

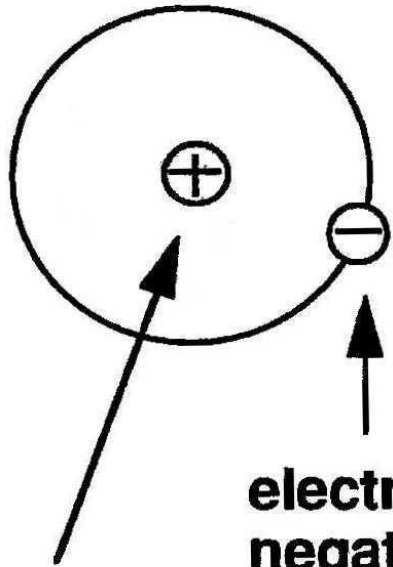


Electricity Merit Badge

Week 1



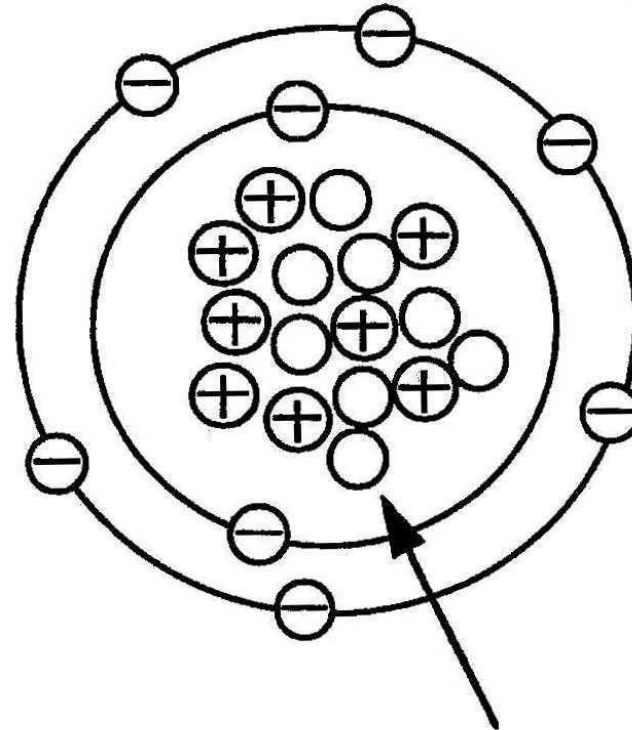
Hydrogen Atom



**electrons are
negative (minus -)**

protons are positive (plus +)

