Current and Circuits

I. Current and Power
   - the ampere

II. Ohm's Law and Resistance
   - the ohm
   - resistors

III. Series and Parallel Circuits
   - applications

	The student will be able to:	HW:
1	Define electric current and the Ampere and solve problems relating current to charge and time.	1 – 3
2	Solve problems involving electric power.	4 – 10
3	Define resistance the Ohm and solve problems using Ohm's Law to relate voltage, current, and resistance.	11 – 23
4	Calculate the effective total resistance for multiple resistors connected in series or parallel and analyze DC circuits consisting of a combination of series and parallel branches of resistors and/or voltage sources, determining voltage and current for each element.	24 – 37

What is Current?

A **current** is the organized flow of a particular substance – for example a river is a water current and wind is an air current.

An **electric current** is the flow of charged particles.

e^- e^- e^- e^- e^- e^- e^- e^- e^- e^- e^-

Most often this involves a flow of electrons.

e^-
e^-
e^-
e^-
e^-
e^-
e^-
e^-
e^-
e^-

Electric current is defined as the rate at which charge passes through. (typically the rate of flow through a wire in a circuit)

$$I = \frac{q}{t}$$

where: q = amount of charge crossing an imaginary plane

t = amount of time for this to occur

Units of Electric Current

- The SI unit for electric current is the **ampere**.
- One ampere is equal to one coulomb of charge per one second:

$$1\ \text{A} = 1\ \text{C/s}$$

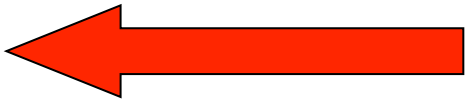
- Although current is not a vector, it is taken to be positive in the direction that positive charges flow (or *would* flow).

AC versus DC

There are two common types of current: AC and DC.

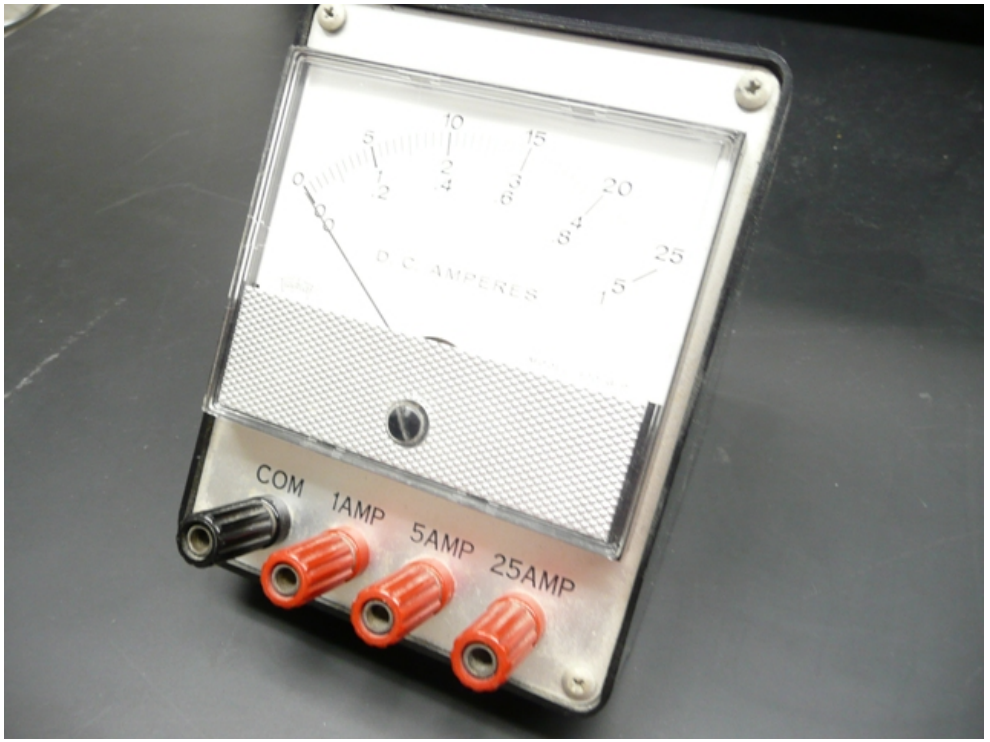
AC stands for **Alternating Current** and means that charge oscillates and travels in alternating directions.

DC stands for **Direct Current** and means that charge travels in only one direction.



Measuring Electric Current

The reading on an ammeter indicates the current that flows in through one of the red terminals and out through the black "COM" terminal.



Analog Ammeter

A **fuse** is an electrical device that is designed to limit current to a certain value. If too much current passes through it the fusable link will melt and break the circuit.

This is a 30-amp fuse. It will "blow" if the current passing through it exceeds 30 amperes.

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Electric Power is the rate at which electric energy is transformed or transferred. This depends on electric potential and current:

$$P = VI$$

where: V = voltage *across* a device
I = current *through* the device

note: the product of volt × ampere = watt
(J/C × C/s = J/s)