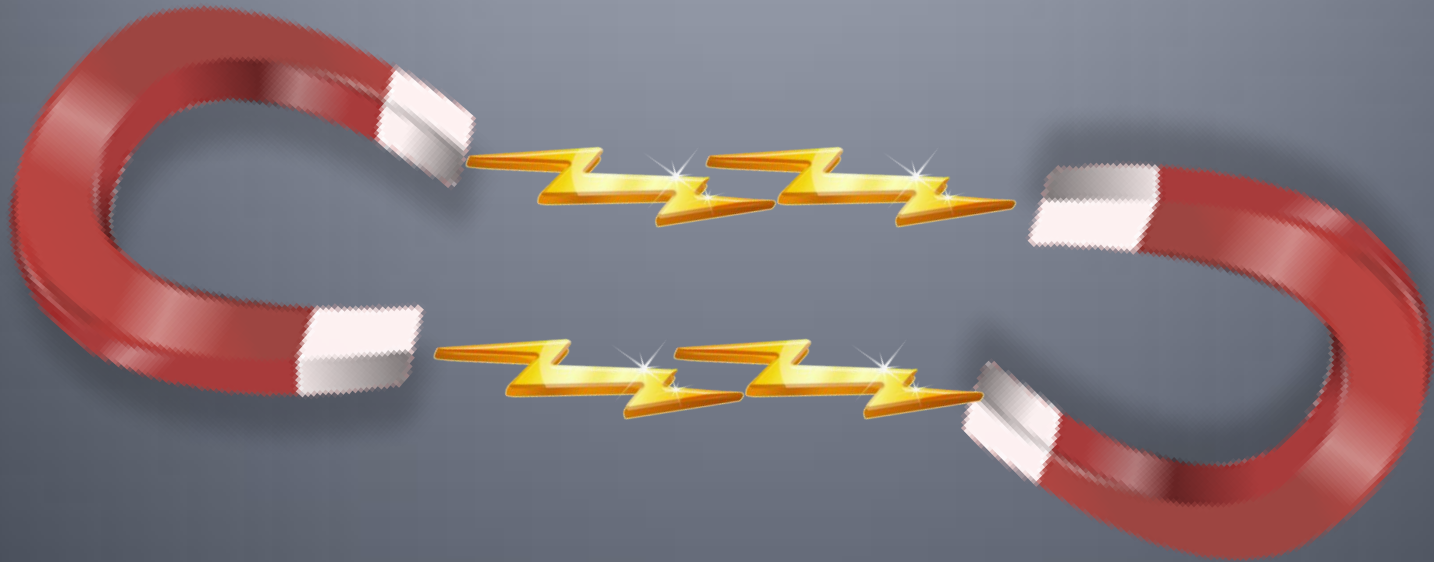


# Magnetism



# Where do magnets come from?

- Magnets are found naturally in a mineral called magnetite (a type of iron).
- There are two stories of how the first magnets were discovered:
  - One comes from the rocky hills of Ancient Greece—unusual black rocks would stick to each other and on the metal-tipped ends of shepherds' walking sticks.
  - Another comes from China—the people were said to carve magnetite to rock back and forth; they would turn and spin, but then always rest pointed in the same direction.

