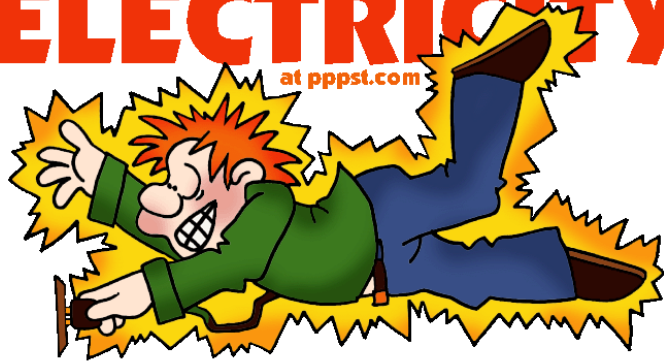


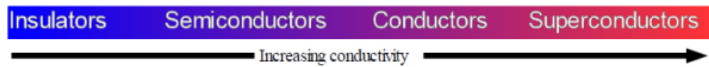
ELECTRICITY

at pppst.com



Electricity is the presence of a flow of electrons within or between substances.

Insulators and Conductors



- Glass
- Plastics
- Rubber
- Wood
- Stone
- Paper

- Any metals
- water
- vinegar
- high salt concentrations

The Electrostatic Series



- Human hands (usually too moist, though) *Very positive*
- Rabbit Fur
- Glass
- Human hair
- Nylon
- Wool
- Fur
- Lead
- Silk
- Aluminum
- Paper
- Cotton
- Steel *Neutral*
- Wood
- Amber
- Hard rubber
- Nickel, Copper
- Brass, Silver
- Gold, Platinum
- Polyester
- Styrene (Styrofoam)
- Saran Wrap
- Polyurethane
- Polyethylene (like Scotch Tape)
- Polypropylene
- Vinyl (PVC)
- Silicon
- Teflon *Very negative*



Ways to transfer a charge:

1. Friction
caused by rubbing

2. Conduction
also known as charging by contact

3. Induction
charging without contact

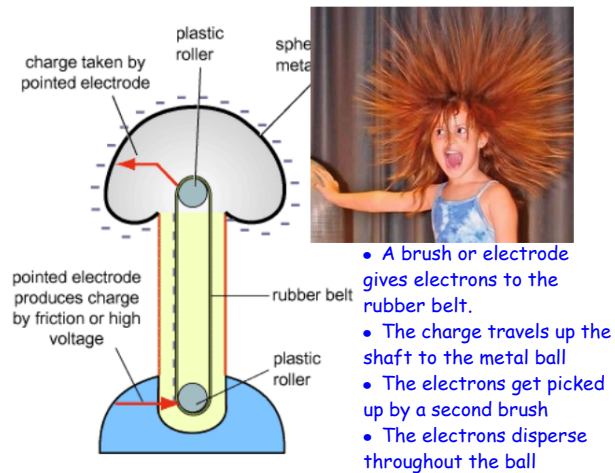


1. Friction

Static electricity: Occurs when a build up of electric charge remains in one place.



Van de Graaff Generator



Fabric Softener



- As clothes tumble in the dryer, electrons are lost and gained by the various materials
- The opposite charges attract, creating STATIC!
- Bounce sheets help redistribute the electrons so that all materials act alike and have the same charge
- NO STATIC!

Lightning!

<http://science.howstuffworks.com/lightning.htm>

- During an electrical storm, electrons pool at the bottom of a cloud
- The electrons on Earth are repelled deeper into the earth, resulting in a positive charge near the surface
- Opposites attract- Step leaders of electrons take the path of least resistance to the earth and streamers of positive charges reach up to meet them



Ways to transfer a charge:

1. Friction

caused by rubbing

2. Conduction

also known as charging by contact

3. Induction

charging without contact



2. Conduction

- 2a) The rod is negatively charged, the metal sphere is neutral
- 2b) The rod repels the electrons in the sphere
- 2c) Conduction allows electrons to migrate to the sphere
- 2d) The electrons are balanced, but the sphere is now negatively charged



Illustration 2a:
Charged and Neutral Objects

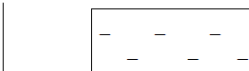


Illustration 2b:
Separation of Charge

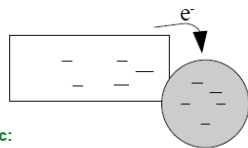


Illustration 2c:
Conduction!



