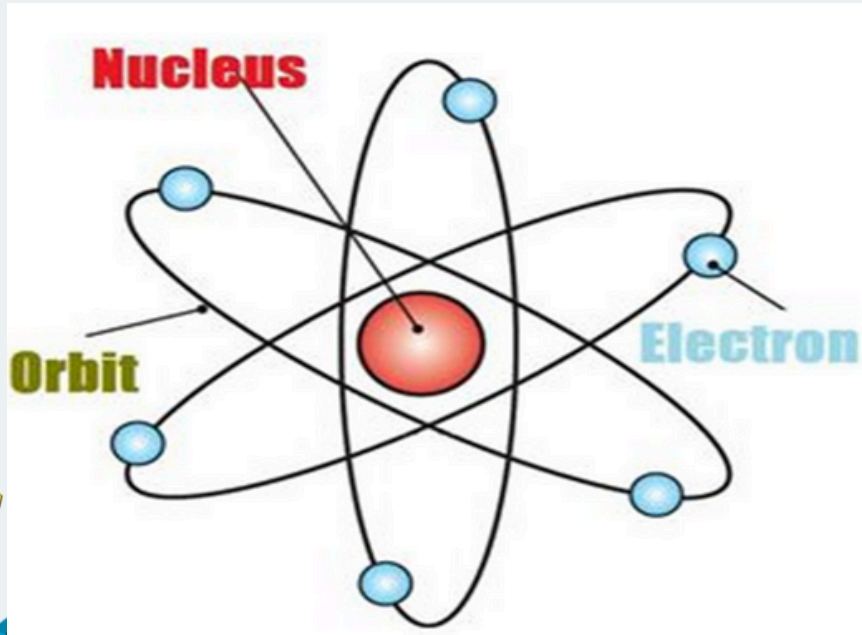
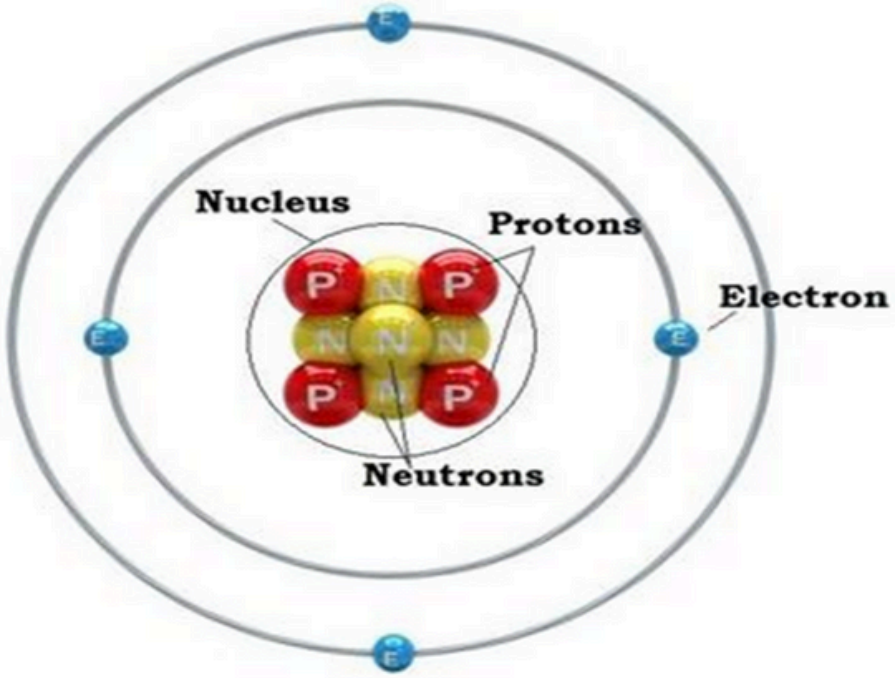
Introduction to Electric in Petrochemical