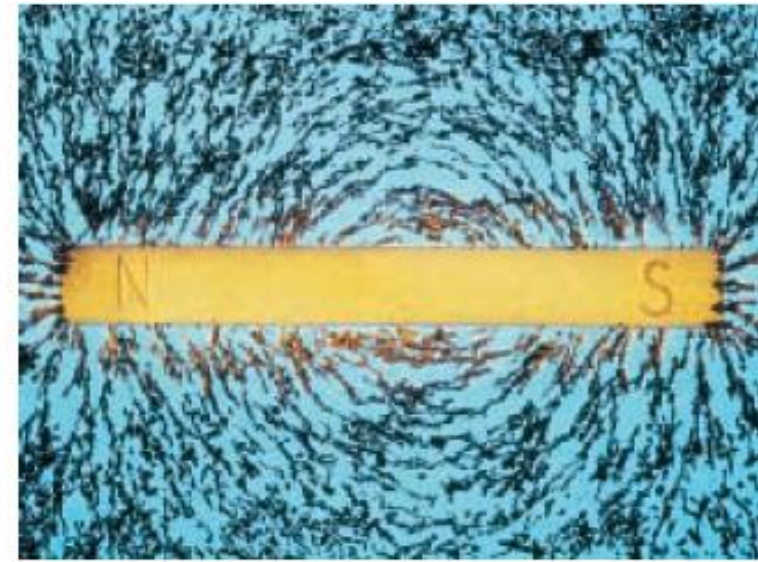
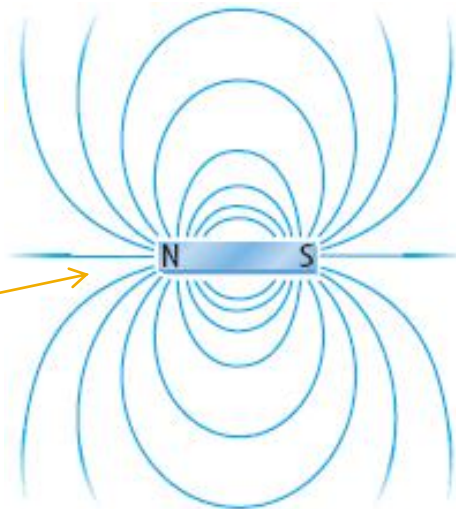


# Magnetism

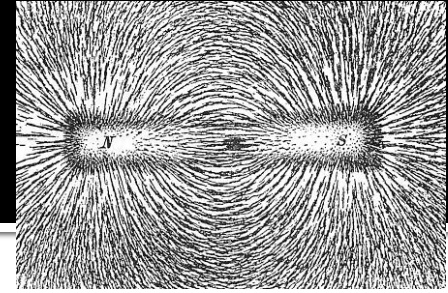


- *Magnetism* is the invisible force produced by certain objects. The force attracts items made of iron, nickel, and cobalt.
- Magnets have a *magnetic field* (invisible lines of force around a magnet) that attract or repel certain materials.

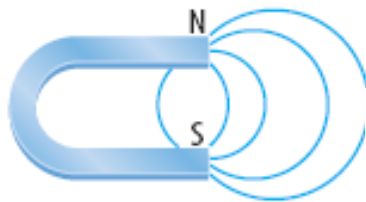
These lines show  
the magnetic  
field.



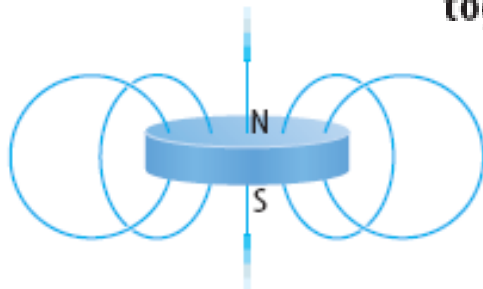
# Magnetic Fields



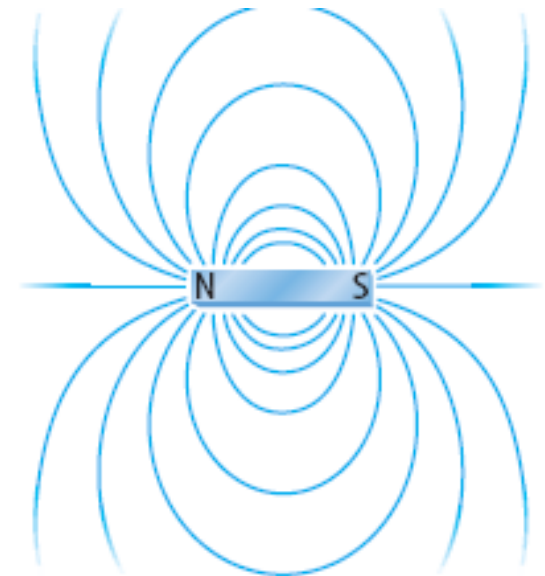
- There are many kinds of magnets, but...
- ...ALL magnets have two *poles* or ends labeled north and south poles. At the poles of a magnet, the magnetic field lines are closer together... so this is where the magnet is **STRONGEST**.