Illustration 2d:
Afterwards



Ways to transfer a charge:

1. Friction

caused by rubbing

2. Conduction

also known as charging by contact

3. Induction

charging without contact



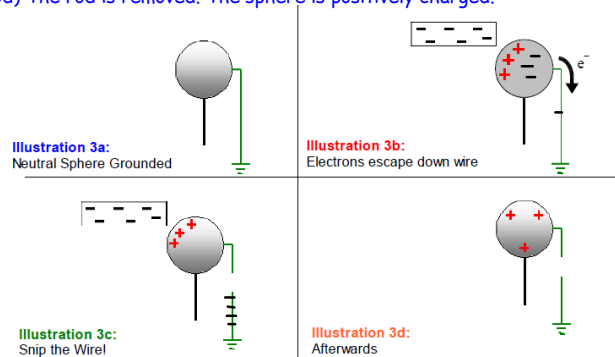
3. Induction

3a) Neutral metal sphere which has been grounded.

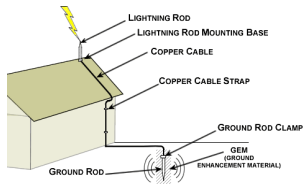
3b) A negatively charged rod approaches the metal sphere, repelling the electrons in the metal sphere down the grounding wire

3c) The wire is cut so electrons can't fill back in.

3d) The rod is removed. The sphere is positively charged.



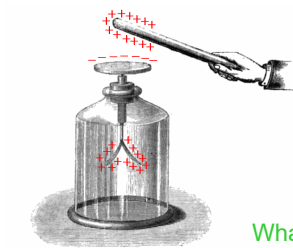
Grounding or Discharging



- grounding or discharging something means you make a pathway available for a surplus of electrons to escape into the ground

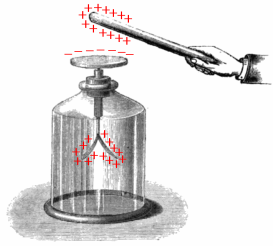


Electroscope

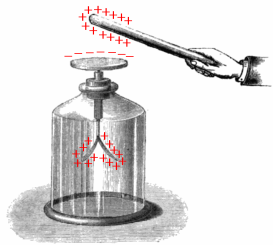


- if the charging rod is positively charged, it will attract electrons from below
- if the electrons leave the bottom of the electroscope, there will be a separation of charge and it will become positive at the bottom
- if both leaves are positive, they will repel

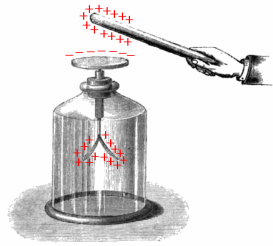
What would happen if the rod was negatively charged?



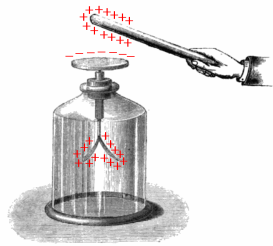
Is this an example of conduction, or induction?



What would happen if I took the rod away?



What would happen if I touched the electroscope with the positive rod for a few seconds, then took it away?



What would happen if I touched the electroscope with the positive rod for a few seconds, then took it away, then touched it with my hand?

Cells and Batteries



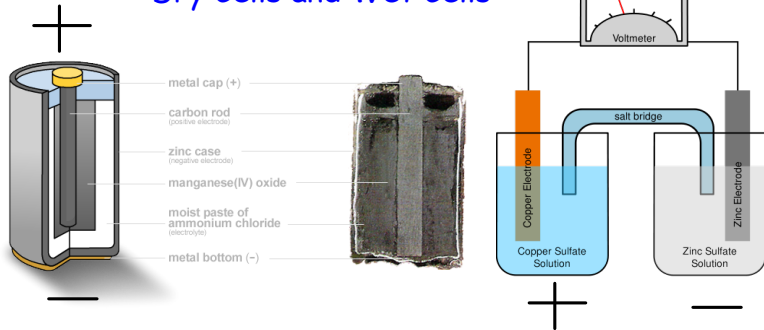
Cells



Battery



Dry Cells and Wet Cells



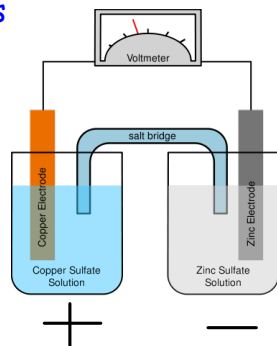
Cells take chemical energy and convert it to electrical energy

