Safety / Intro

- The mains supply and batteries are sources of Electrical Energy
- Electrical Appliances are Energy Changers

Power

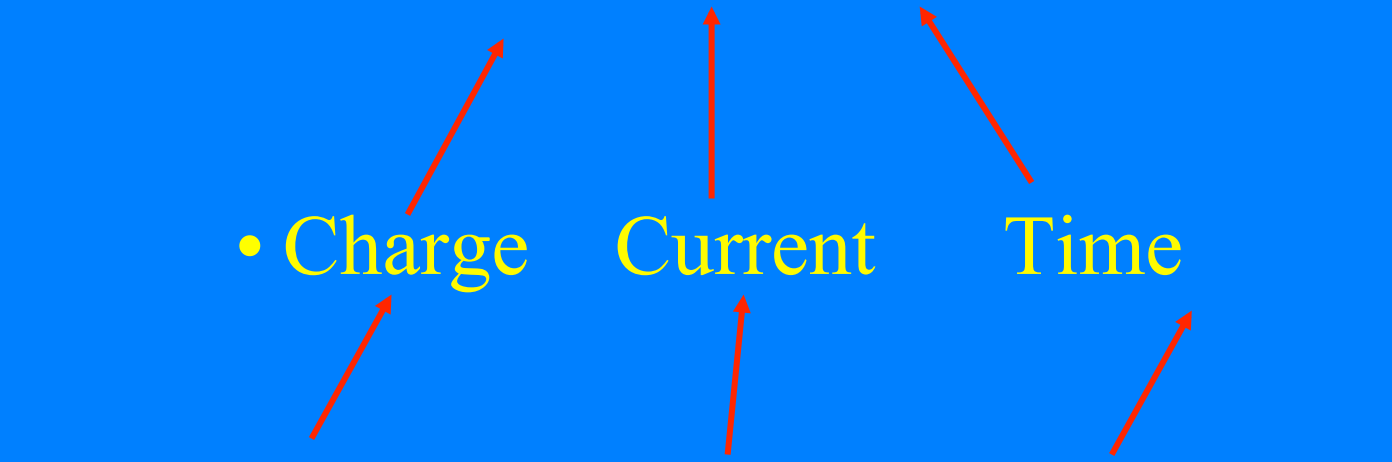
- Heat producing appliances have a power rating greater than 1000 Watts

- Power Rating is the amount of energy used per second
- Appliances greater than 700 W are protected by a 13 A fuse

Electric Current

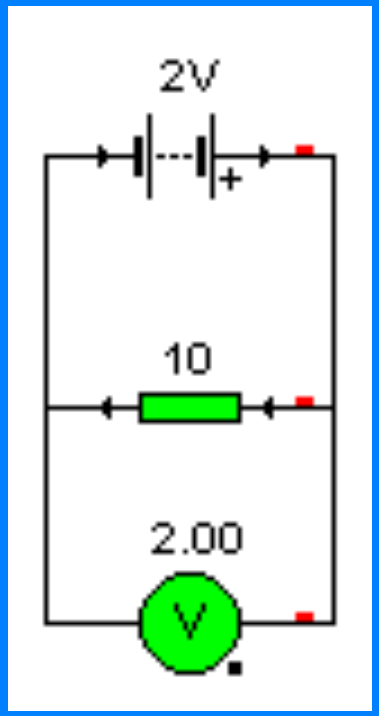
- This is a Flow of Charged Particles

$$»Q = I \times t$$



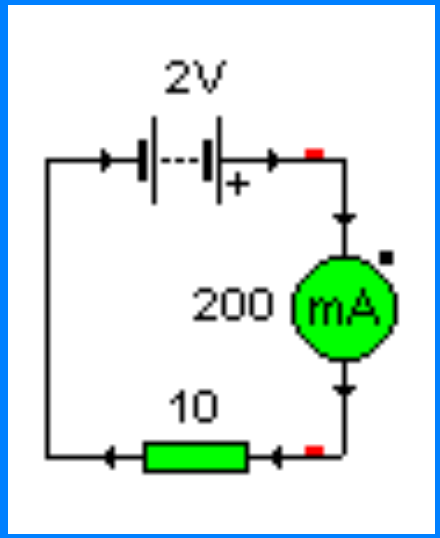
Voltage

- Energy Given to each coulomb of charge
- Units are Volts (V)
- Measured by Voltmeter ,
- Connected in parallel