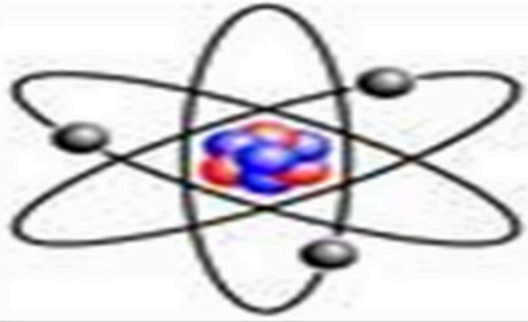
ATOM STRUCTURE





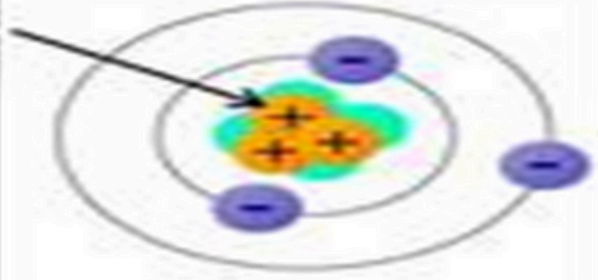
Atom

The smallest unit of matter that can't be broken down chemically



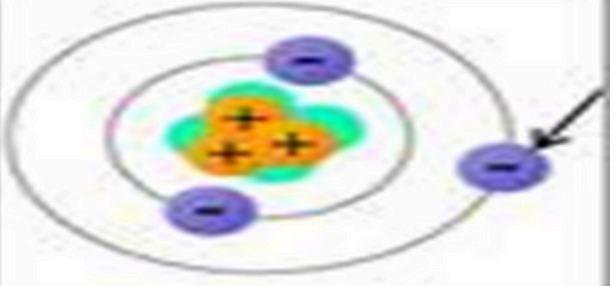
Proton

A positively charged subatomic particle



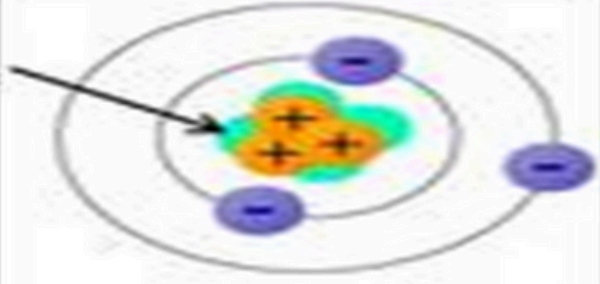
Electron

A negatively charged subatomic particle

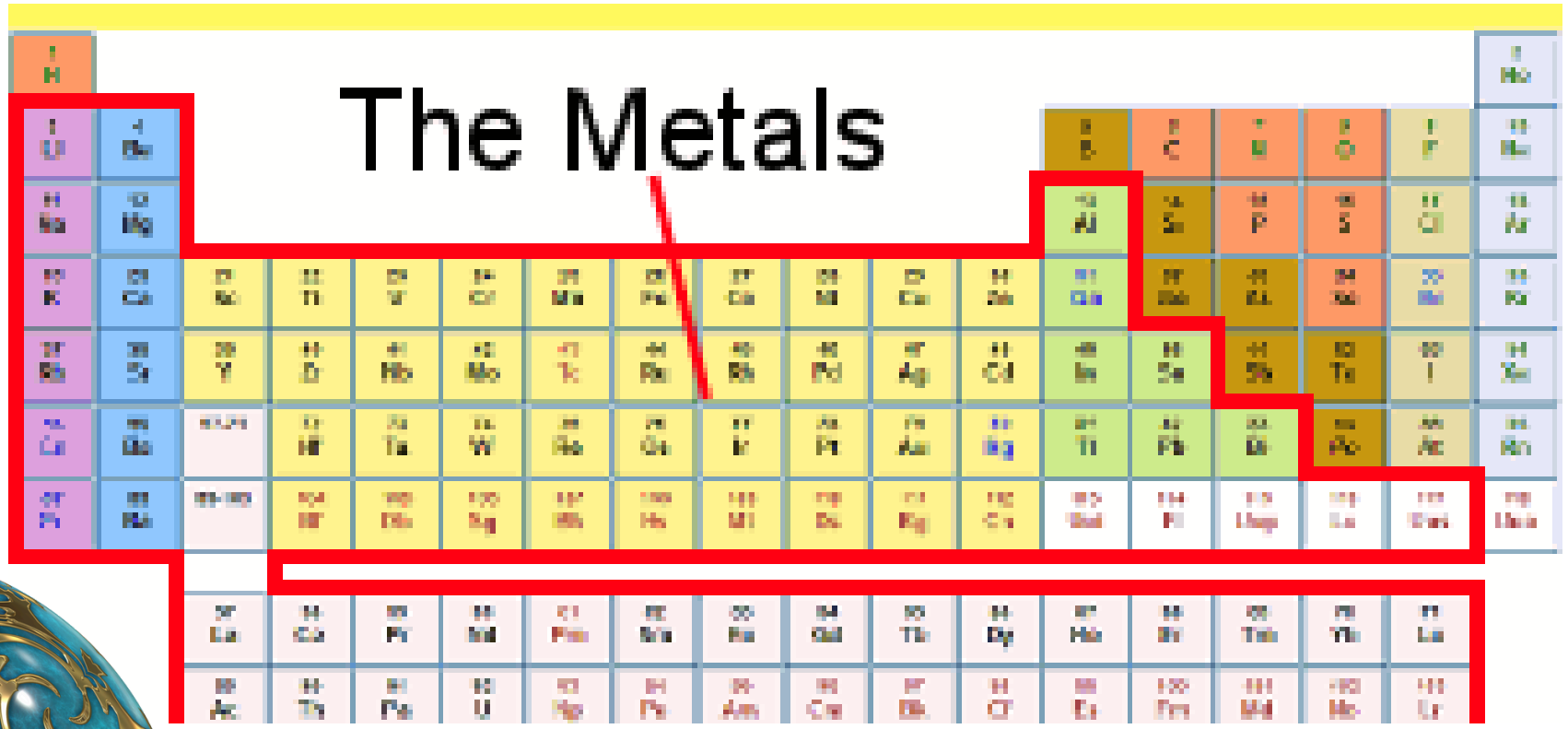


Neutron

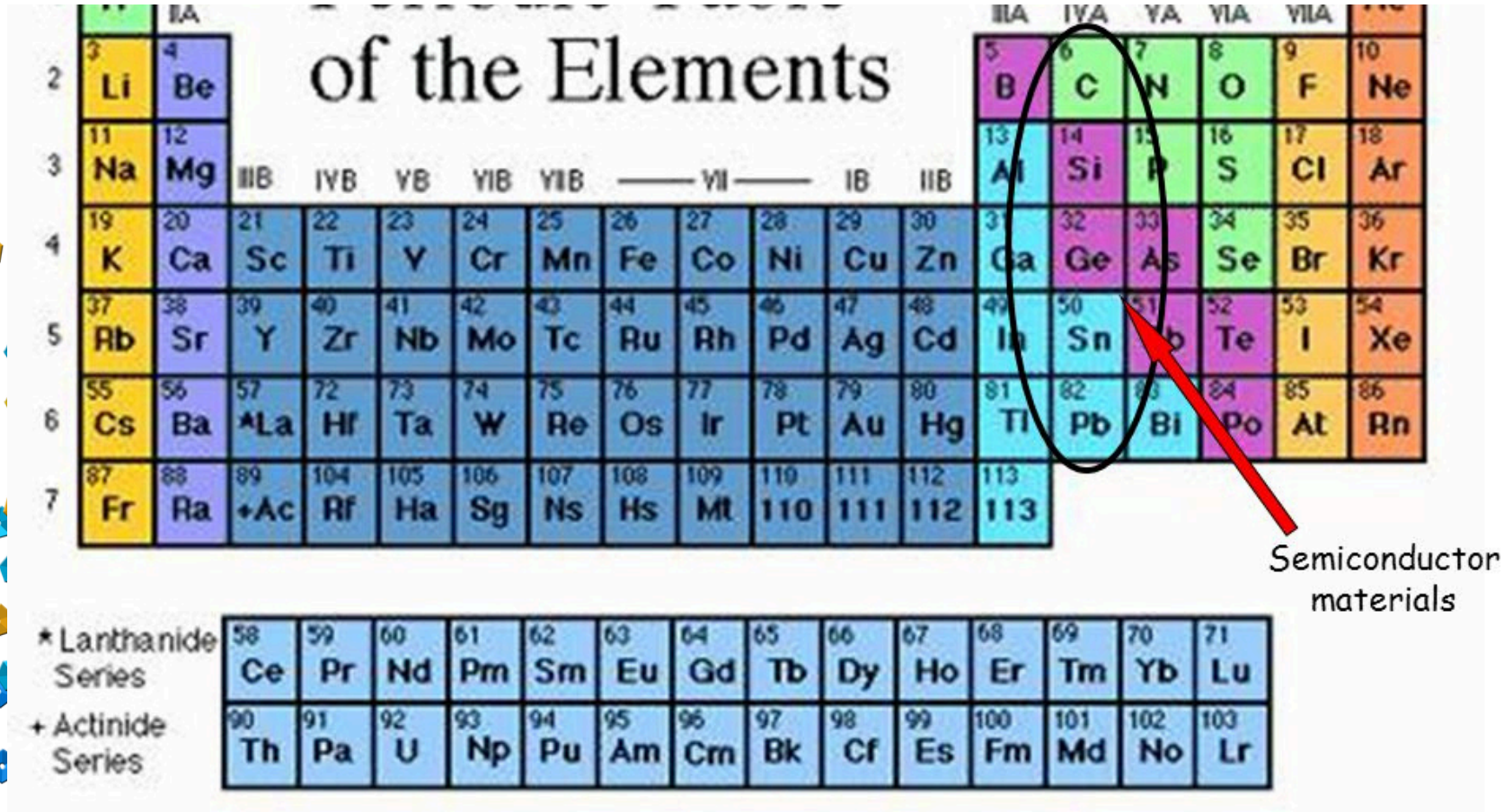
A subatomic particle with no charge



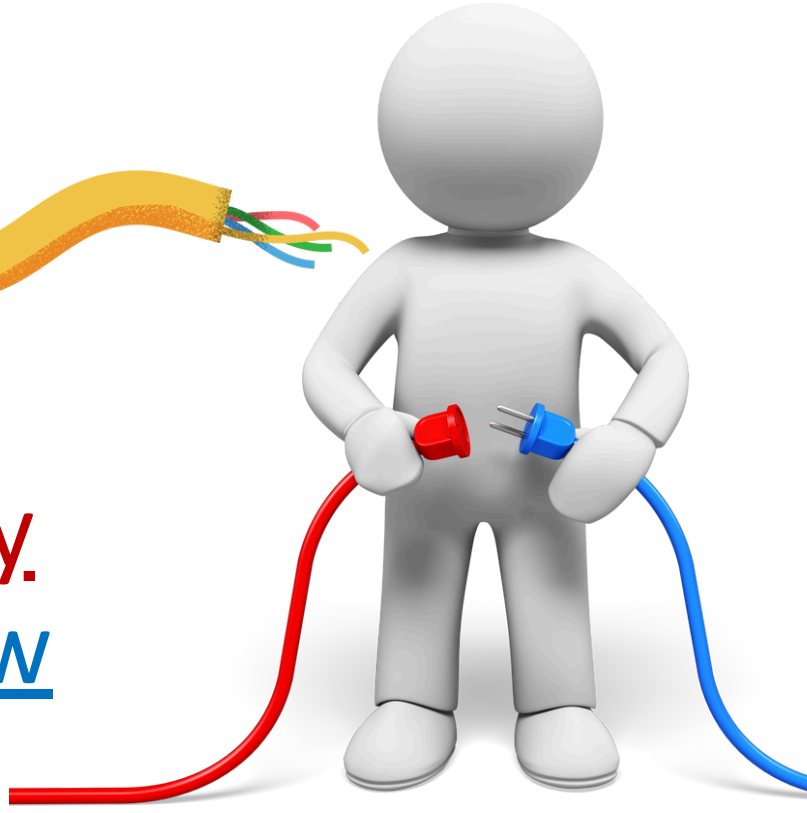
Conductor – high electrical conductivity, is metallic element **usually in group 1 until 3**



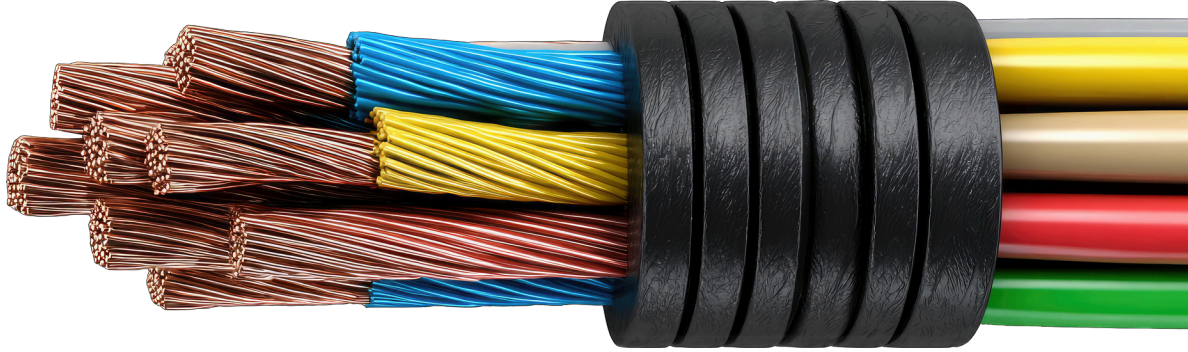
Semiconductor – is intermediate between metal & non-metal (group 4)



Conductor:

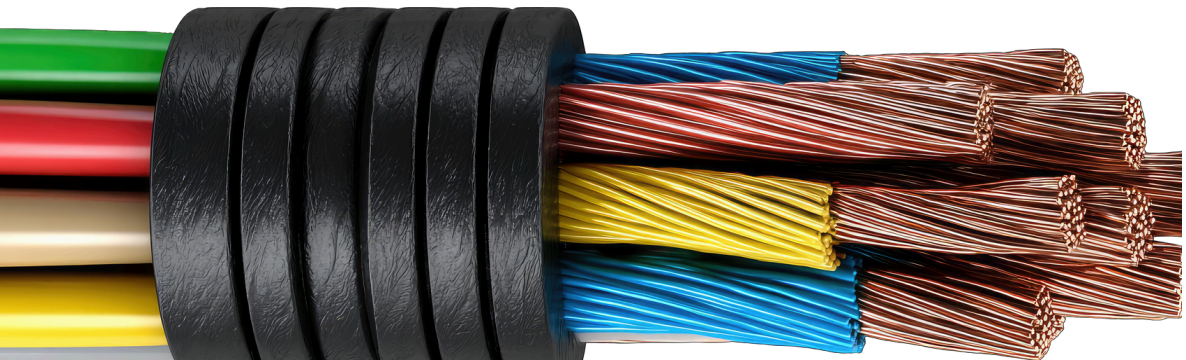


- Material that readily allow current to flow through.
- Generally have high electrical conductivity when in solid state



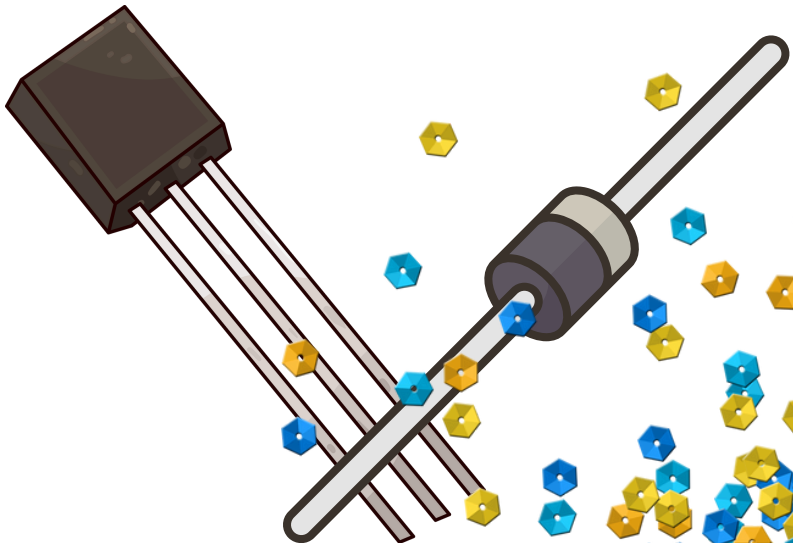
Insulator:

- Material that poor conductors electric current, does not conduct electrical current under normal condition.
- Used to prevent current when it is not wanted.



