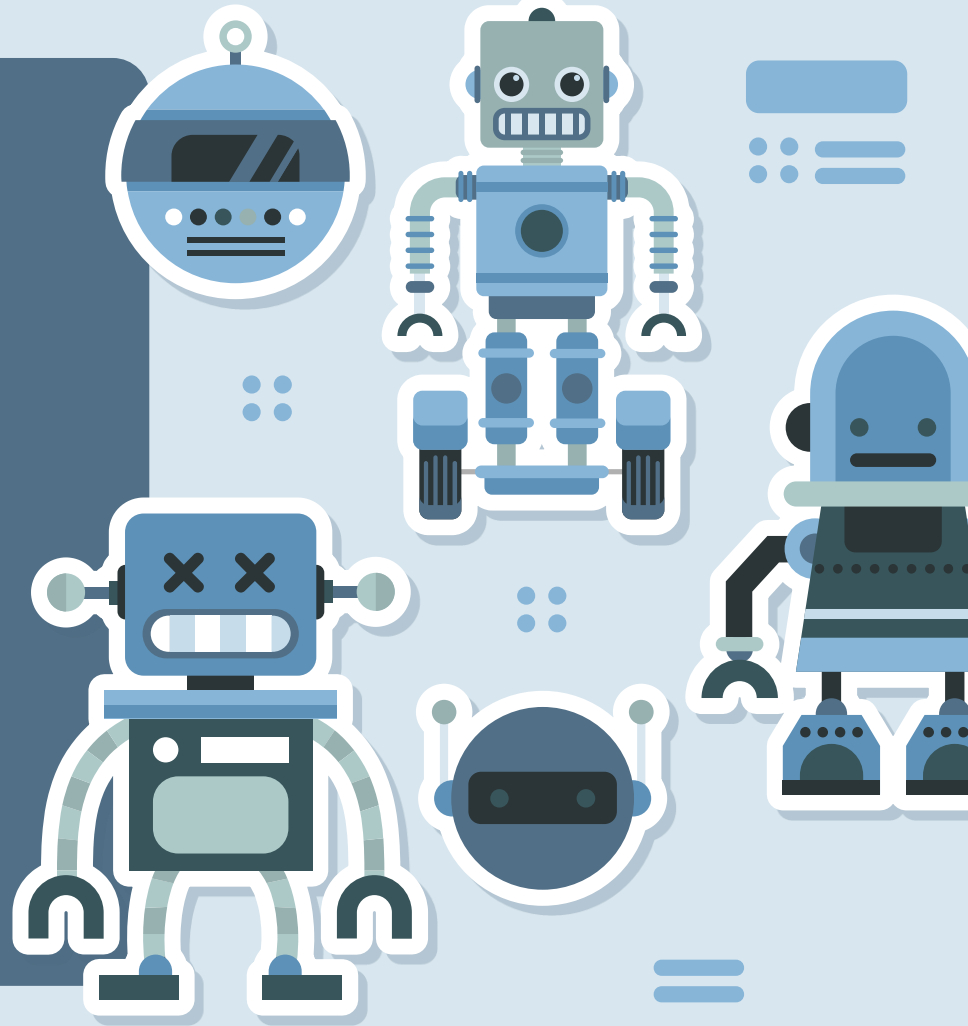
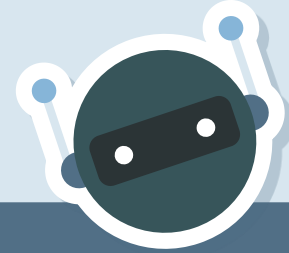
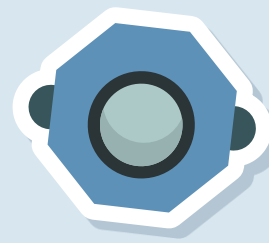


# Robotics



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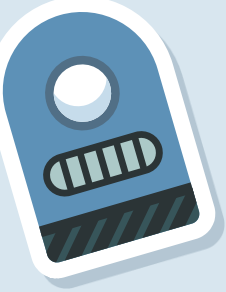
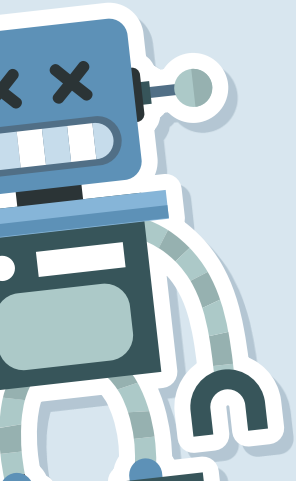
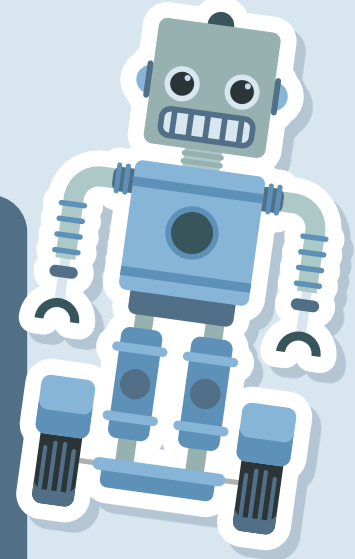