Dry Cells and Wet Cells



Dry cells have:

- a gel electrolyte
- a positively charged metal cap called a cathode
- a negatively charged metal bottom called an anode



Wet cells have:

- a liquid electrolytes (2 of them)
- a positively charged electrode made of copper (still called a cathode)
- a negatively charged electrode of zing (still referred to as an anode)

http://www.youtube.com/watch?v=TriS8_X6cTc

<http://www.youtube.com/watch?v=adk4V24Es3g>

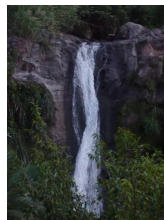
Circuit terminology:

- **Volts**- the pressure pushing electrons through the circuit
- **Current**- the amount of electrons flowing through the circuit
- **Resistance**-the ease with which the electrons can flow through a circuit

Voltage



low (low drop)



high (high drop)

Current



low (less water)

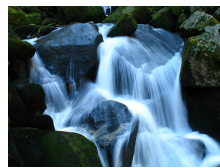


high (more water)

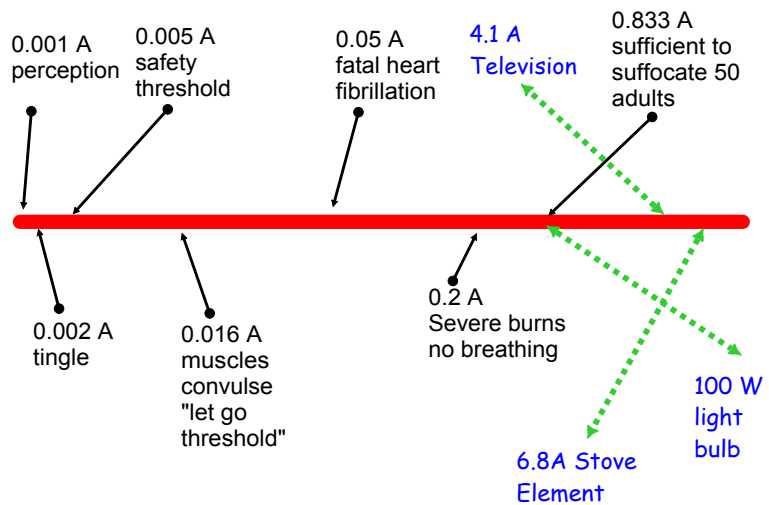
Resistance



low (nothing in way)



high (lots in the way)



Ohm's Law

$$V = IR$$

voltage (v) current (A) x resistance (Ω)

Resistance of some electrical loads

Find the missing value

Electrical Load	Voltage Drop (V) volts	Current (I) amperes	resistance (R) ohms
flashlight bulb	6	0.25	24
coffee grinder		1.2	100
food dehydrator		4.6	26
toaster oven	120		8.6
water heater	240	18.75	
60 W light bulb	120	0.5	

$$V = IR$$

volts (v)

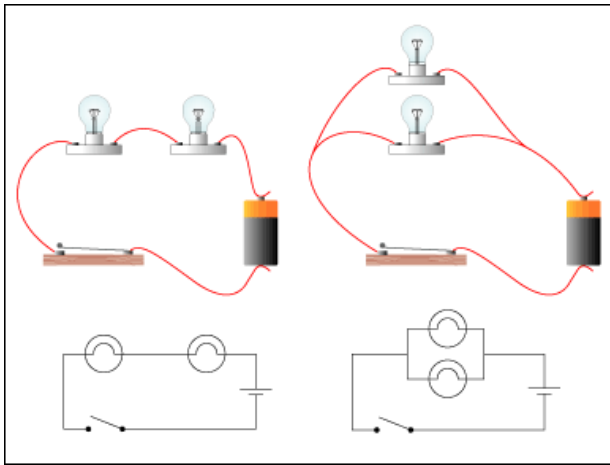
$$I = \frac{V}{R}$$

Amperes (A)

$$R = \frac{V}{I}$$

ohms(Ω)

