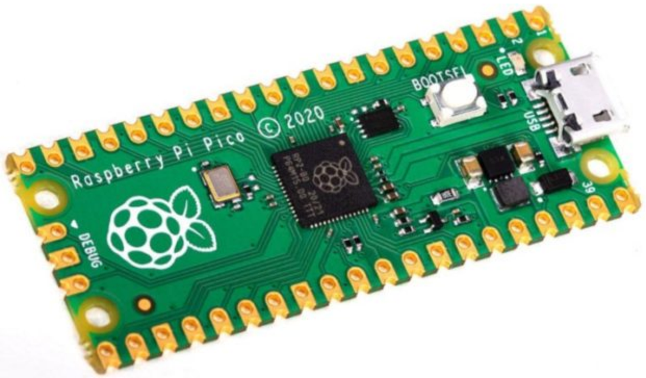
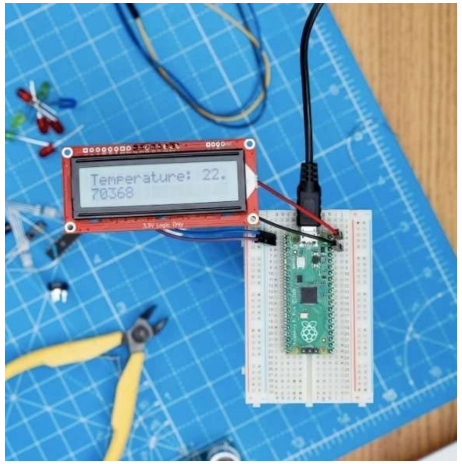


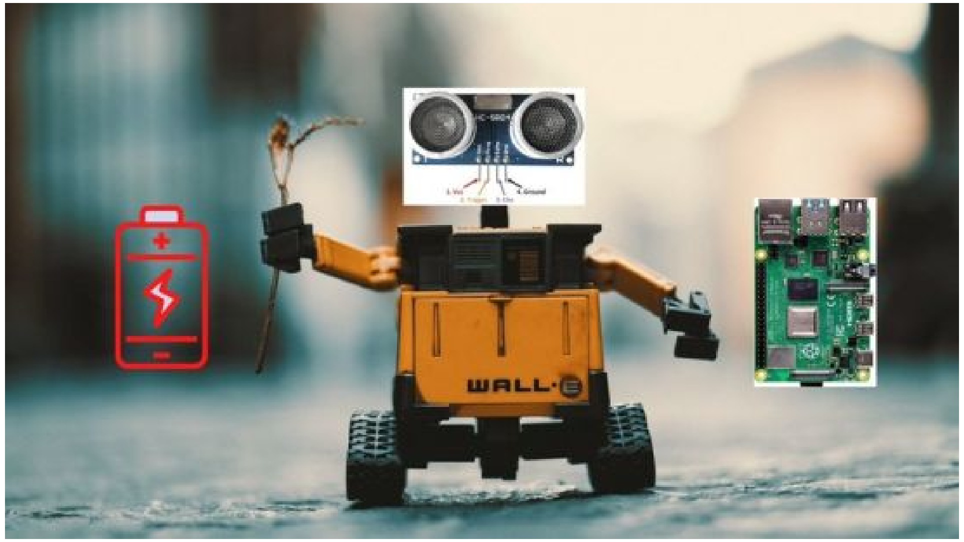
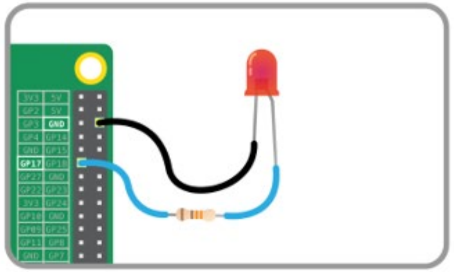
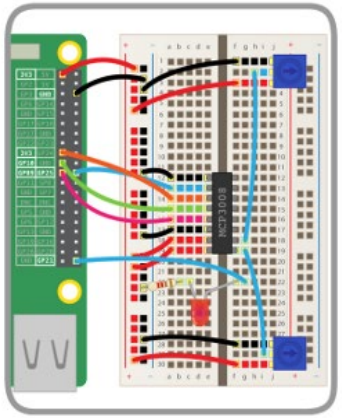




INTERNET OF THINGS (IOT) PROJECTS USING PYTHON

(CSE 4110)

(LECTURE – 2)

What Is Outcome-Based Education? OBE Vs Traditional Education System

- Outcome-based education is a system where all the parts and aspects of education are focused on the outcomes of the course. The students take up courses with a certain goal of developing skills or gaining knowledge and they have to complete the goal by end of the course.

- There is no specific style or time limit of learning. The student can learn as per their choice. The faculty members, moderators, and instructors guide the students based on the target outcomes.

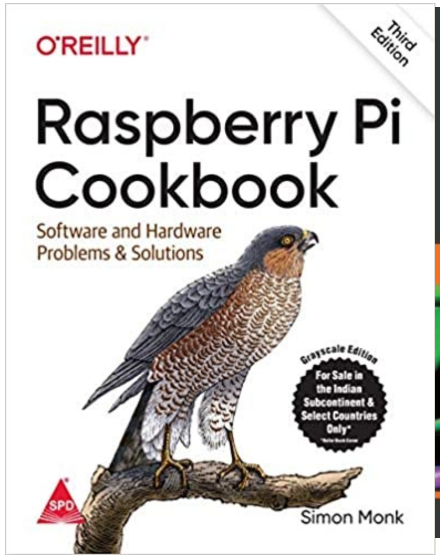
Benefits Of Outcome-Based Education (OBE) For Students

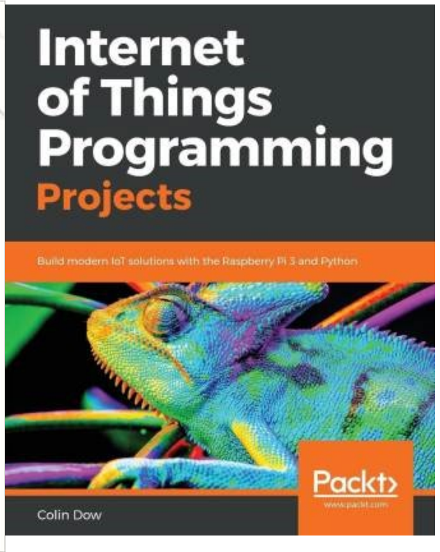
- Brings clarity among the teachers and students
- Every student has the flexibility and freedom of learning in their ways.
- There is more than one method of learning
- Reduces comparison among the students as everyone has a different target
- Completely involves students taking responsibility for their goals

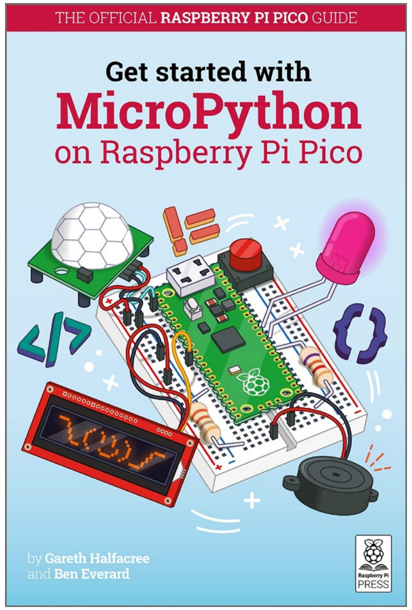
About your subject

- Grading Pattern : 3
- Credit : 4
- TextBook: • 1) Raspberry Pi Cookbook by by Simon Monk, shroff/O'Reilly

  2) Internet of Things Programming Projects by By Colin Dow, Packt,
- Reference : 3) Get started with Micro-Python







Evaluation Scheme

- ATTENDANCE : 5
- WEEKLY ASSIGNMENTS / QUIZZES : 20
- MID TERM : 15
- TOTAL INTERNAL : 40

MID-TERM

- FINAL ASSIGNMENT : 40
- ASSIGNMENT PRESENTATION : 20
- TOTAL EXTERNAL : 60

END-TERM

Course Outcomes

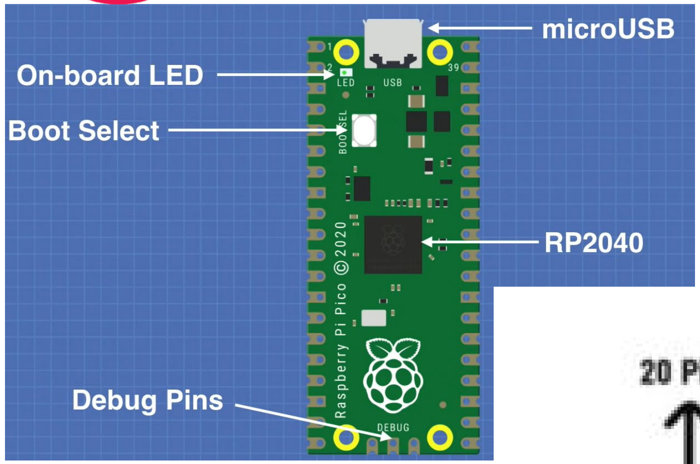
Course Outcomes	
CO1	Understand general concepts of Internet of Things (IoT), the working of Raspberry Pi and its features.
CO2	Recognize various components, sensors, actuators, devices and their applications.
CO3	Analyze various python programs to interface with sensors, actuators, LED's, cloud and camera using Raspberry pi.
CO4	Measure physical parameters using sensors.
CO5	Demonstrate the ability to transmit data wirelessly between different devices to build simple IoT systems using Raspberry Pi.
CO6	Create IoT devices and systems through a variety of interfaces, including web apps and mobile apps.

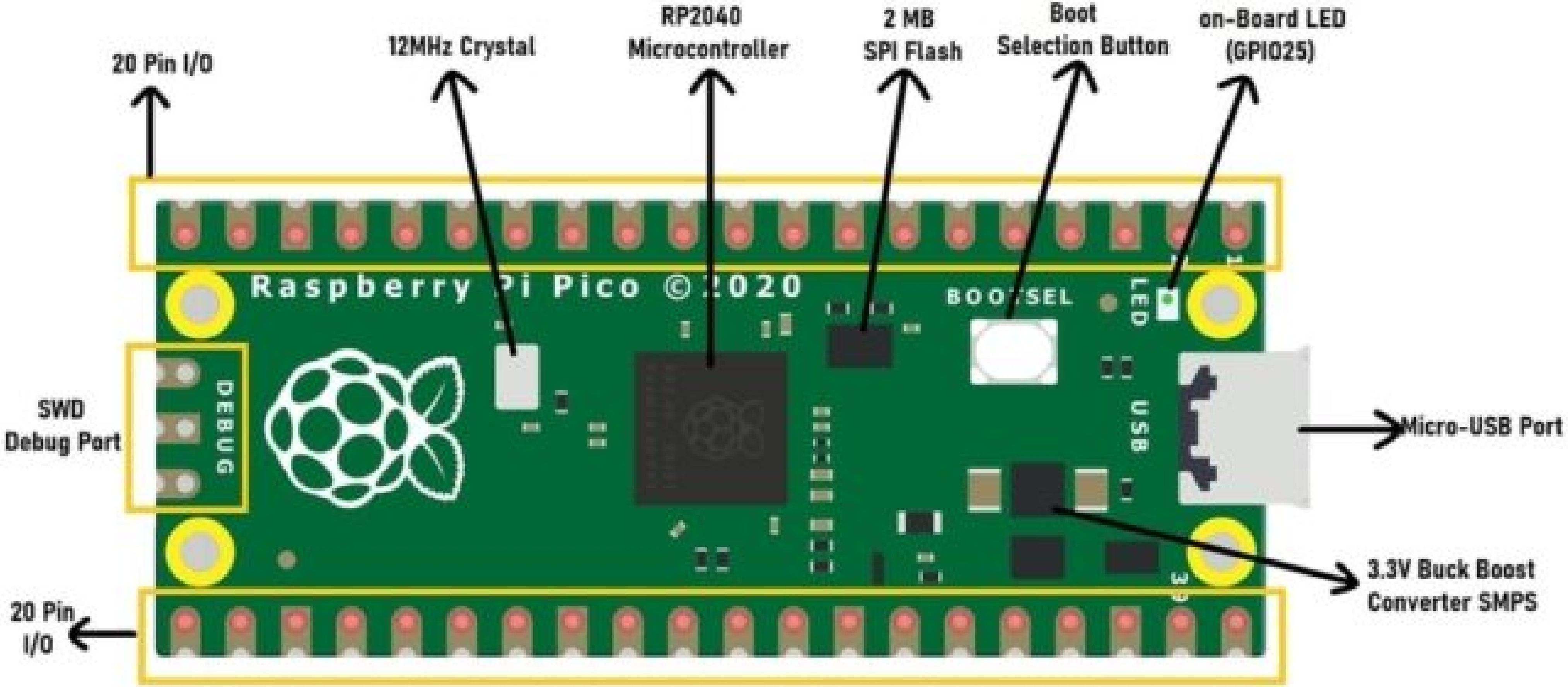
What Students will learn?

Students will revise the basics of electronics, types of electrical signal, Resistance colour code to enhance the knowledge to build an electronic circuit. Also students will experience about ability to learn coding and electronics to implement a LED flash SOS (Morse code) .

- ✓ **Familiarization with Basic Electronic concepts, their origin, impact, and different applications to improve technical results.**
- ✓ **Introduction to Resistance Colour code**
- ✓ **Implementation of LED Flash SOS (Morse Code) using Raspberry Pi Pico**

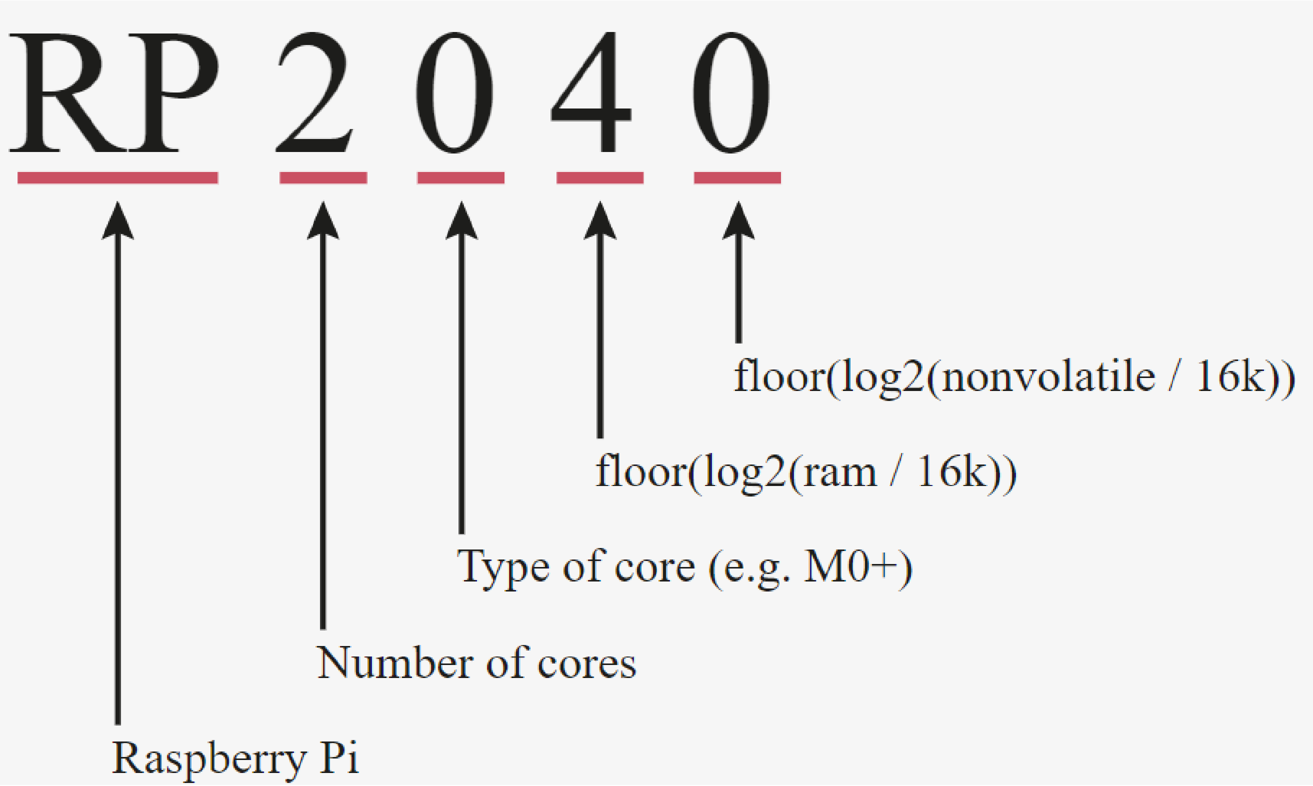
Raspberry Pi Pico – Simple Pinout





Why is the chip called RP2040?

The post-fix numeral on RP2040 comes from the following,



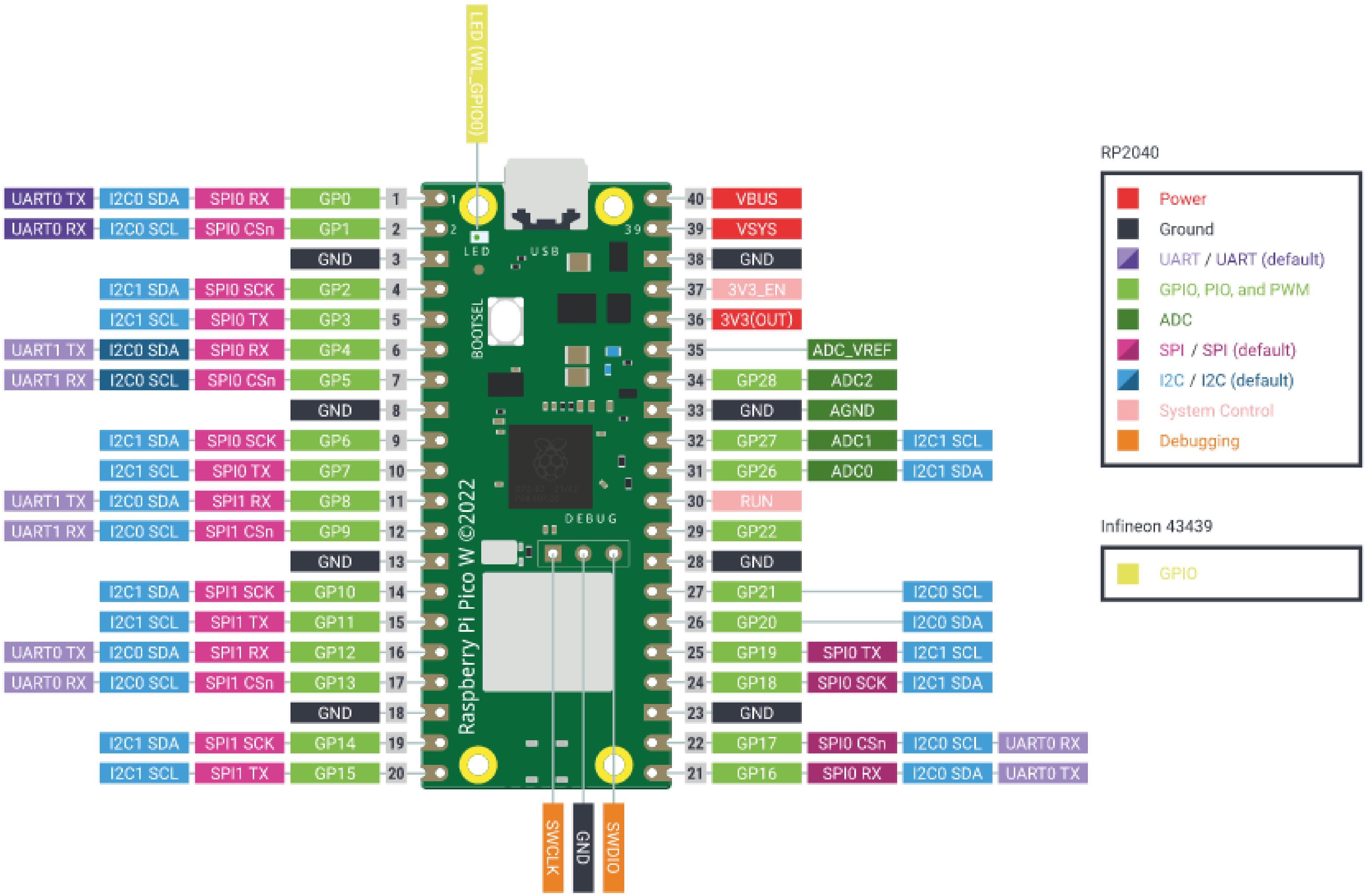
1. Number of processor cores (2)

2. Loosely which type of processor (M0+)

3. floor(log2(ram / 16k))

4. floor(log2(nonvolatile / 16k)) or 0 if no onboard nonvolatile storage

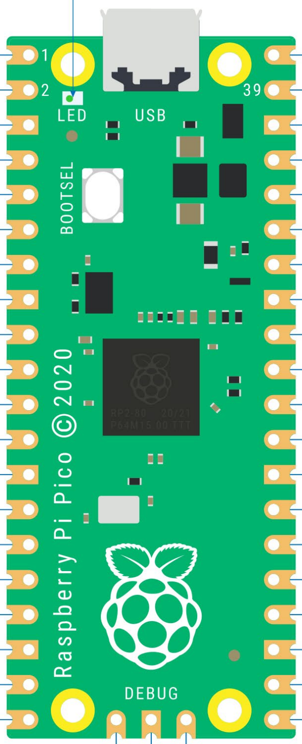
Raspberry Pi Pico W Pinout



Raspberry Pi Pico – Full Pinout

LED/GP25

	ARDUINO COMM	ARDUINO	UART	I2C	SPI	POW/GPIO	
1	SERIAL1_TX	0	UART0 TX	I2C0 SDA	SPI0 RX	GP0	1
2	SERIAL1_RX	1	UART0 RX	I2C0 SCL	SPI0 CSn	GP1	2
3						GND	3
4		2	UART0 CTS	I2C1 SDA	SPI0 SCK	GP2	4
5		3	UART0 RTS	I2C1 SCL	SPI0 TX	GP3	5
6	WIRE0_SDA	4	UART1 TX	I2C0 SDA	SPI0 RX	GP4	6
7	WIRE0_SCL	5	UART1 RX	I2C0 SCL	SPI0 CSn	GP5	7
8						GND	8
9		6	UART1 CTS	I2C1 SDA	SPI0 SCK	GP6	9
10		7	UART1 RTS	I2C1 SCL	SPI0 TX	GP7	10
11	SERIAL2_TX	8	UART1 TX	I2C0 SDA	SPI1 RX	GP8	11
12	SERIAL2_RX	9	UART1 RX	I2C0 SCL	SPI1 CSn	GP9	12
13						GND	13
14		10	UART1 CTS	I2C1 SDA	SPI1 SCK	GP10	14
15		11	UART1 RTS	I2C1 SCL	SPI1 TX	GP11	15
16	SPI1_CIPO	12	UART0 TX	I2C0 SDA	SPI1 RX	GP12	16
17	SPI1_CS	13	UART0 RX	I2C0 SCL	SPI1 CSn	GP13	17
18						GND	18
19	SPI1_SCK	14	UART0 CTS	I2C1 SDA	SPI1 SCK	GP14	19
20	SPI1_COPI	15	UART0 RTS	I2C1 SCL	SPI1 TX	GP15	20



	POW/CTRL /GPIO	ADC	SPI	I2C	UART	ARDUINO	ARDUINO COMM	
40	VBUS							40
39	VSYS							39
38	GND							38
37	3V3 EN							37
36	3V3 OUT							36
35		AREF						35
34	GP28	ADC2	SPI1 RX		UART0 RX	28		34
33	GND	AGND						33
32	GP27	ADC1	SPI1 TX	I2C1 SCL	UART1 RTS	27	WIRE1_SCL	32
31	GP26	ADC0	SPI1 SCK	I2C1 SDA	UART1 CTS	26	WIRE1_SDA	31
30	RUN							30
29	GP22		SPI0 SCK		UART1 CTS	22		29
28	GND							28
27	GP21		SPI0 CSn	I2C0 SCL		21		27
26	GP20		SPI0 RX	I2C0 SDA		20		26
25	GP19		SPI0 TX	I2C1 SCL	UART0 RTS	19	SPI0_COPI	25
24	GP18		SPI0 SCK	I2C1 SDA	UART0 CTS	18	SPI0_SCK	24
23	GND							23
22	GP17		SPI0 CSn	I2C0 SCL	UART0 RX	17	SPI0_CS	22
21	GP16		SPI0 RX	I2C0 SDA	UART0 TX	16	SPI0_CIPO	21

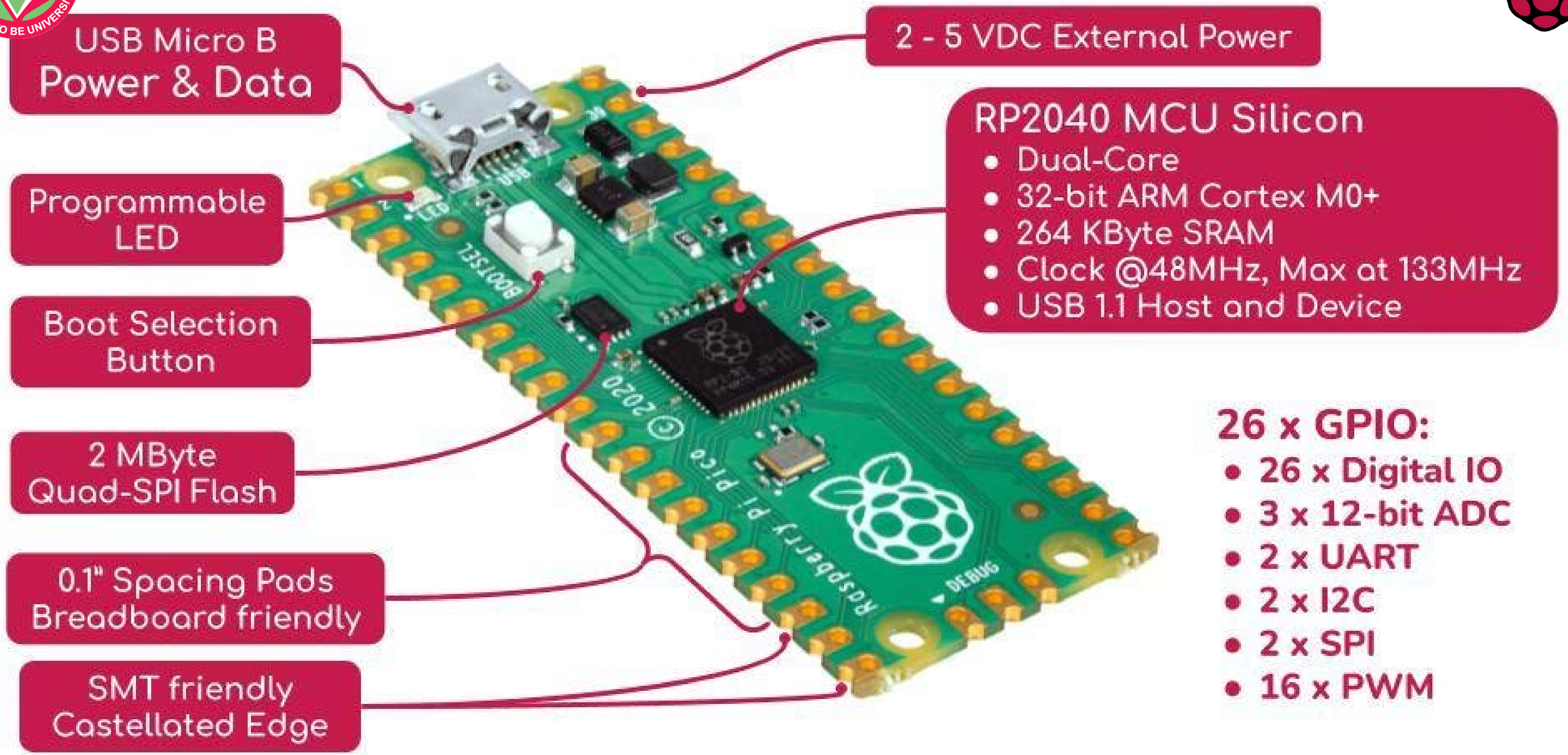
SWCLK
GND
SWDIO

ARDUINO PINS	SWD Pins		
PHYSICAL PIN	POSITIVE SUPPLY	UART1 Pins	UART0 Pins
RESET/ENABLE	GROUND SUPPLY	I2C1 Pins	I2C0 Pins
GPIO PORT/PIN	ANALOG PIN	SPI1 Pins	SPI0 Pins

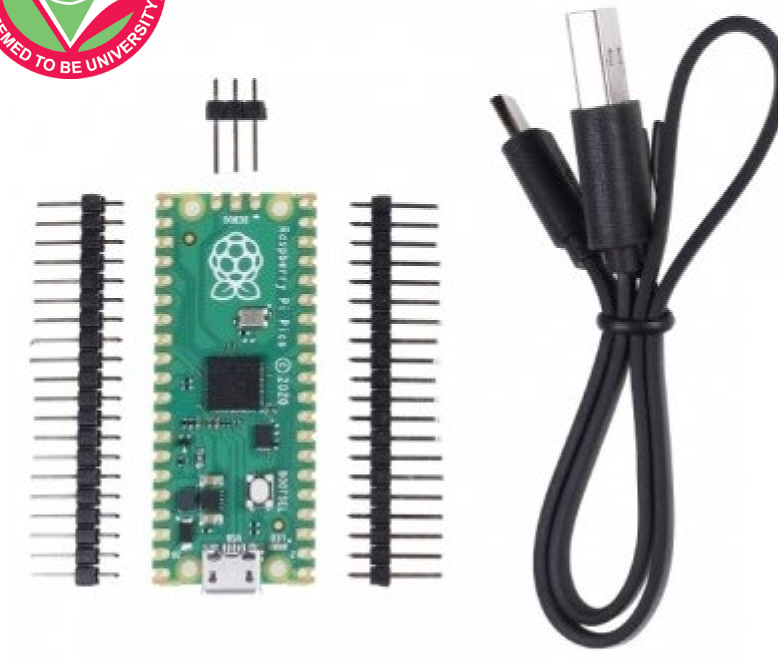
- **GP29/ADC3** is used to measure VSYS.
- **GP25** is used by debug LED.
- **GP24** is used for VBUS sense.
- **GP23** is connected to SMPS Power Save pin.
- All GPIO pins support PWM. There are total 16 PWM channels.
- All GPIO pins support level and edge interrupts.
- Arduino pins are as per **Arduino-Pico** core by ***Earle F. Philhower, III*** @earlephilhower
- Arduino's default **Serial** is the USB-CDC of Pico.