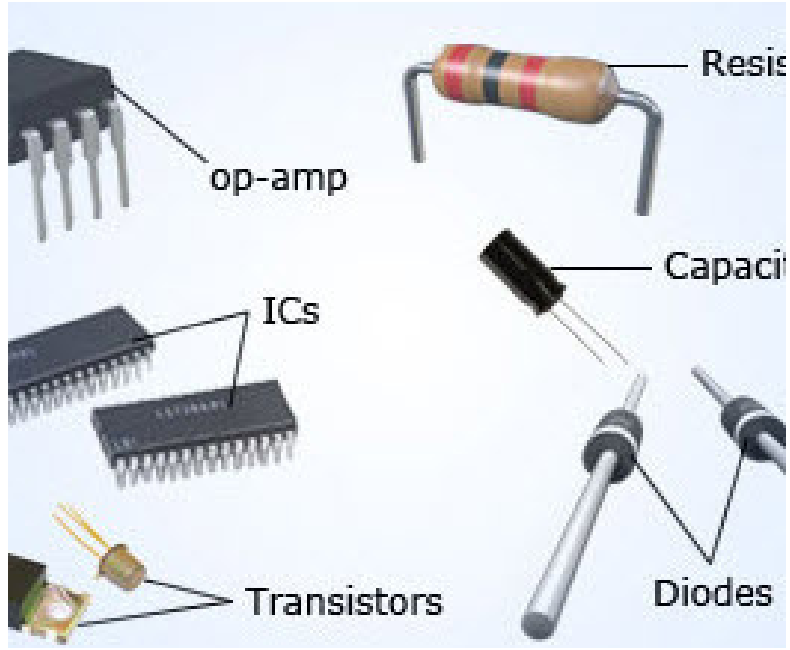
Semi Conductor:

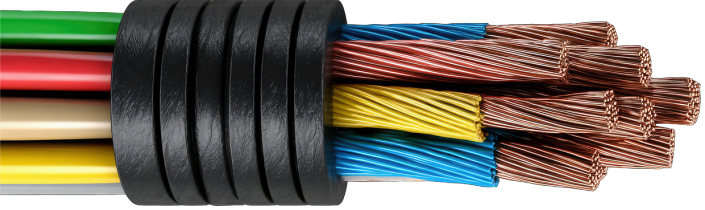
- Material that is between conductor & insulator in its ability to conduct electric current.
- It classed below the conductor in their ability to carry current



SEMI CONDUCTOR:

Unique characteristic , certain semiconductors material are basis for electronic device





Insulator (5-8)

Conductor (1- 3)

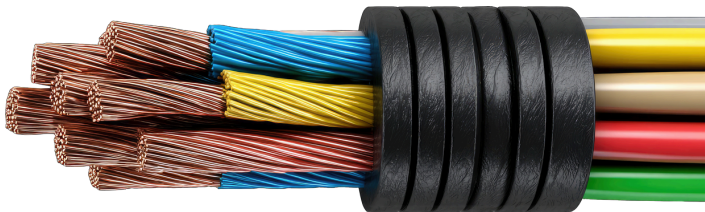
Semiconductor

Periodic Table of the Elements

1 IA 1A	2 IIA 2A	3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8	9 VIII 8	10	11 IB 1B	12 IIB 2B	13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A
1 H Hydrogen																	2 He Helium
3 Li Lithium	4 Be Beryllium											5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
11 Na Sodium	12 Mg Magnesium											13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
55 Cs Cesium	56 Ba Barium	57-71	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra Radium	89-103	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Uut Ununtrium	114 Fl Flerovium	115 Uup Ununpentium	116 Lv Livermorium	117 Uus Ununseptium	118 Uuo Ununoctium

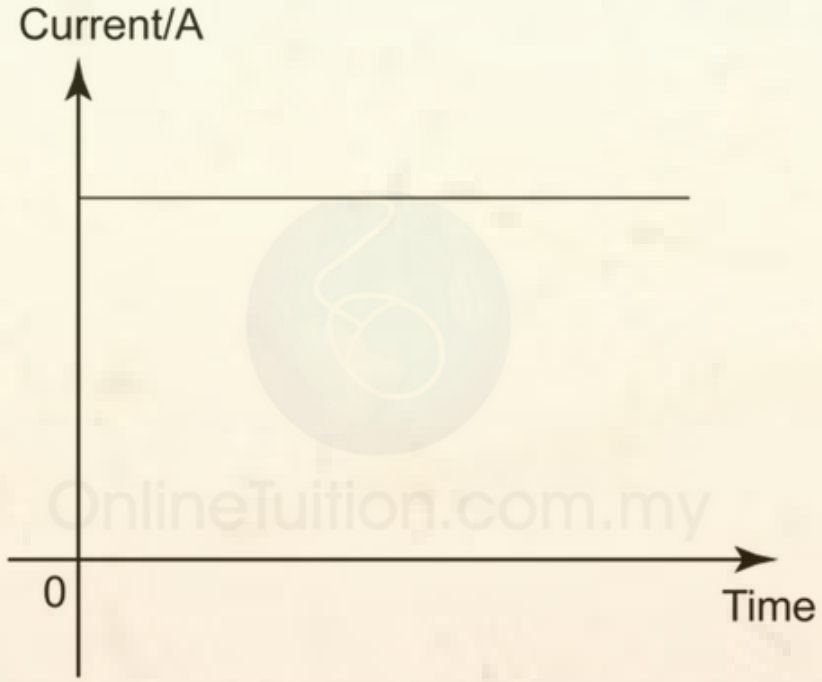
Atomic Number | Oxidation States* | Symbol | Name | Atomic Mass

*Oxidation States in Bold are most common. States in italics are predicted.



DIRECT CURRENT

- Flowing continued to one direction only
- the polarity to the terminal voltage cell is constant



BATTERY

- Combination of cell
- Cell - one unit or a combination of material that is used to convert chemical energy into electrical energy
- Output current depend on output voltage and resistance

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

I = current

V = voltage

R = resistance

ELECTROMOTIVE FORCE, E.M.F

- Electric current cannot flow through the conductor until one source of external energy supply to that conductor
- It provided by a source of energy such as a battery or generator and measured in volts
- e.m.f is the external work expended per unit of charge to produce an electric potential difference across 2 open circuit terminal
- Known as measurement of energy that causes current to flow through circuit - voltage

Charge

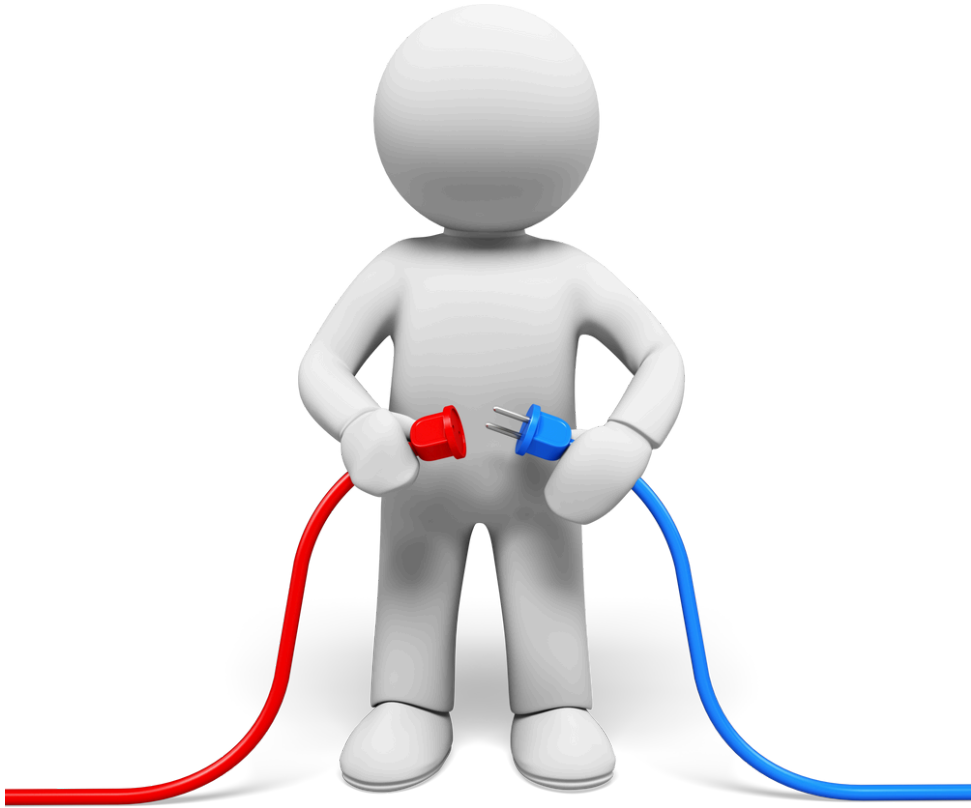
- Unit of charge is the coulomb (C) where one coulomb is one ampere second
- 1 Coulomb = 6.24×10^{18}