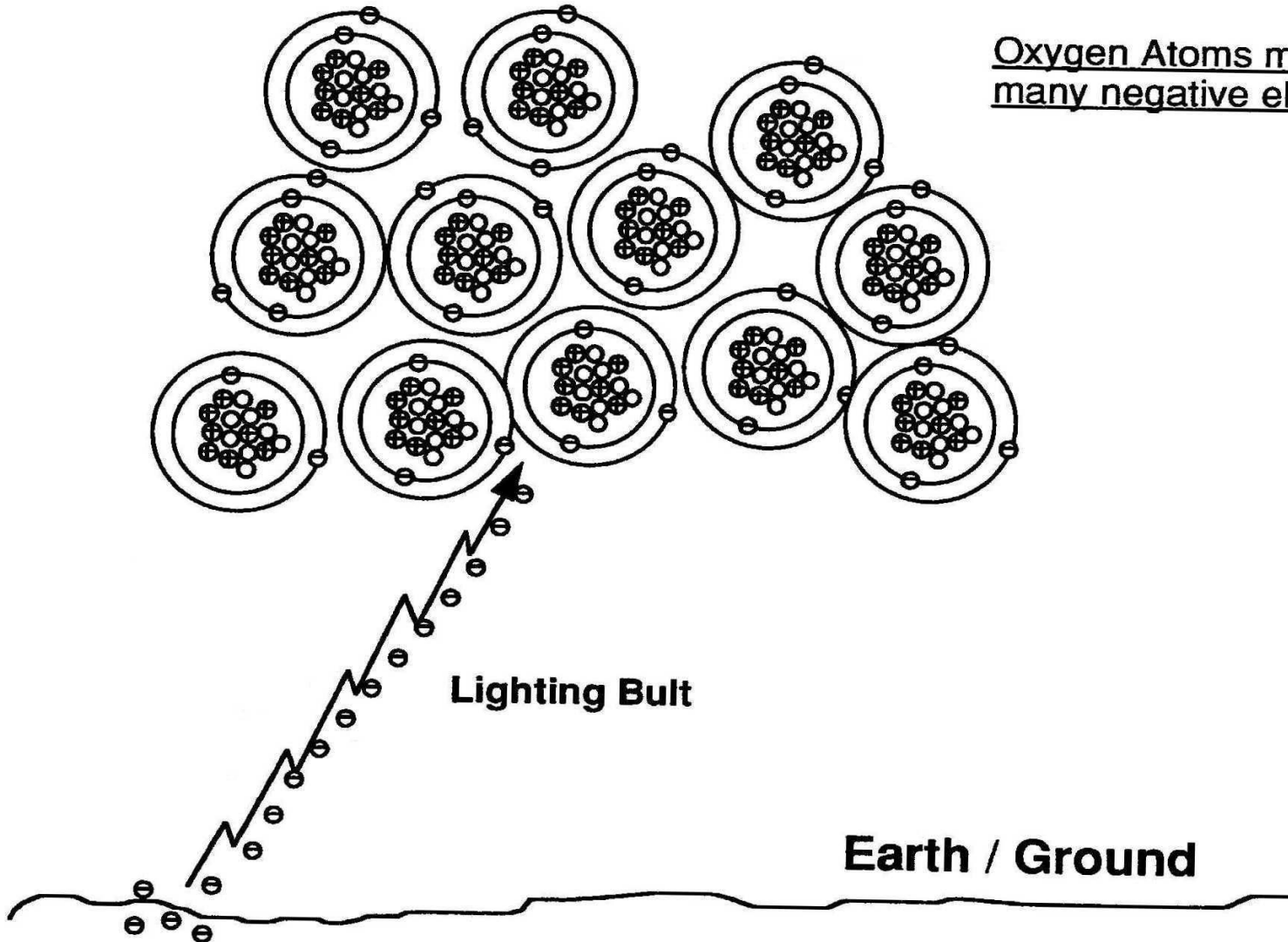
Oxygen Atom



**neutrons have
no charge.**

Oxygen Atoms

Oxygen Atoms missing many negative electrons



Types of Electricity

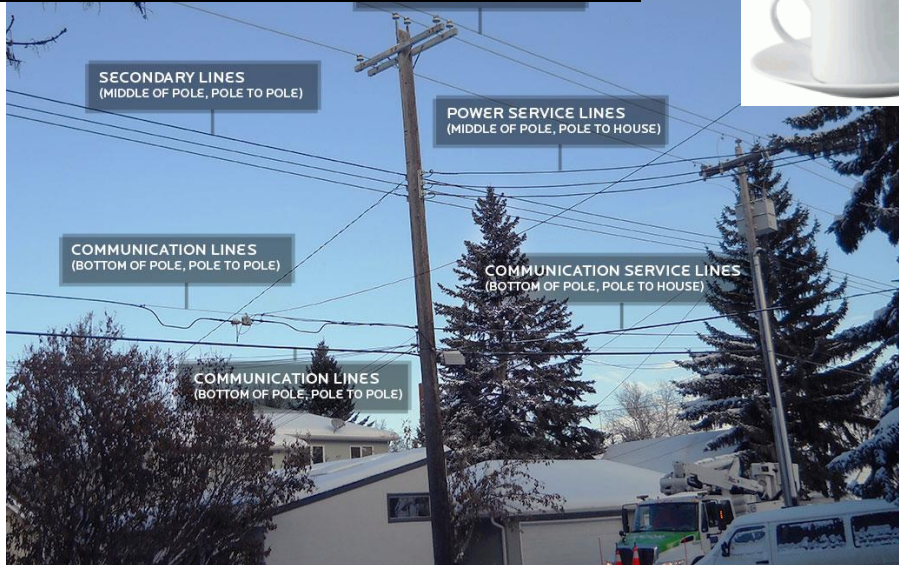
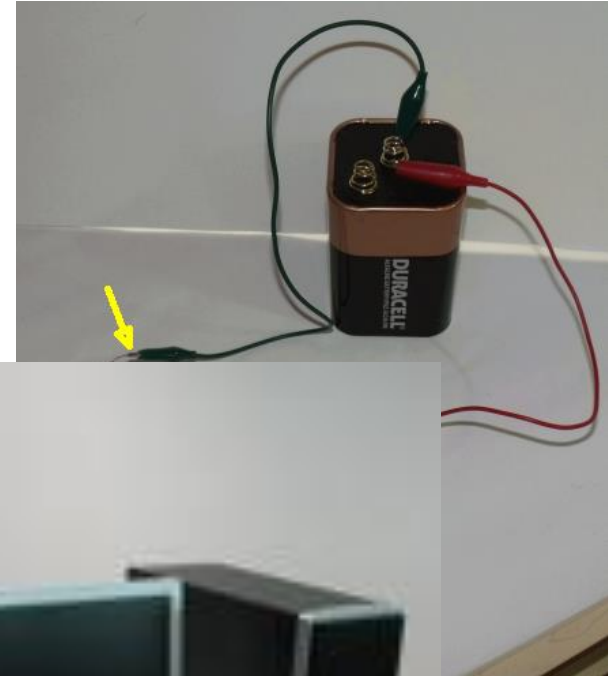


