vector/free-vector-vector-clip-art-ruler-clip-art-115827>

### Motors:

1. Hila Road Science Camp: <http://hilaroad.com/camp/projects/magnet.html>

### Station Relation:

1. Popular Mechanics: <http://www.popularmechanics.com/technology/engineering/infrastructure/4232548>
2. BBC: [http://www.bbc.co.uk/schools/gcsebitesize/science/triple\\_aqa/keeping\\_things\\_moving/the\\_mot\\_or\\_effect/revision/2/](http://www.bbc.co.uk/schools/gcsebitesize/science/triple_aqa/keeping_things_moving/the_mot_or_effect/revision/2/)
3. eGFI: <http://teachers.egfi-k12.org/special-feature-roller-coaster-physics/>

### Circuits:

1. RKM: <http://www.rkm.com.au/animations/animation-electrical-circuit.html>