06

**Critical  
thinking**



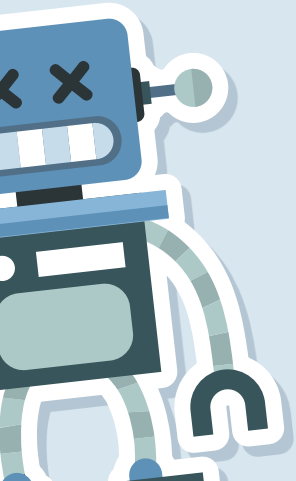
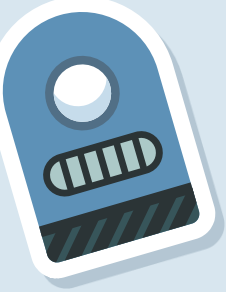
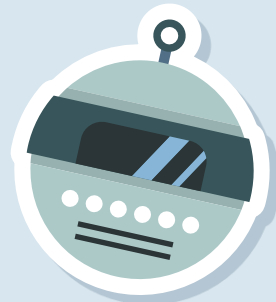
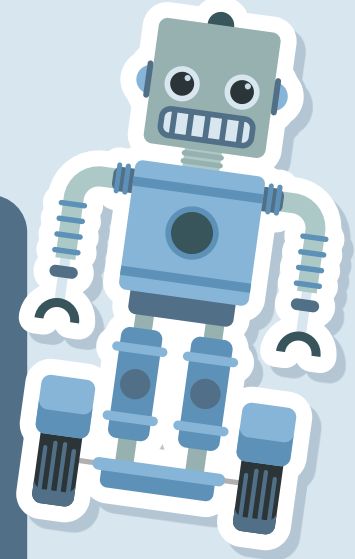
# Important definitions



# What is electricity ?

Motion of electrons from point to another

## But what are electrons ?



# Important definitions:

Electricity → motion of electrons from point to another.

Current → stream of electrons flows through a conductor, its unit is Ampere.

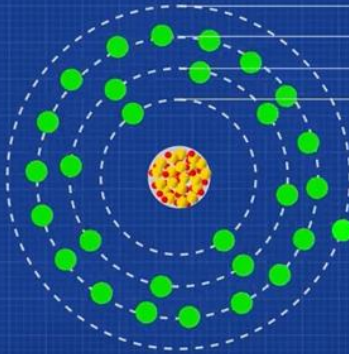
1 Ampere =  $12.50 \times 10^{18}$  electrons

# How Electricity Works

## Copper Atom

<sup>29</sup>  
**Cu**  
63.55

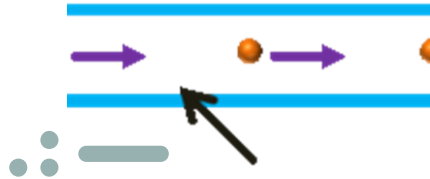
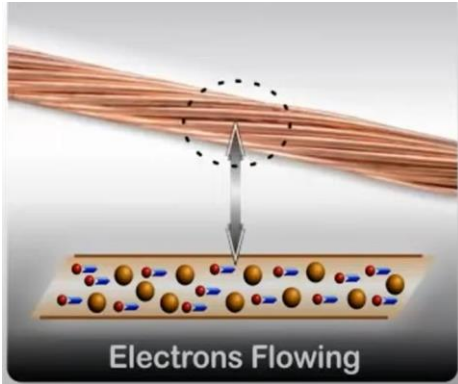
- Protons = 29
- Neutrons = 36
- Electrons = 29  
(of which are free = 1)



- 4th Shell = 1 Electron
- 3rd Shell = 18 Electrons
- 2nd Shell = 8 Electrons
- 1st Shell = 2 Electrons

● Free electron in outer (Valance) shell

TheEngineeringMindset.com





# Important definitions:

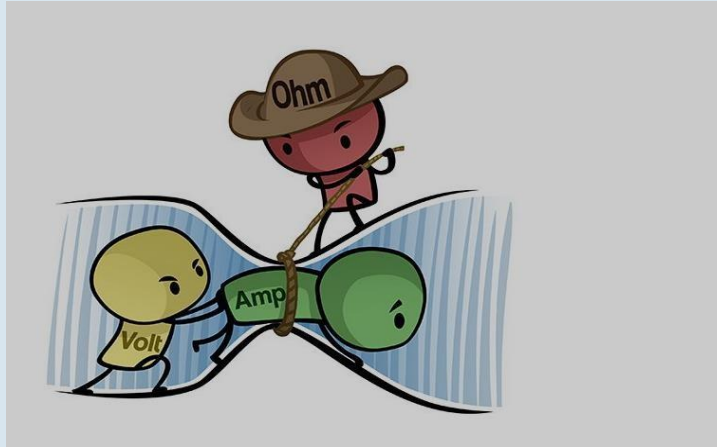
*Voltage* → difference between 2 points, the amount of energy needed by electron to move between these 2 points  
its unit: **VOLT**

*Resistance* → electrical quantity that measures how the device or material reduces the electric current flow through it.

Its unit: **OHM**

Ohm's Law :  $V = I * R$





## Ohm's Law Explained

What is Ohm's Law?



## Ohm's Law Explained



To Find voltage

$$V = I \times R$$

Voltage (V) = Current (I) x Resistance (R)