6/21/2022

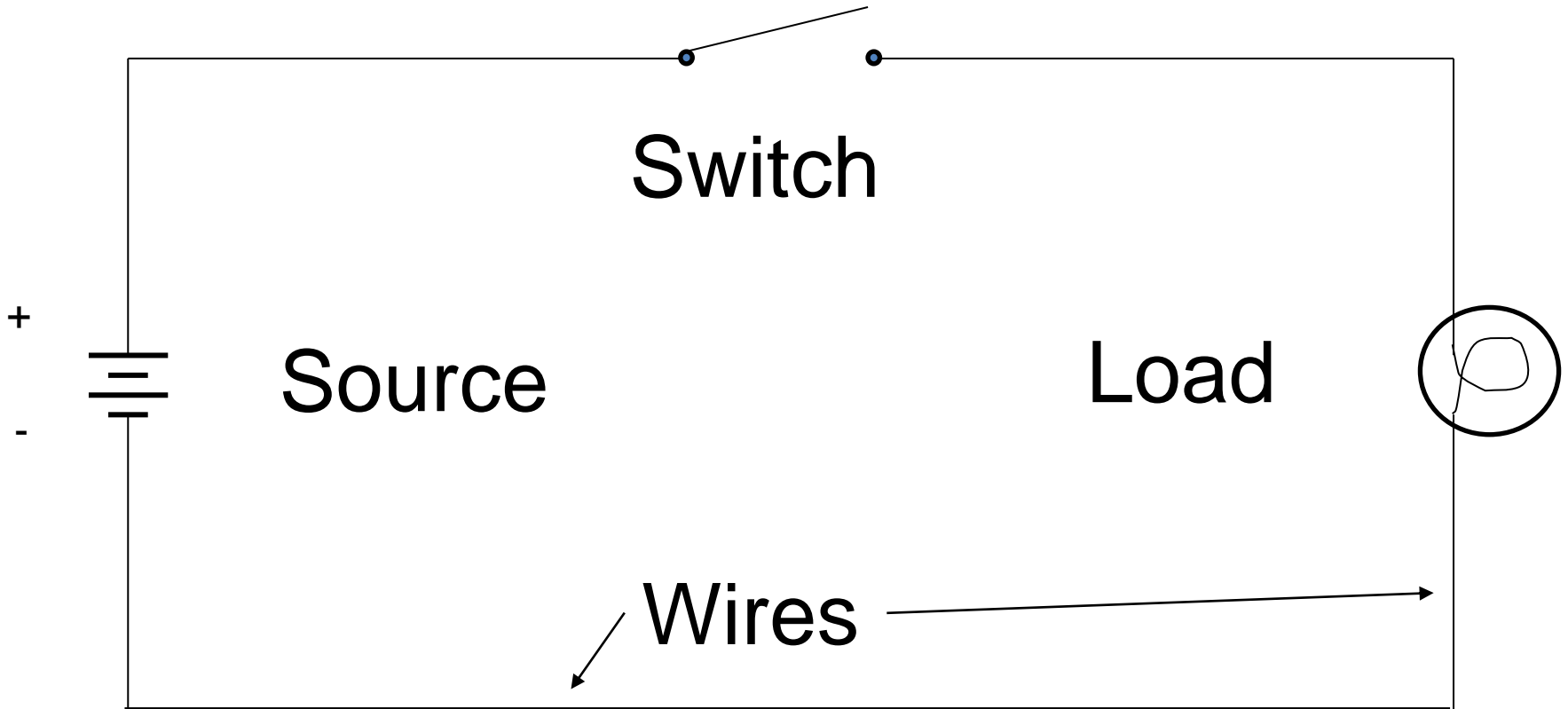
Electricity Merit Badge Class 1
2017 National Scout Jamboree