The magnetic field lines around horseshoe and disk magnets are closest together at the magnets' poles.



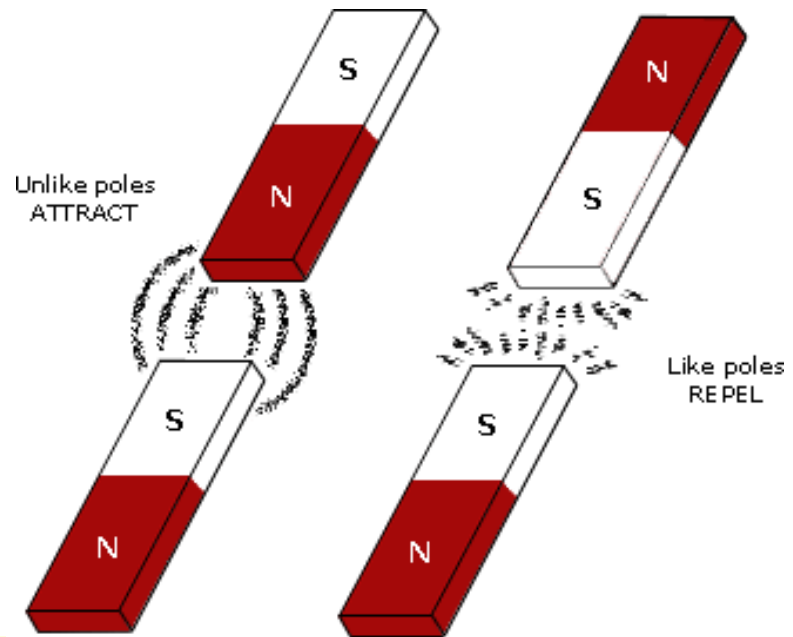
Let's try it! 😊



# Like... repel      Opposites... attract

(Haven't we heard this before??)  

- Just like we learned in electricity, opposite poles **attract** and like poles **repel**.
- A magnet's N pole will attract another magnet's S pole (and vice versa).
- A magnet's N pole will repel another magnet's N pole (and vice versa).
- Let's try it! 😊