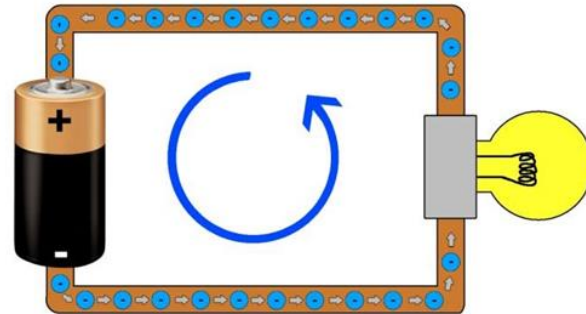
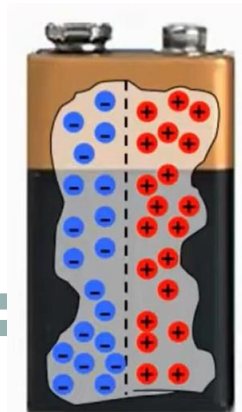
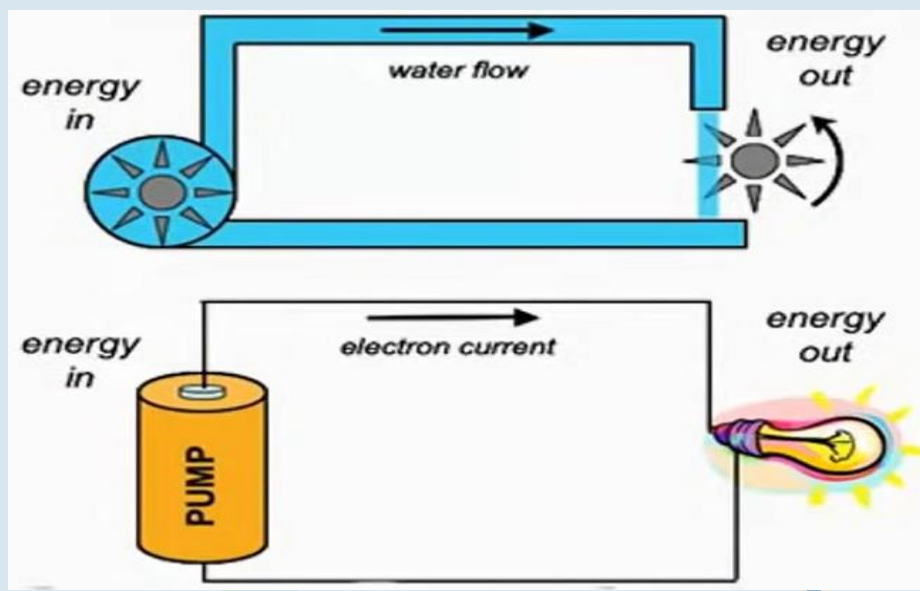


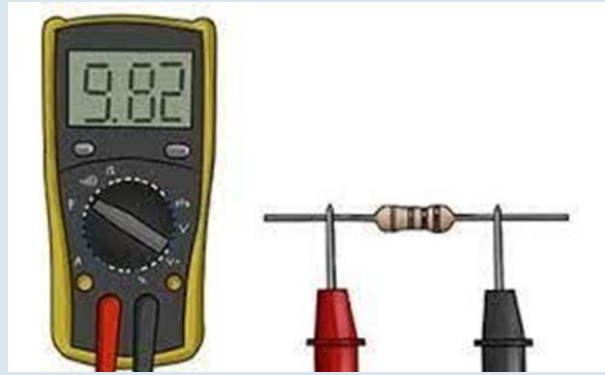
## Ohm's Law Explained

To Find voltage

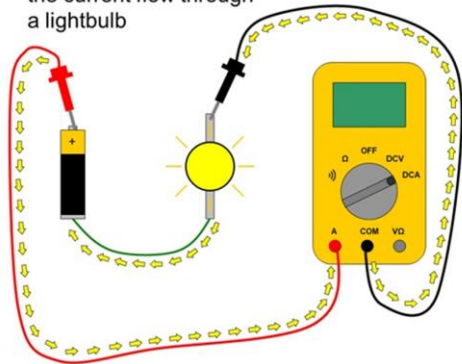




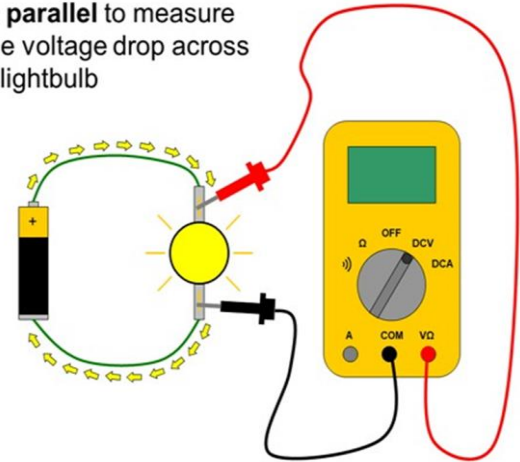




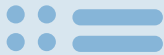
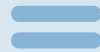
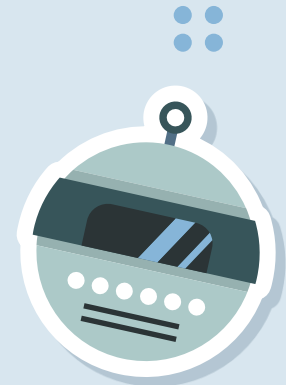
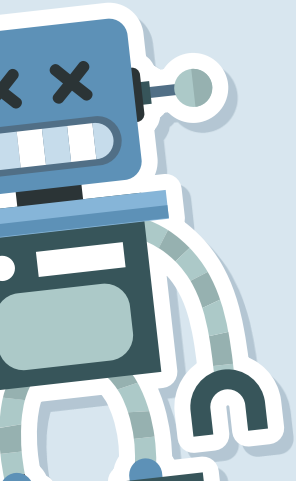
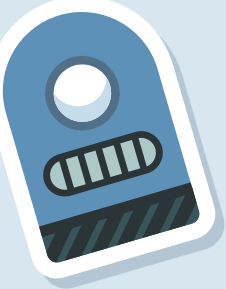
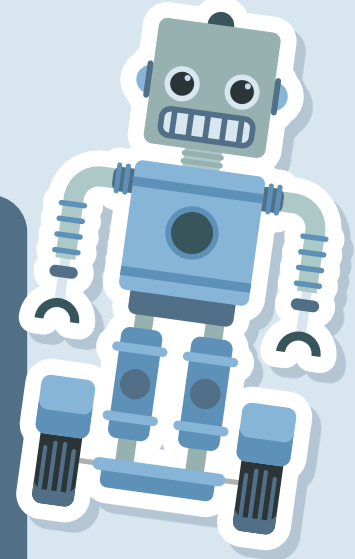
Connect a multimeter  
in **series** to measure  
the current flow through  
a lightbulb



Connect a multimeter  
in **parallel** to measure  
the voltage drop across  
a lightbulb