Dynamic Electricity



Electrical Circuit

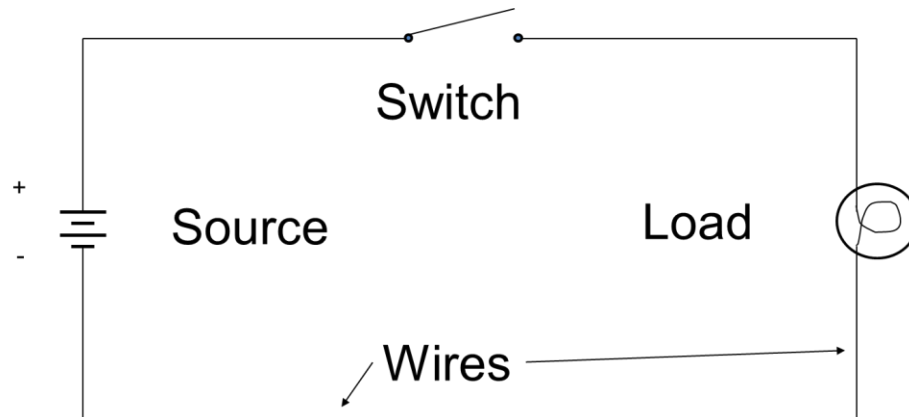


Stations

1. – Motors
2. – Electromagnetism and Basic Circuits
3. – Basic Electricity

Basic Electricity

- Circuit - A conductor or system path of electrical elements through which current will flow.

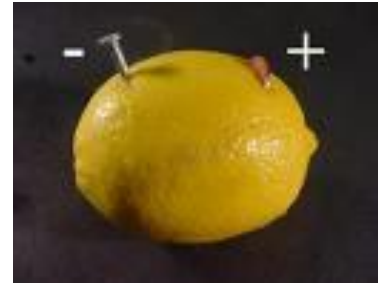


- Conductor – Material that will allow current to pass continuously along it (wire).

Types of Electricity

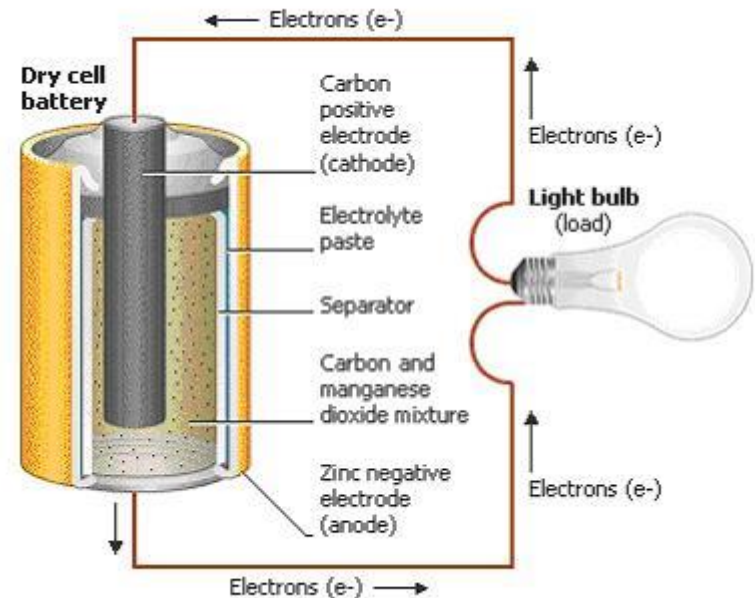
Direct Current (DC)

Type of electricity used in most, if not all electronics we have today.
Current only flows in one direction (not both directions, like AC).