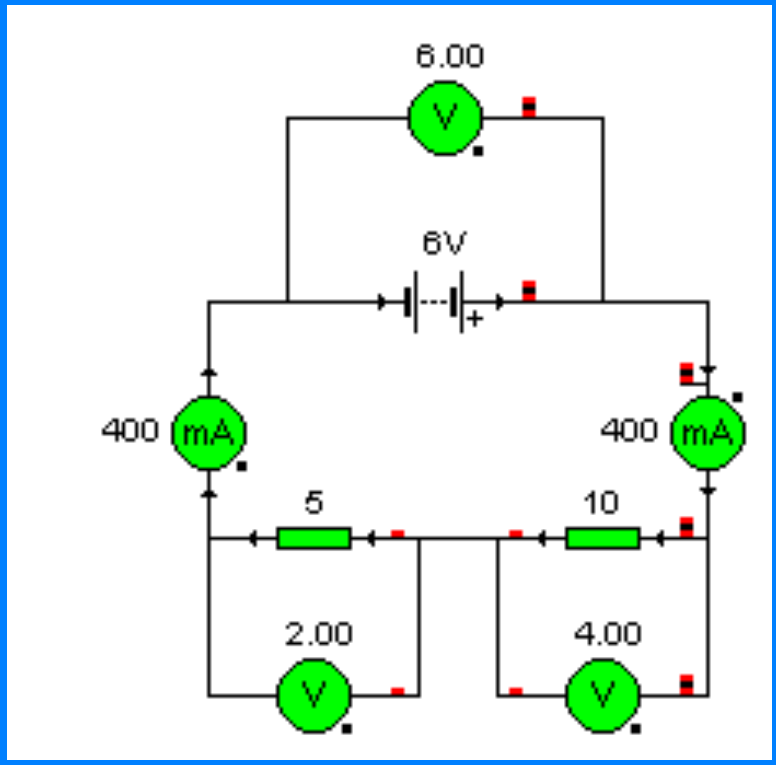


Current

- This is a flow of Charged Particles
- Units are Amps, (A)
- Measured using an Ammeter
- Connected in Series



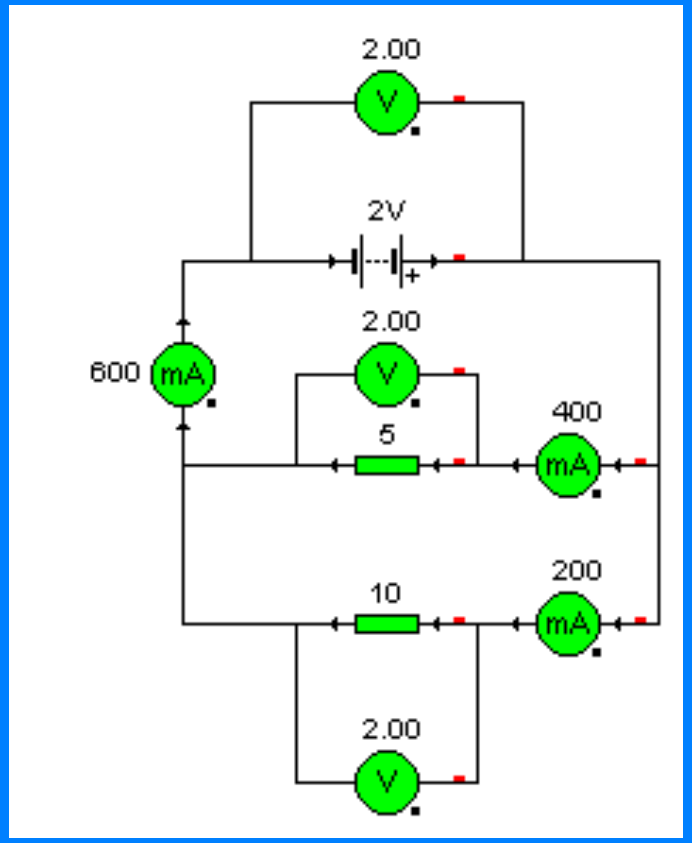
Series Circuits



- Current is the SAME at ALL points
- Voltage across Supply equals the voltage across Resistor 1 + voltage across resistor 2
- $V_s = V_1 + V_2$

Parallel Circuits

- Voltage across each branch is the same
- Current through resistor 1 plus current through resistor 2 equals the supply current
- $I_t = I_1 + I_2$



Resistance

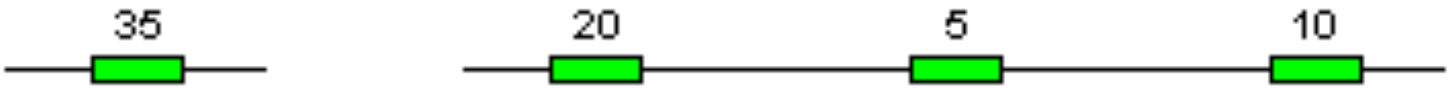
- Ohm's Law V = I x R at constant Temp
- Resistance : measure of how easy it is for charges to flow.