# TOOLS



# TOOLS

## Battery

DEVICES USED TO CONVERT CHEMICAL ENERGY INTO ELECTRICAL ENERGY,

ITS TYPES

→ CHARGEABLE

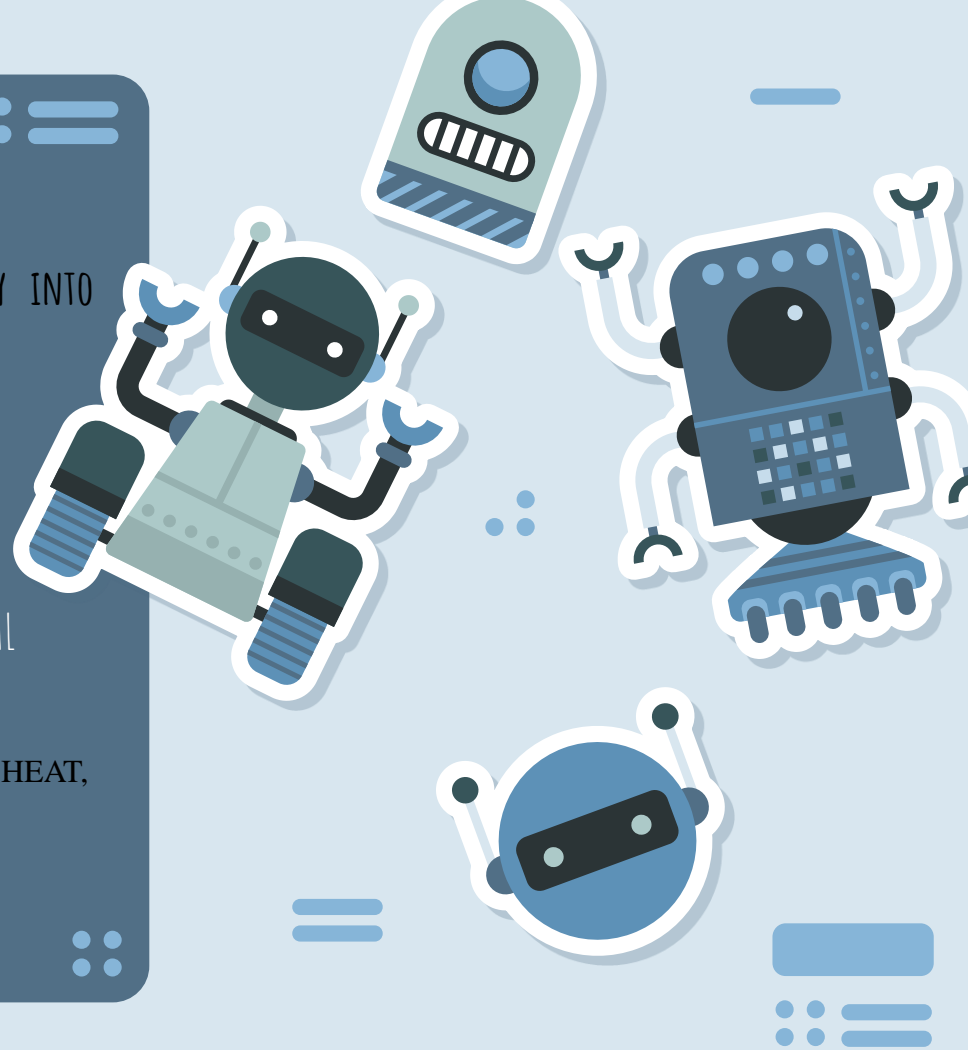
→ UNCHARGEABLE

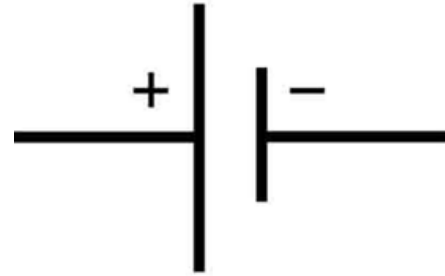
## Resistors

USED TO RESIST THE CURRENT FLOW IN ELECTRICAL CIRCUITS.

IT WORKS BY CONVERTING ELECTRICAL ENERGY INTO HEAT, WHICH DISSIPATED INTO THE AIR.