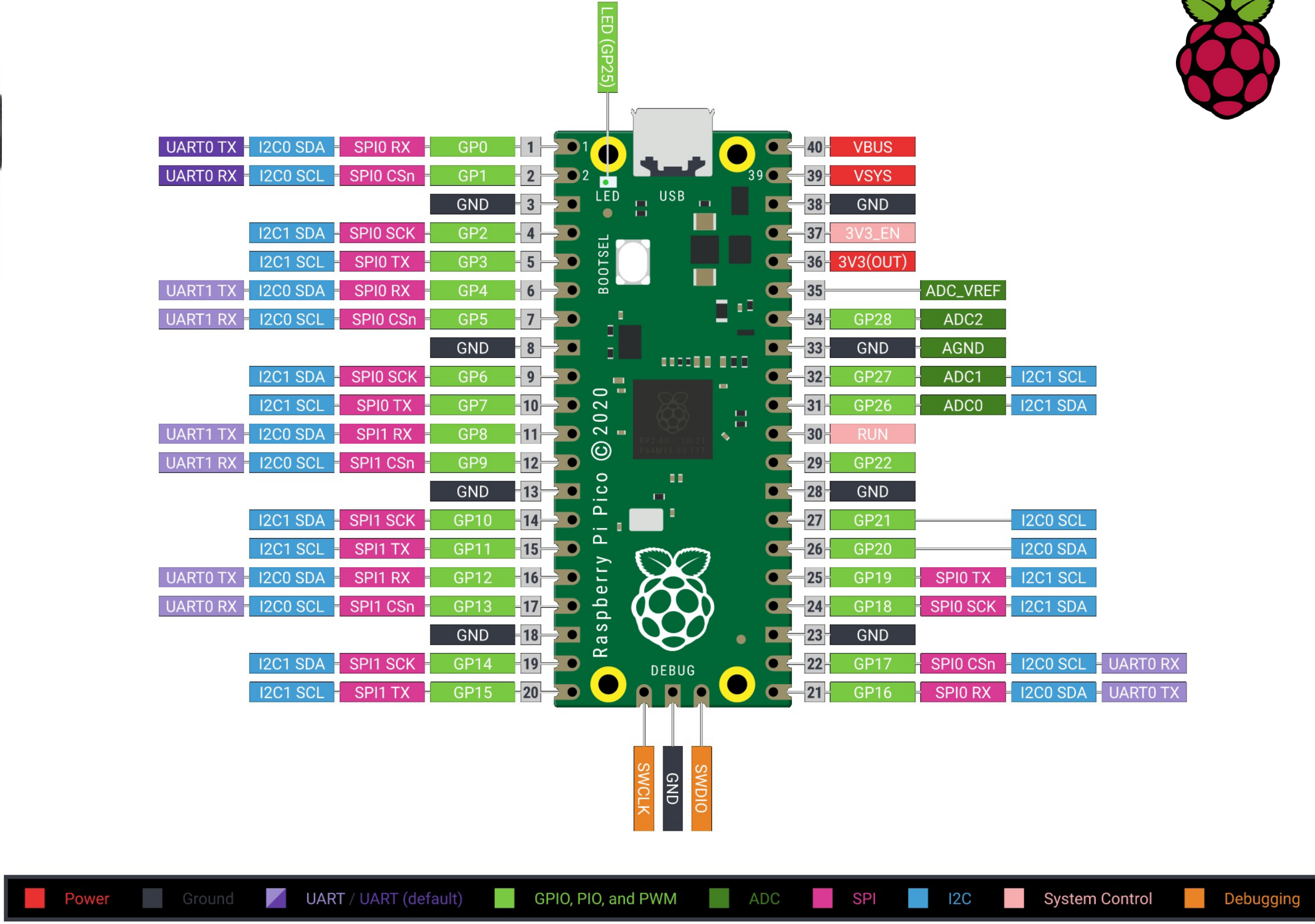
Rev. 0.2, 15-07-2022
Design: Vishnu Mohanan

Raspberry Pi Pico – In Short



Pi Foundation has released an RP2040 Microprocessor based development board, in the same form factor as an Arduino Nano.

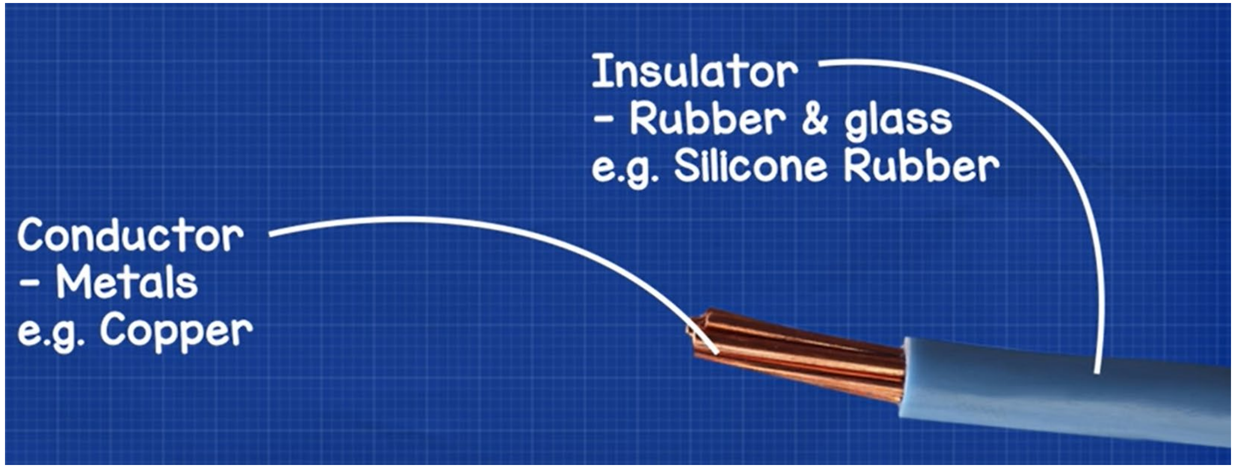


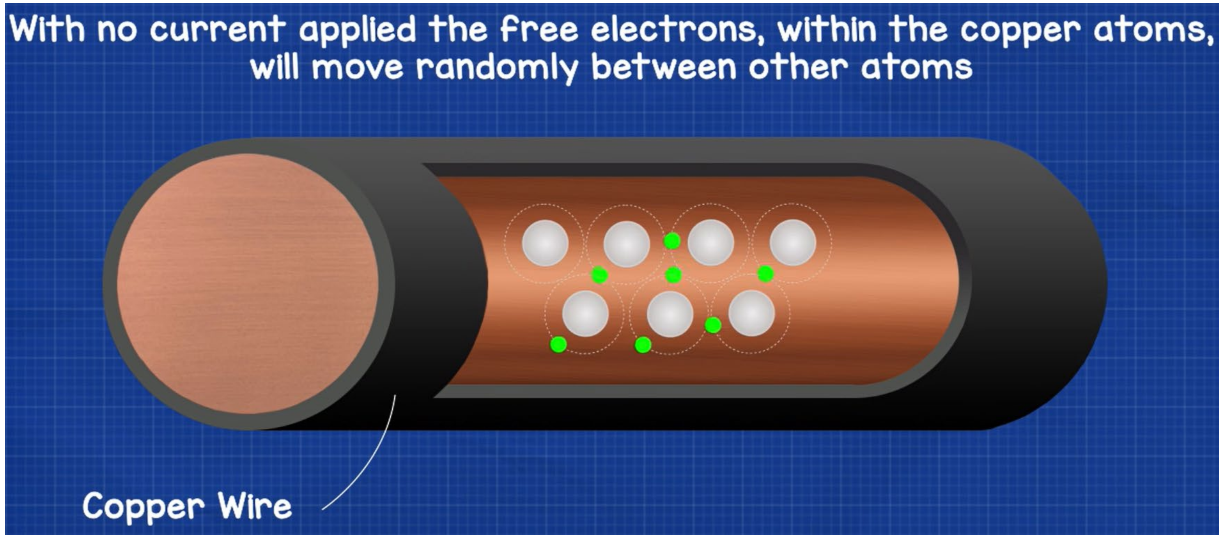


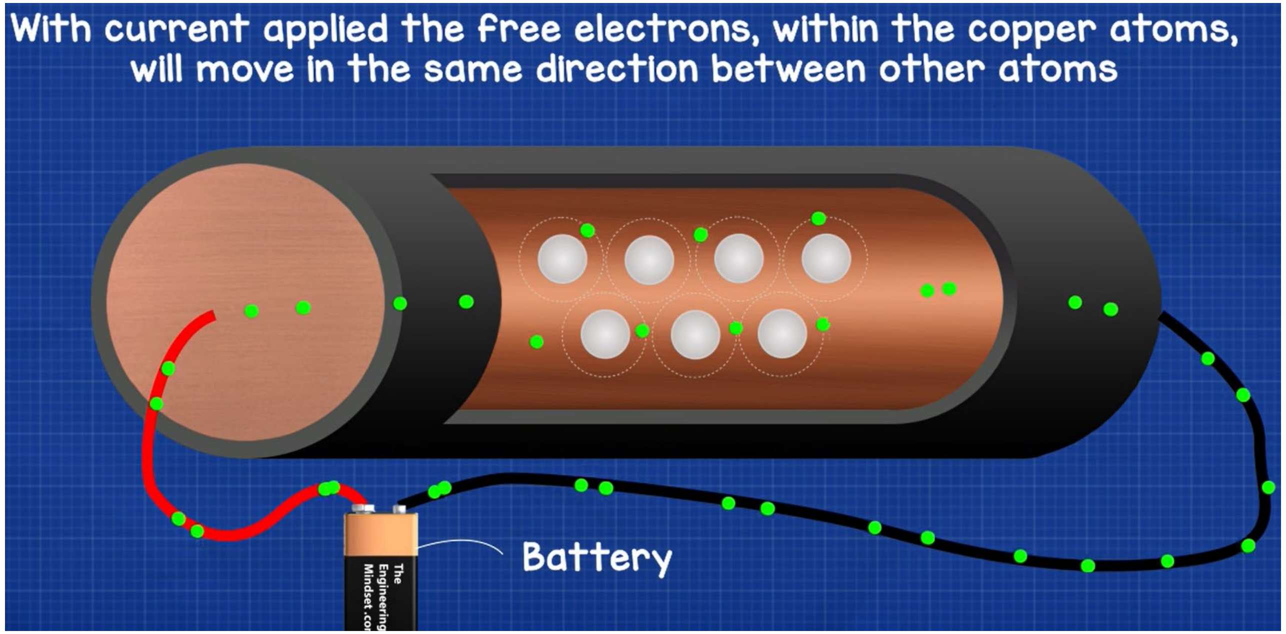
Package Includes:

- 1 x Raspberry Pi Pico
- 1 x Micro-USB cable
- 2 x 20 Pin Header
- 1 x 3 Pin Header

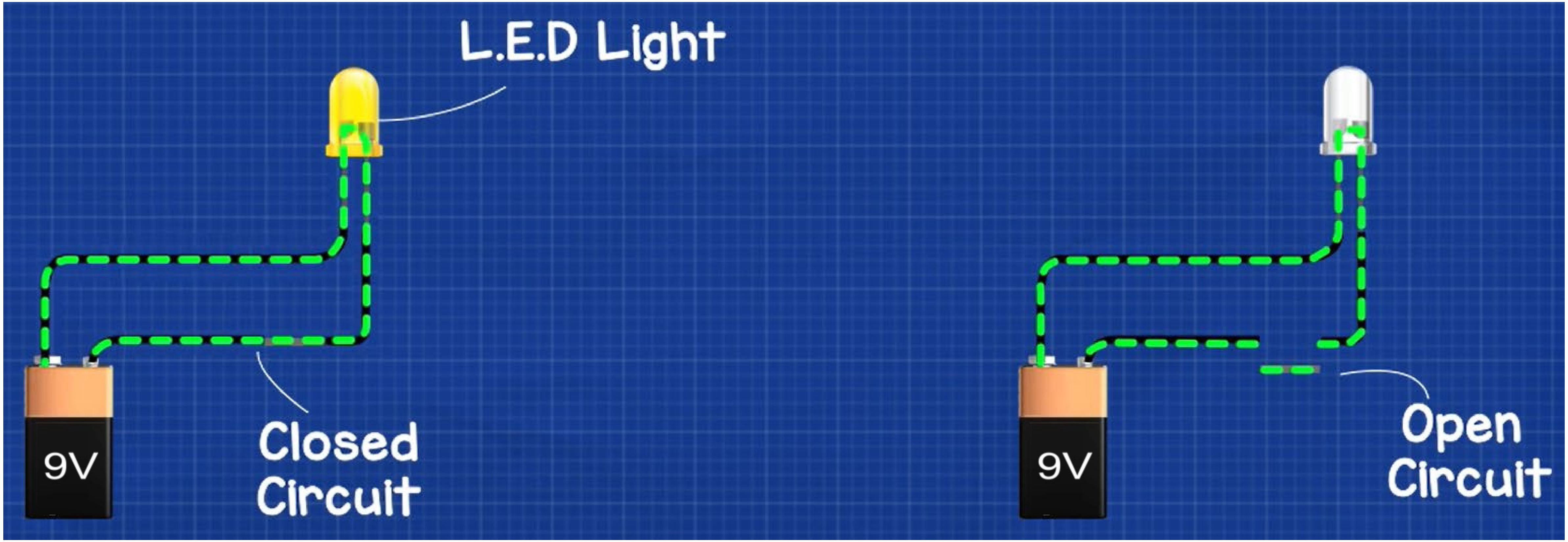
Conductors and Insulators



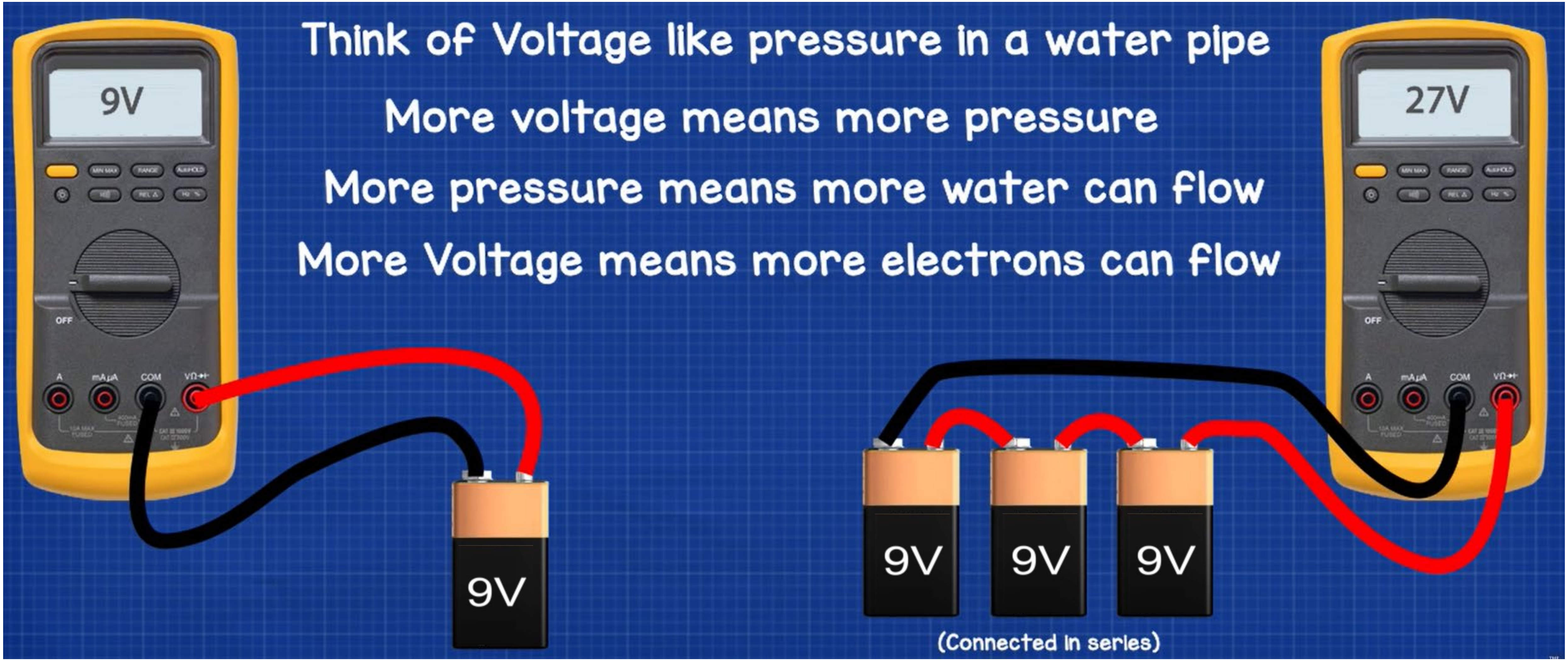




Open and Closed Circuit

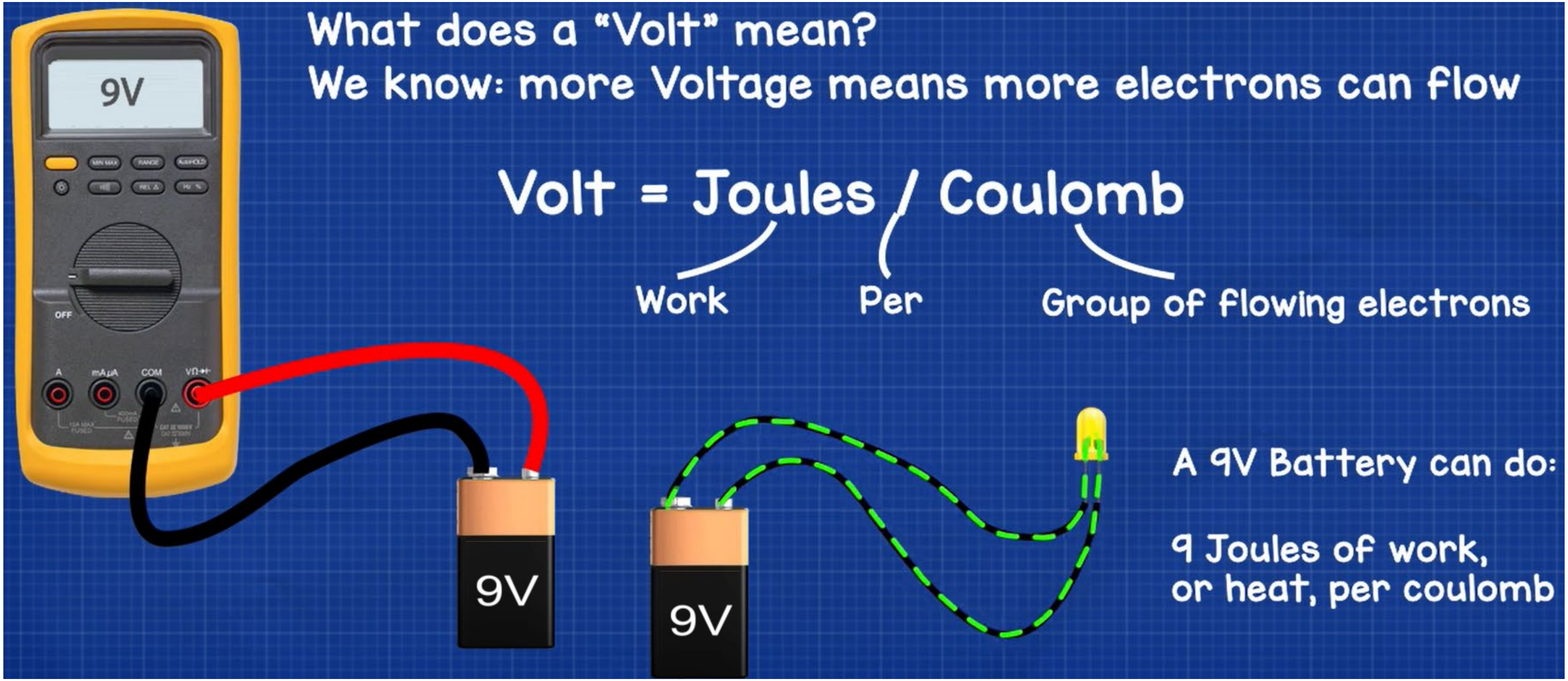


Voltage



Think of Voltage like pressure in a water pipe
More voltage means more pressure
More pressure means more water can flow
More Voltage means more electrons can flow
9V
27V
OFF
COM
9V
9V
9V
9V
(Connected in series)

Voltage

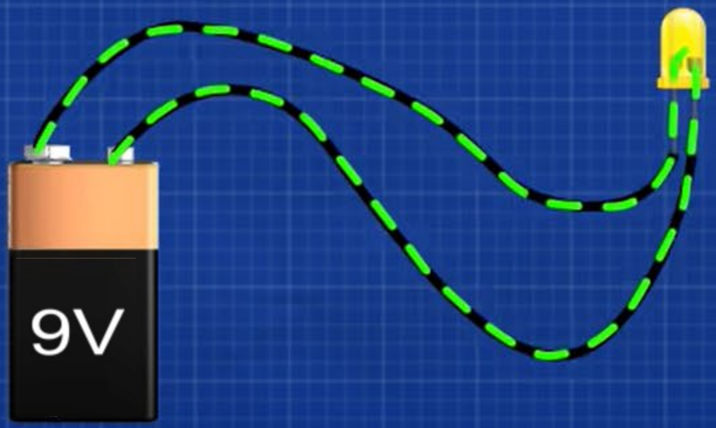

What does a "Volt" mean?
We know: more Voltage means more electrons can flow
Volt = Joules / Coulomb
Work
Per
Group of flowing electrons
A 9V Battery can do:
9 Joules of work,
or heat, per coulomb
9V
9V
9V
OFF
A
mA μA
COM

Current

Current is the flow of electrons, measured in Amperes (Amps), past a single point in a circuit within a set amount of time

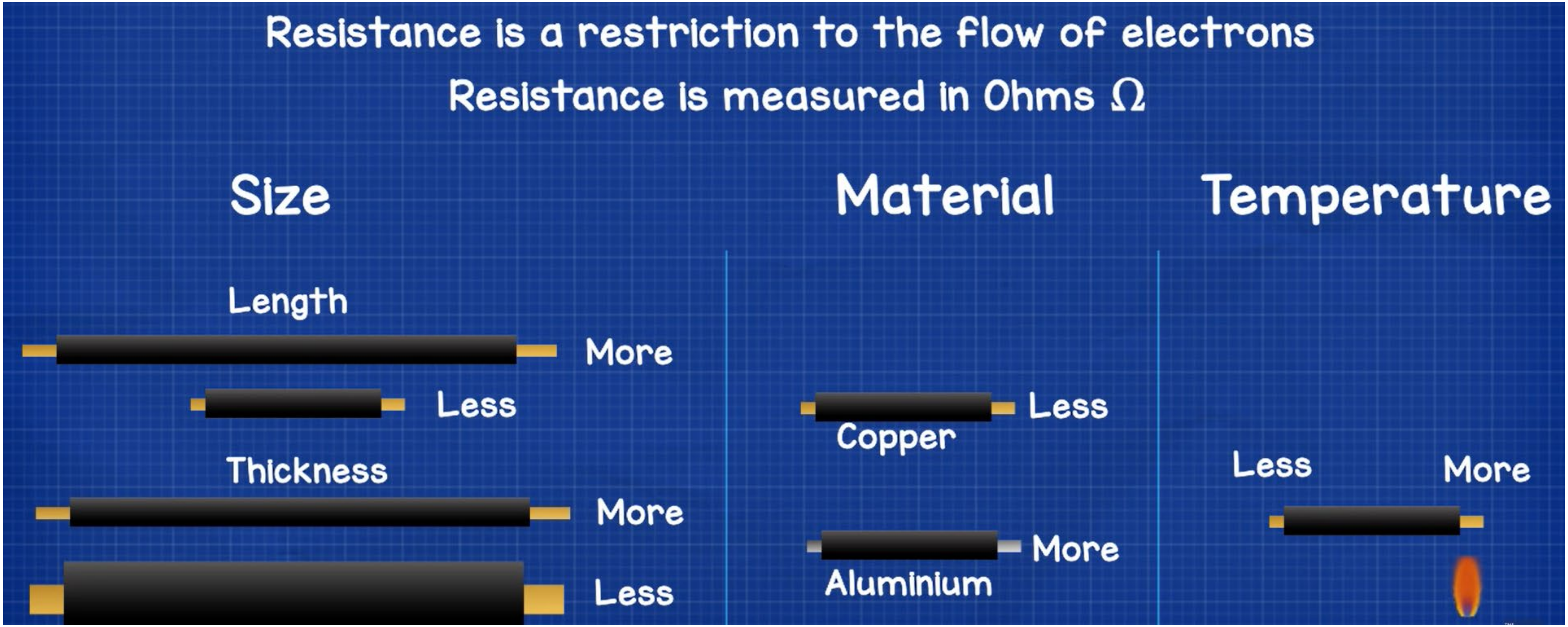
1 Amp = 1 Coulomb

1 Coulomb = 6,242,000,000,000,000,000 electrons per second

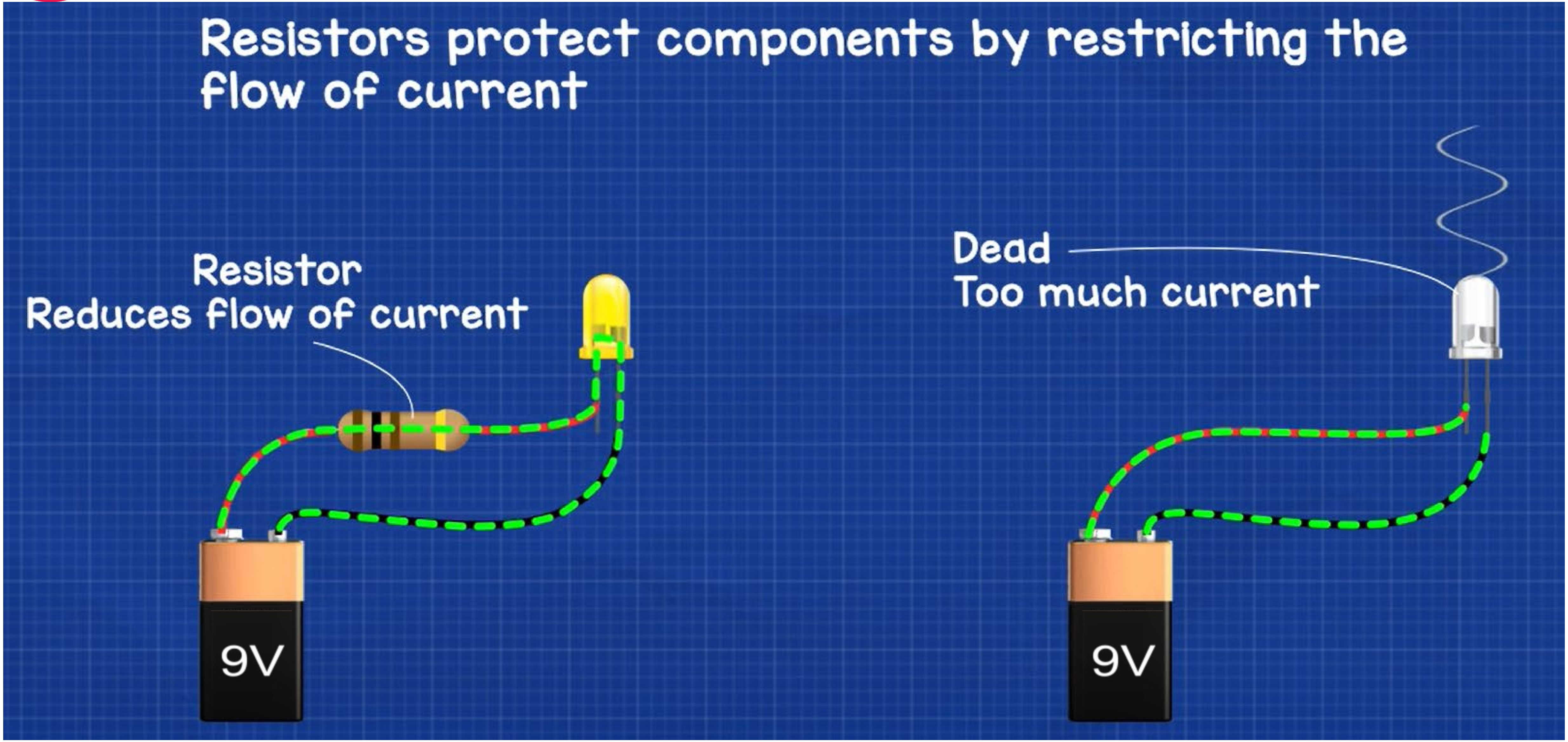


Electrons are negatively charged they flow from the negative terminal to the positive terminal