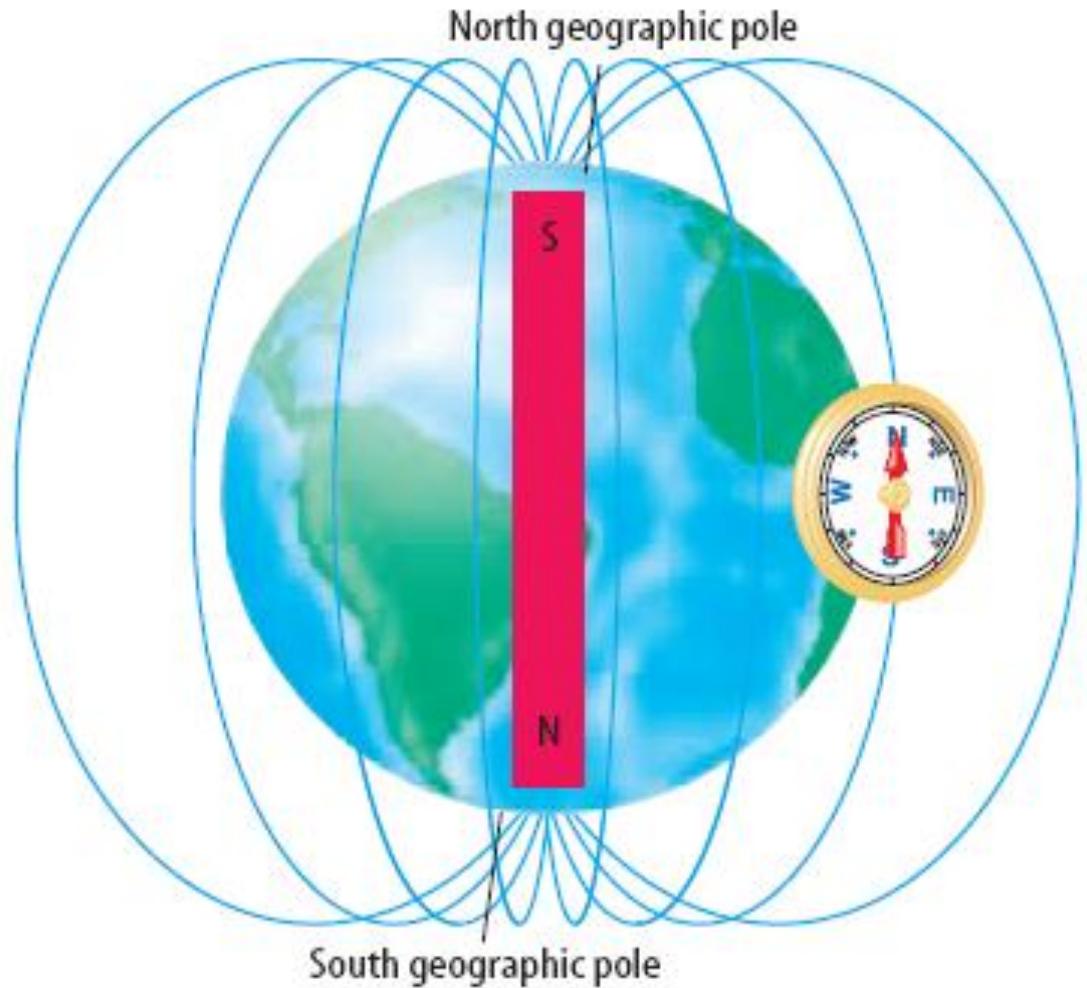




# One BIG magnet!



- The earth is a giant magnet!
- The nickel-iron core of the earth gives the earth a magnetic field much like a bar magnet.
- This is why compasses work!



# Compasses

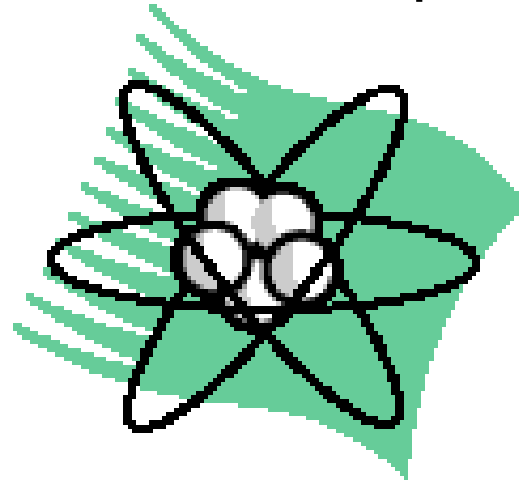
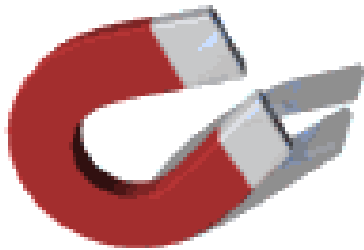


- The first compasses were made from magnetite and were used on ships to help guide them across the oceans.
- The magnetite is attracted to the north pole (really the south pole) of the earth. (See picture...)
- Therefore, the magnetic needle will always spin to face N, and you just adjust your compass to find out your current direction.
- Let's try it! 😊

# Magnets and Electricity



- Magnets and electricity are closely related.
- Magnets get their force from electric charges (electrons) moving in the magnet.
- This week, and next week, we will explore magnets further! 😊





# Magnets are EVERYWHERE!



- If you have ever used a computer, phone, microwave oven, copy machine, or refrigerator, then you have used magnets!
- All these items, and many more, use magnets everyday to function and work.
- **Did you know? Acrophobia** at Six Flags over Georgia uses powerful magnets to slow the ride to a stop! How natural! 😊



# What do magnets attract?



- We are going to try out some different materials to see what items are magnetic... and record our findings!