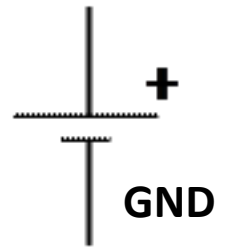
Examples of DC usage:

1. MP3 players
2. Radios
3. Electricity in cars.
4. Anywhere you use a battery for power.



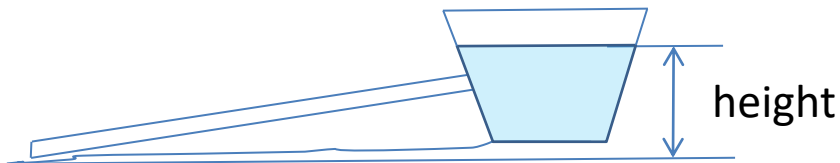
Voltage

- Volts is the electromotive force that causes electrons (current) to flow.
- Voltage can also be thought of as the electrical force that pushes electrons in a wire.
- Potential Difference-The Voltage between two points in a circuit.
- Units for voltage is VOLTS.
- The schematic symbol for dc voltage is generally shown as a battery



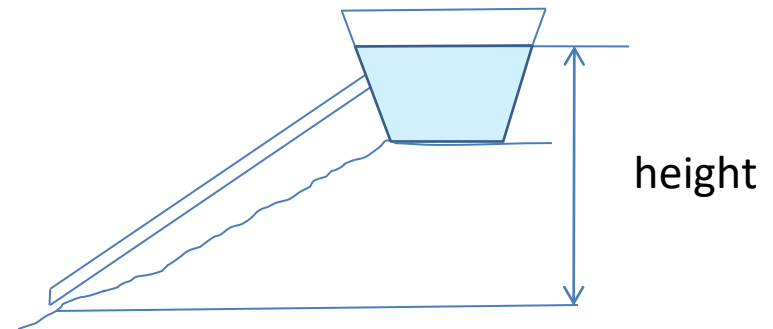
Voltage – Water Analogy

Small height = low voltage



1. Gravity provides the force for water (current) to flow.
2. This illustrates a small voltage, so current flow is small.
3. You can increase water (current) flow by making the pipe larger as well.

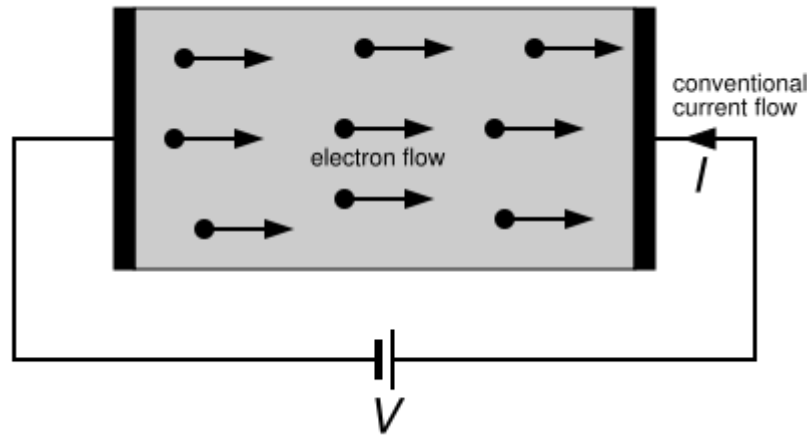
Big height = high voltage



1. Gravity provides the force for water (current) to flow.
2. This illustrates a larger voltage, so current flow is larger.
3. You can increase water (current) flow by making the pipe larger as well.

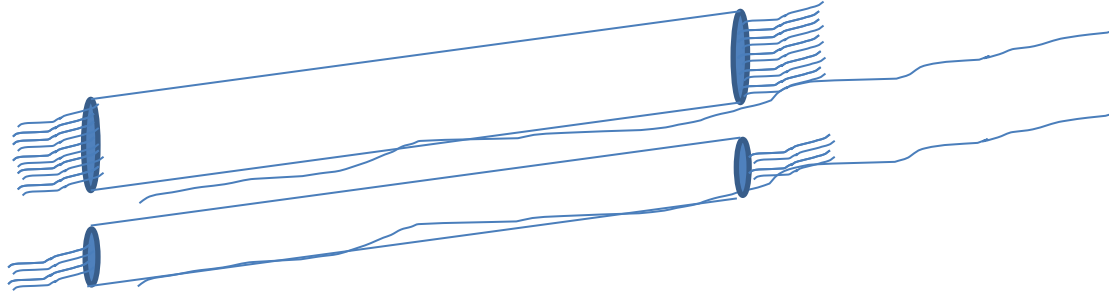
Current

- Current: Defined as “flow(time rate of change) of electrons”.




- Current: Units of current is AMPS.
- Current: Electrical symbol for current is I (eye).