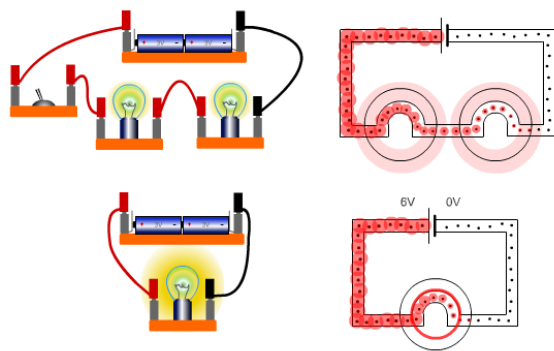
Series and Parallel Circuits



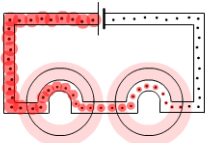
Series

Parallel

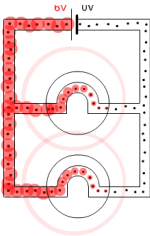
Why do lights in series dim?



Why don't lights in Parallel dim?

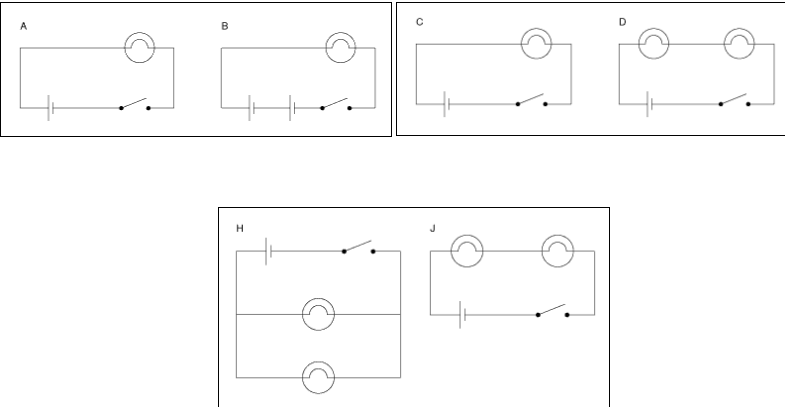


- Series**
- the same electrons must supply the energy to light TWO light bulbs

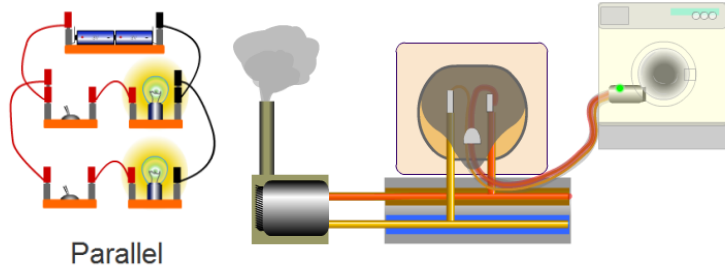


- Parallel**
- different electrons go through each light bulb
 - they can give all of their energy to the light bulb

Which circuit will be brighter?



Your House



Sources of Energy

1. Fossil Fuels

- combustion of coal, gas, petroleum



- plenty
- cheap



- acid rain
- global warming



Sources of Energy

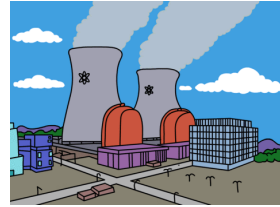
2. Nuclear
- breaking atoms into pieces



- kind of environmentally friendly
- efficient production



- expensive to build
- nuclear wastes dangerous
- dangerous if uncontrolled
- non renewable



Sources of Energy

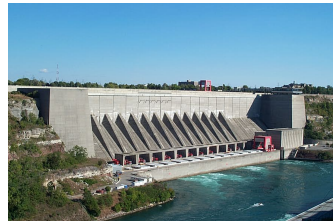
3. Hydroelectric
- energy created from water



- renewable
- E friendly
- efficient
- accessible



- requires flow of water
- affects ecosystems



Sources of Energy

4. Solar

- converting light



- renewable
- E friendly

- must be sunny
- not efficient

Sources of Energy

5. Wind

- converting turbine energy



- renewable
- E friendly

- must be windy
- not efficient
- expensive to run

Sources of Energy

6. Geothermal

- using heat from earth's core



- renewable
- E friendly



- must have good location
- not efficient