$$Q = It$$

Q – charge

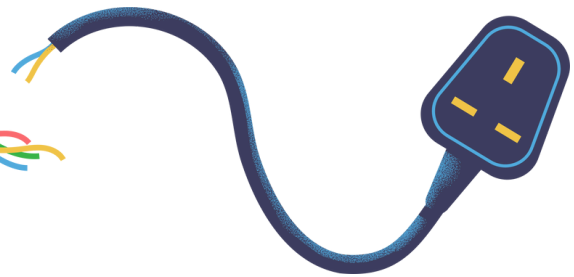
I - current in ampere

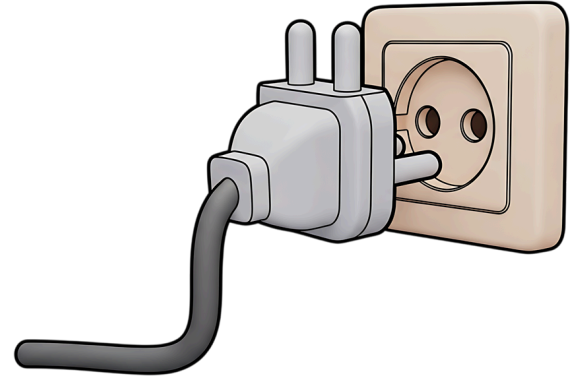
t - time (second)



Current

- Electrical charge movement or rate of movement of charge
- Unit - Ampere (A), symbol - I
- The number of electrons flowing past a point in a circuit.
- Conventional Current flows from positive to negative *however electrons are negative so they really flow from negative to positive*
- So faster electrons or more electrons, bigger current, brighter bulb





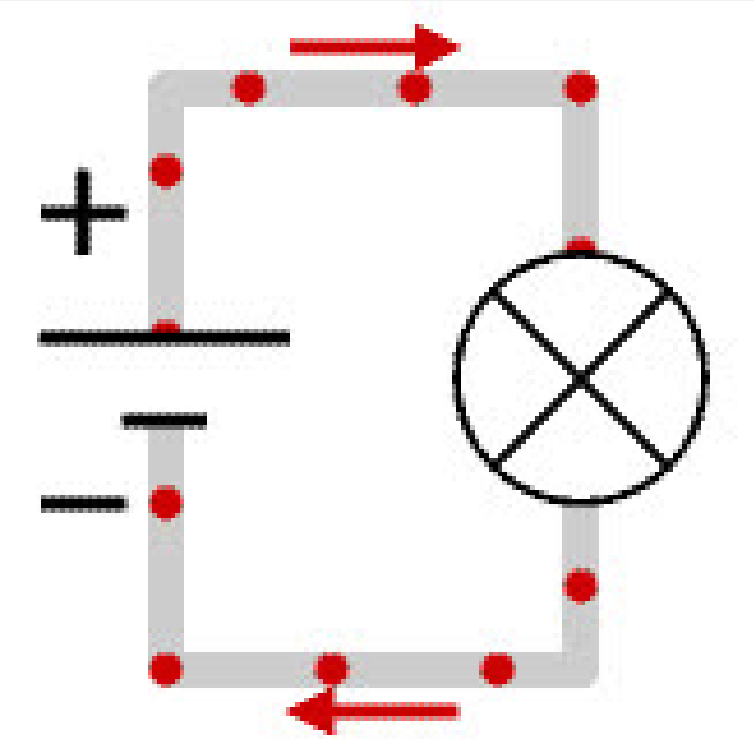
- Symbol: I
- Units: ampere (A)

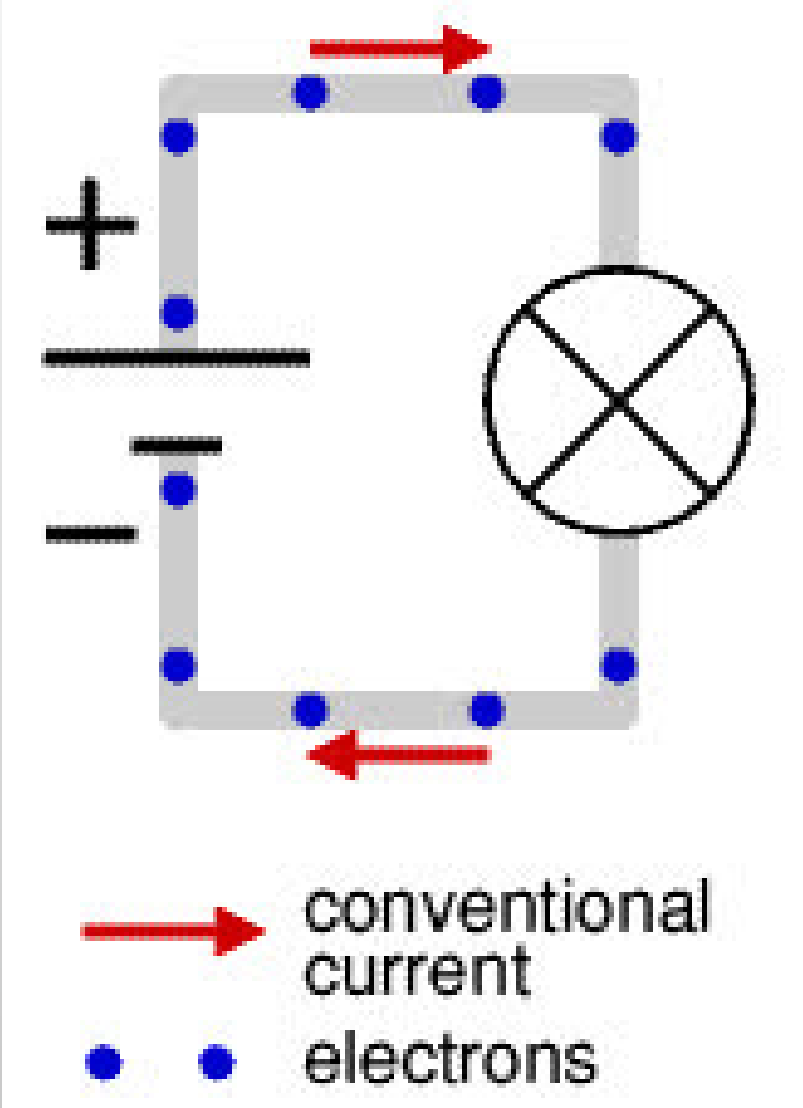
(ampere = amps)

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

1 ampere is the amount of current that exists when a number of elctrons having a total charge of one coulomb move through a given cross- sectional area in one second

REPRESENTING CURRENT DIRECTION





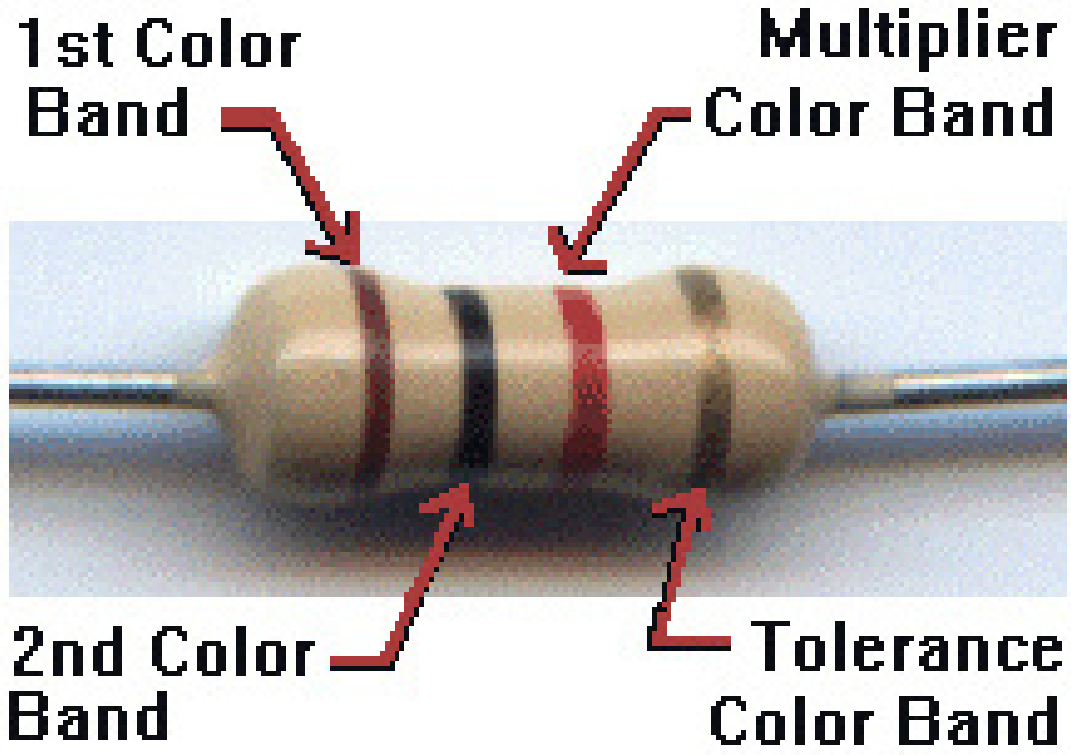
Potential energy (Voltage)