Resistance

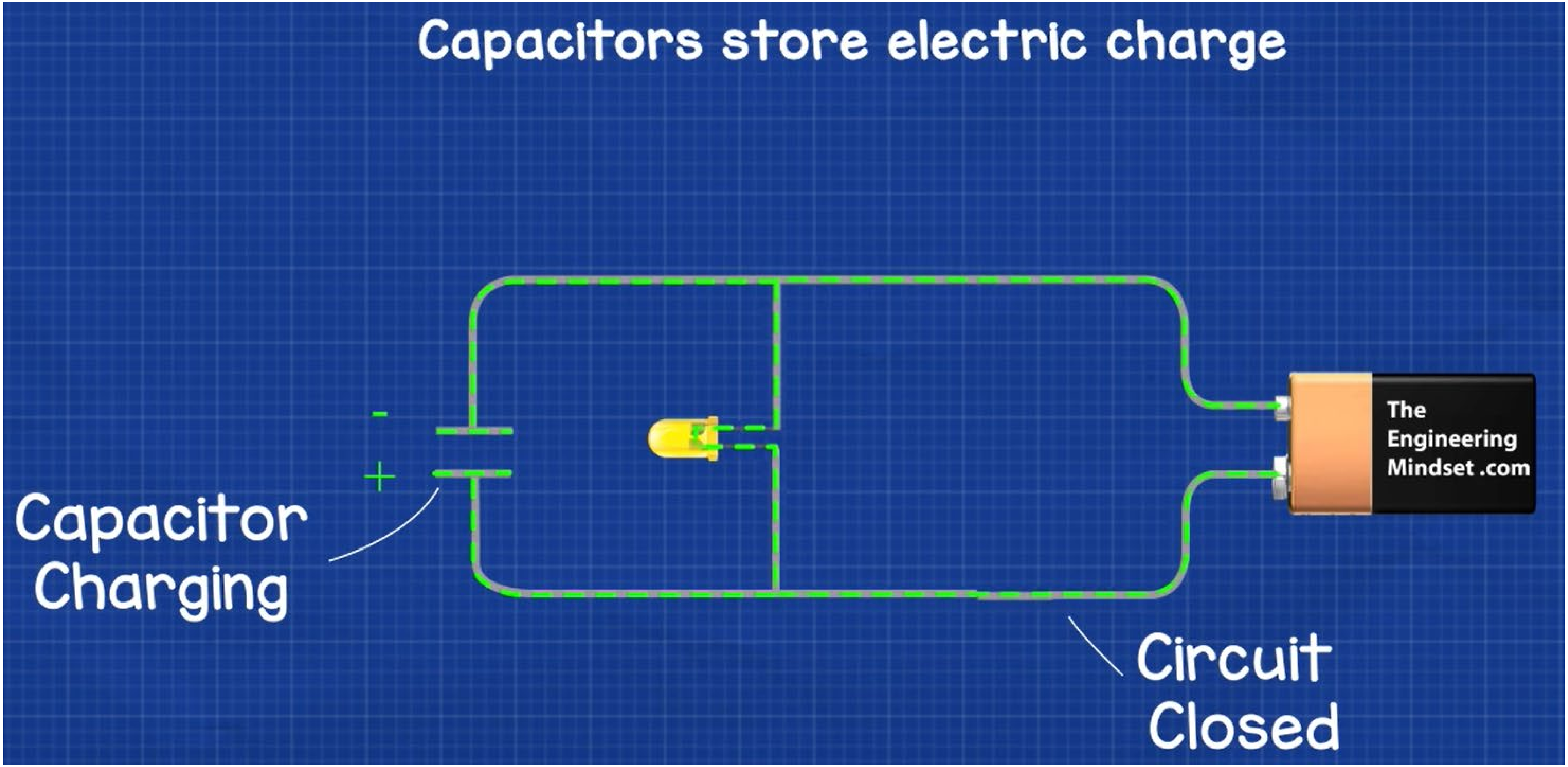

Resistance is a restriction to the flow of electrons
Resistance is measured in Ohms Ω
Size
Material
Temperature
Length
More
Less
Less
Copper
Thickness
Less
More
More
More
Aluminium
Less

Resistors



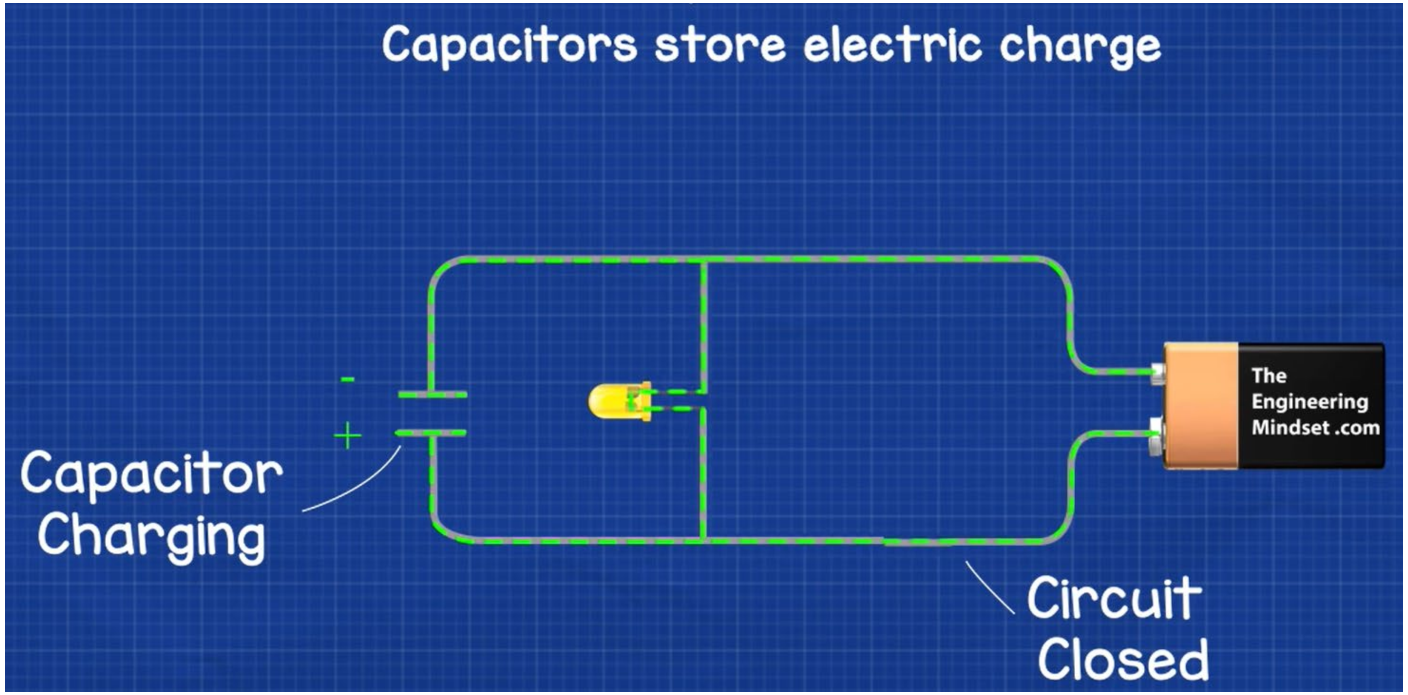
Resistors protect components by restricting the flow of current
Resistor
Reduces flow of current
Dead
Too much current
9V
9V

Capacitors

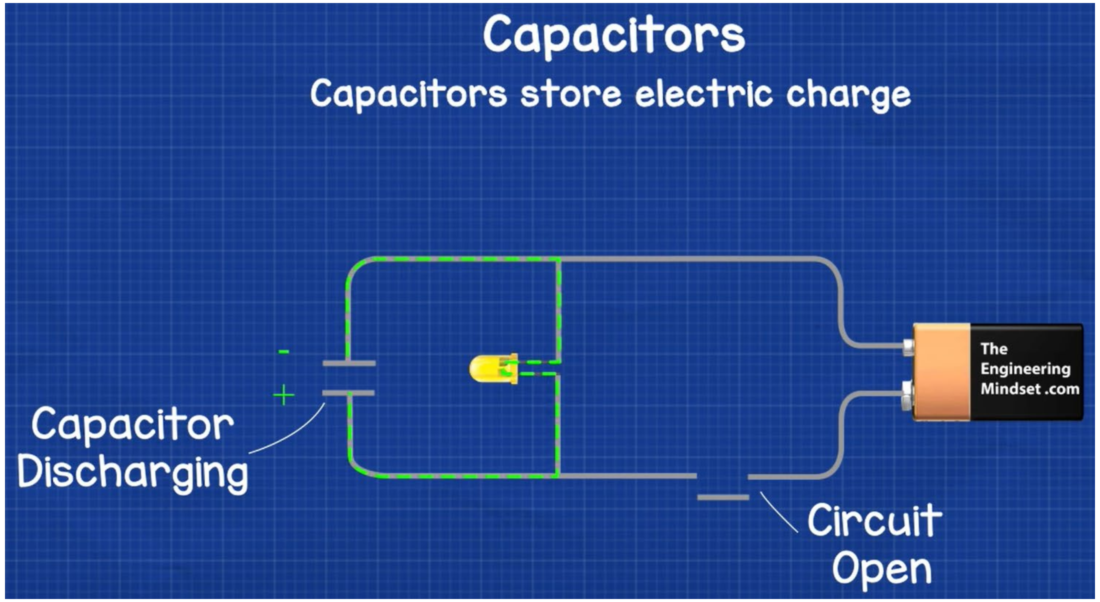


Capacitors store electric charge
-
+
Capacitor Charging
The Engineering Mindset .com
Circuit Closed

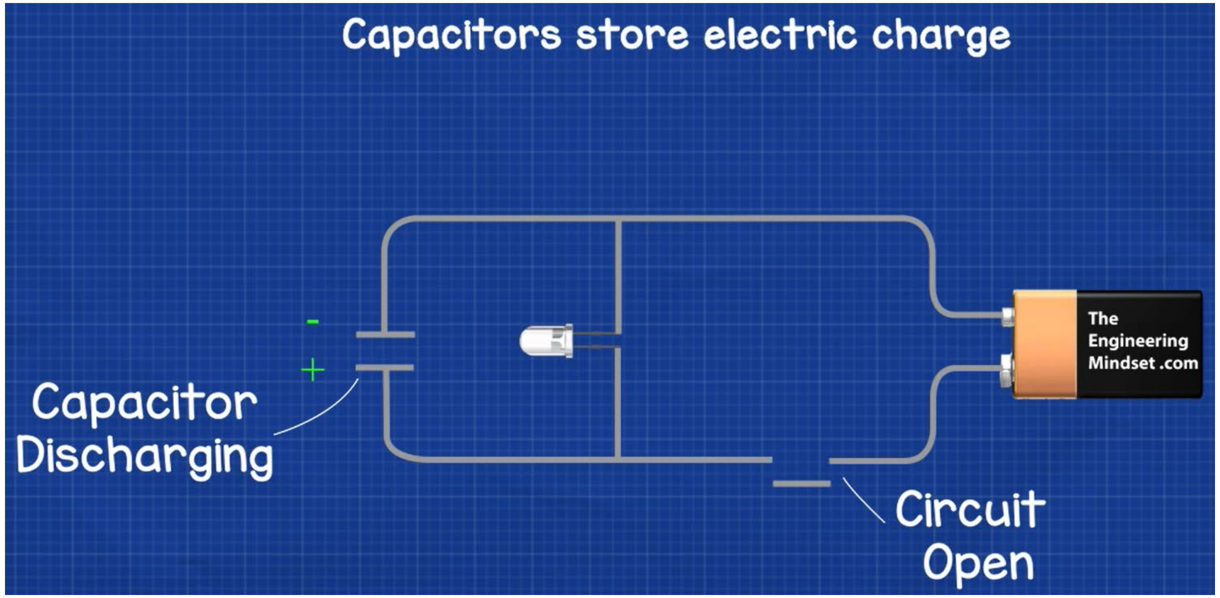
Capacitors



Capacitors store electric charge
-
+
Capacitor Charging
The Engineering Mindset .com
Circuit Closed

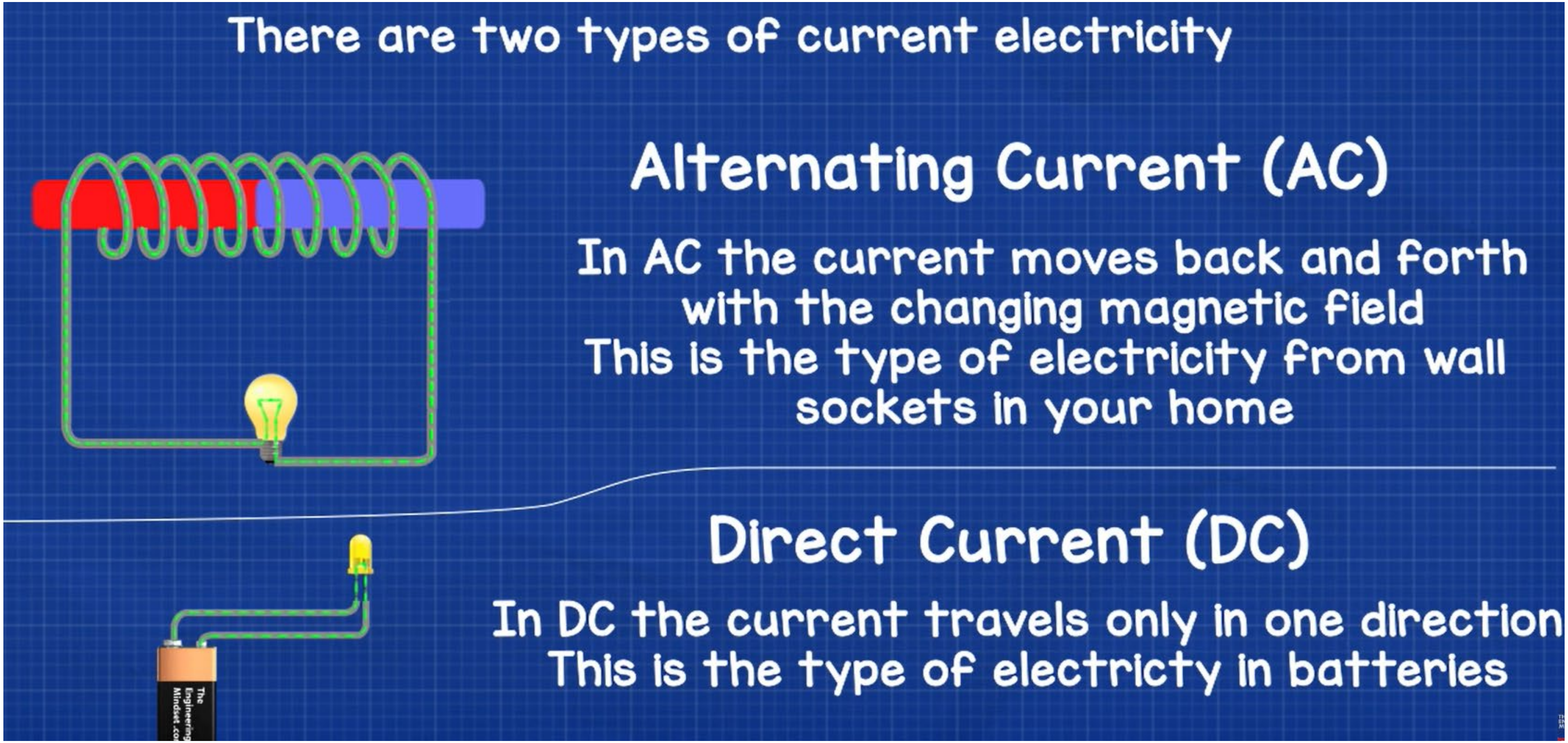


Capacitors
Capacitors store electric charge
-
+
Capacitor Discharging
The Engineering Mindset .com
Circuit Open

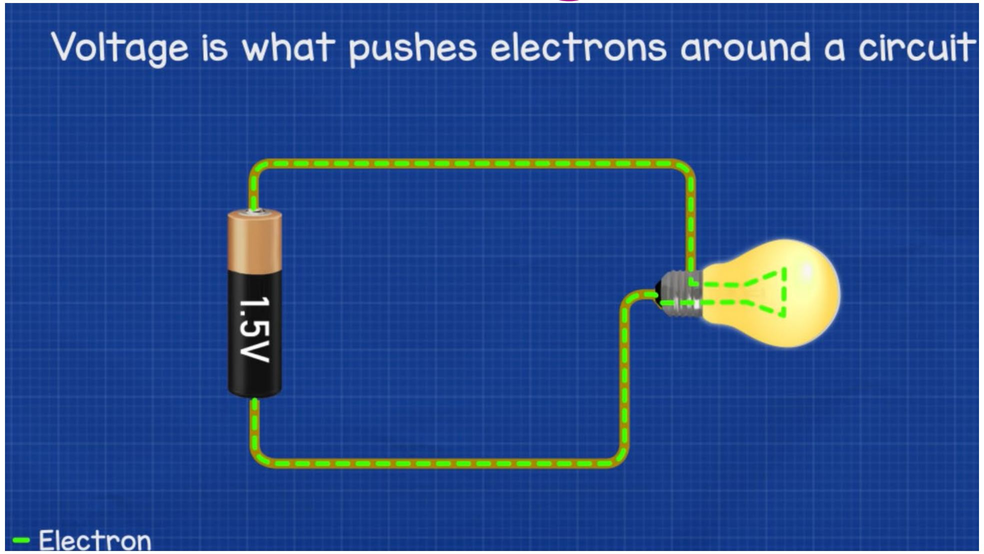


Capacitors store electric charge
-
+
Capacitor Discharging
The Engineering Mindset .com
Circuit Open

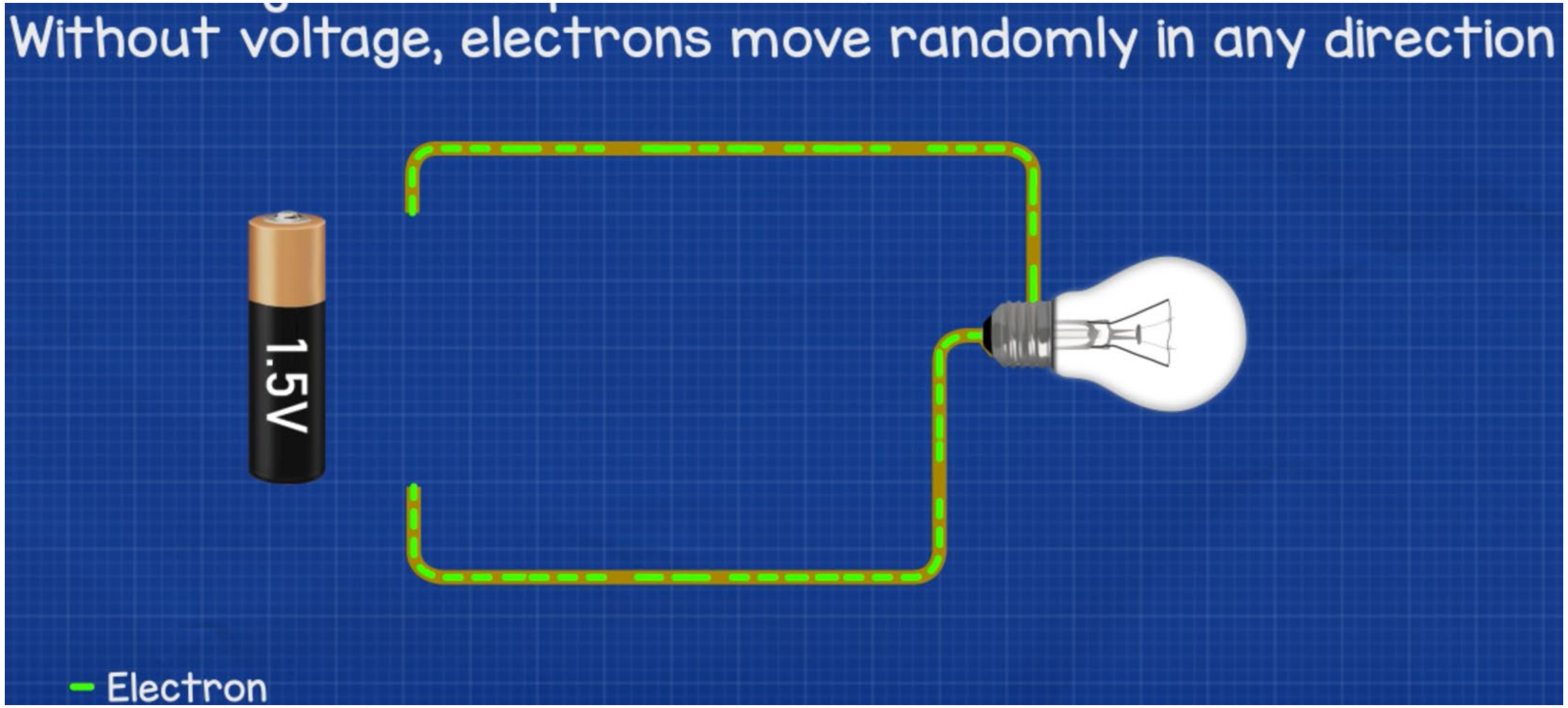
Types of Electricity



Voltage

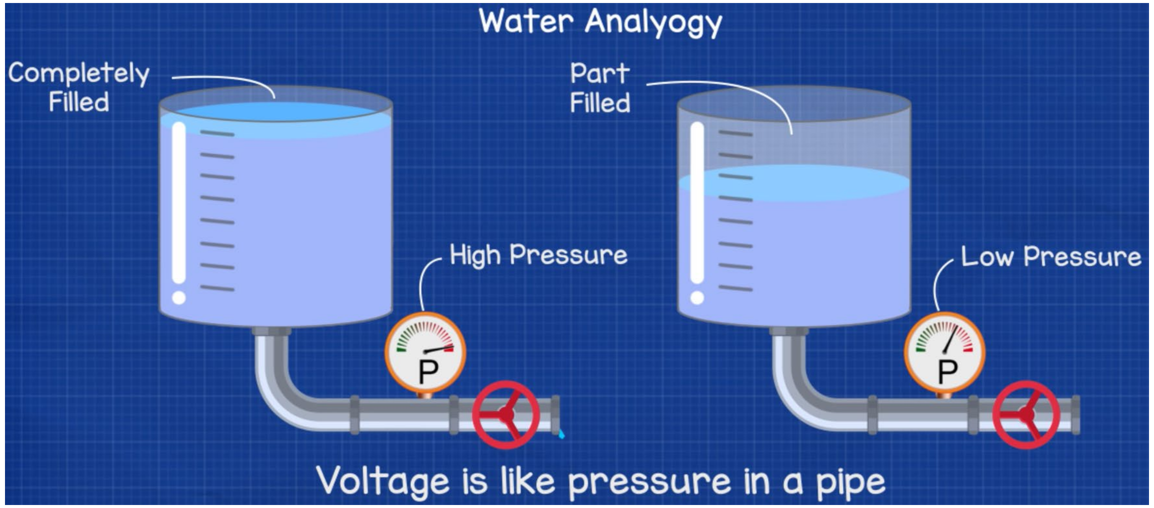


Voltage is what pushes electrons around a circuit
1.5V
Electron

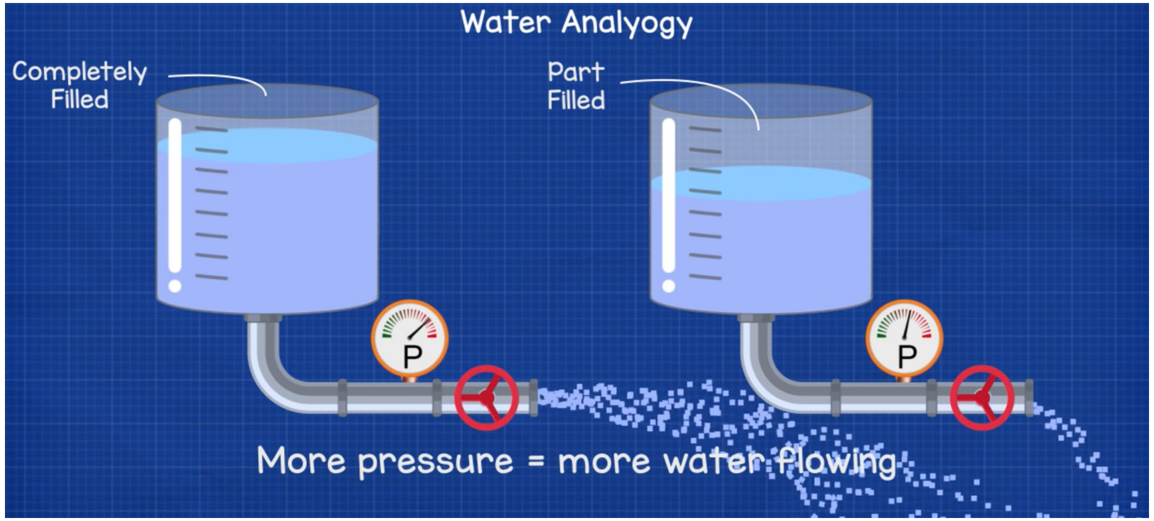


Without voltage, electrons move randomly in any direction
1.5V
Electron

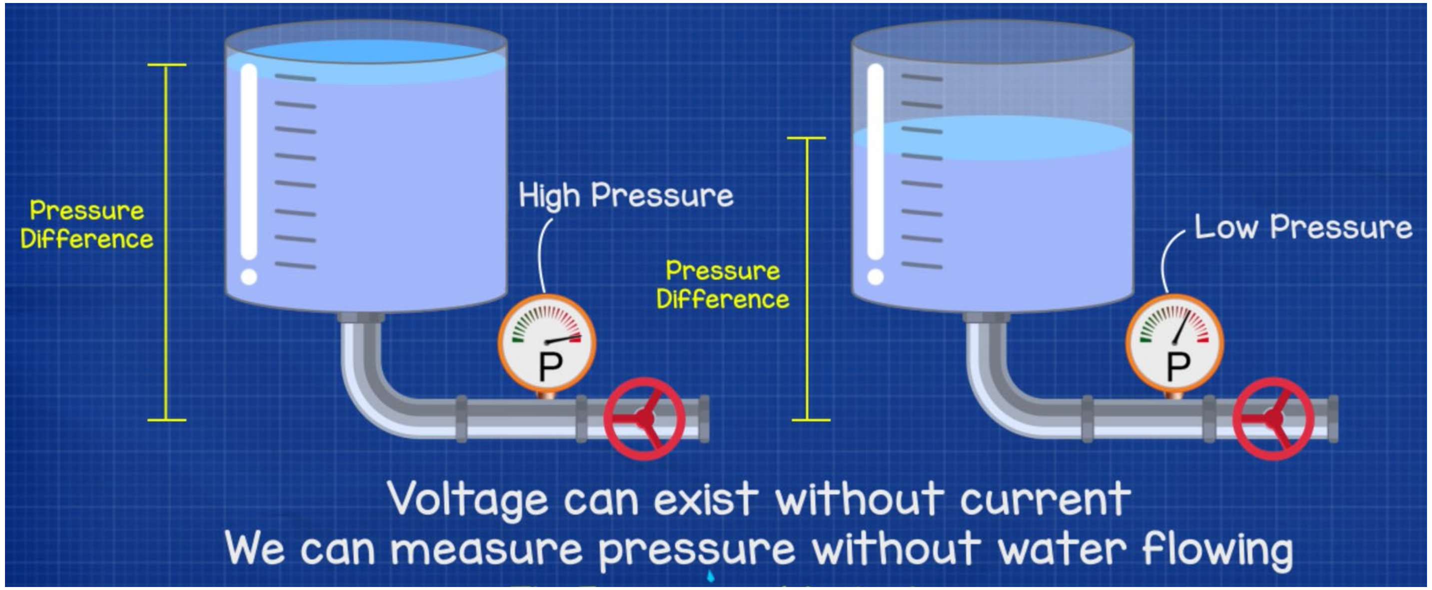
Voltage



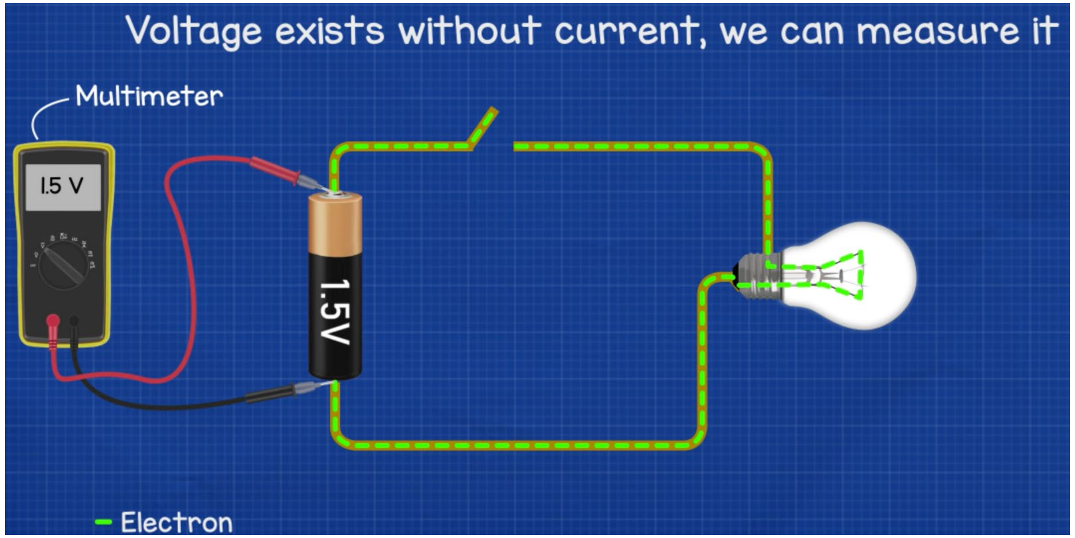
Water Analyogy
Completely Filled
Part Filled
High Pressure
Low Pressure
P
P
Voltage is like pressure in a pipe