# Temporary versus Permanent



- The magnets that we used today are *permanent magnets* (magnets that keep their magnetic force at all times).
- However, we can also make *temporary magnets* (magnets that only have a magnetic force after being around another magnet).
- Let's try it! 😊



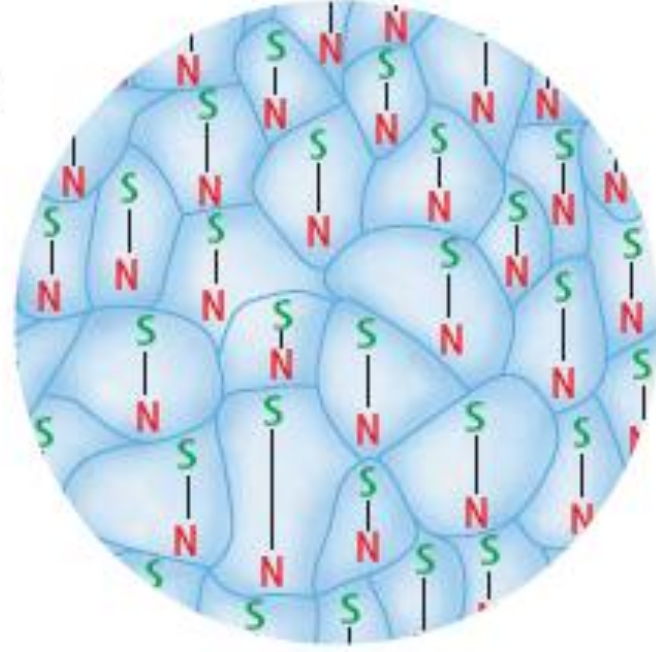
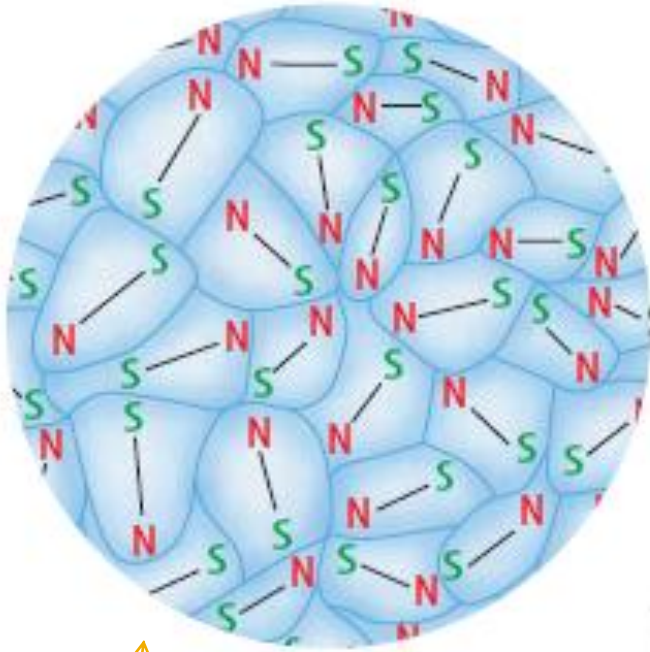
# Why does this work?



- Certain items can be magnetized because of the magnetic domains located inside each of the items. (These domains are typically composed of billions of atoms.)
- Magnetic substances like iron, cobalt, and nickel are composed of small areas (domains) where the groups of atoms are aligned like the poles of a magnet.
- All of the domains of a magnetic substance tend to align themselves in the same direction when placed in a magnetic field...making a temporary magnet.



# Magnetic Domains



**A** A normal iron nail is made up of billions of domains that are arranged randomly.

**B** The domains will align themselves along the magnetic field lines of a nearby magnet.

(If you drop the nail, though, then its domains will get all jumbled up again.)