- Define as the difference in energy level of a unit charge located at each of 2 points in a circuit
- Represents the energy required to move the unit charge from one point to the other
- Known as electrical potential, unit volt (V)

$$\text{volts} = \frac{\text{watts}}{\text{ampere}} \quad \text{OR} \quad \text{volts} = \frac{\text{joules}}{\text{coulombs}}$$

Resistance

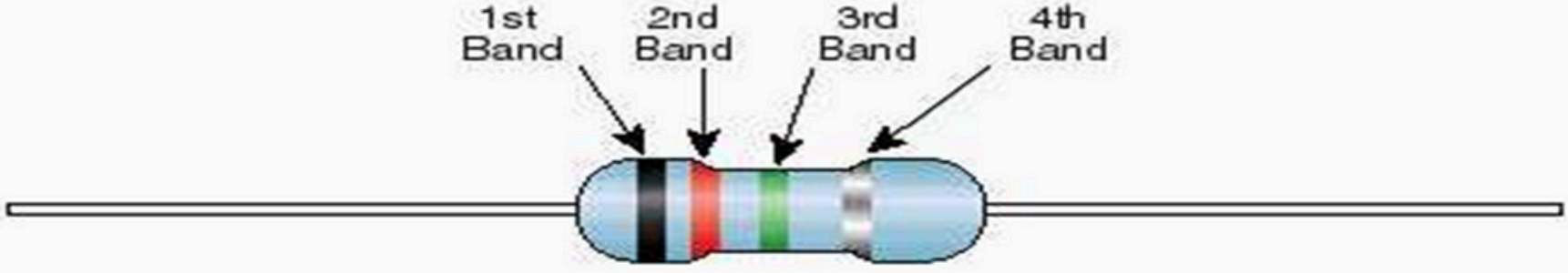
- Define as resistance that exist from conductor in current flow
- Unit is ohm (Ω) and symbol is R
- Opposition of current in electric circuit
- One ohm (1Ω) of resistance if there is one ampere (1A) of current in a material when one volt (1V) is applied across the material


1st Color Band
Multiplier Color Band
2nd Color Band
Tolerance Color Band

RESISTOR

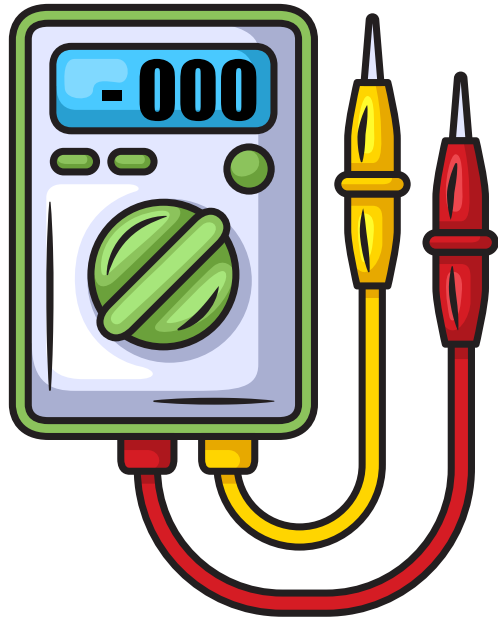
Resistor Colour Code:

Standard EIA Color Code Table 4 Band: ±2%, ±5%, and ±10%



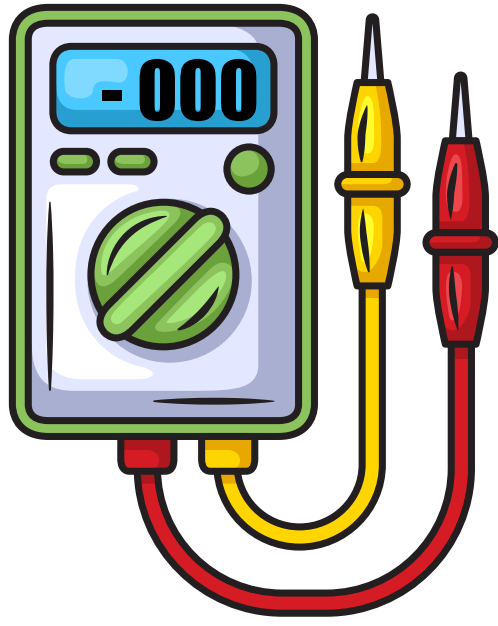
Color	1st Band (1st figure)	2nd Band (2nd figure)	3rd Band (multiplier)	4th Band (tolerance)
Black	0	0	10^0	
Brown	1	1	10^1	
Red	2	2	10^2	±2%
Orange	3	3	10^3	
Yellow	4	4	10^4	
Green	5	5	10^5	
Blue	6	6	10^6	
Violet	7	7	10^7	
Gray	8	8	10^8	
White	9	9	10^9	
Gold			10^{-1}	±5%
Silver			10^{-2}	±10%

Measuring Instruments



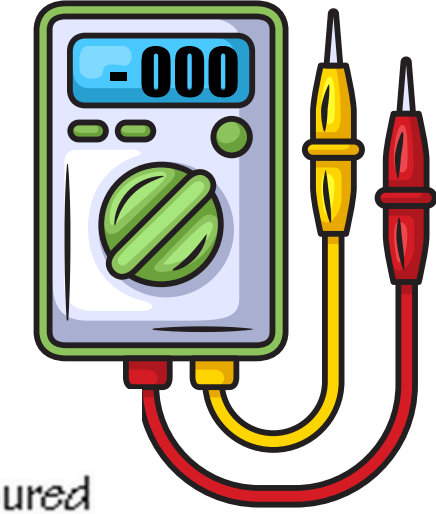
There are many types of electronic measuring instrument. Such as Wattmeter, Ohmmeter, Voltmeter,Ammeter and Megger

The Ohmmeter

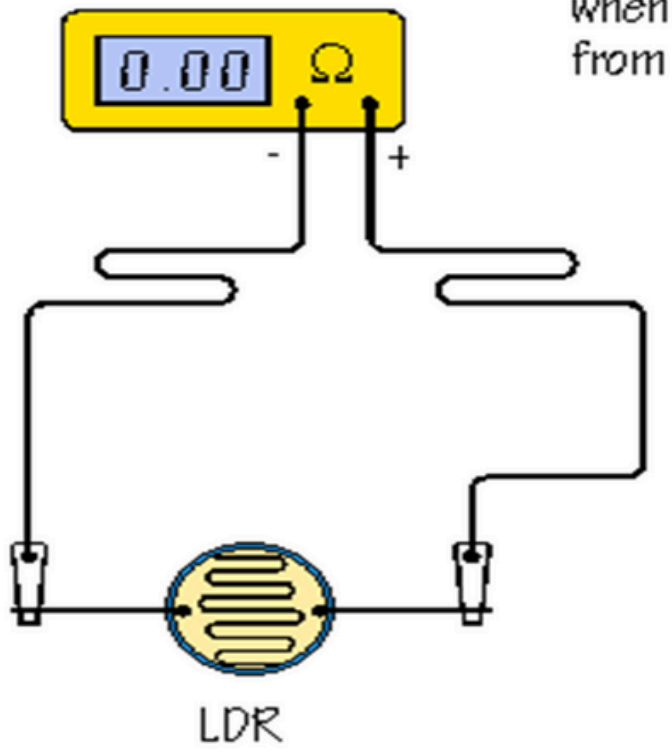


- Symbol Ω
- Instrument for measuring electrical resistance
- Does not function with a circuit connected to a power supply
- To measure the resistance of particular component, it must take out from the circuit and tested separately