Water Analyogy
Completely Filled
Part Filled
P
P
More pressure = more water flowing

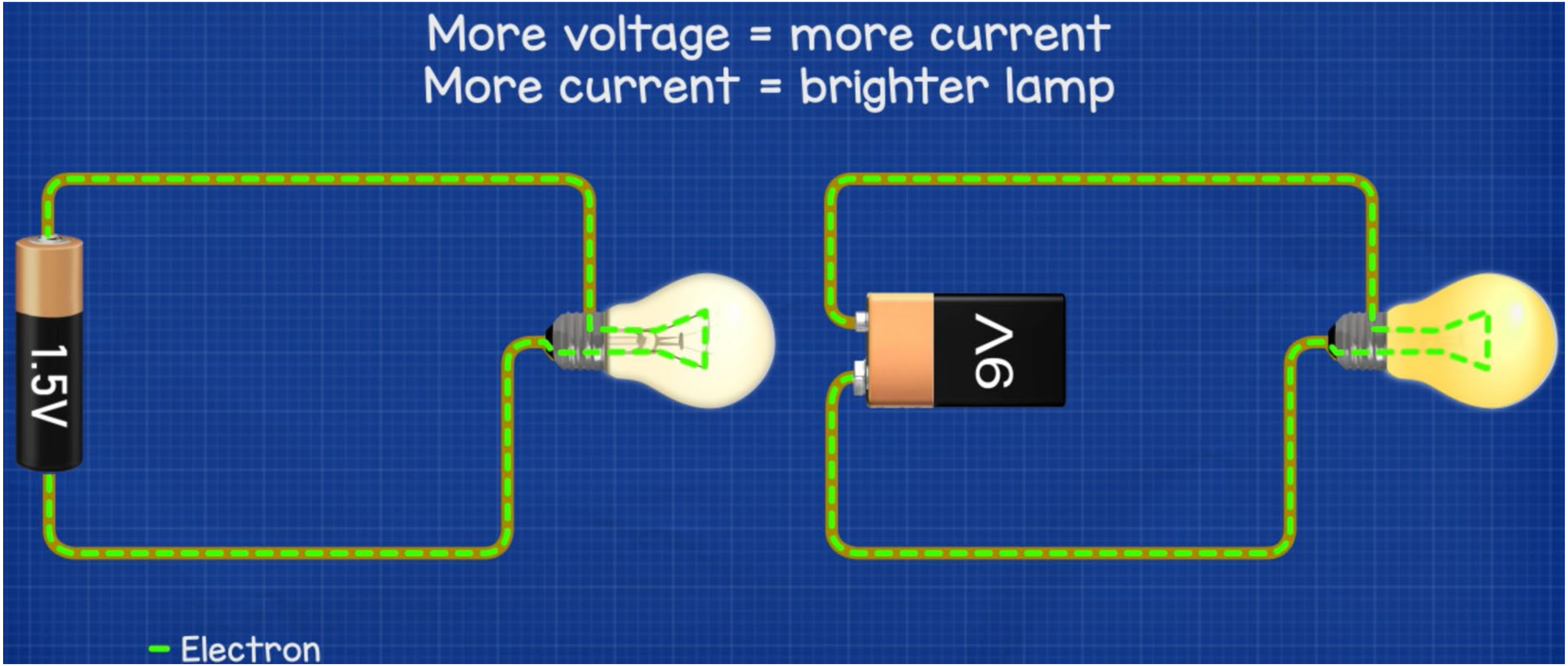


Pressure Difference
High Pressure
Pressure Difference
Low Pressure
P
P
Voltage can exist without current
We can measure pressure without water flowing

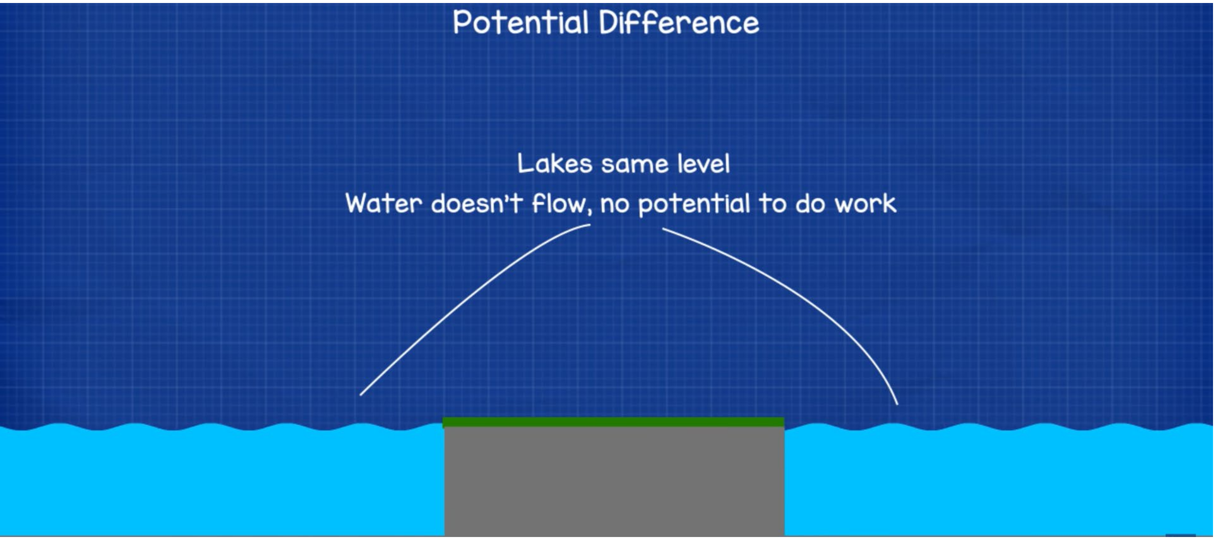


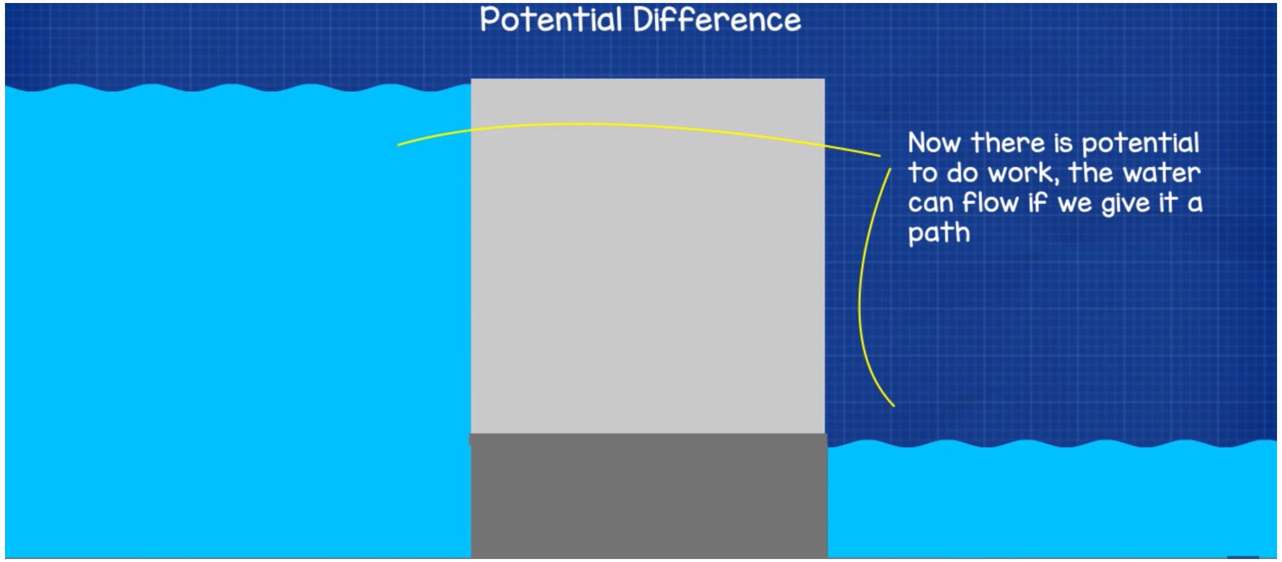
Voltage exists without current, we can measure it
Multimeter
1.5 V
1.5V
Electron

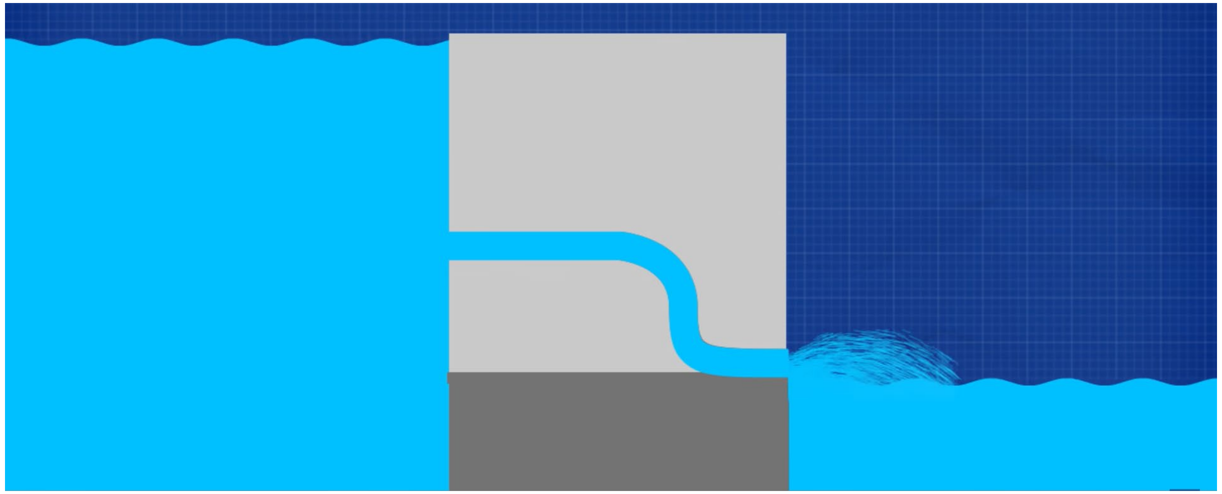
Voltage

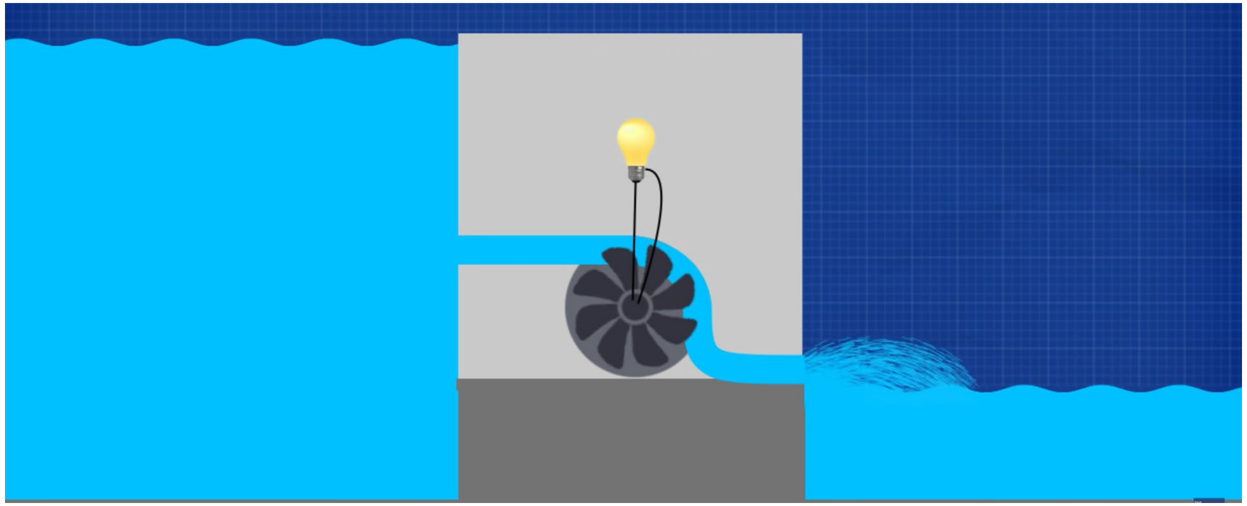

More voltage = more current
More current = brighter lamp
1.5V
9V
Electron

Potential Difference

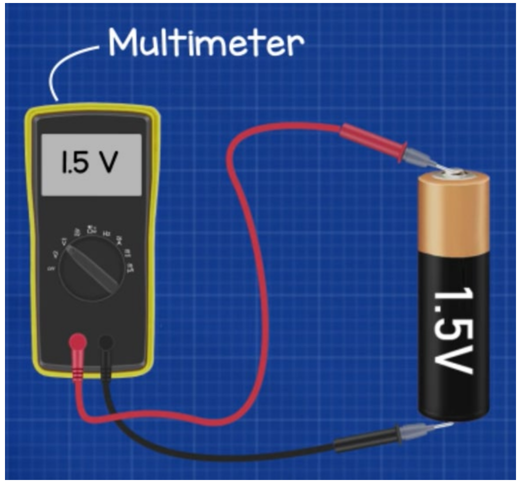


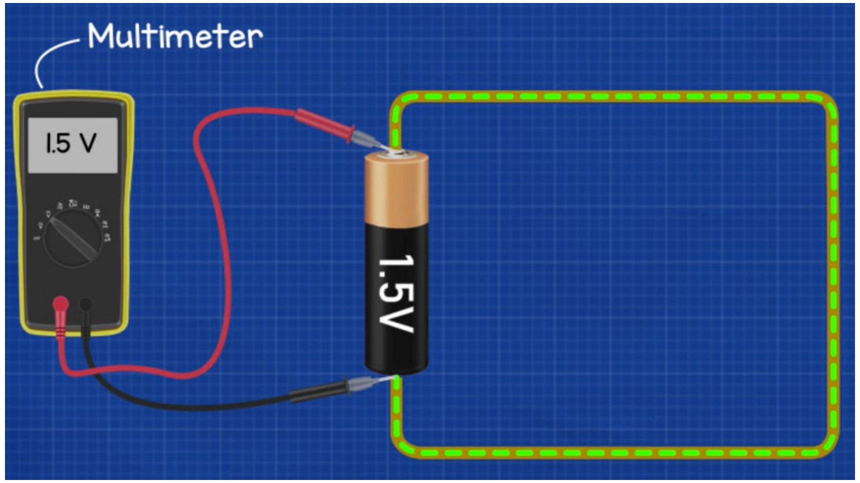


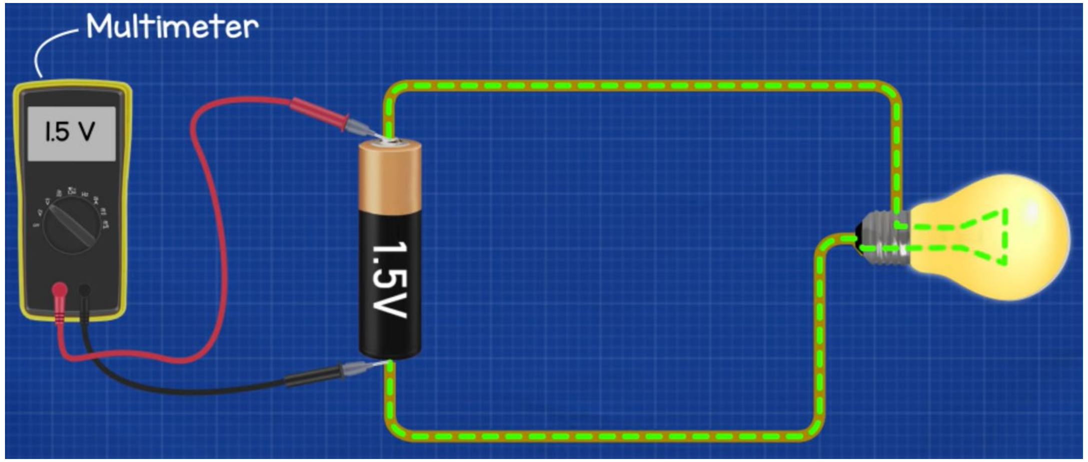


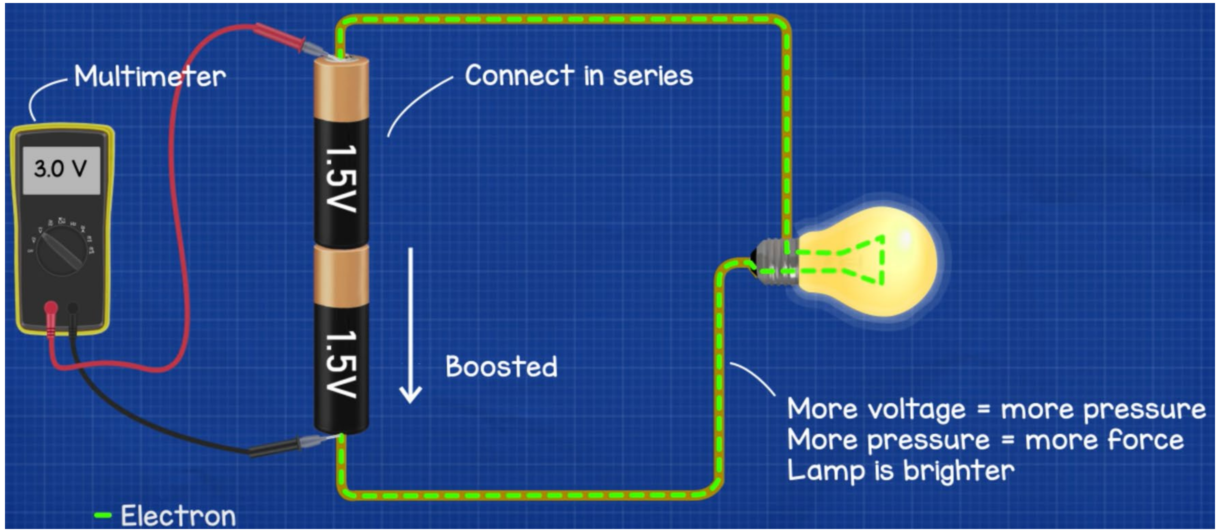


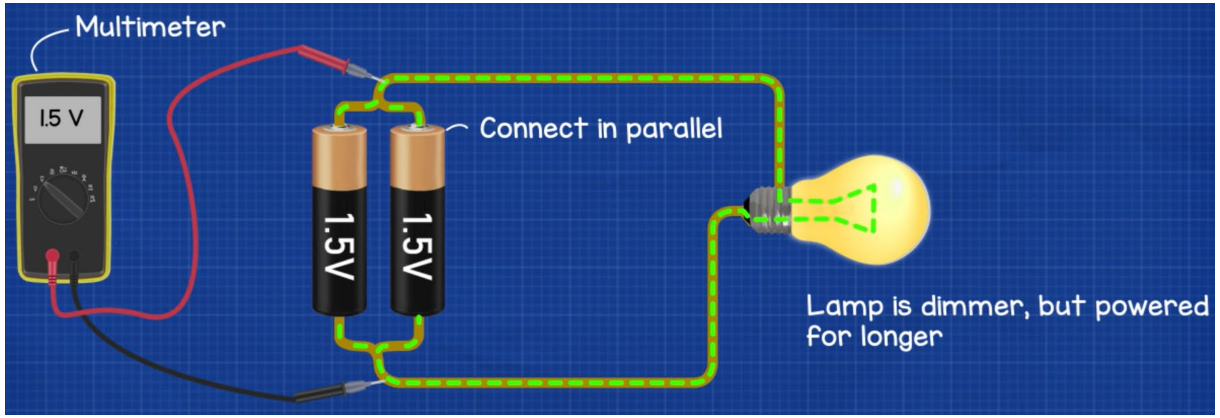
Series and Parallel









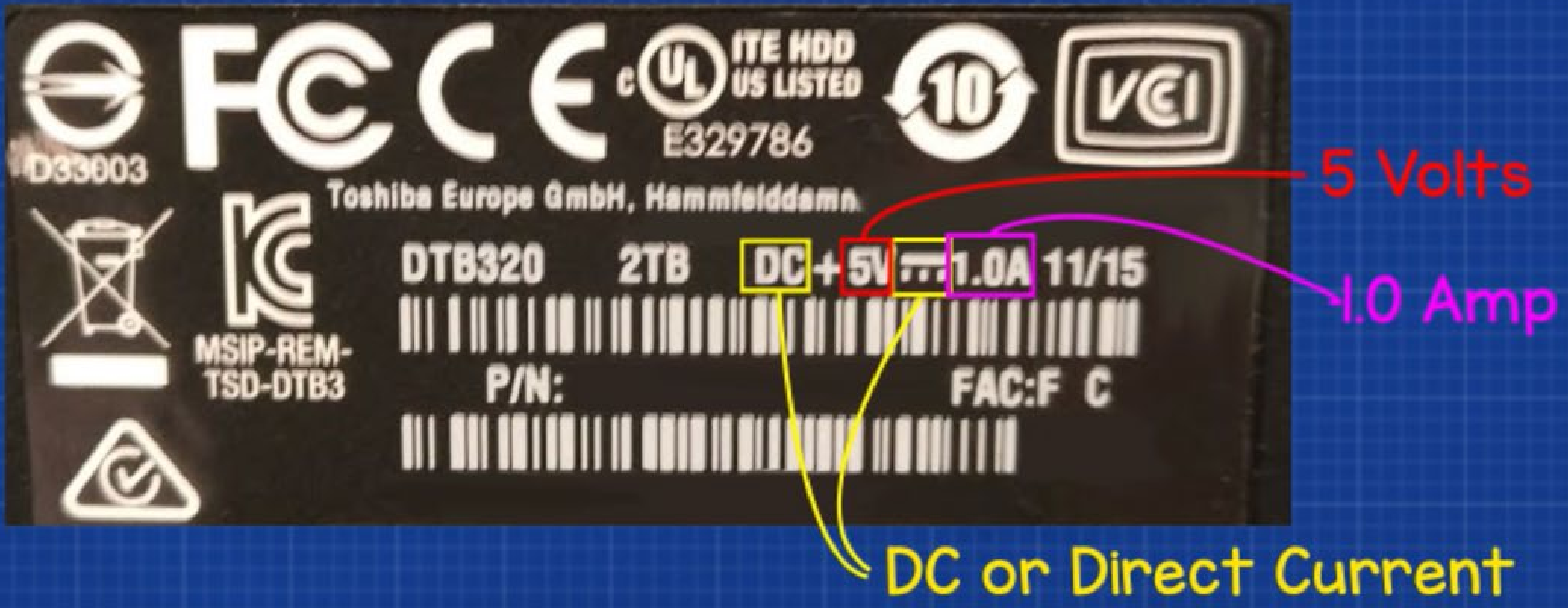


Voltage Measurement

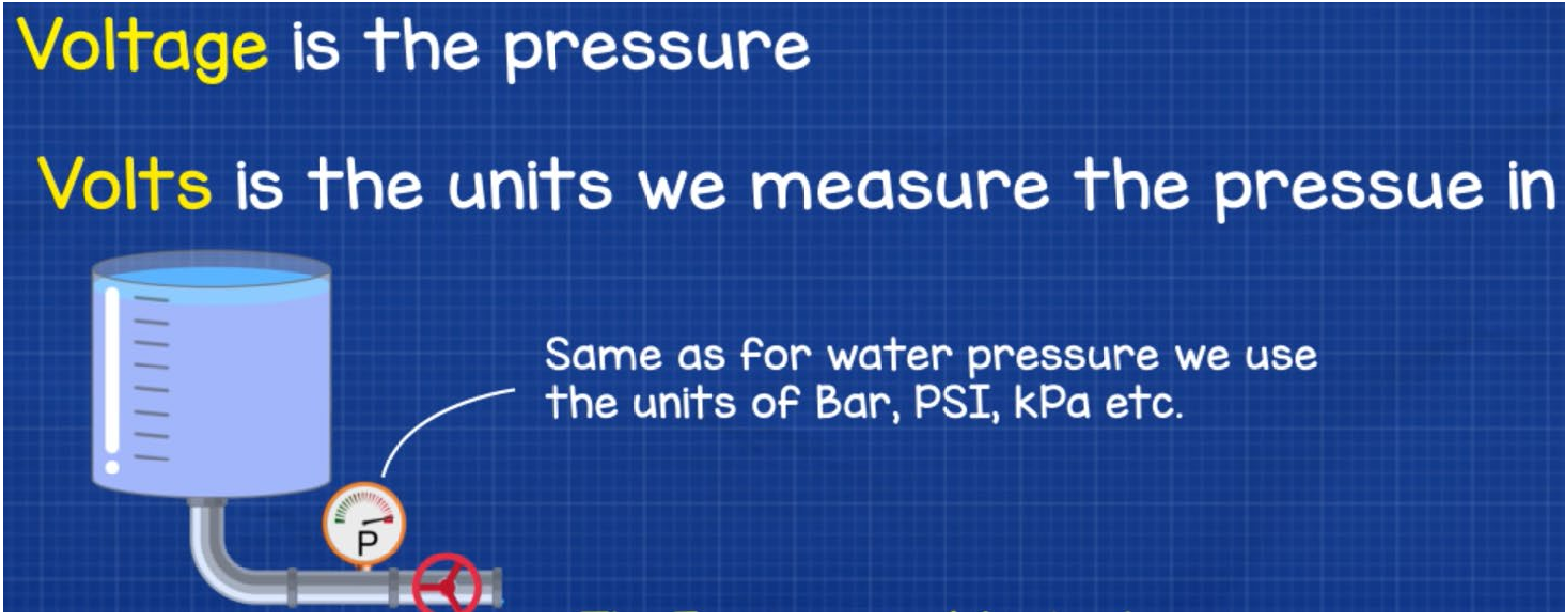
We measure potential difference or voltage in the units of Volts

We represent this value with a capital "V"