# Electricity and *Magnetism* – how are they related?

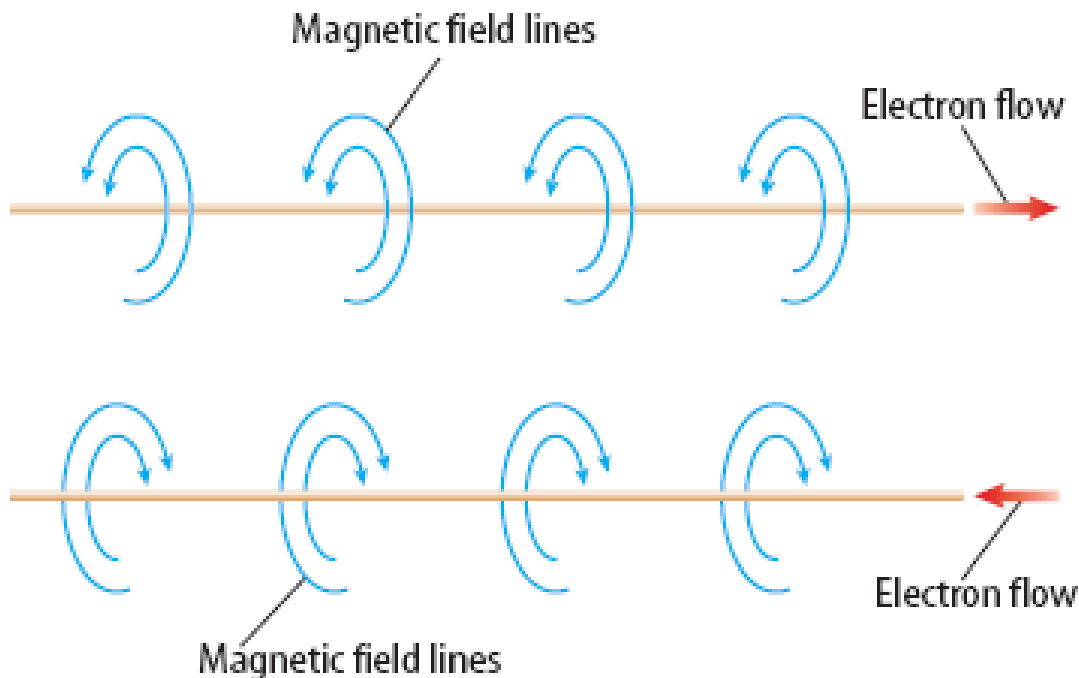




# Electricity = Magnetism



- When an electric current passes through a wire, a magnetic field is formed around that wire.

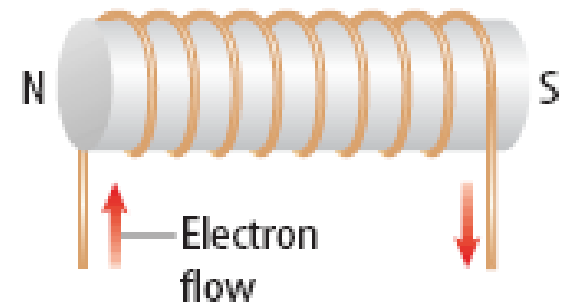
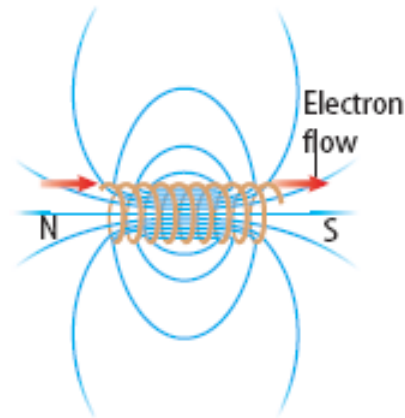


When electric current flows through a wire, a magnetic field forms around the wire. The direction of the magnetic field depends on the direction of the current in the wire.

# Electromagnets (p.96)



- When an electric current is passed through a coil of wire wrapped around a metal core, a very strong magnetic field is produced. This is called an **electromagnet**.
- Electromagnets use electricity to generate magnetic fields around magnetic materials.
- Let's try it! 😊



An iron core inserted into the coil becomes a magnet.