Current Flow – Water Analogy



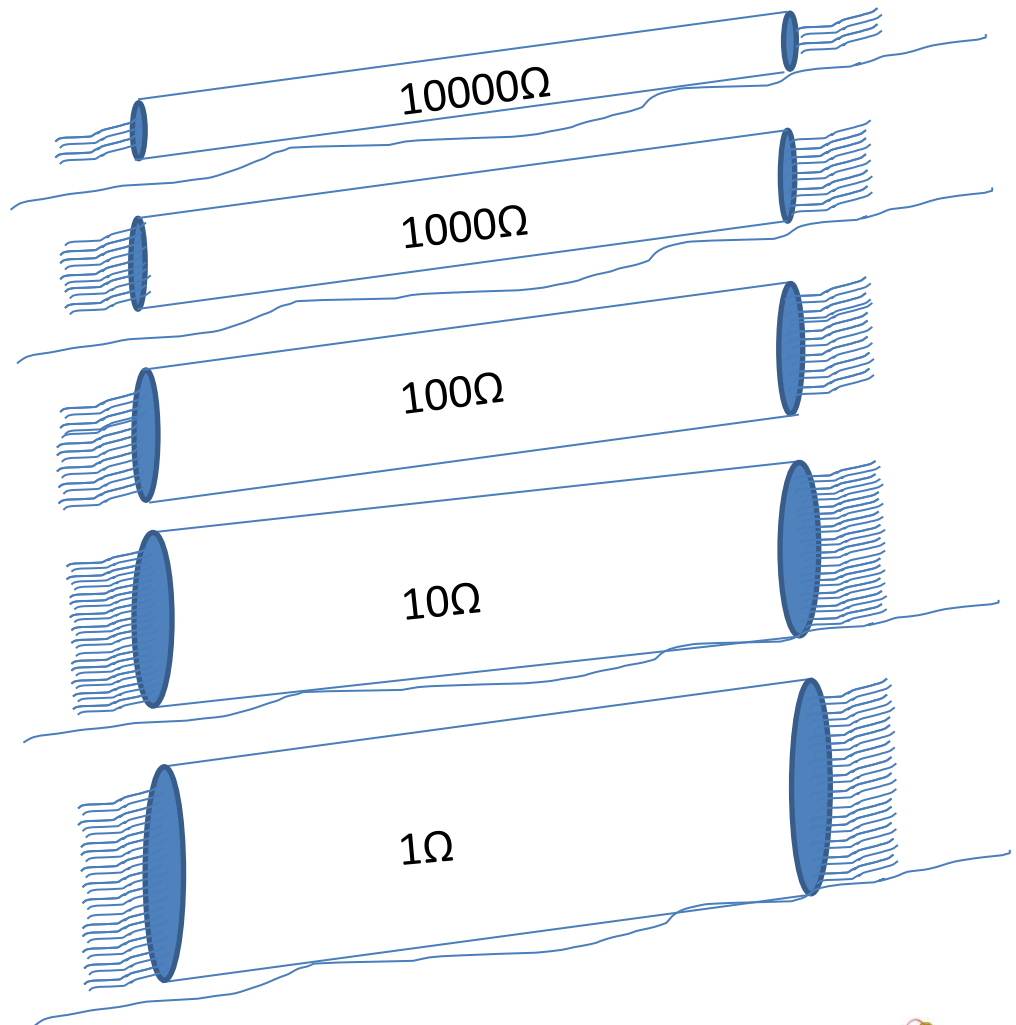
1. Water flows in the hose, entering at the top and exiting the bottom.
2. The water is the “current” ; the flow of electrons.
3. The more water flowing in the pipe, the more current is flowing in the wire.
4. Different pipe diameters illustrates different resistance to water flow, which correlates to different resistor values.

Resistance

- Resistance is the electrical property of a substance to resist the flow of electrons.
- The units of resistance is OHMS (Ω).
- The symbol for resistance is R.
- The schematic symbol is 
- The larger the resistance, the more resistance to current flow (the lower the current)

Resistance – Water Analogy

- Different pipe diameters represents different resistor values.
- The smaller the diameter of the pipe, the larger the resistance.