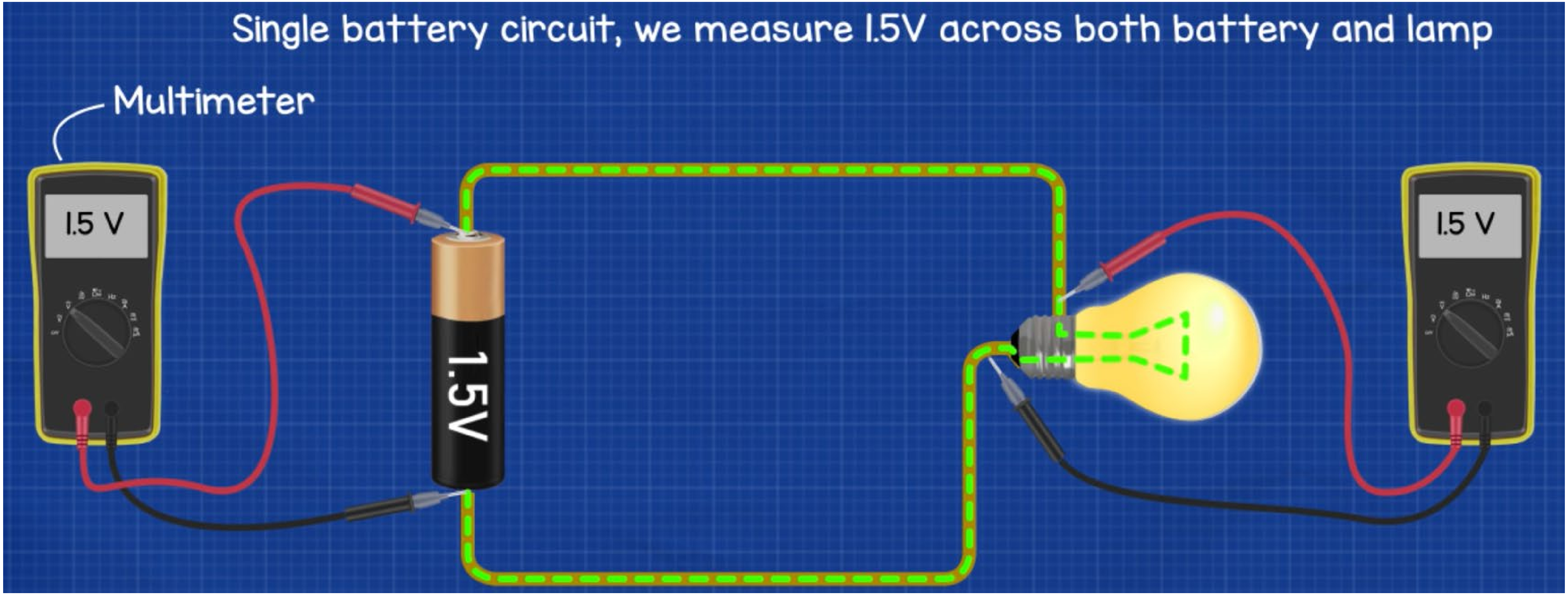
Manufacturers Label



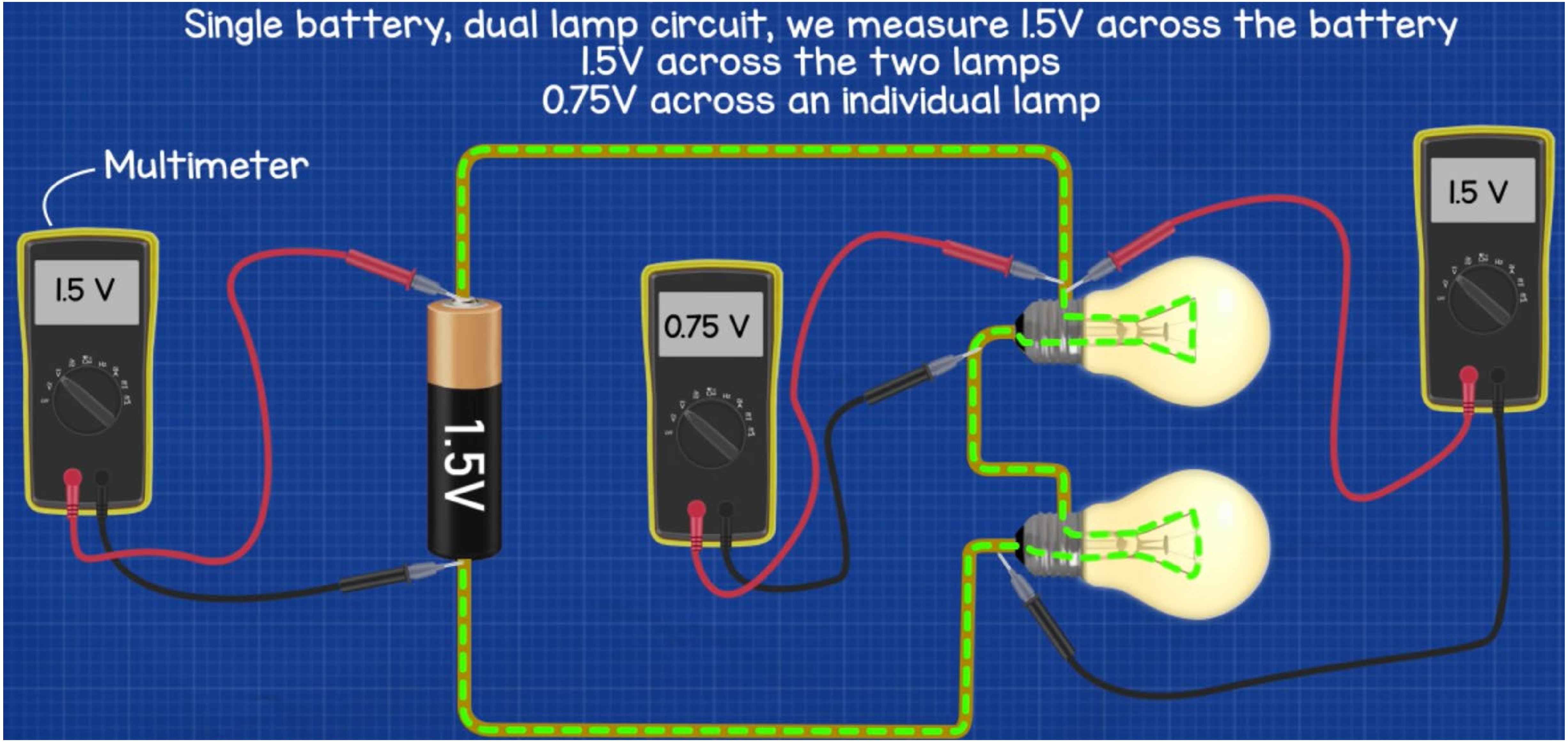
Voltage and Volts are Different



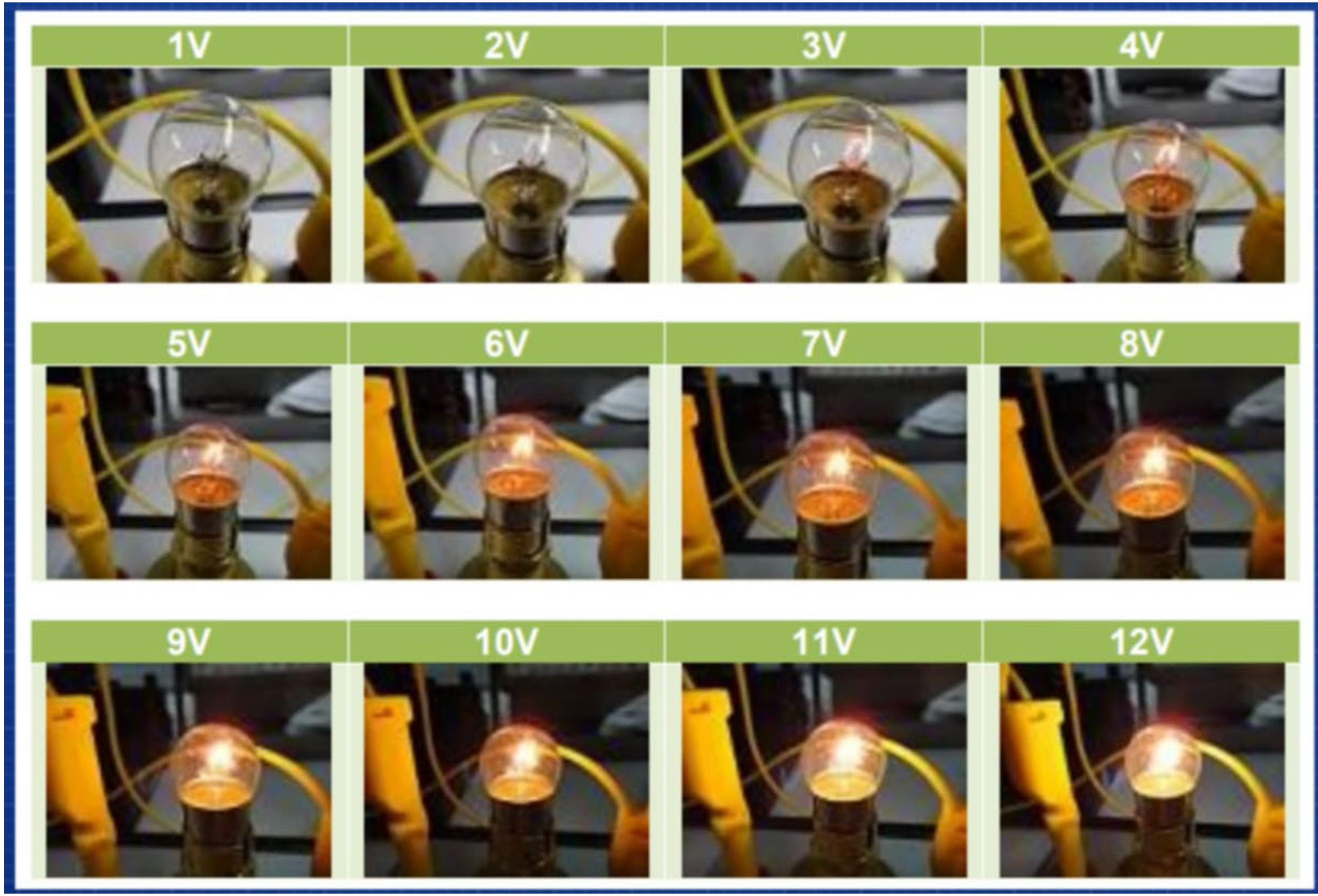
Voltage Measurement



Voltage Measurement

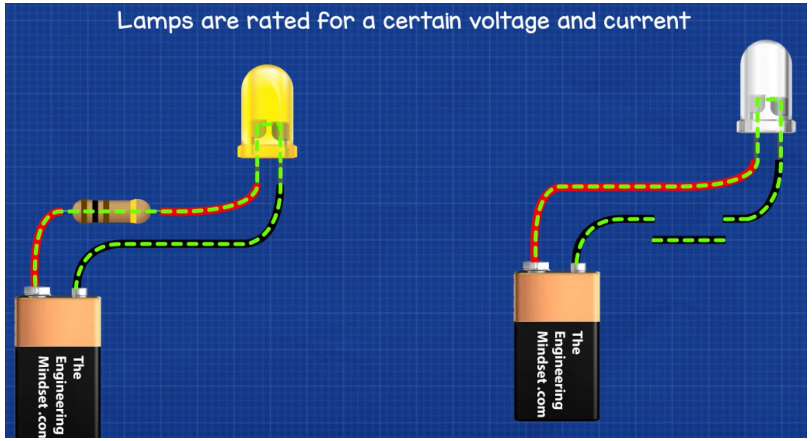


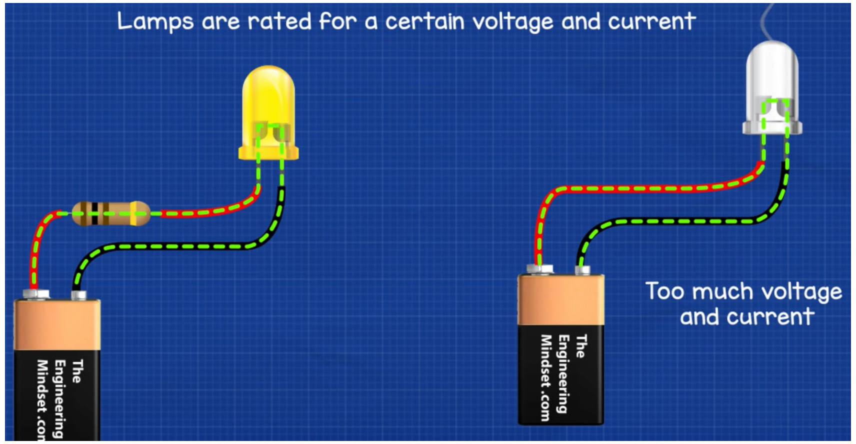
Voltage Measurement

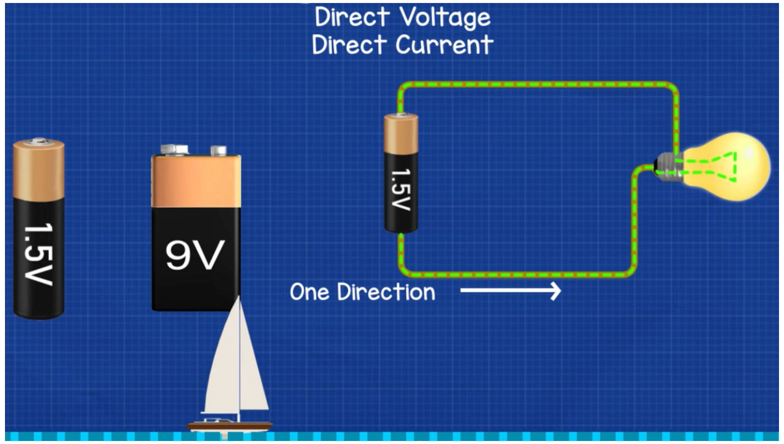


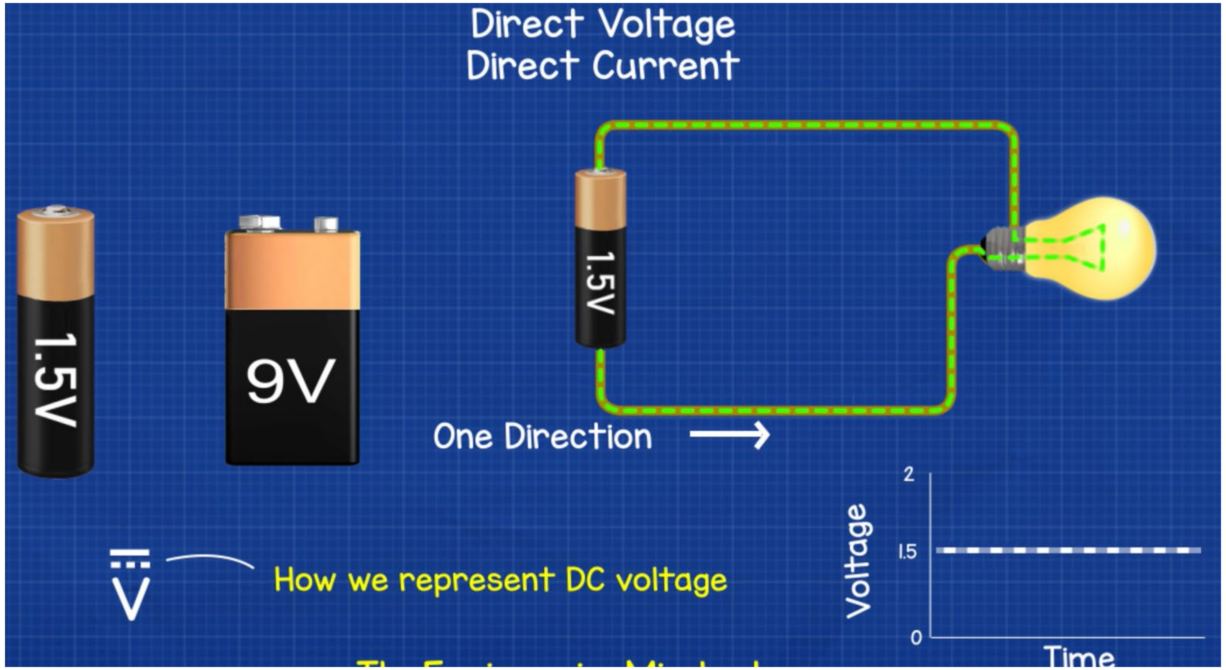
As voltage decreases so does the brightness because there is less pressure to force electrons so less light is produced