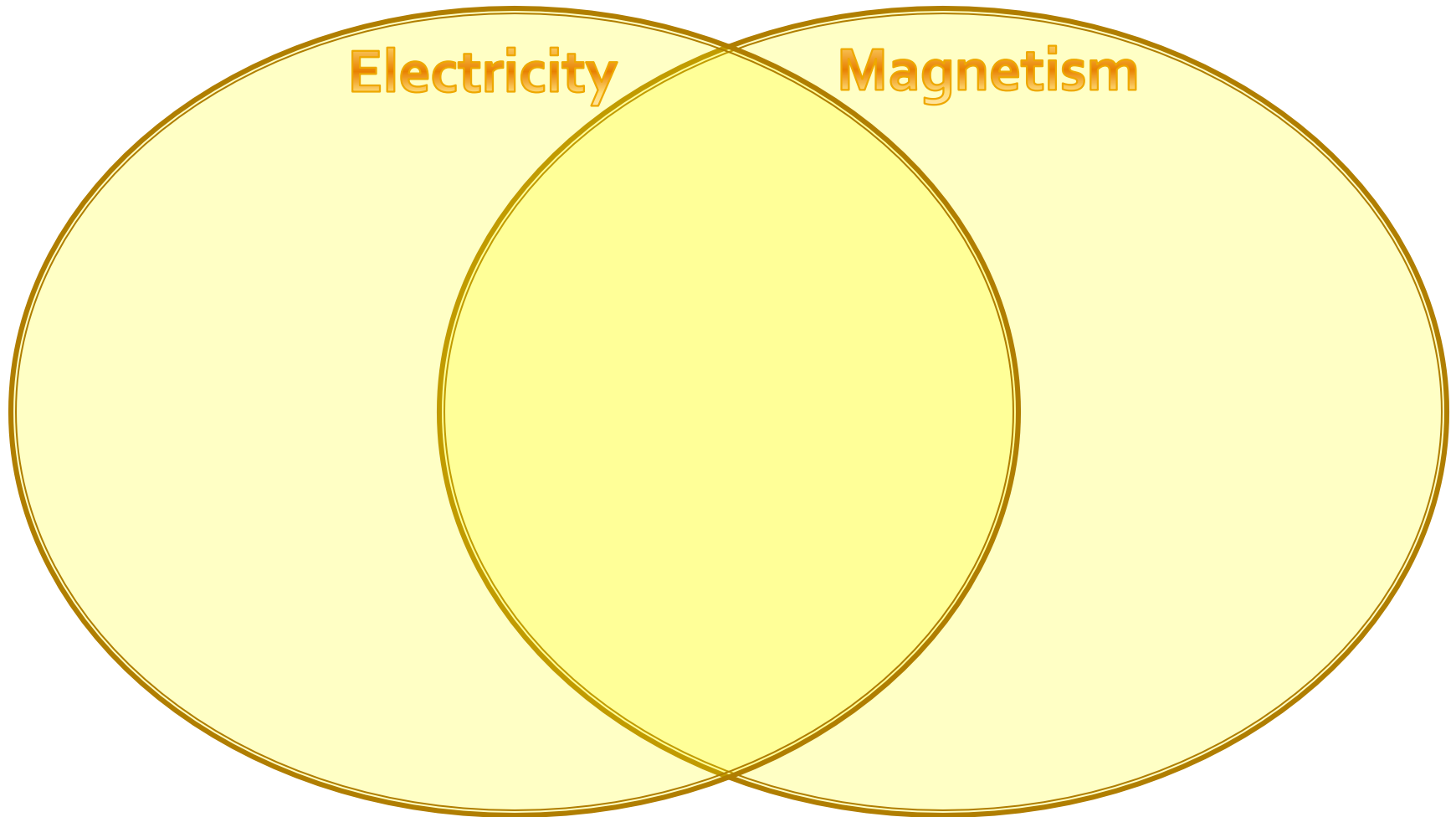
# How useful! (p.97)



- Electromagnets are very useful, because the magnetism can be “turned off” at will!
- Once the electric current stops flowing through the wire, the magnetism ceases.
- Electromagnets are used in scrap yards to lift and drop huge metal items.



# Compare and Contrast



# Compare and Contrast