How to connect Ohmmeter



ohmmeter
200 kilohms fsd



resistance may only be measured when components are removed from any circuit

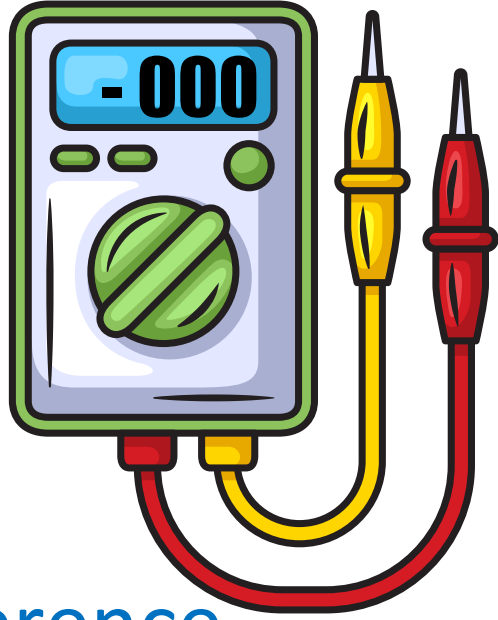
black lead

red lead

crocodile clip

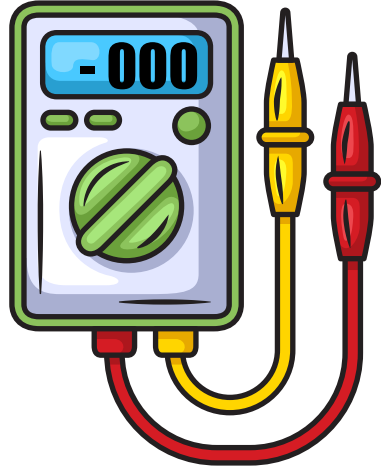
LDR

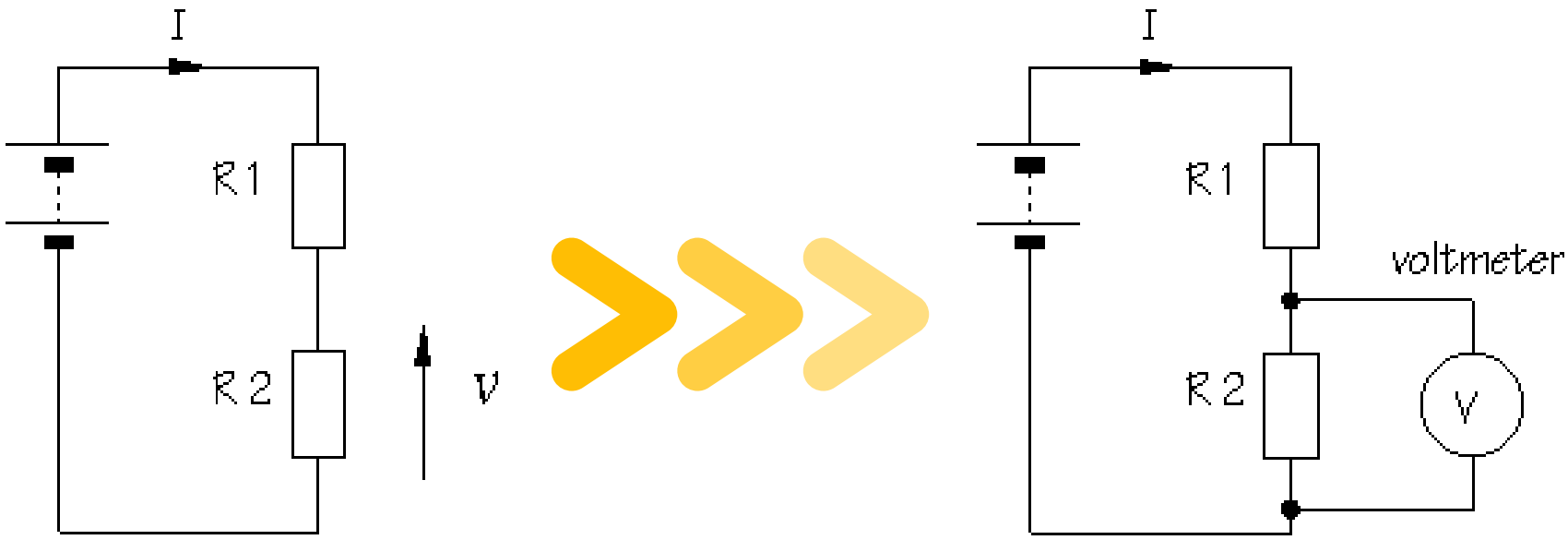
Voltmeter



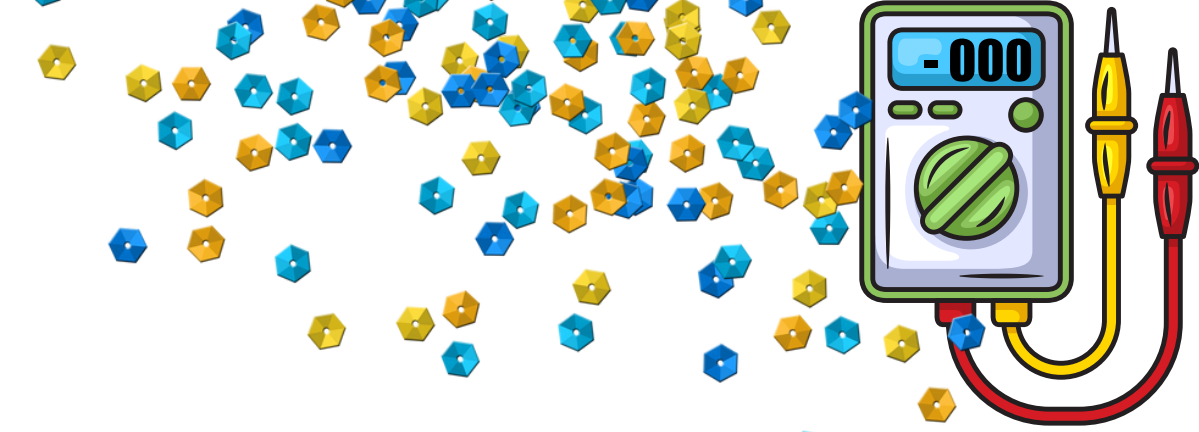
- symbol V
- Used to measure the potential difference (voltage) between 2 points
- The circuit is not changed,hence voltmeter is connected in parallel
- Voltmeter should have a very HIGH resistance

How to connect Voltmeter

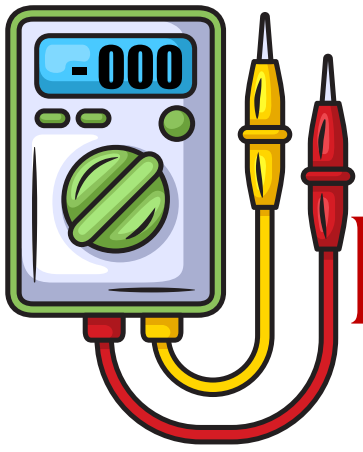




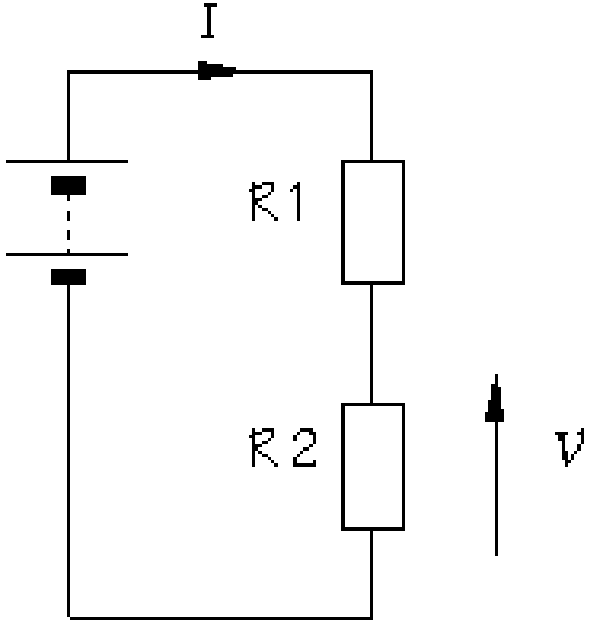
Ammeter

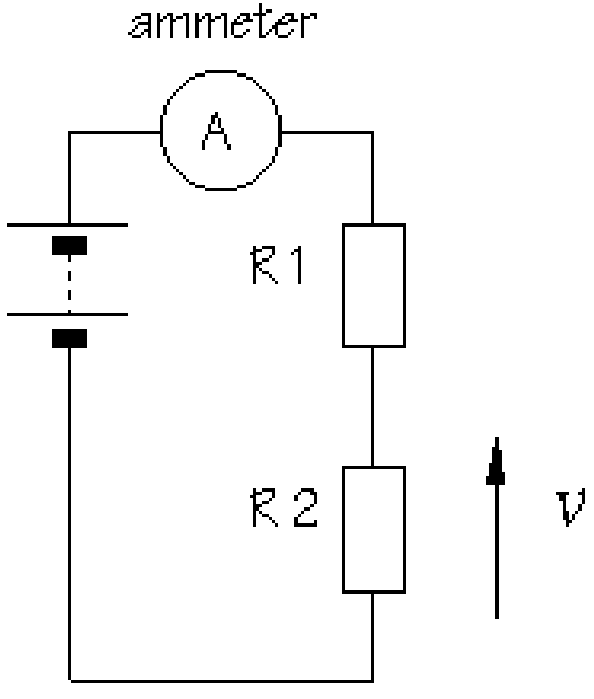


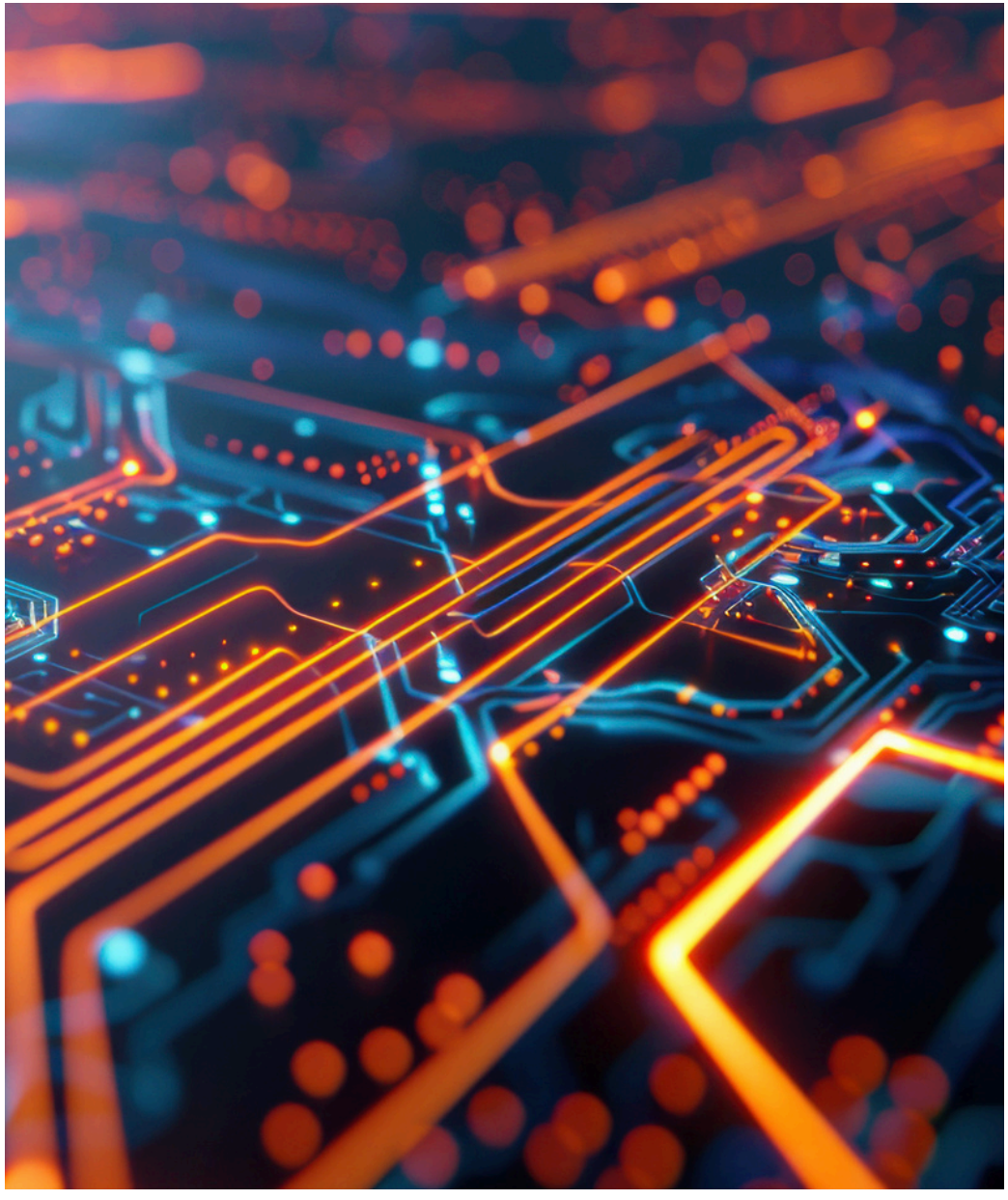
- Symbol A
- Used to measure current
- To measure current, the circuit must be ‘broken’ ,to allow the ammeter to be connected in series
- Ammeter must have a low resistance
- All the current flowing in the circuit must through the ammeter