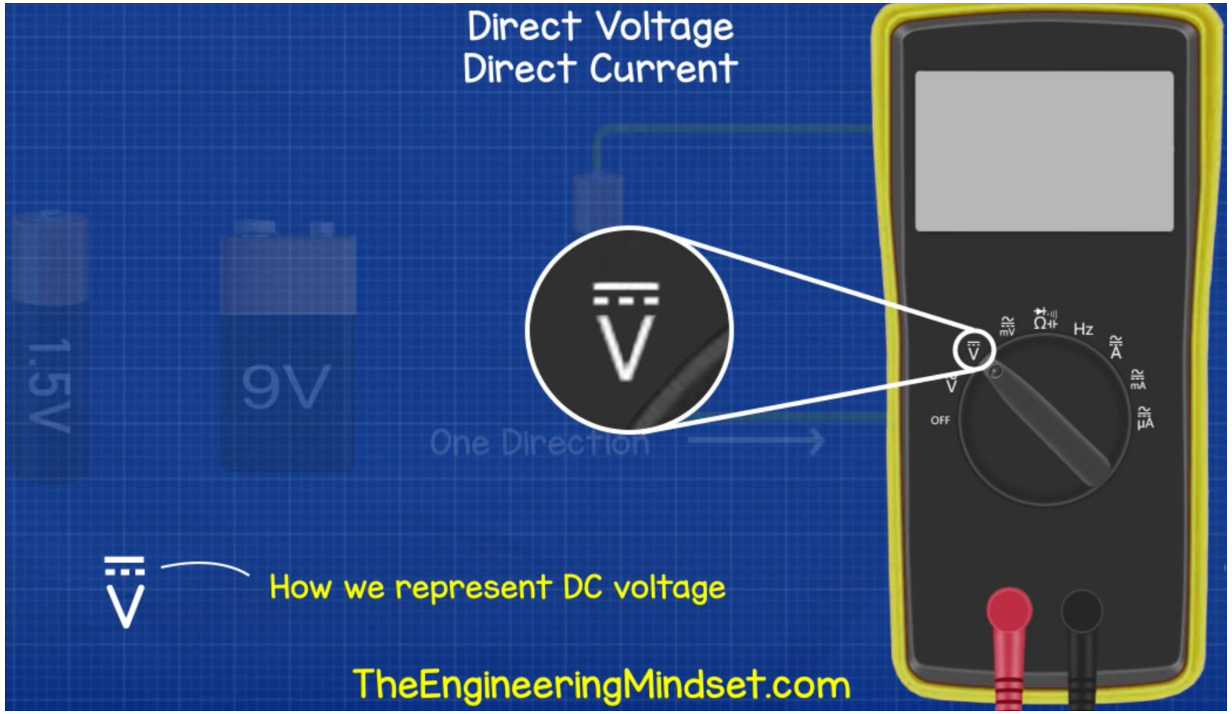
Direct Voltage



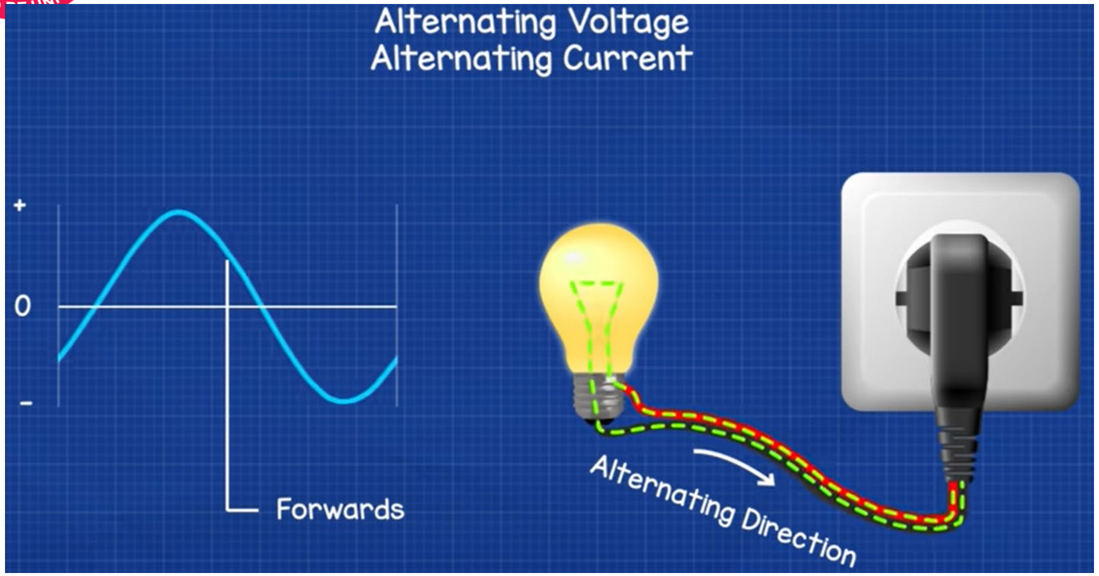


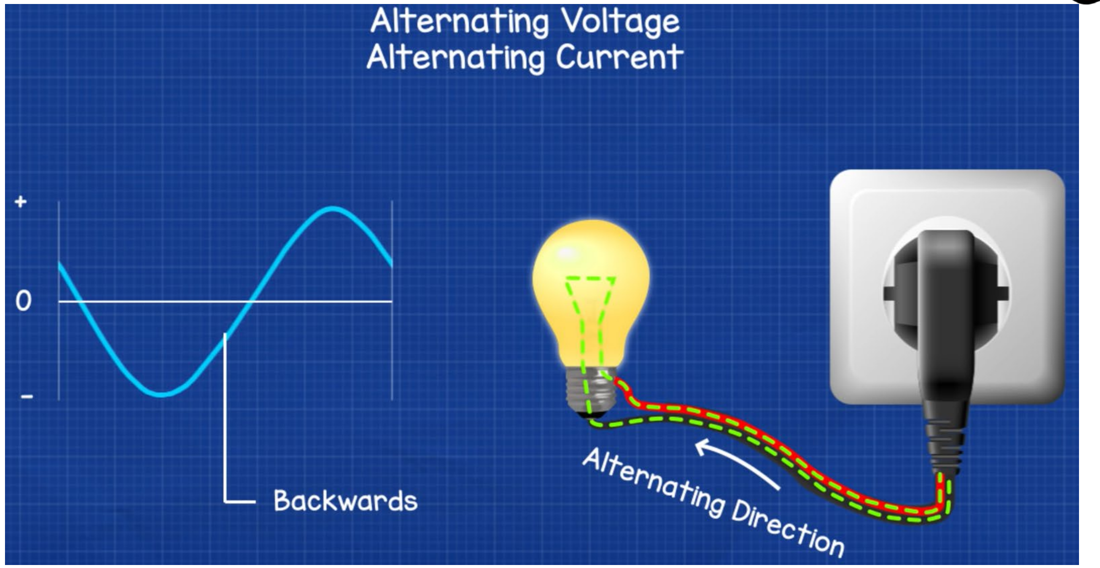


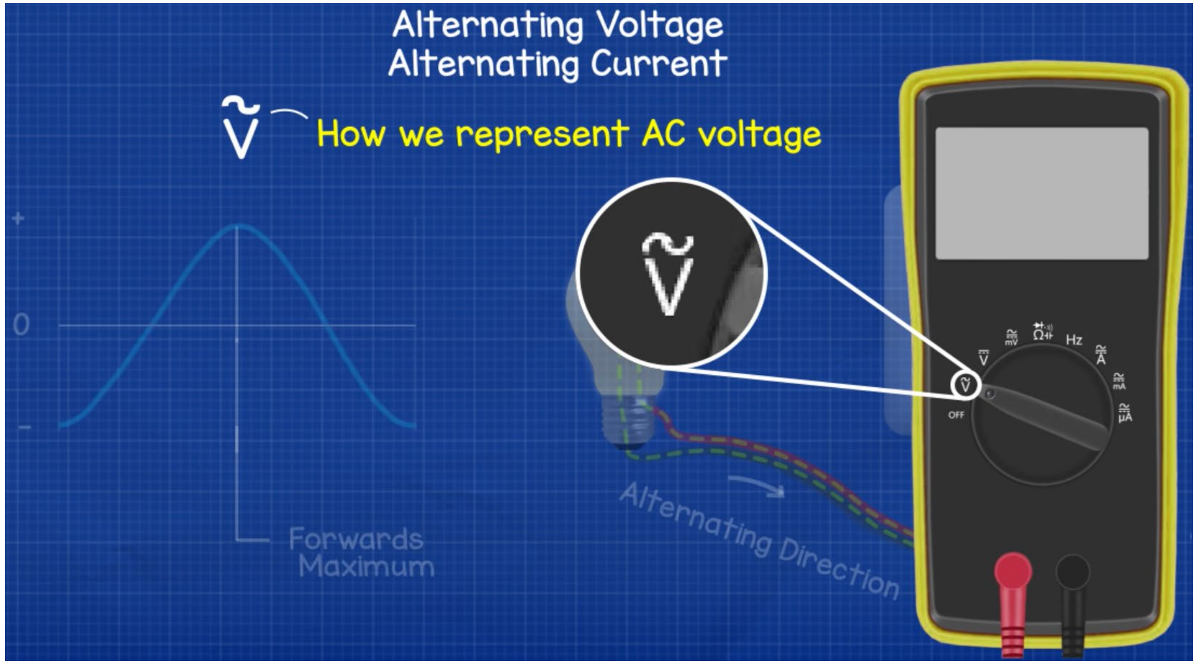


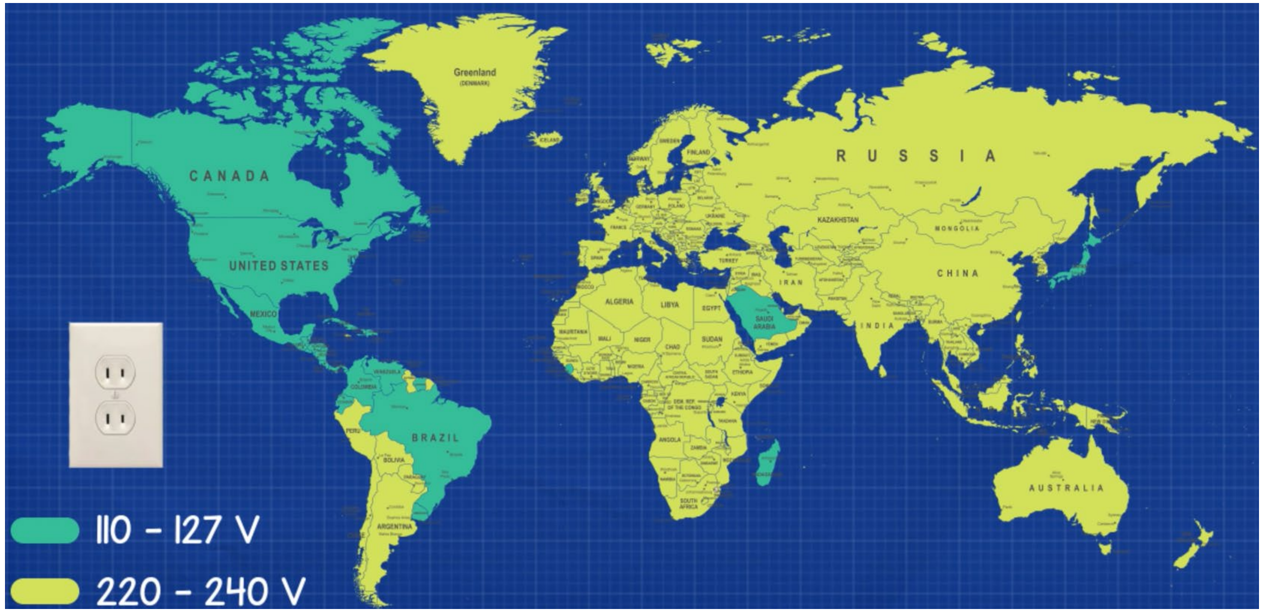


Alternating Voltage

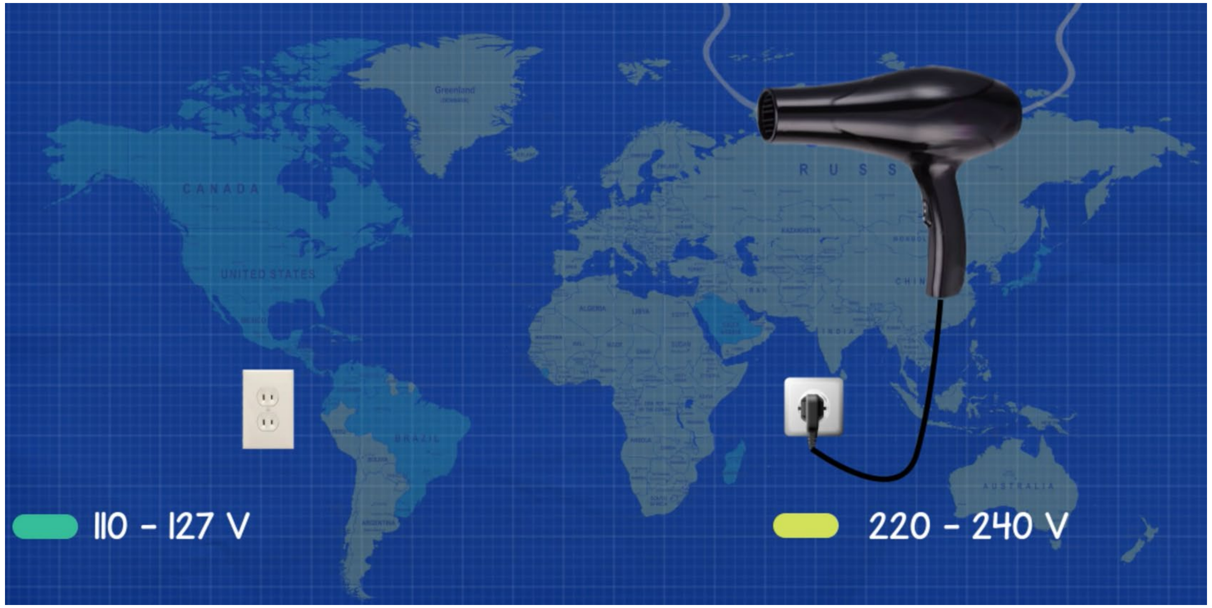




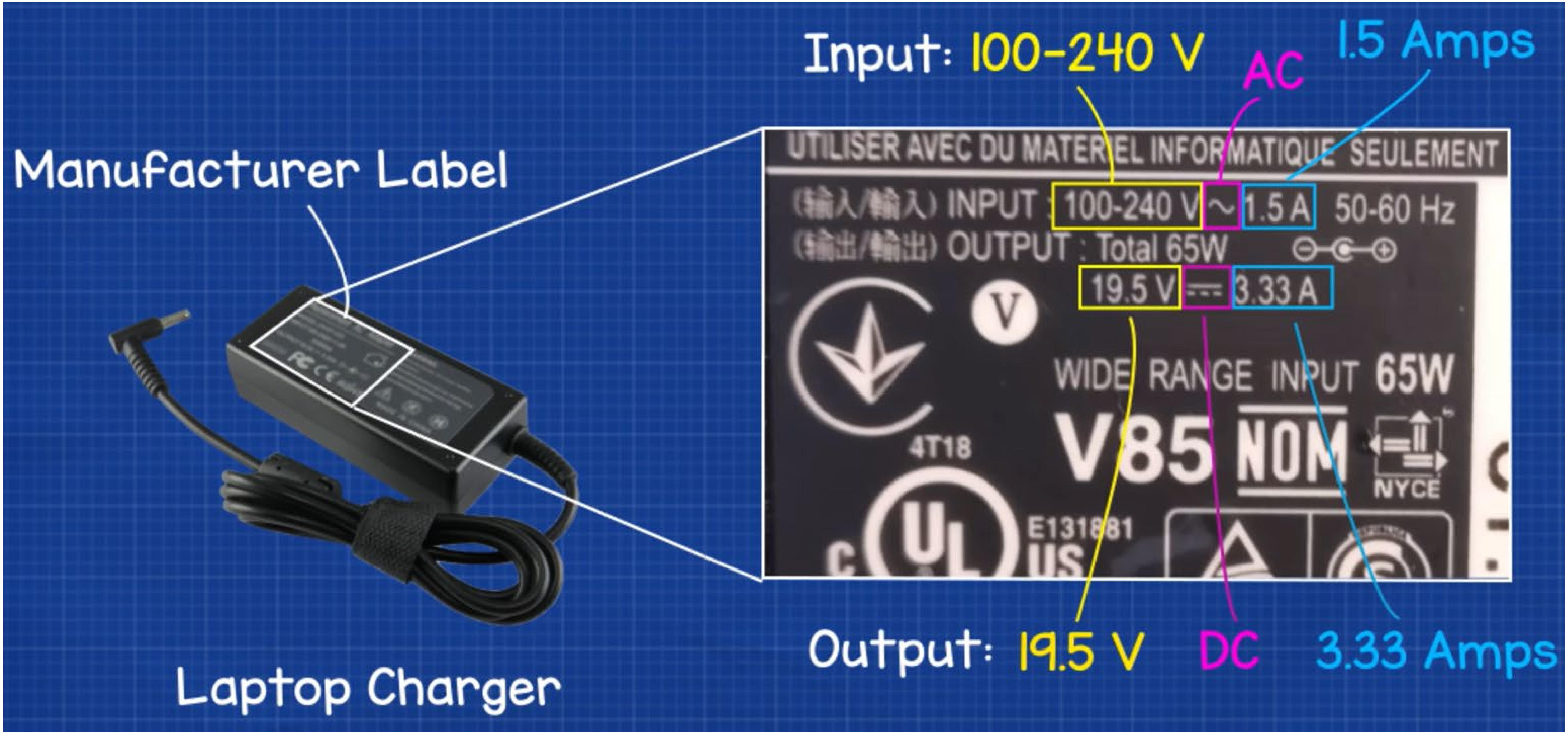




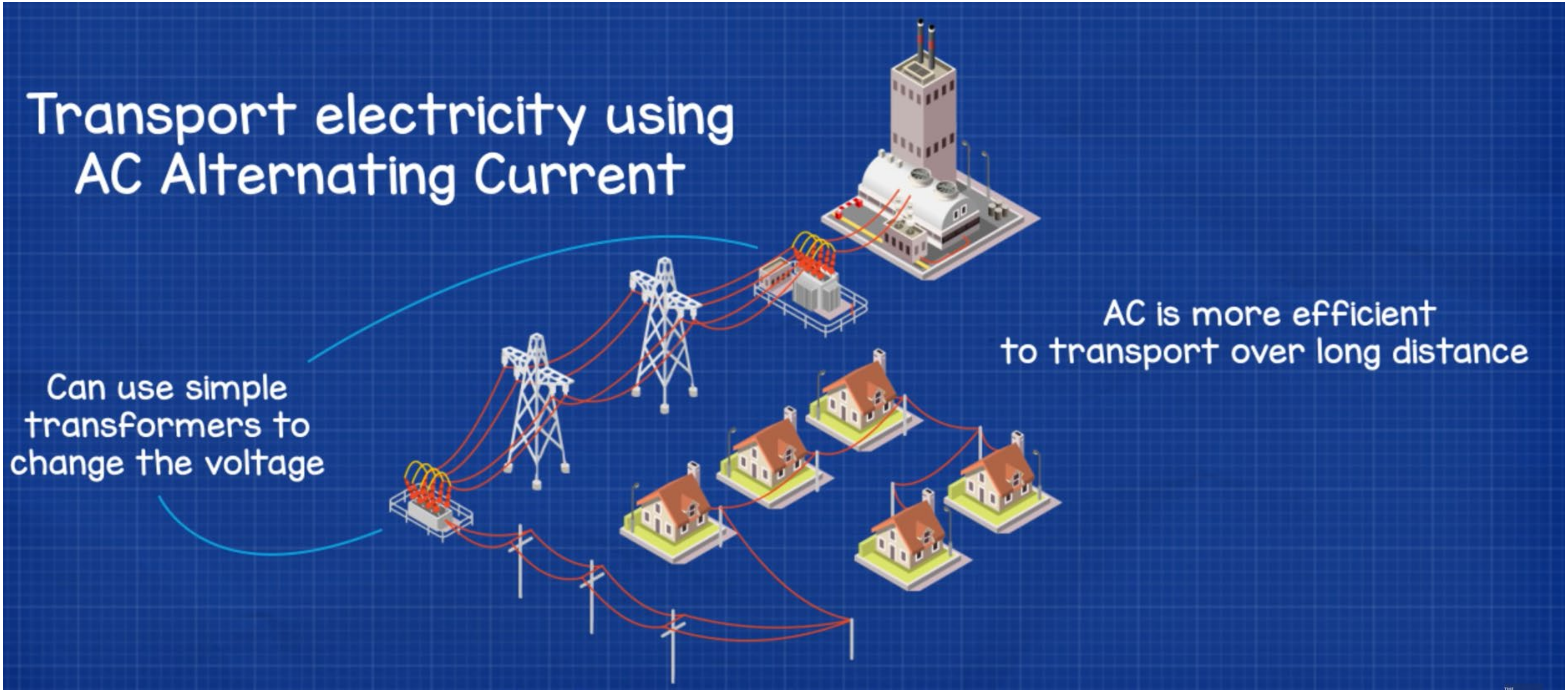
Voltage in Different Region



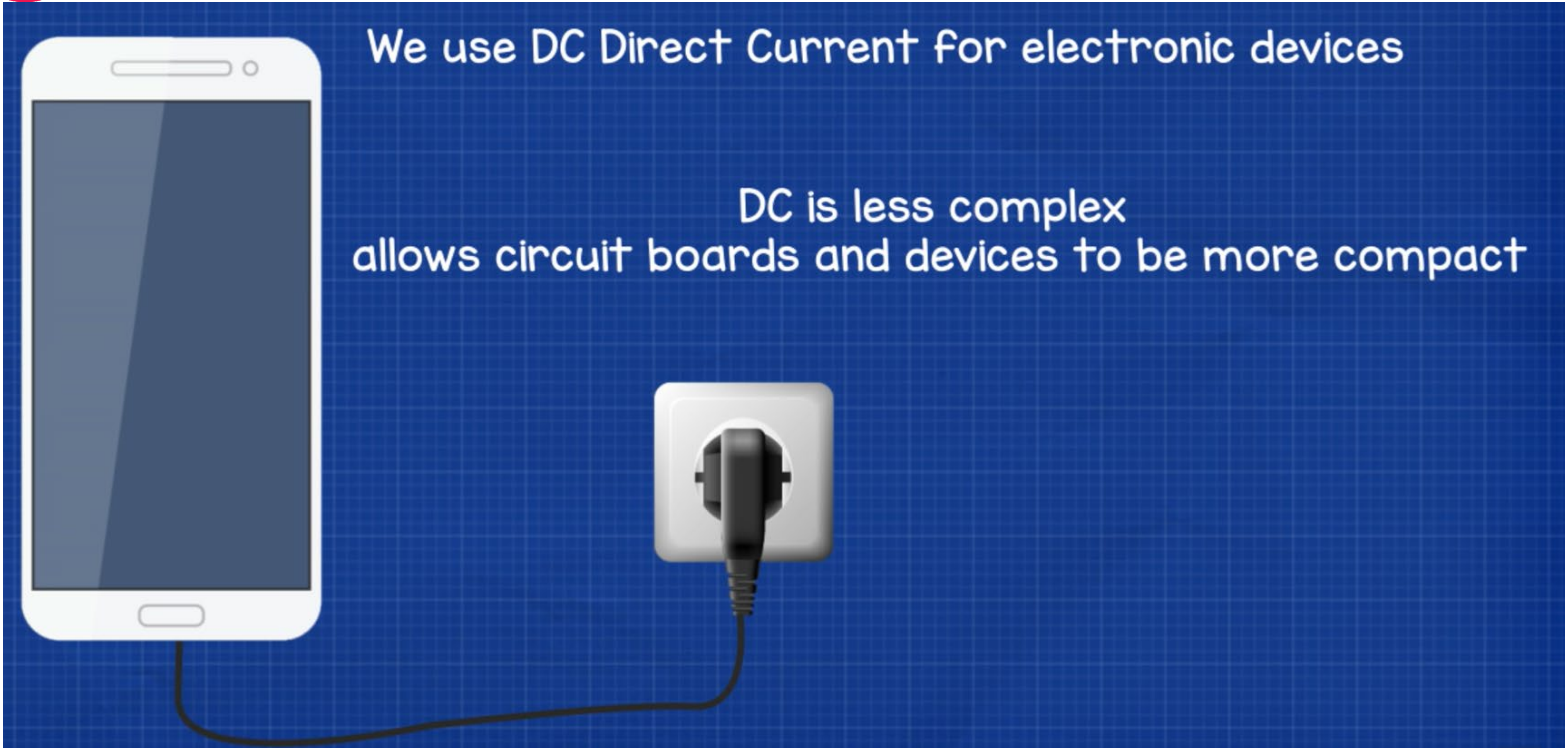
Voltage


Manufacturer Label
Laptop Charger
Input: 100-240 V
AC
1.5 Amps
UTILISER AVEC DU MATERIEL INFORMATIQUE SEULEMENT
INPUT : 100-240 V ~ 1.5 A 50-60 Hz
OUTPUT : Total 65W
19.5 V 3.33 A
WIDE RANGE INPUT 65W
4T18
V85 NOM
NYCE
E131881
US
Output: 19.5 V
DC
3.33 Amps