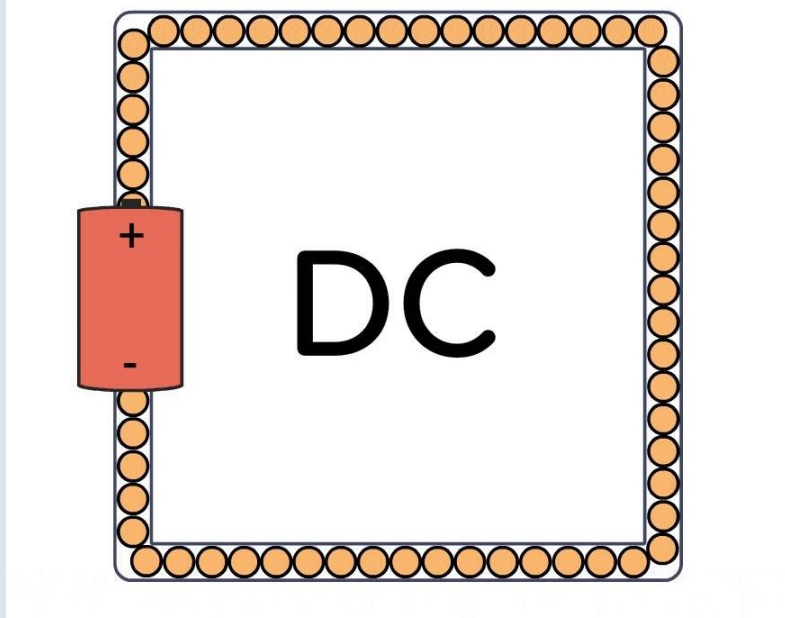
**FIXED RESISTORS VALUE CAN BE CALCULATED FROM ITS COLOR**



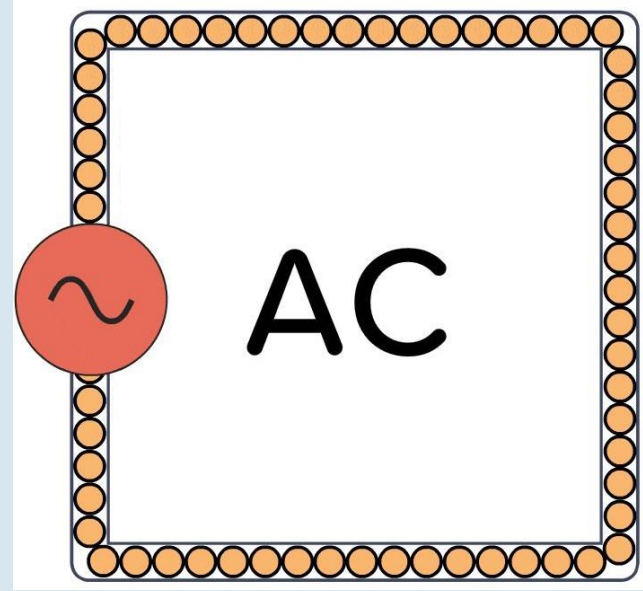


# Electricity types

**DC** (Direct current)



**Ac** (alternating current)



# TOOLS

## Battery

DEVICES USED TO CONVERT CHEMICAL ENERGY INTO ELECTRICAL ENERGY,

ITS TYPES

→ CHARGEABLE

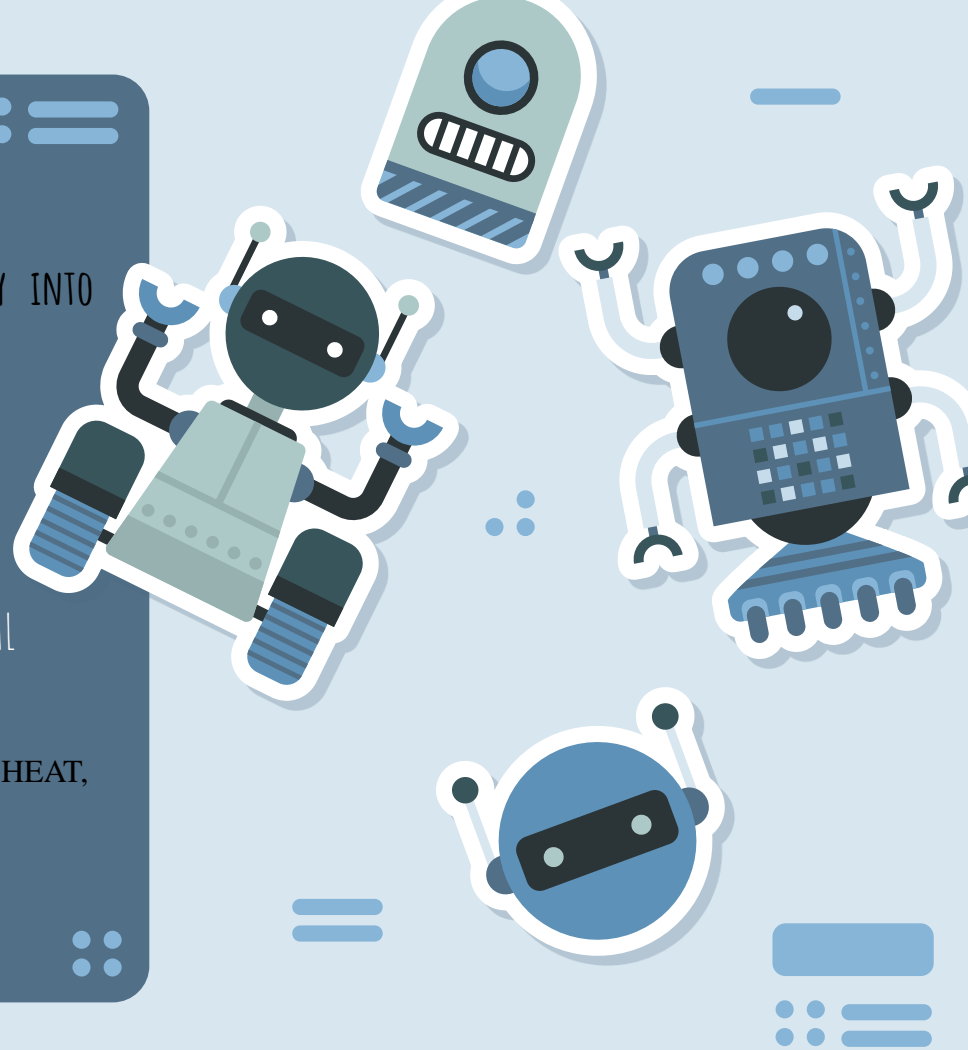
→ UNCHARGEABLE

## Resistors

USED TO RESIST THE CURRENT FLOW IN ELECTRICAL CIRCUITS.

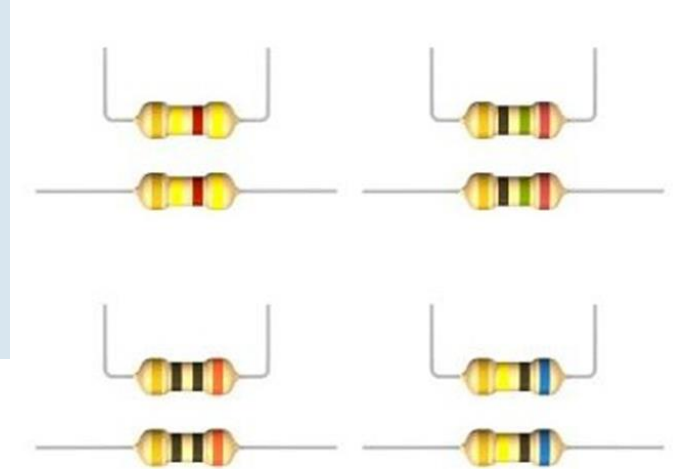
IT WORKS BY CONVERTING ELECTRICAL ENERGY INTO HEAT, WHICH DISSIPATED INTO THE AIR.