» V = I x R

» Volts (V) Amps (A) Ohms (Ω

Series Resistors

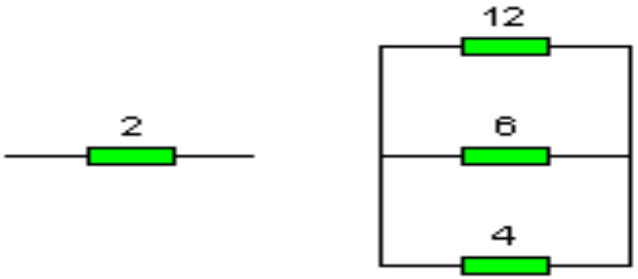
$$R_s = R_1 + R_2 + R_3$$



Total Resistance = Resistor 1 + Resistance 2 + Resistance 3

Parallel Resistors

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$



The effective resistance is always smaller than the smaller of the resistances in the circuit. Adding resistors in parallel increases the number of paths for the current to flow and so the effective resistance decreases and current flowing increases .

Variable Resistors

- A length of wire is wrapped into a cylinder
- Different lengths can be tapped into
- The longer the length the bigger the resistance
- The bigger the resistance the lower the current

Variable Resistors

- Uses
- Light Dimmer Switches
- Volume controls
- Speed Controls
- Temperature Controls for grills/ ovens …
- Computer Joysticks
- Fuel gauges

Power

This is the amount of energy transferred per second. Units are Watts (W).

Heat producing appliances have big power ratings

$$Power = \frac{Energy\ Tranferred}{Time} \qquad P = \frac{E}{t}$$

$$One\ Watt\ is\ one\ joule\ per\ \text{sec}ond\ \left(1W = 1J/s\right)$$

Power

- Power can also be calculated from

$$Power = Voltage \times Current \quad P = V \times I$$

$$Power = Current\ squared \times resistance \quad P = I^2 \times R$$

$$Power = Voltage\ squared \div resistance \quad P = \frac{V^2}{R}$$

Lamps

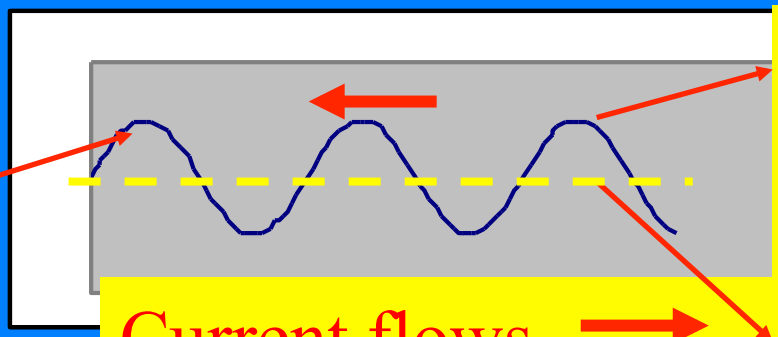
- Discharge Lamps (Fluorescent Tubes)
- An electric current passes through the gas
- Virtually NO heat Energy is produced
- MUCH more efficient than
- Filament lamps
- An electric current is passed through a piece of resistance wire which heats up
- Produces more heat energy than light energy

Direct Current

- Current flows in one direction ONLY
- Electrons flow from Negative to Positive
- Size of Voltage remains constant
- Batteries supply D.C.

Alternating Current

- Mains electricity is A.C.
- The current constantly changes direction
- Mains electricity is 50 Hz , 50 cycles in 1 second
- The size of the voltage is constantly changing. Quoted value (230 V mains)is smaller than the peak value



Quoted value, 230 V

Peak value, 325 V for mains

Current flows when below 0V line

0V Line

Behind the Wall

- Household appliances are connected in parallel : same voltage (230 V) and independent switching
- Sockets are wired in a RING circuit:
- Current flows via 2 paths therefore smaller currents flow and thinner cable can be used
- Less cable needed than conventional parallel
- Easy to add extra sockets