Alternating Current

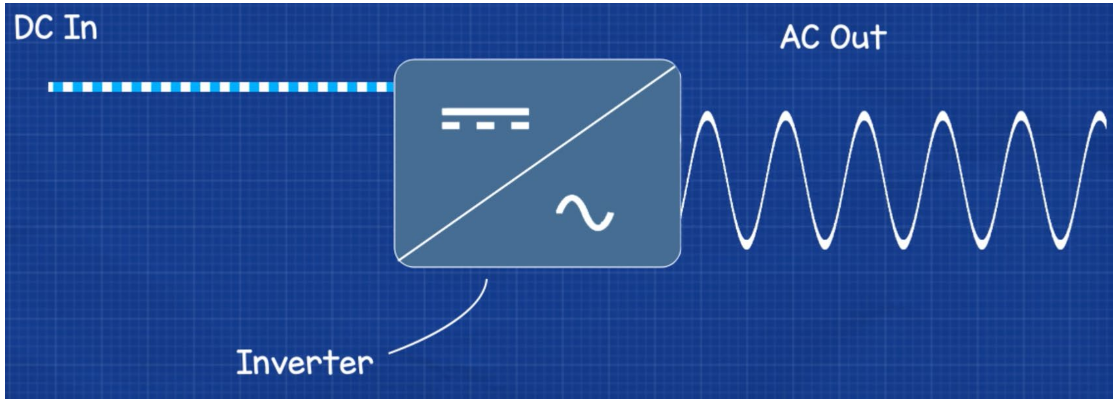


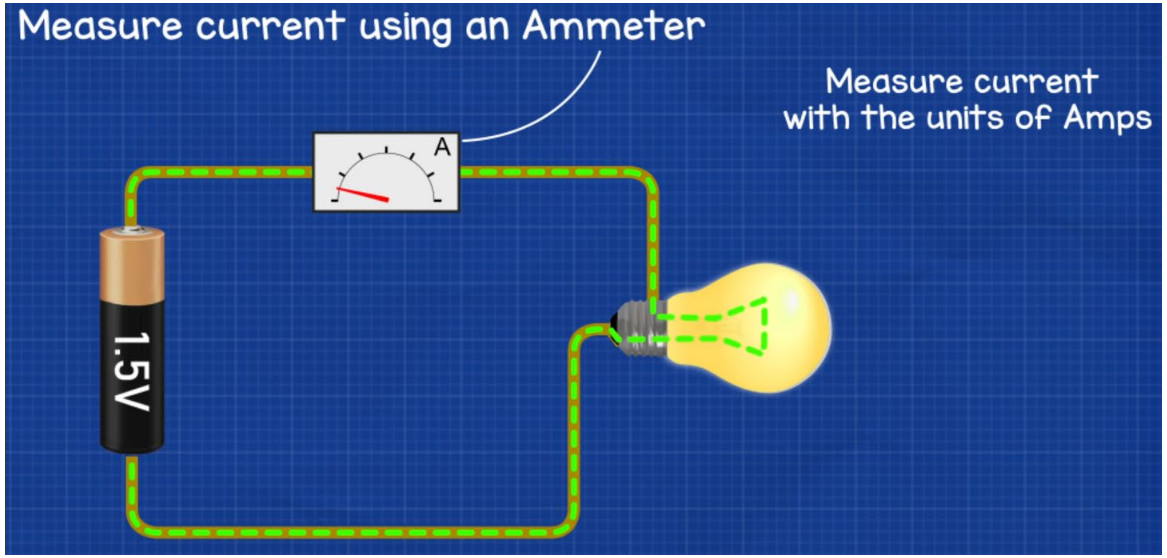
Direct Current

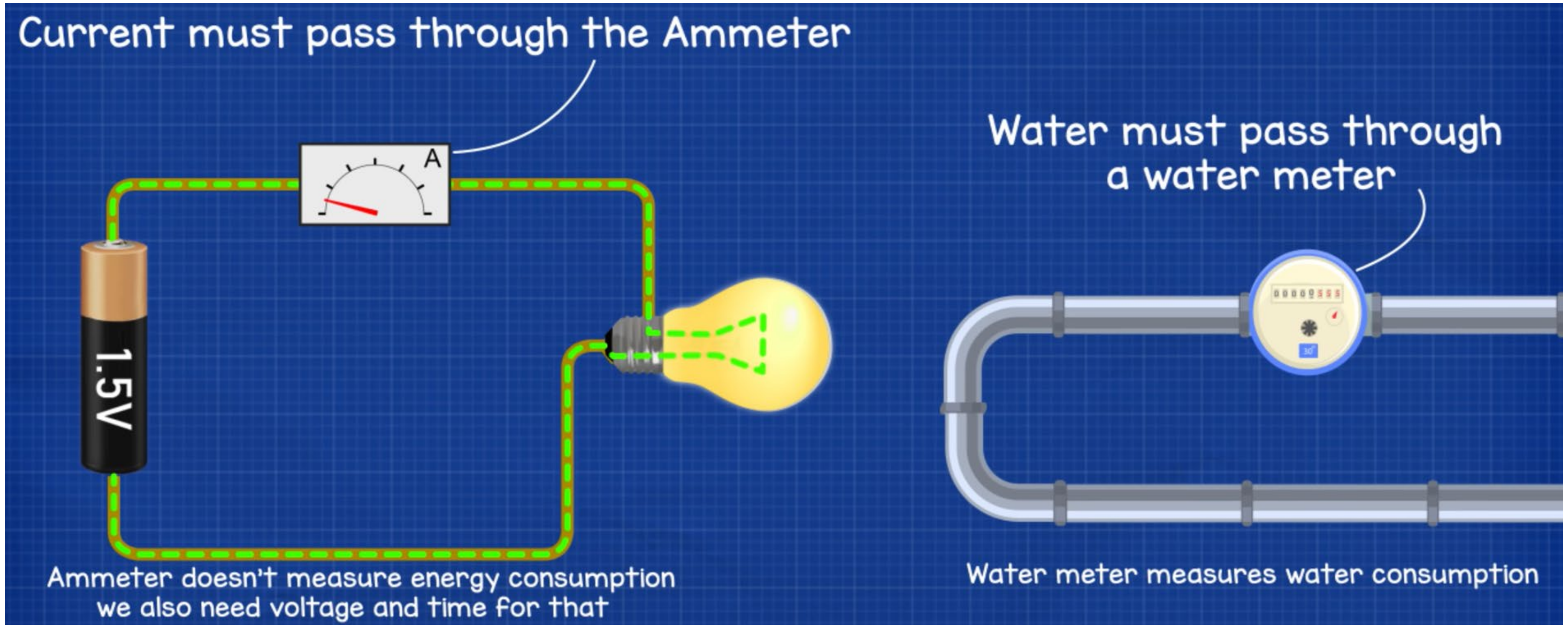


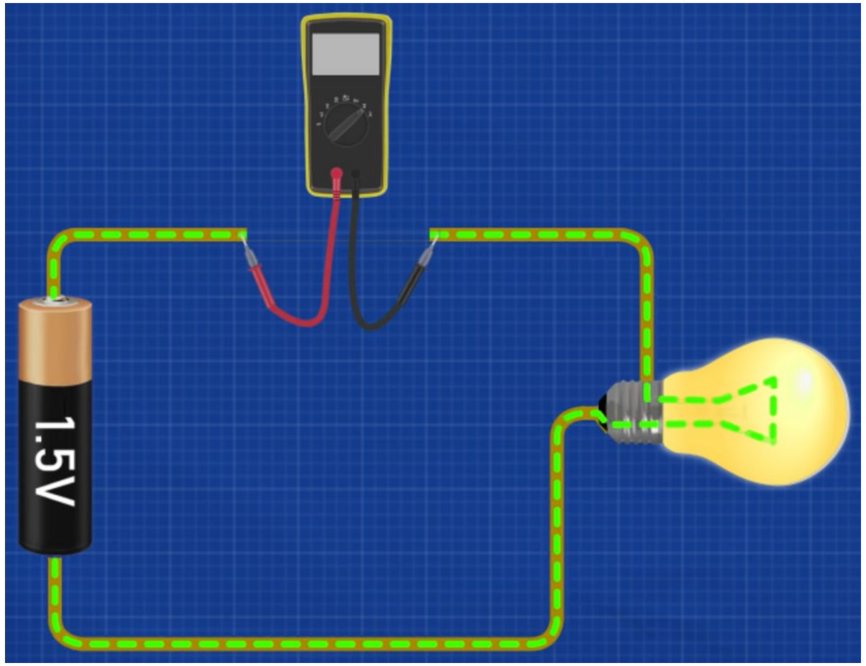
Direct Current

Current Measurement

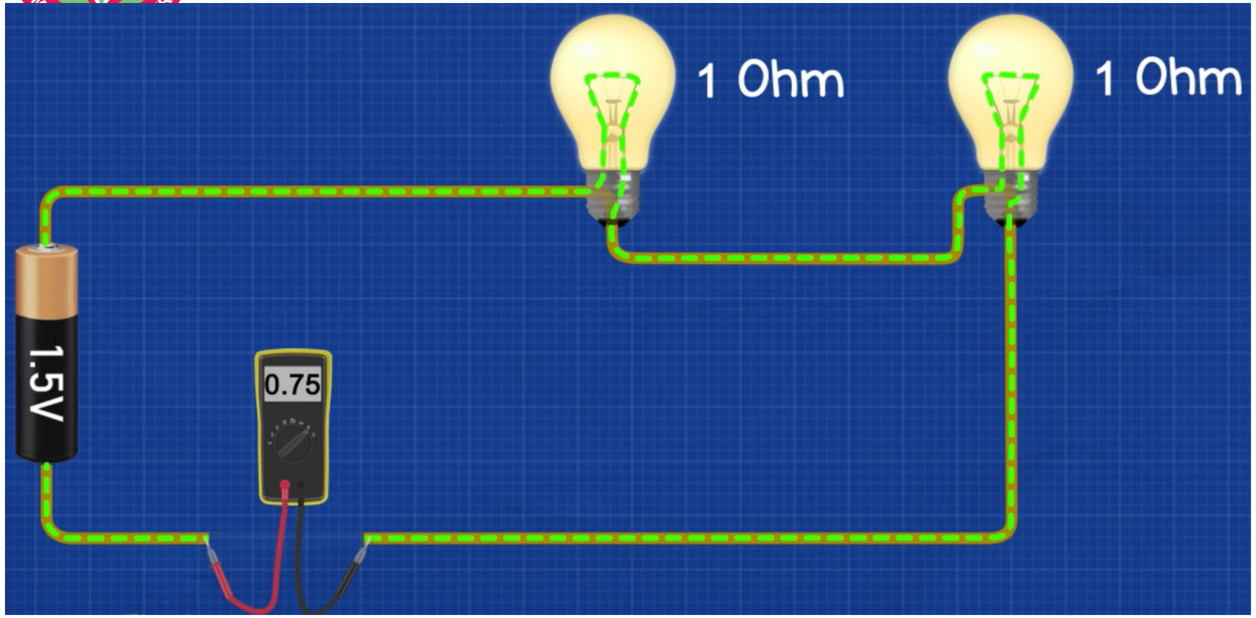


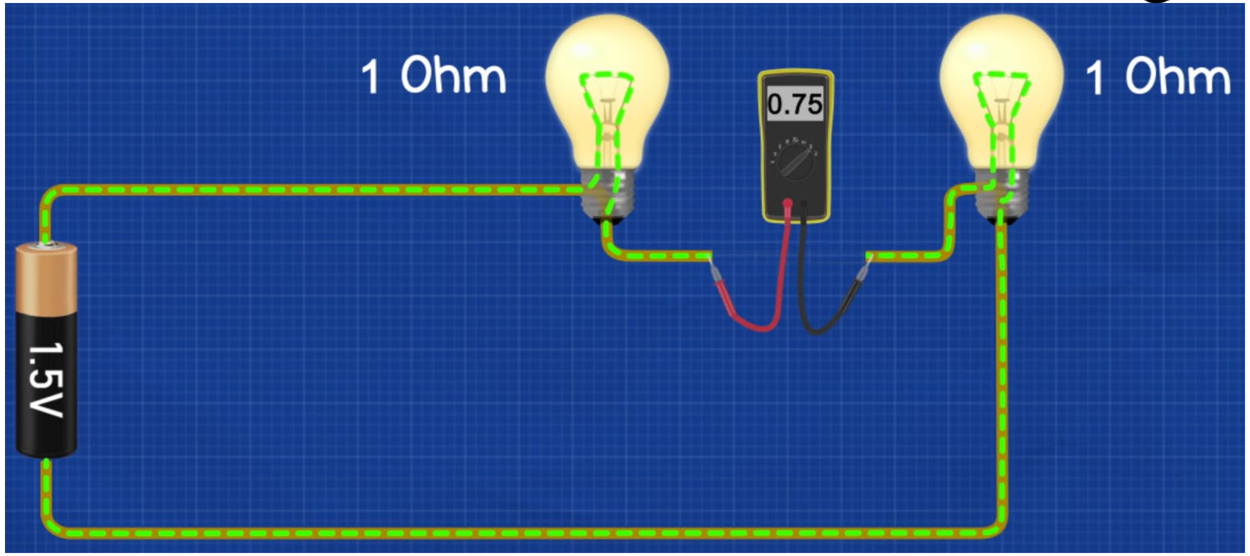


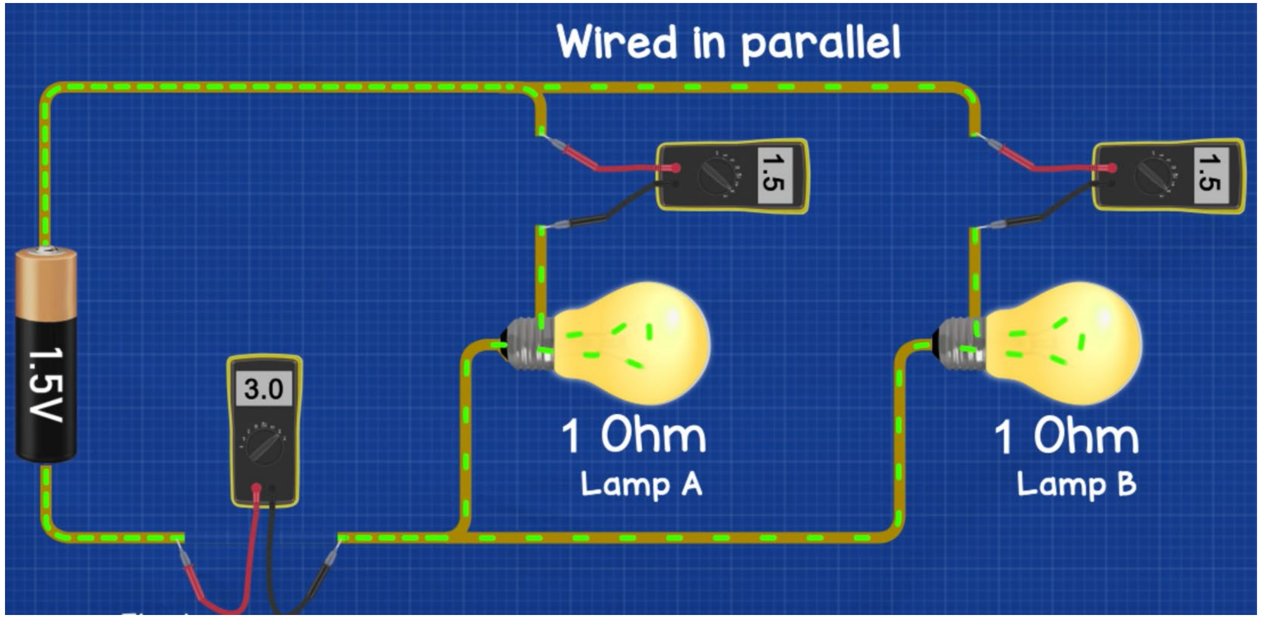


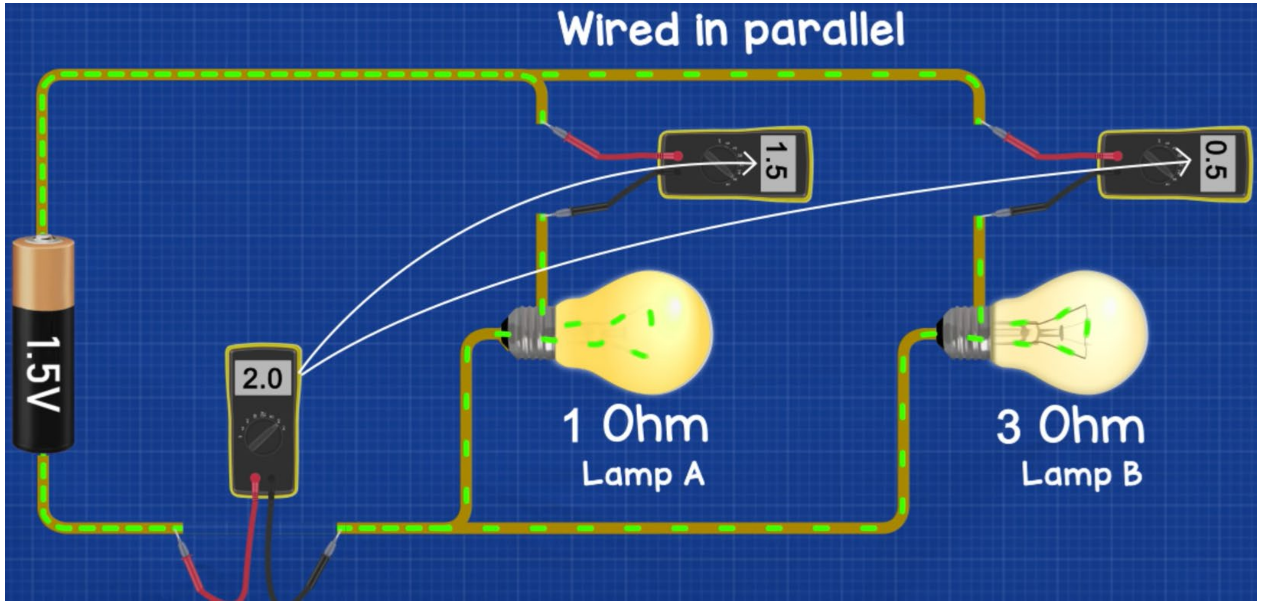


Current in Series and Parallel Circuit

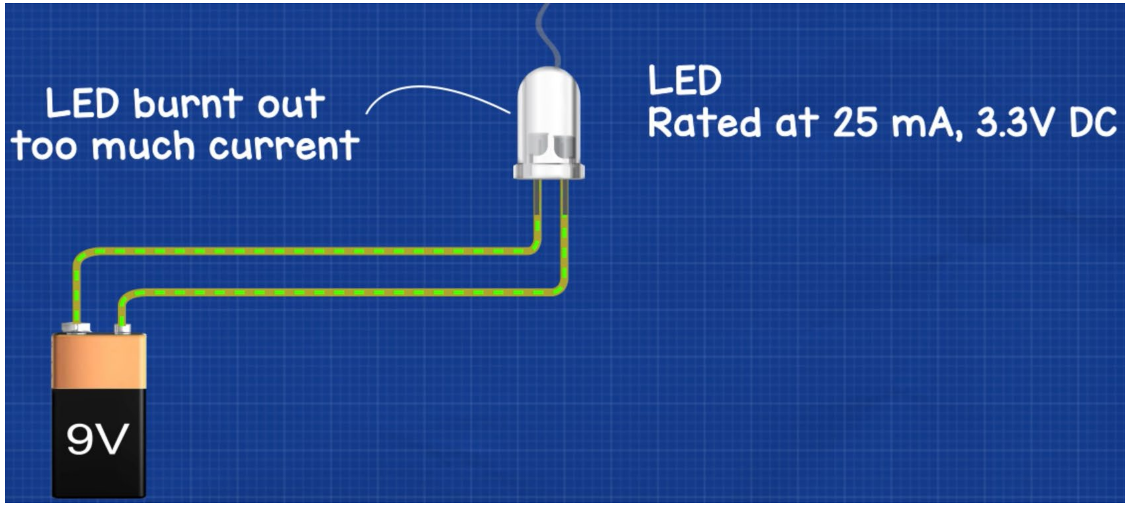


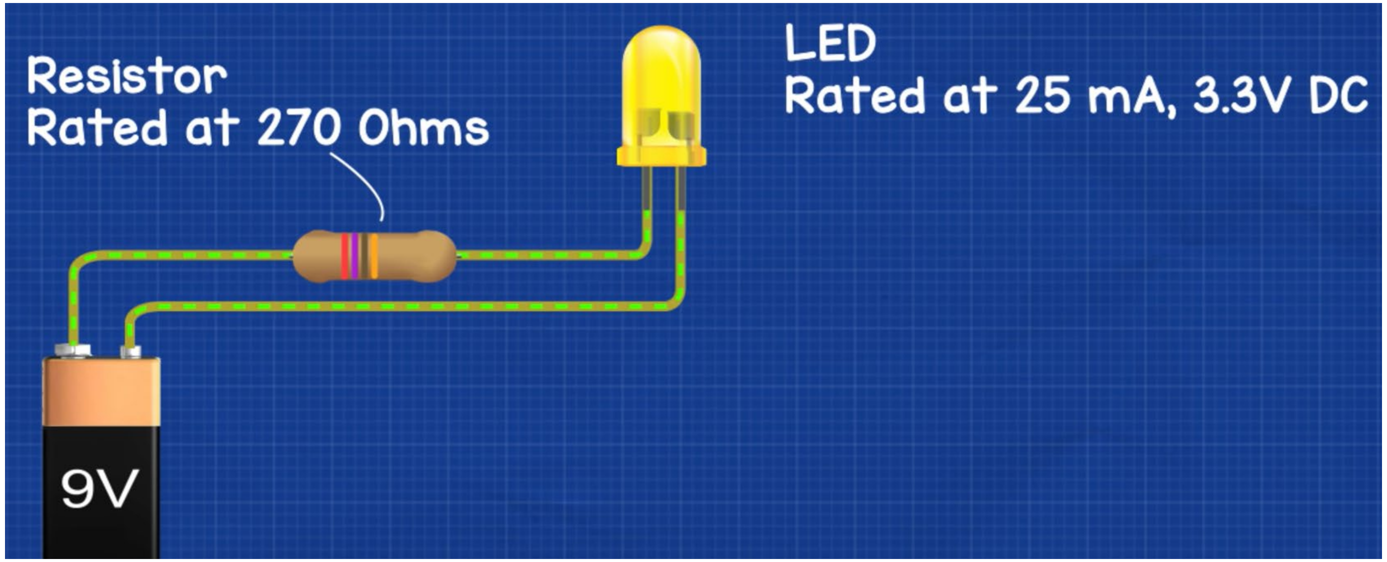


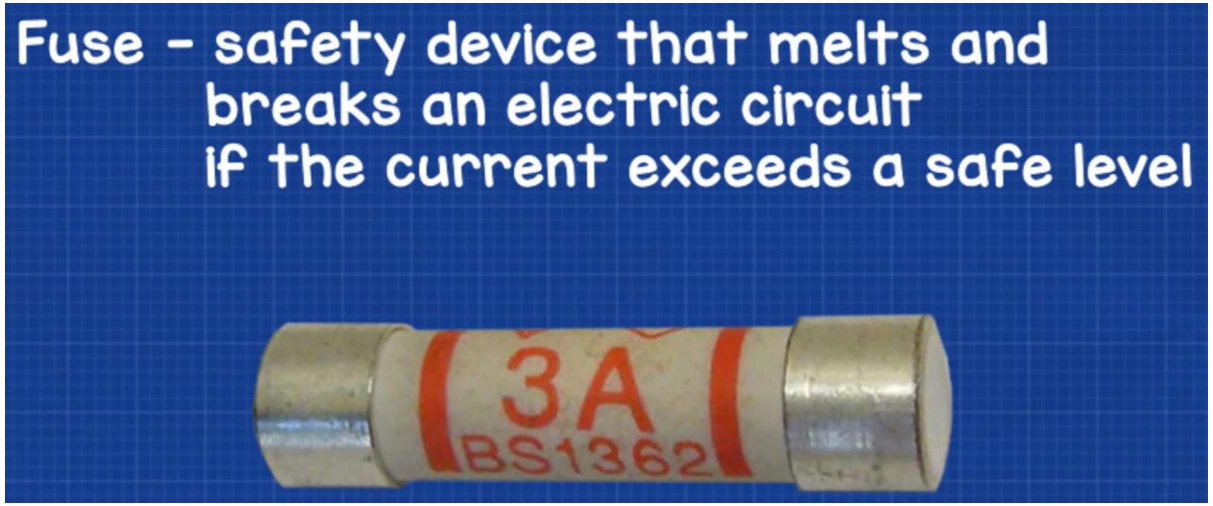


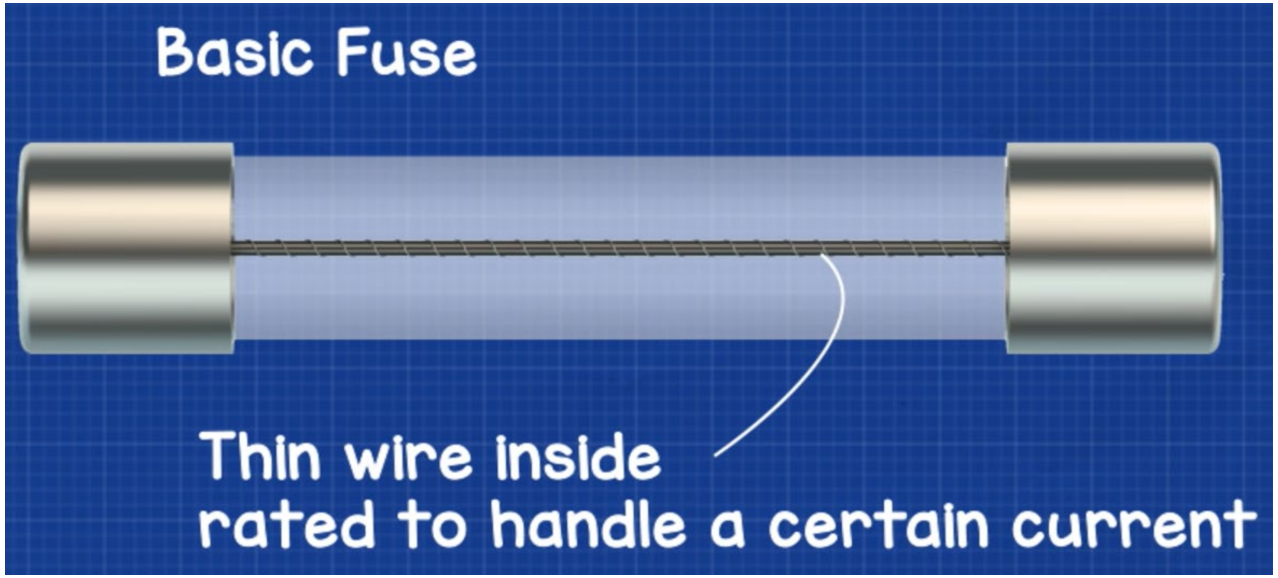


Current and limiting Resistor

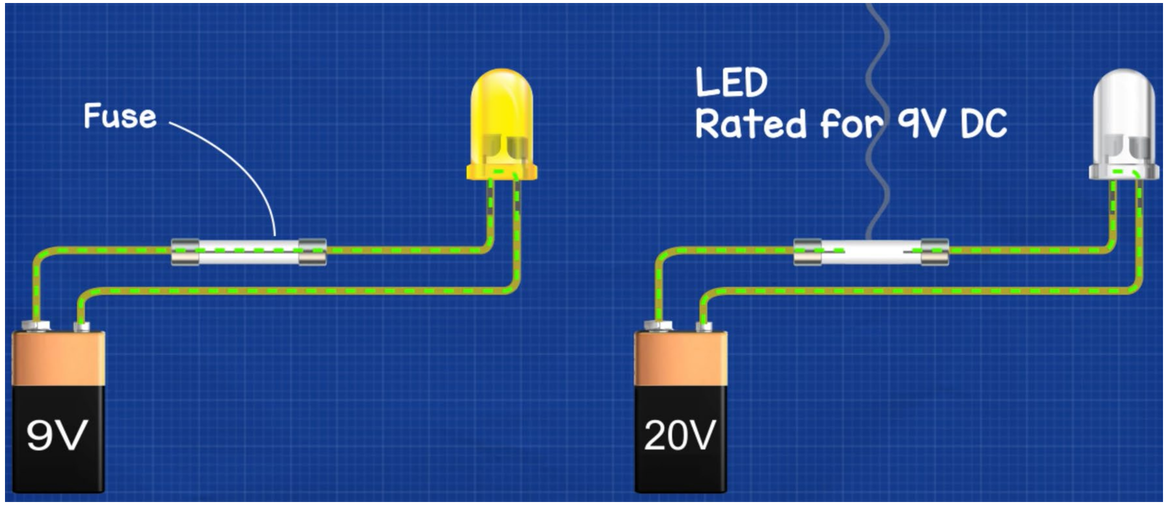


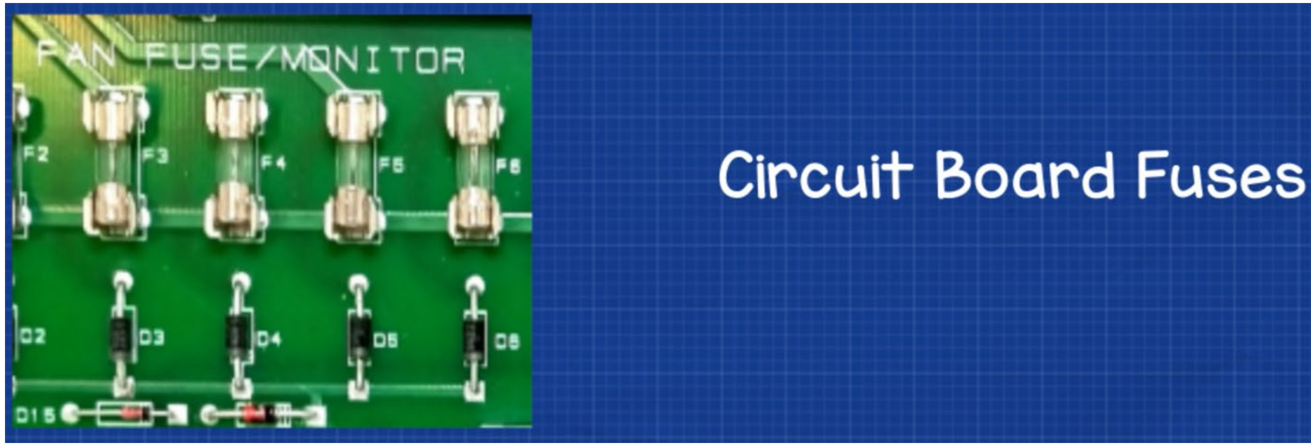


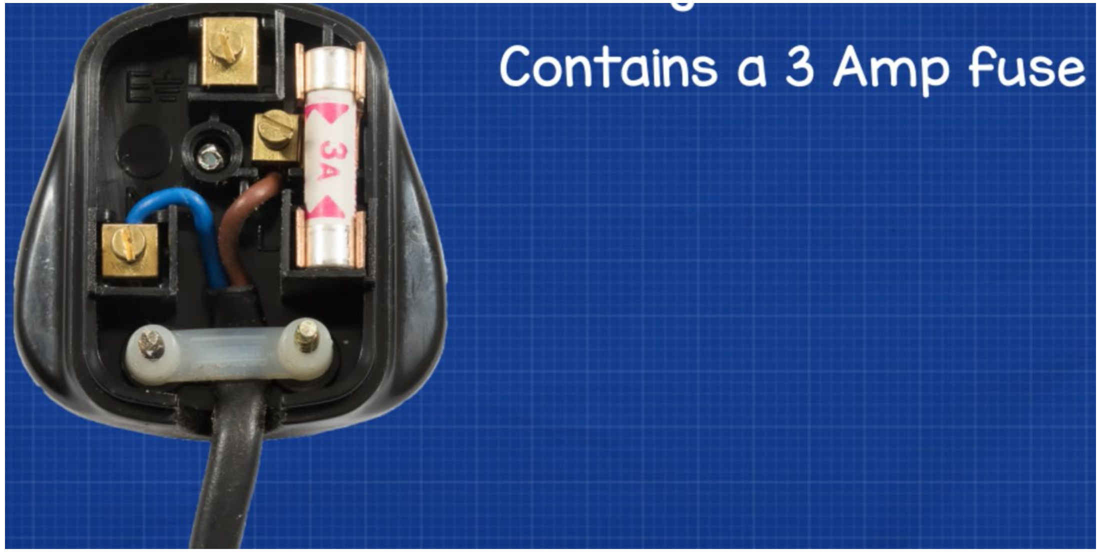


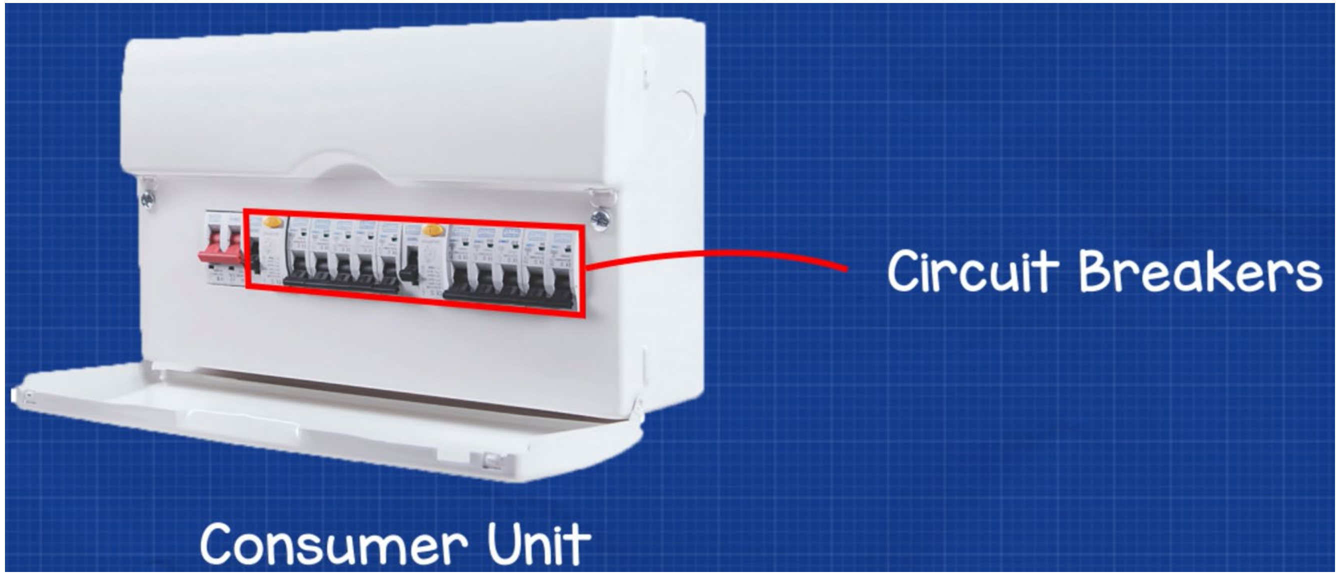


Fuse


Fuse
LED
Rated for 9V DC
9V
20V


FAN FUSE/MONITOR
Circuit Board Fuses


3A
Contains a 3 Amp fuse


Circuit Breakers
Consumer Unit

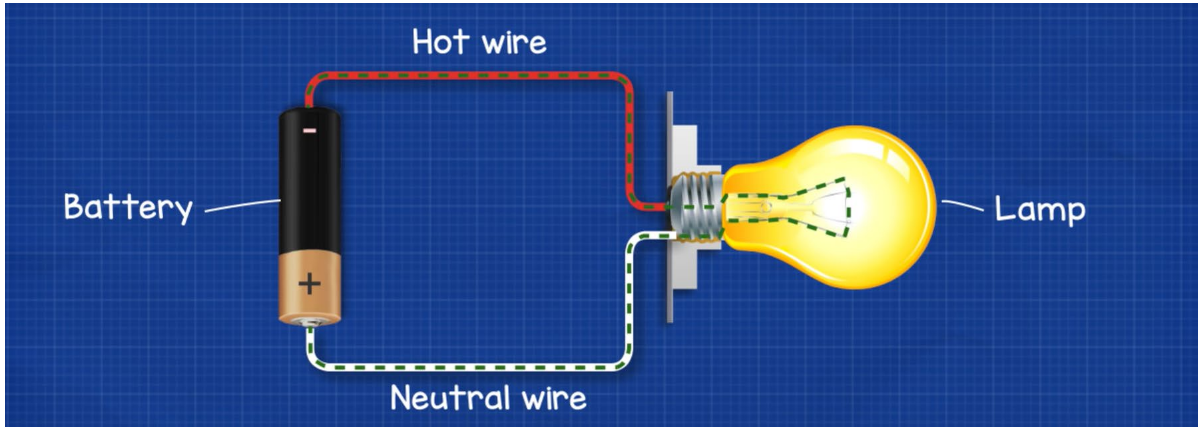
Remember these Points

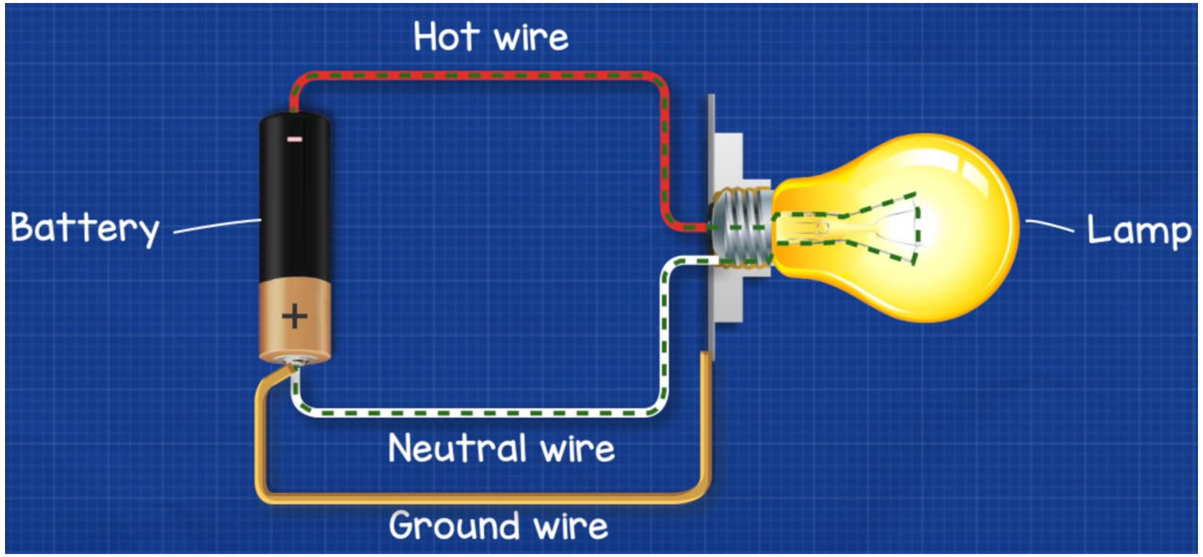
1) Electricity will only flow in a complete circuit. If you come into contact with an electrical conductor, your body might complete the circuit.

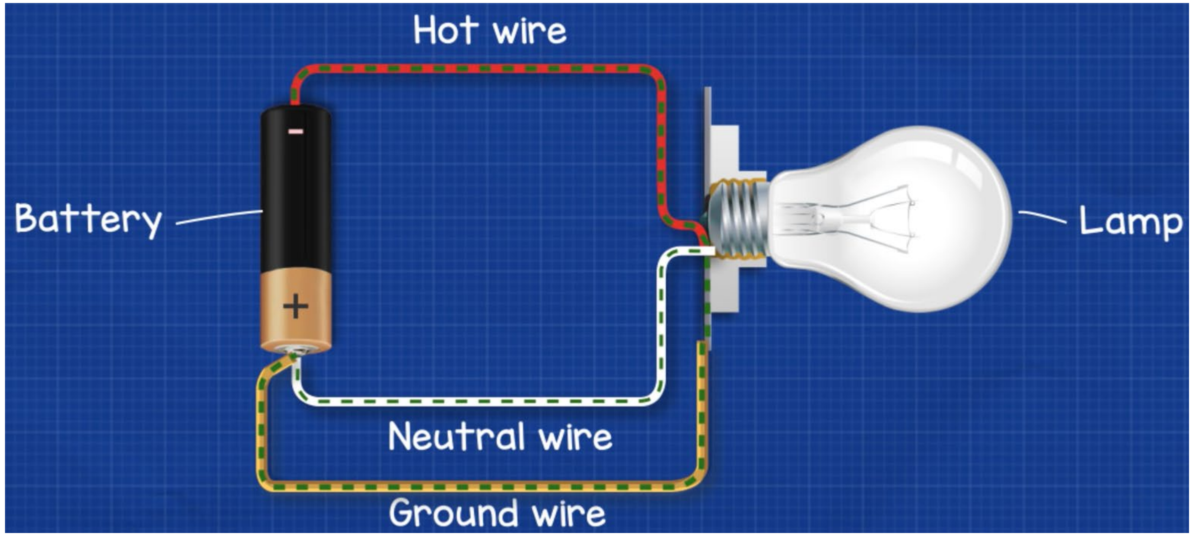
2) Electricity always tries to return to its source.

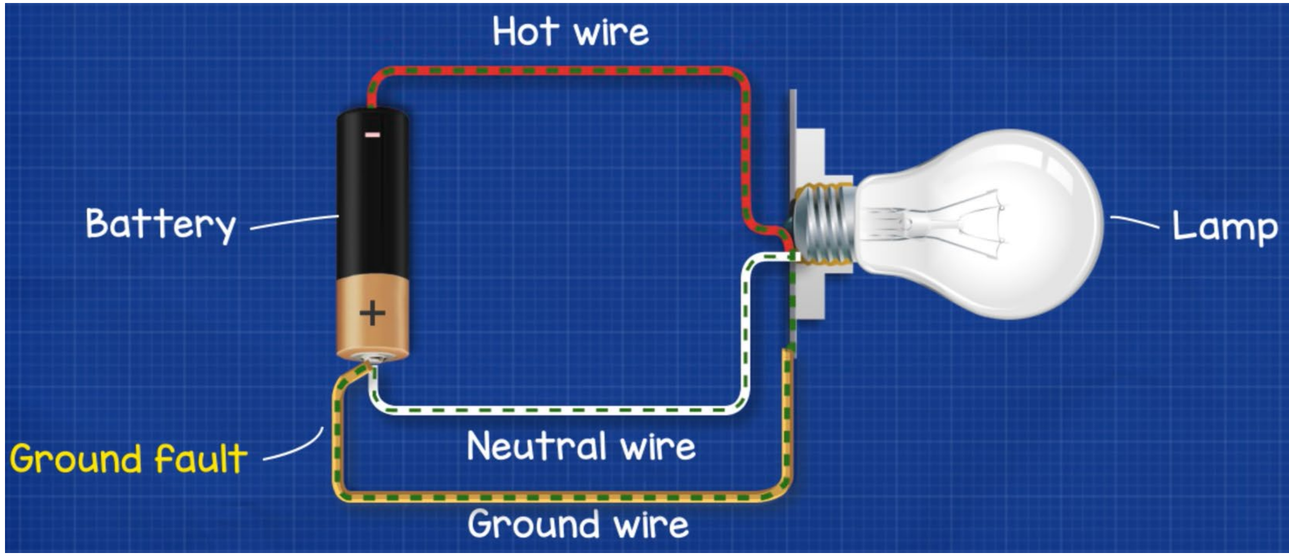
3) Electricity takes all available paths to complete a circuit. It takes preference to a path with less resistance and more current will flow in that path.