**FIXED RESISTORS VALUE CAN BE CALCULATED FROM ITS COLOR**



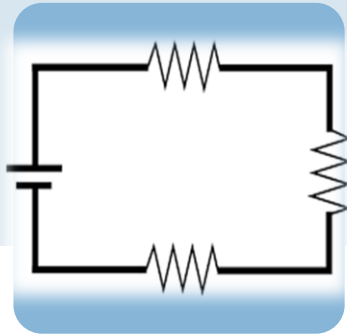


Color	Digits		Multiplier	Tolerance
black	0	0	$10^0$	
brown	1	1	$10^1$	$\pm 1\%$
red	2	2	$10^2$	$\pm 2\%$
orange	3	3	$10^3$	
yellow	4	4	$10^4$	
green	5	5	$10^5$	
blue	6	6	$10^6$	
violet	7	7	$10^7$	
grey	8	8	$10^8$	
white	9	9	$10^9$	
gold			$10^{-1}$	$\pm 5\%$
silver			$10^{-2}$	$\pm 10\%$



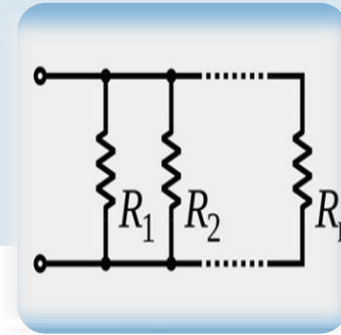


# Types of connection



## Series

In a type of electric circuit called a series circuit, all of the current flows through each part of the circuit.



## Parallel

In a parallel circuit the current is divided into

# TOOLS

## Led

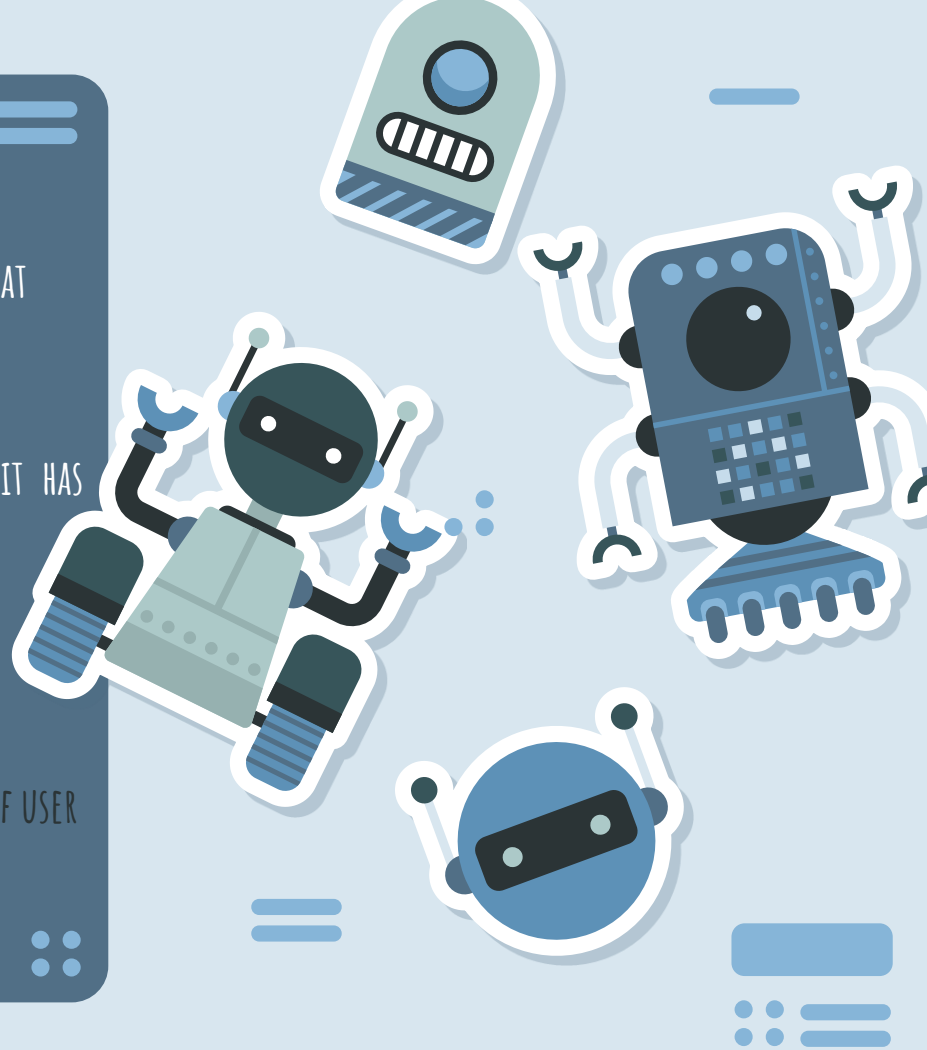
A LIGHT EMITTING DIODE IS A SMALL COMPONENT THAT LIGHTS UP WHEN CURRENT FLOWS THROUGH IT.