Ohms Law DC Circuits

Volts = Current x Resistance

- $E = I \times R$
- Units
 - E is in Volts
 - I the electrical current is in Amps
 - R is Resistance is in Ohms

Example: If the Voltage E stays the SAME and Resistance R goes UP, then the amount of Current I flowing in the circuit goes DOWN

Electrical Terms

- Short Circuit-An abnormal connection of low impedance (resistance) between two points of different potential.
- Ground-A point of common connection of zero volts often the earth

Other Electrical Terms

- Switch-Electronic or Mechanical means for opening and closing a circuit.
- Fuse-A device that protects a circuit from over-current by melting a link in the device.
- Circuit Breaker-A device that protects a circuit for over-current by opening the circuit with a switch.

Other Electrical Terms

Power

- Watt- Power to do work at 1 joule/sec
- $W = V \times I$
- $KW = 1000 W$

Energy

- $KW * Hr = 1 KW$ of power delivered for 1 hour

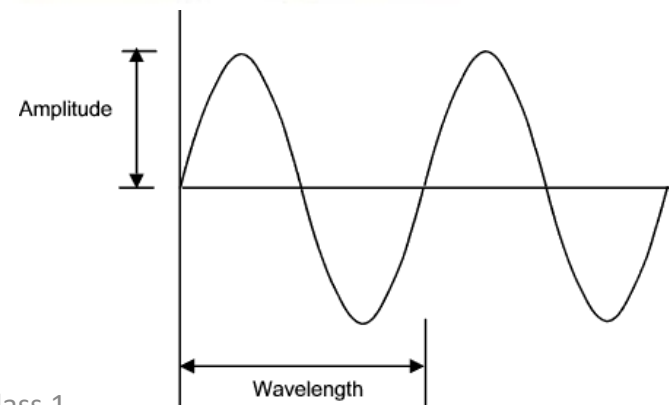
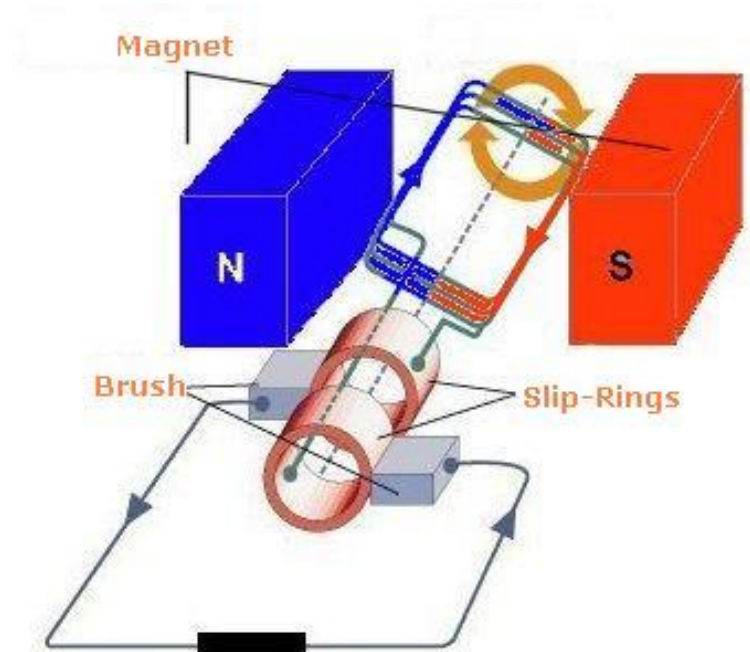
Types of Electricity

Alternating Current (AC)

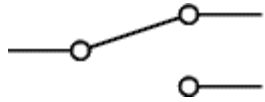
The common form of electricity from power plant to home/office. Its direction is reversed 60 times per second in the U.S.; 50 times in Europe.

Examples of AC usage:

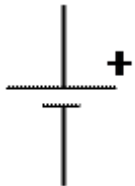
1. Kitchens: Stoves, ovens, mixer, etc.
2. Computer chargers
3. Lights in house
4. Home air conditioners.



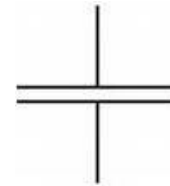
Electricity and Electronic Symbols



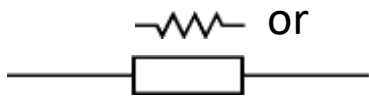
Single Pole, Double Throw Switch (SPDT)



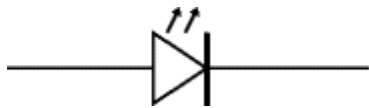
Battery



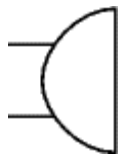
Capacitor



Resistor



Light Emitting Diode (LED)



Buzzer



Ground



Fuse



Lamp