How to connect Ammeter

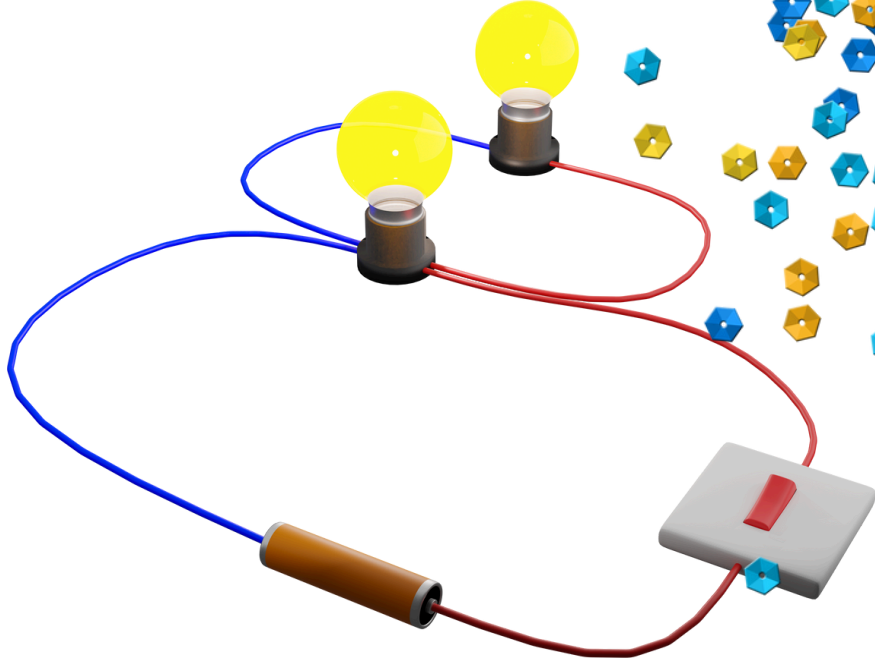






Types of Electrical Circuit

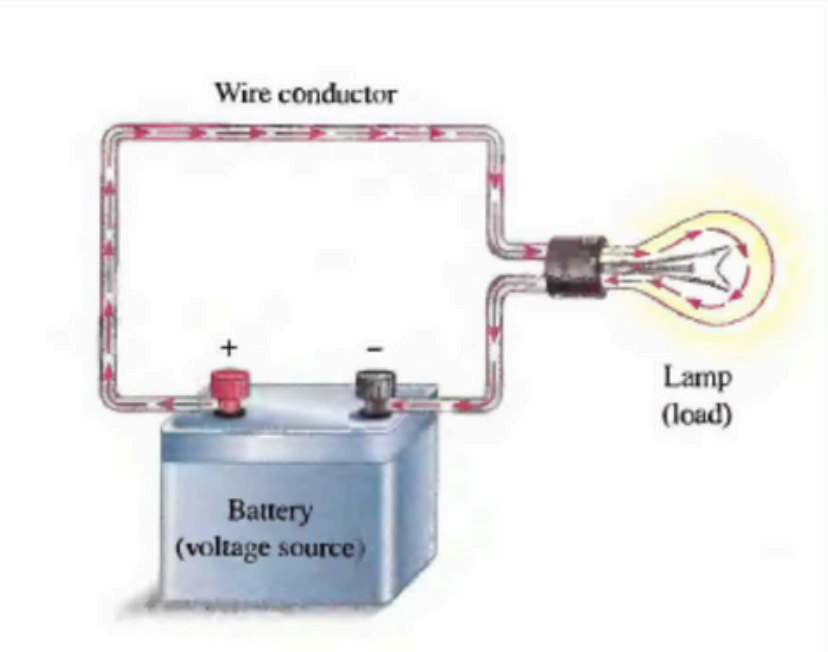
Simple Circuit

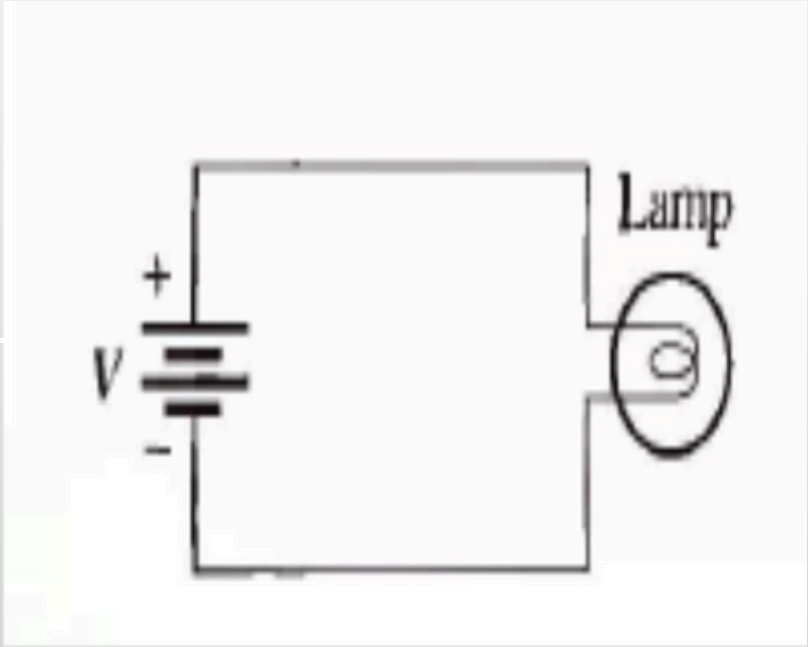


Consist of 3 basic things:
–Voltage source
–Load
–Path for current

A simple circuit consists of a source of potential difference (battery), a load or device that uses the energy (light, stereo, etc), and conductors creating a continuous path (wires).

Simple Circuit



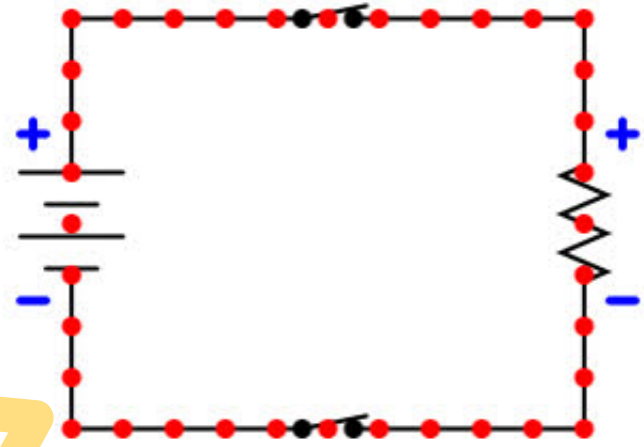


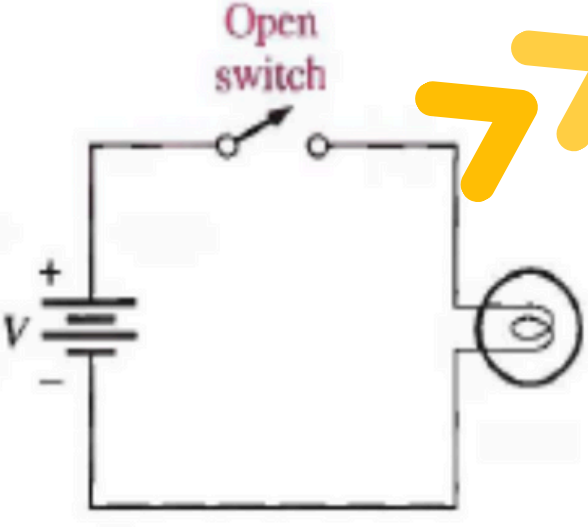
Open Circuit

- The current path is broken
- A condition in an electric circuit in which there is no path for current between 2 points
- Example: broken wire or a switch in the ‘open’ or ‘off’ position