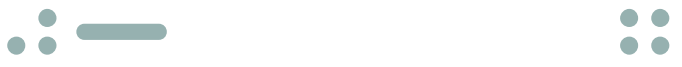
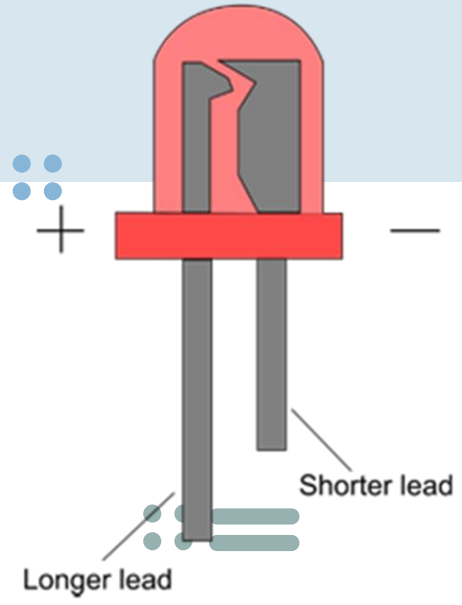
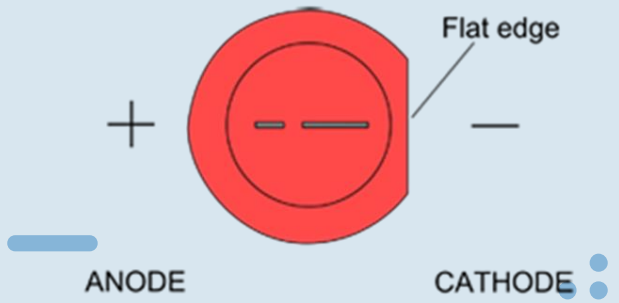
usage → FOR SIMPLE TASKS LIKE : INDICATING THAT CIRCUIT HAS POWER OR NOT.

## Buzzers

IS AN AUDIO SIGNALING DEVICE.

usage → ALARM DEVICES, TIMERS, AND CONFIRMATION OF USER INPUT SUCH AS A MOUSE CLICK OR KEYSTROKE





# TOOLS

## *push button*

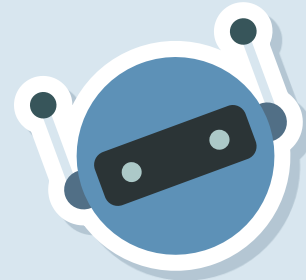
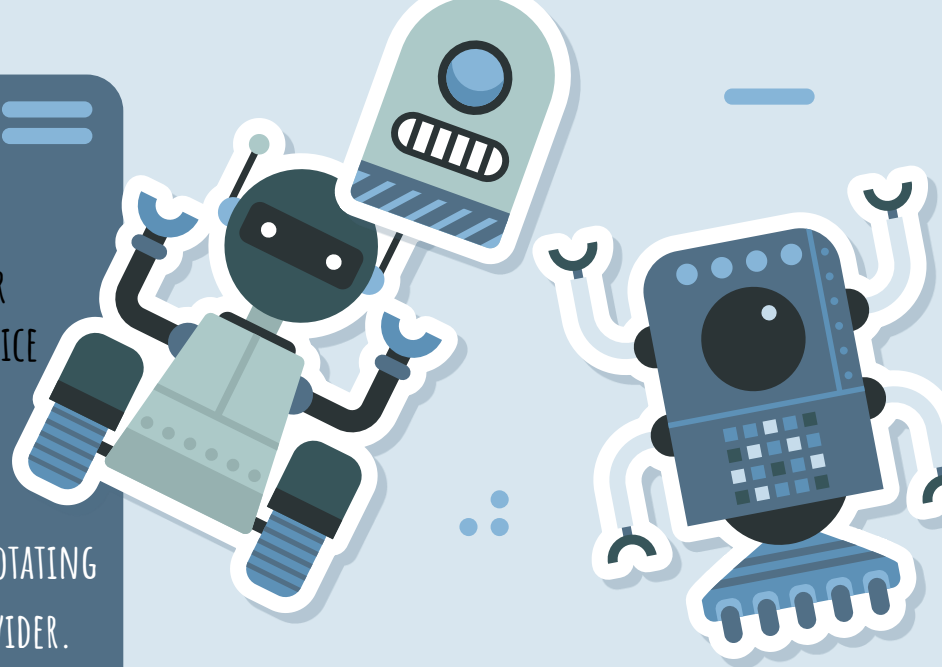
SMALL BUTTON THAT, WHEN PRESSED, OPENS OR CLOSES AN ELECTRIC CIRCUIT TO ACTIVATE A DEVICE OR FUNCTION.

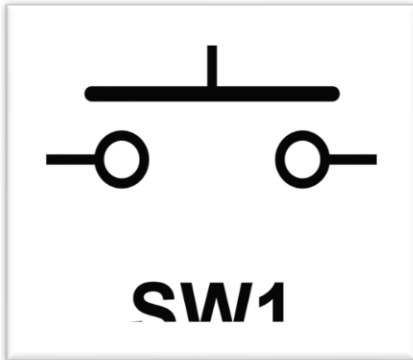
## *potentiometer*

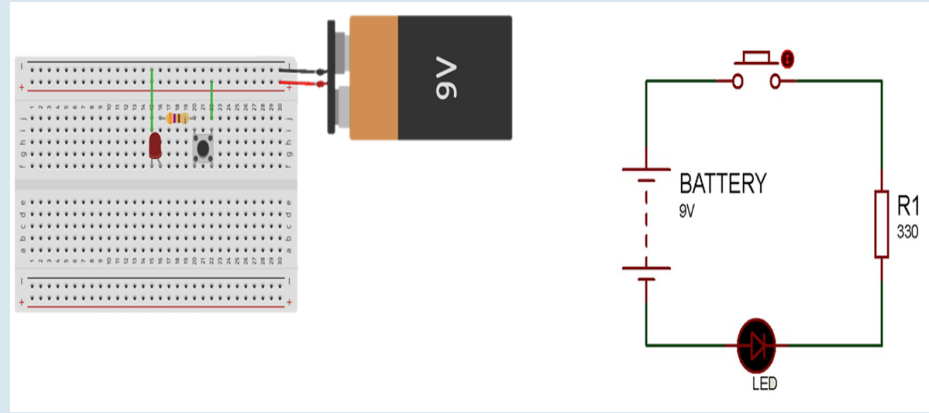
THREE-TERMINAL RESISTOR WITH A SLIDING OR ROTATING CONTACT THAT FORMS AN ADJUSTABLE VOLTAGE DIVIDER.

ACTS AS A VARIABLE RESISTOR

usage → CONTROL ELECTRICAL DEVICES SUCH AS:  
VOLUME CONTROLS ON AUDIO EQUIPMENT.