Open circuit

Direction of electron motion

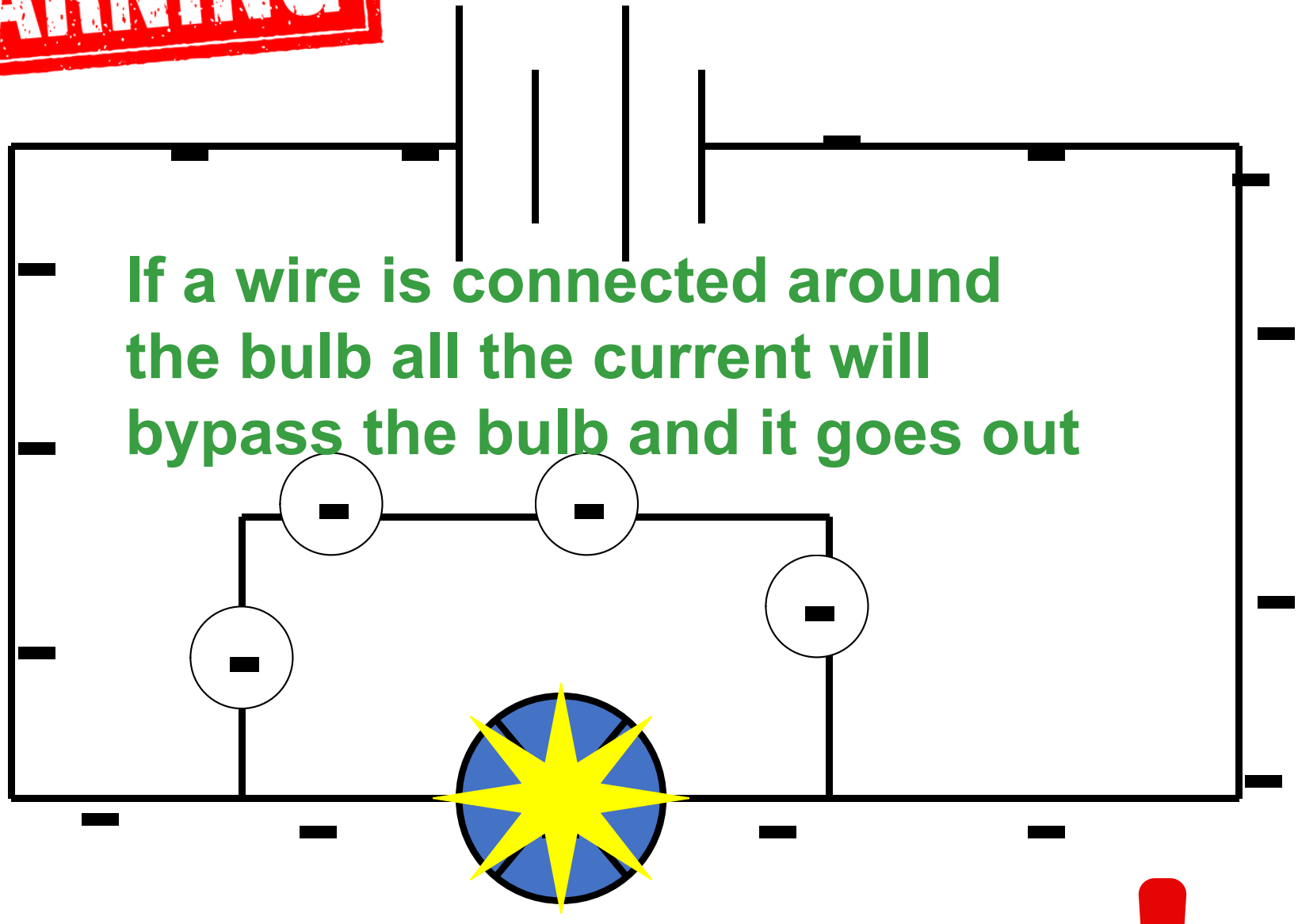




Short Circuit

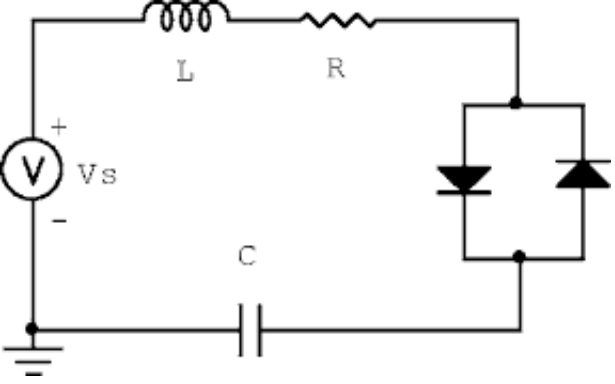
- A low resistance connection established by accident or intention between 2 points in the circuit
- The current tends to flow through the area of low resistance, bypassing the rest of the circuit
- The voltage tends to zero, and current tends to infinity

WARNING



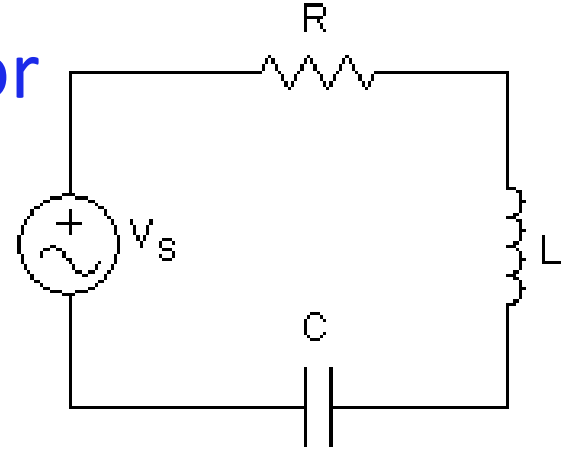
If a wire is connected around the bulb all the current will bypass the bulb and it goes out

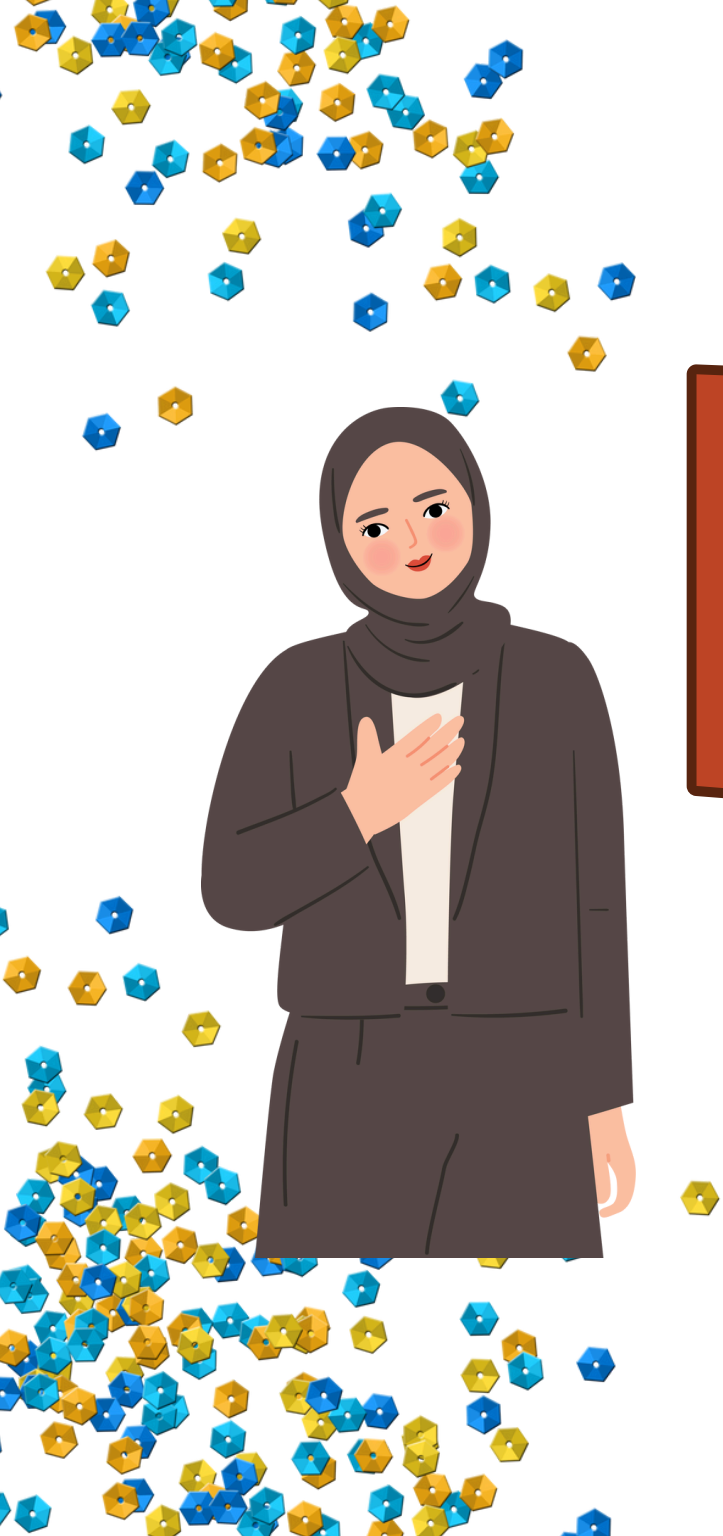
We call this a SHORT CIRCUIT !!



Complex Circuit

- A circuit that consist of inductor (L), resistor (R) and Capacitor (C) or diode
- All the components are treated as resistor to find net impedance
- Complex number must sometimes be used to solve this types of circuit
- contains RLC and diode or transistor in neither purely series or parallel.





Thank You!