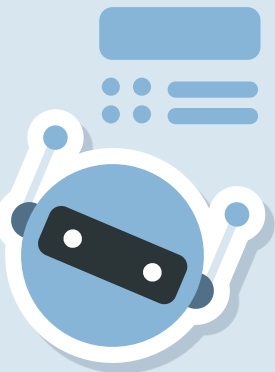






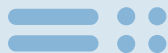
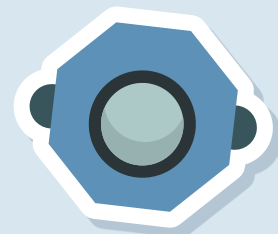
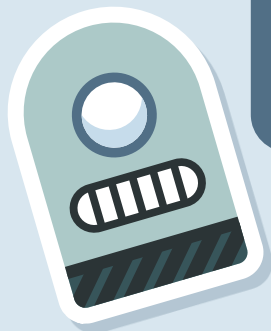
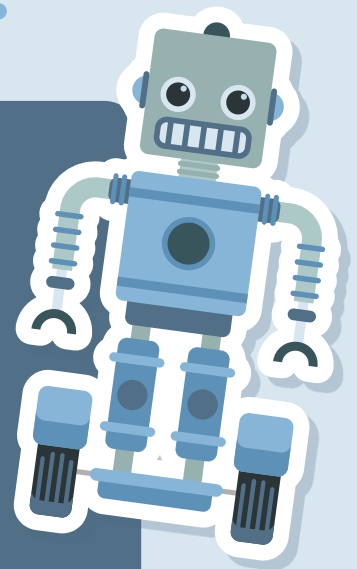
TEST BOARD  
OR  
BREAD BOARD

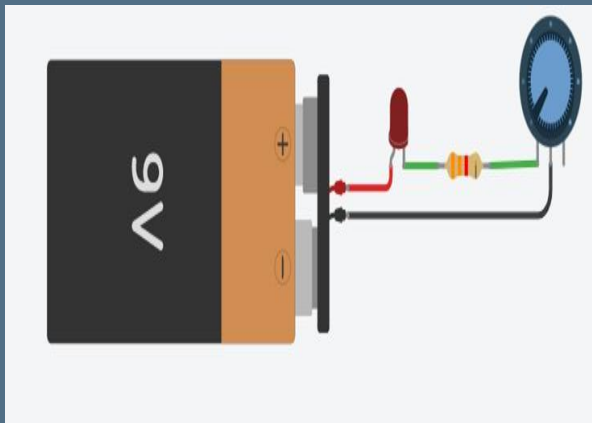
Small circuit



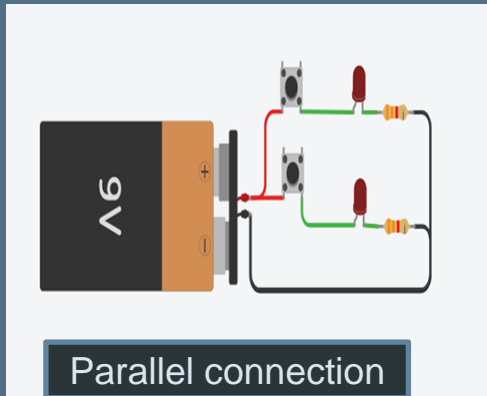
# Task

1. Source of electricity is .....
2. Unit of electric current is .....
3. Unit of voltage difference is .....
4. Unit of Resistance is .....
5.  $V = \dots\dots\dots$  ( Ohm's law )
6. The electric current increases when resistance  
..... ( increases – decreases ) . Choose

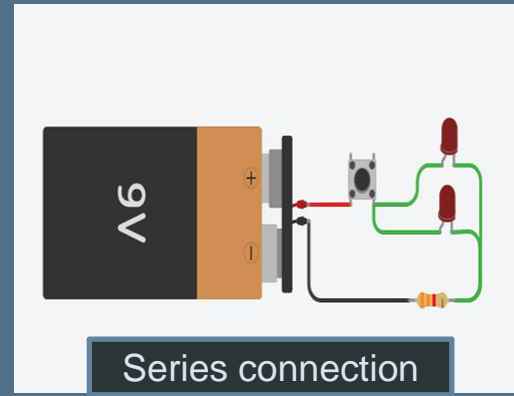




Controlling led with potentiometer



Parallel connection



Series connection

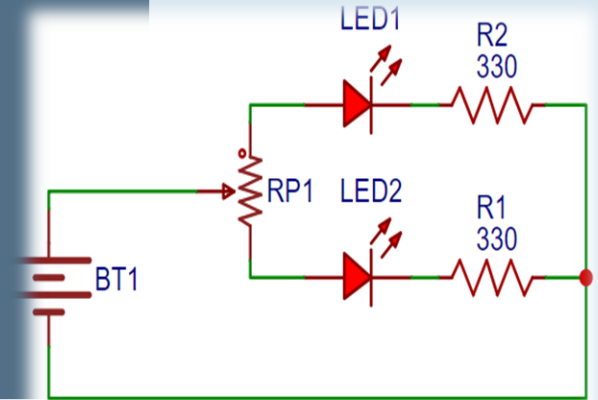
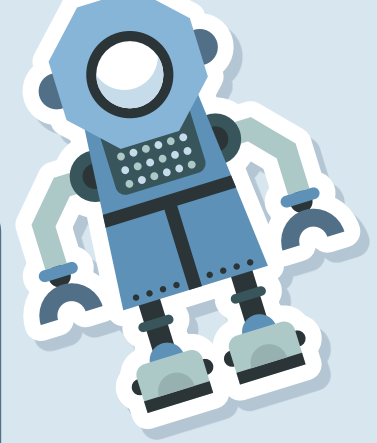
Controlling led with pushbutton





Critical thinking?!

HOW TO CONTROL 2  
LED INVERSLY WITH  
POTENTIOMETER???



Thank you