Ground, Neutral and Hot Wire/Phase

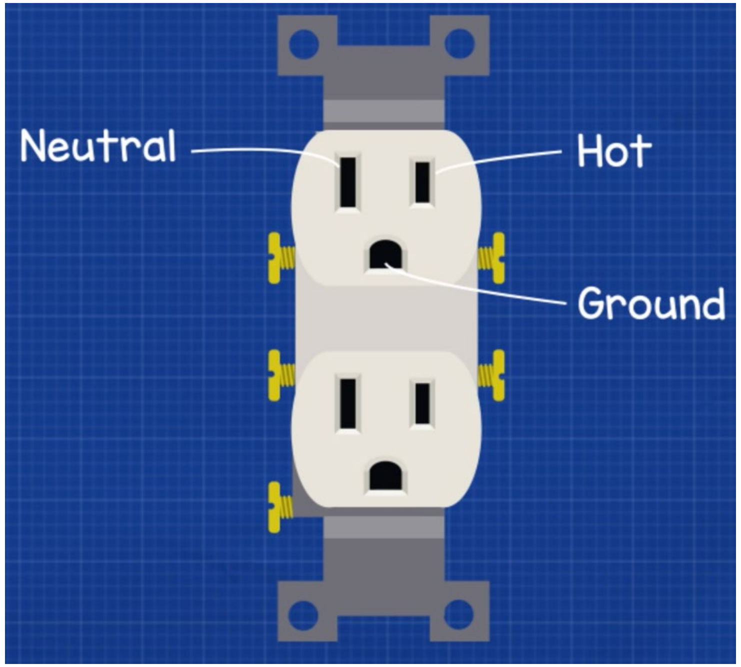


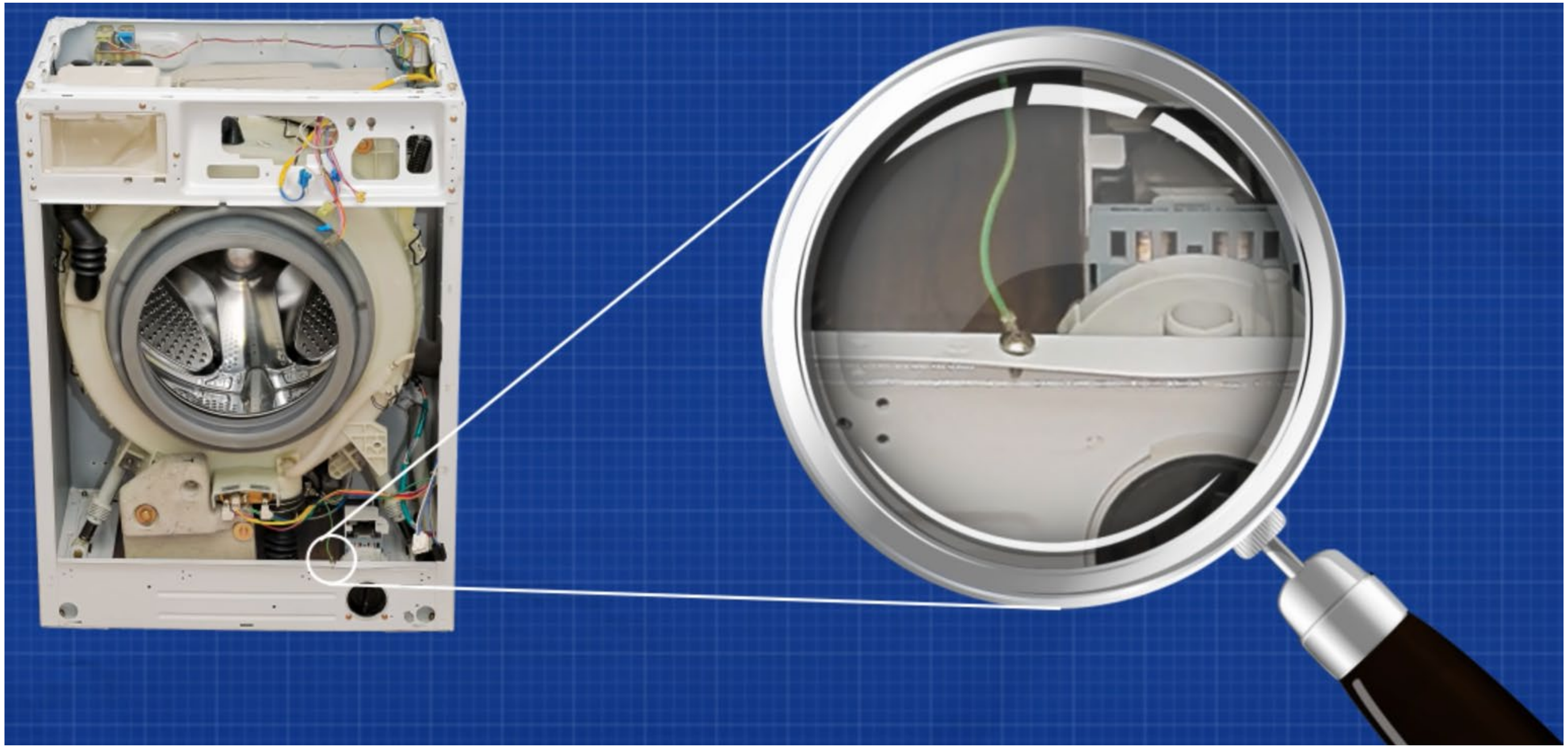




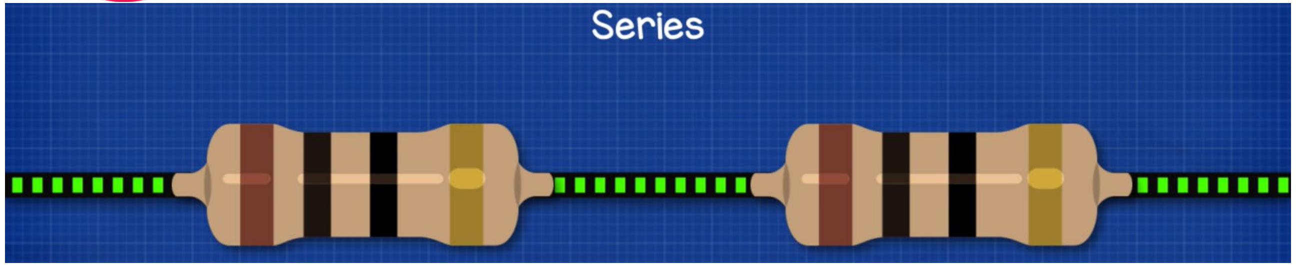


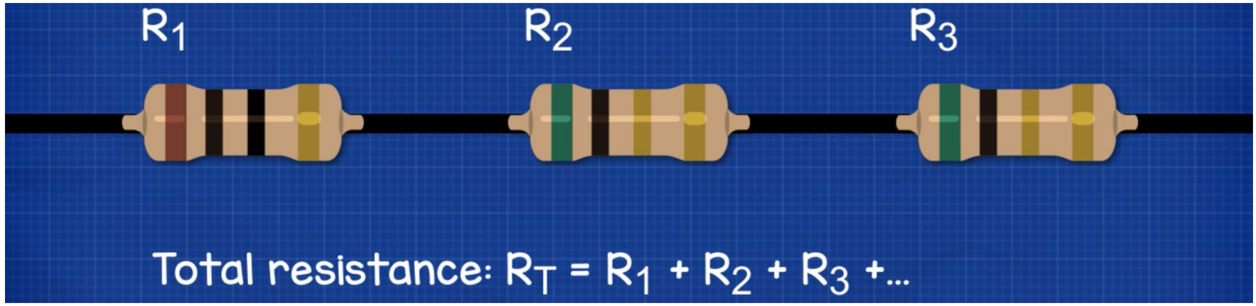
Ground, Neutral and Hot Wire/Phase

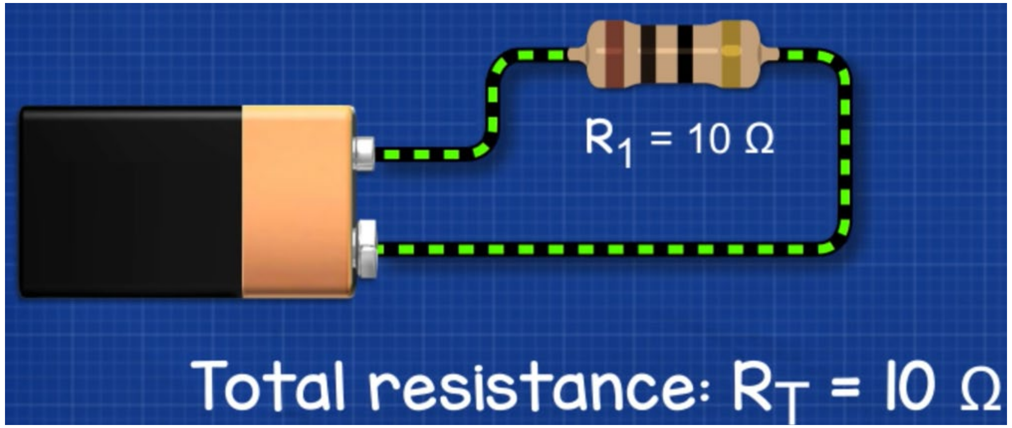


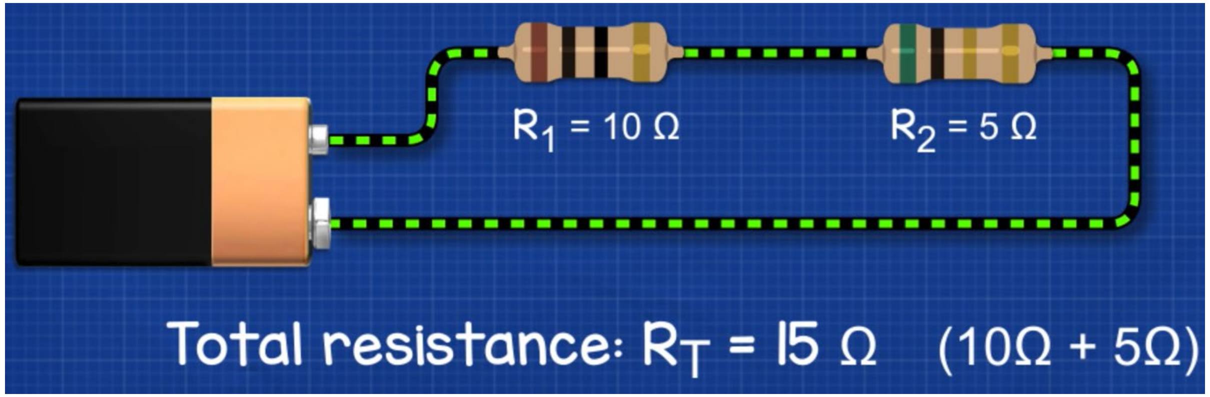


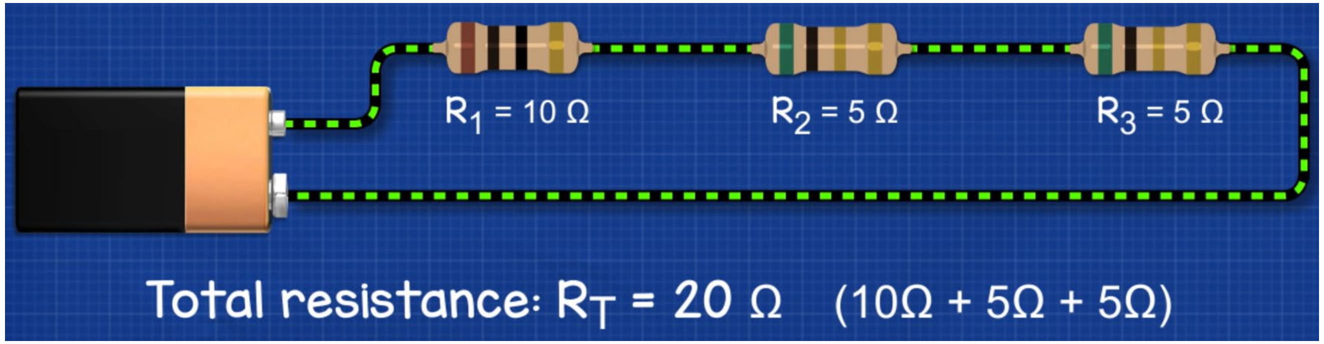
Resistance in Series

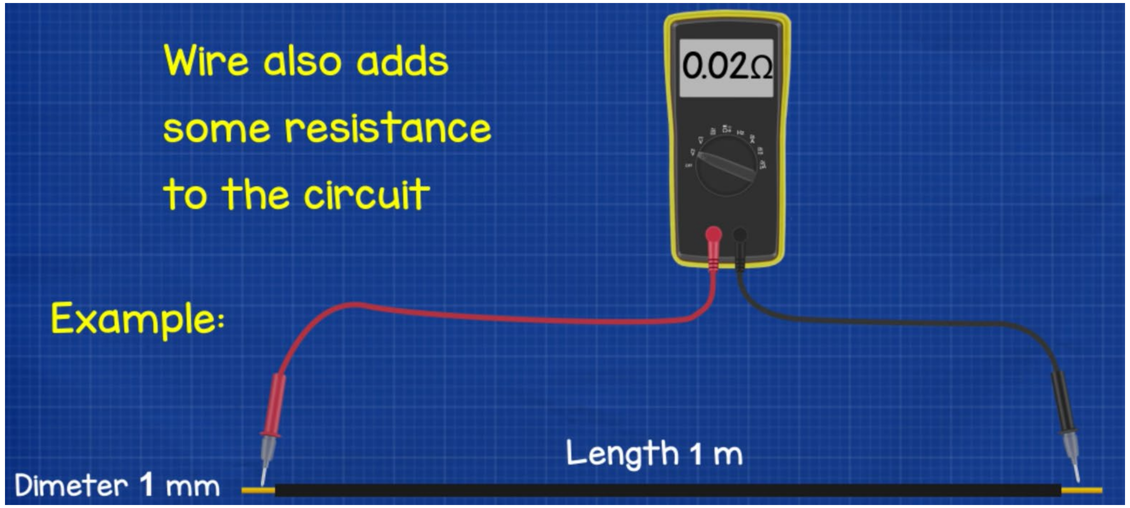




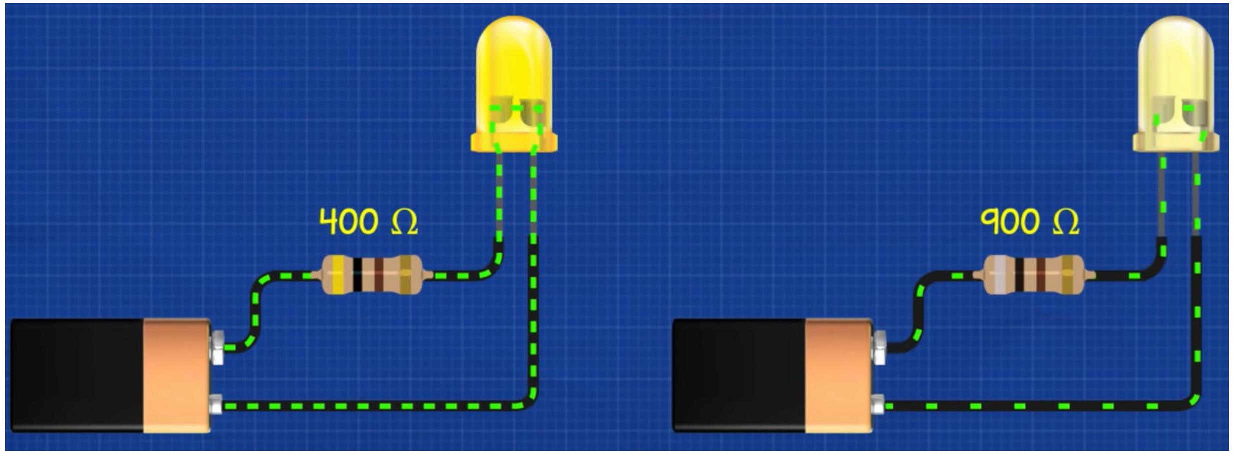


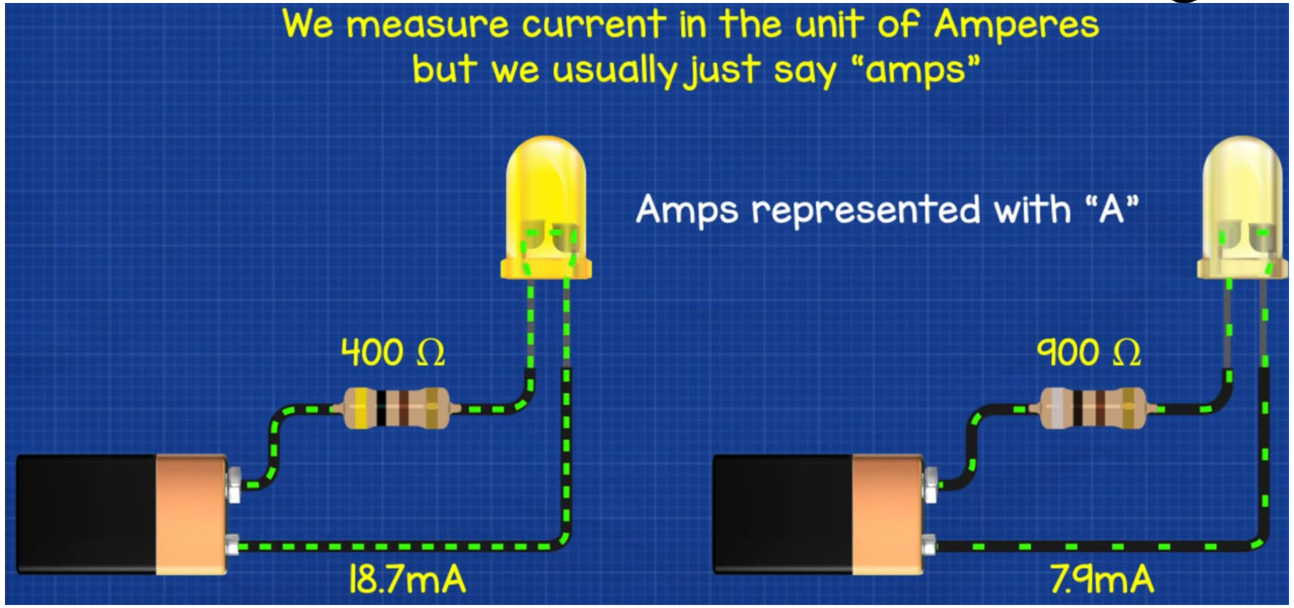


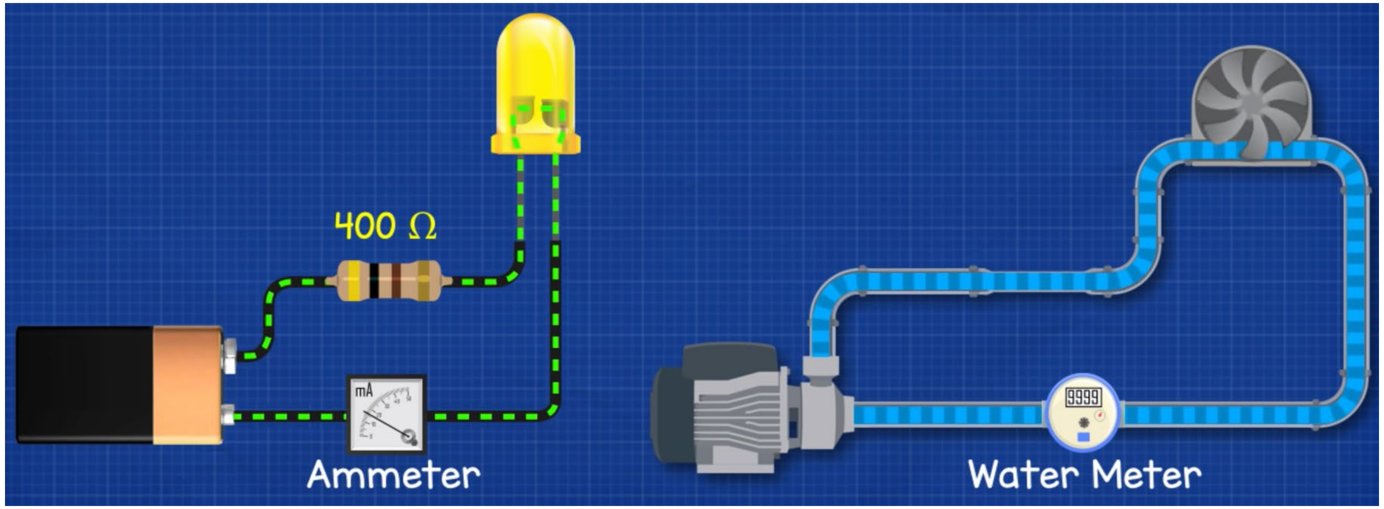


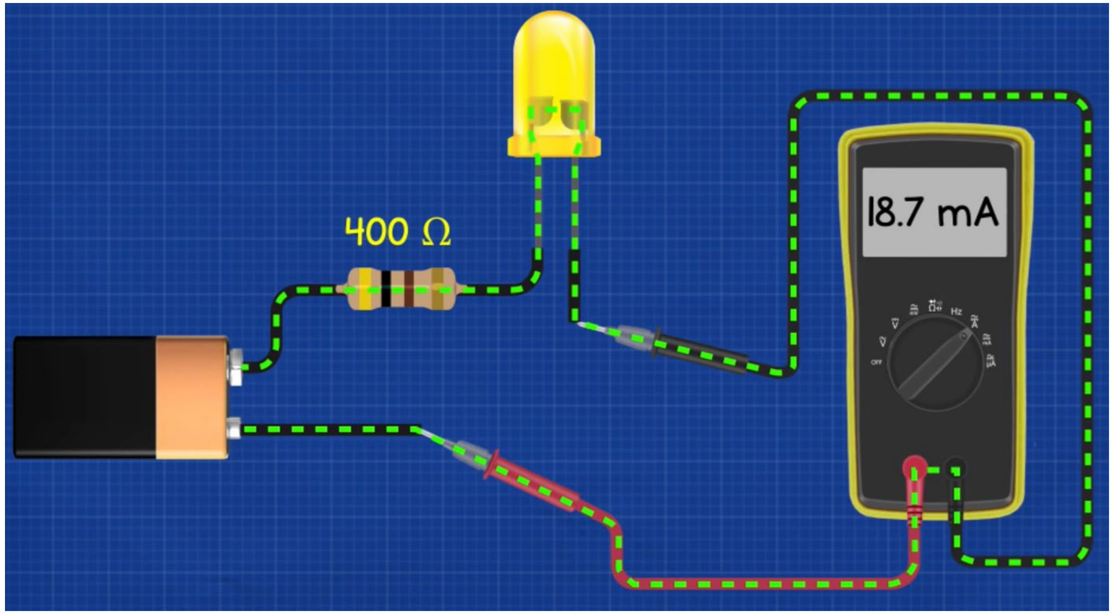


Resistor Application

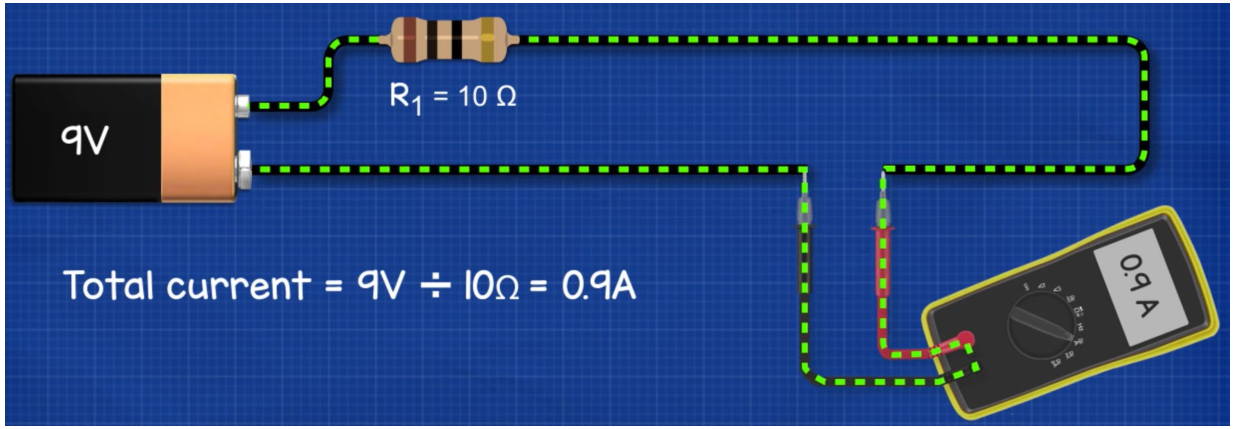


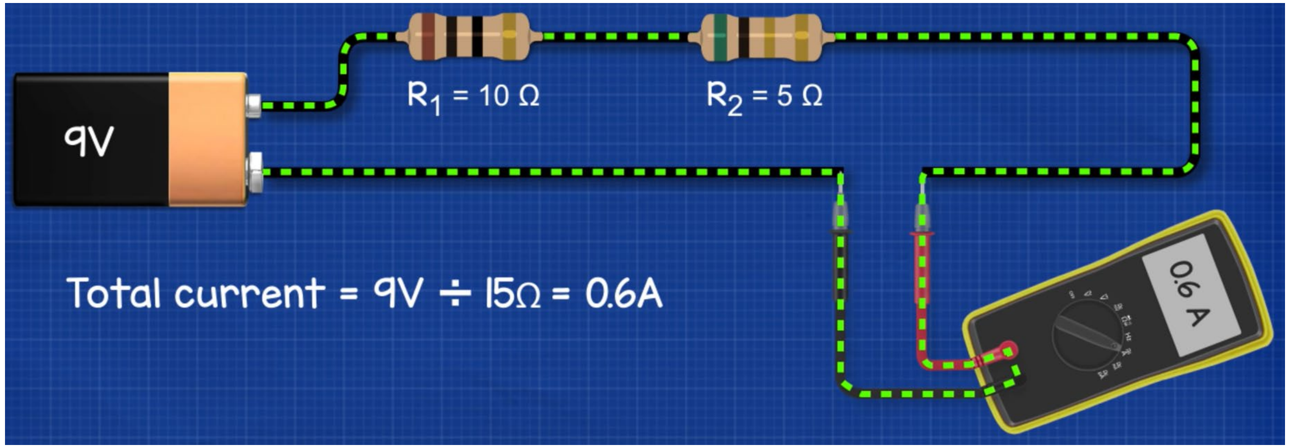


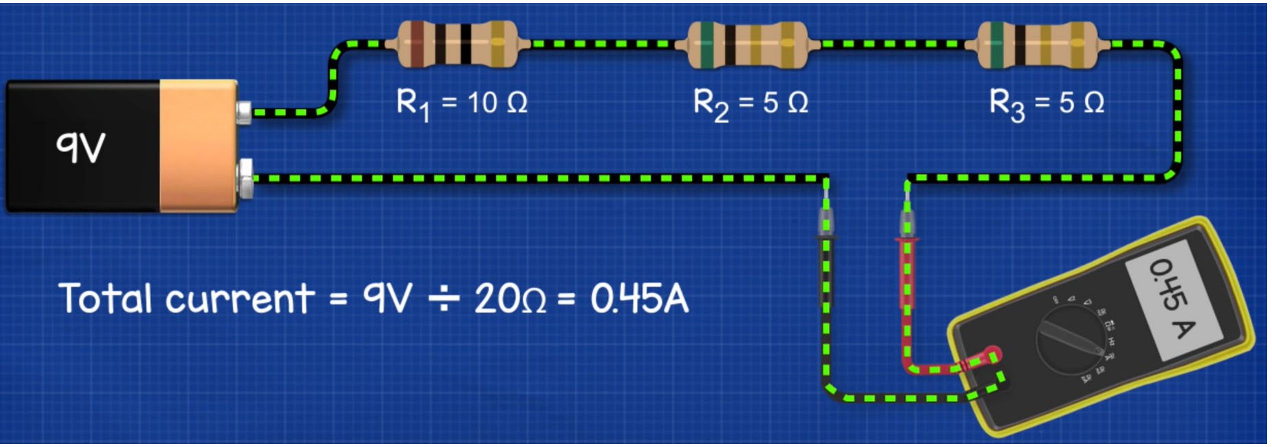


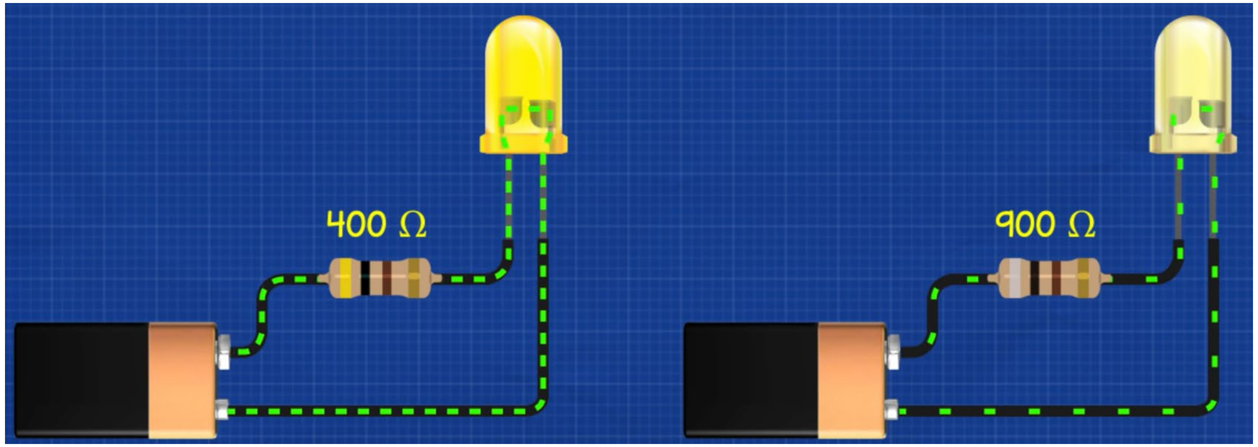


Resistor Application

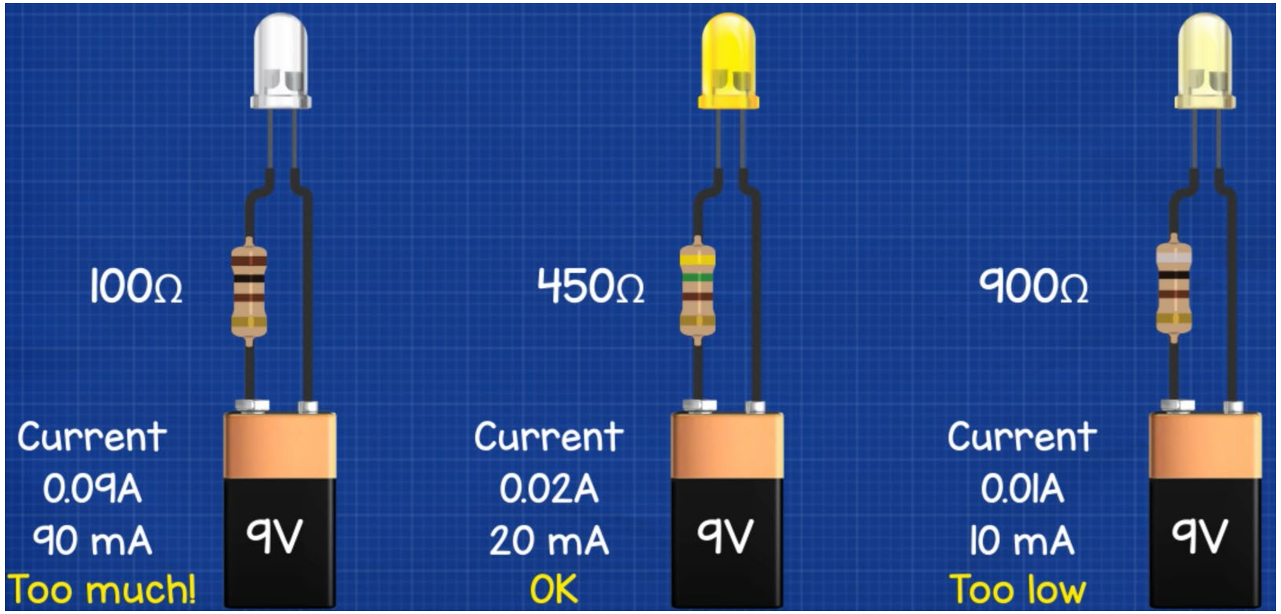


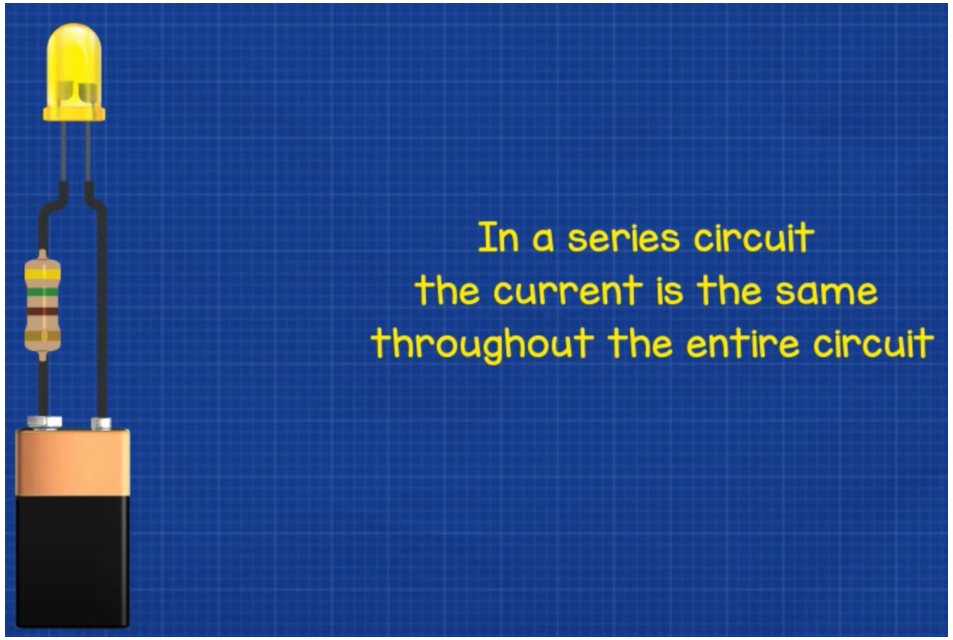


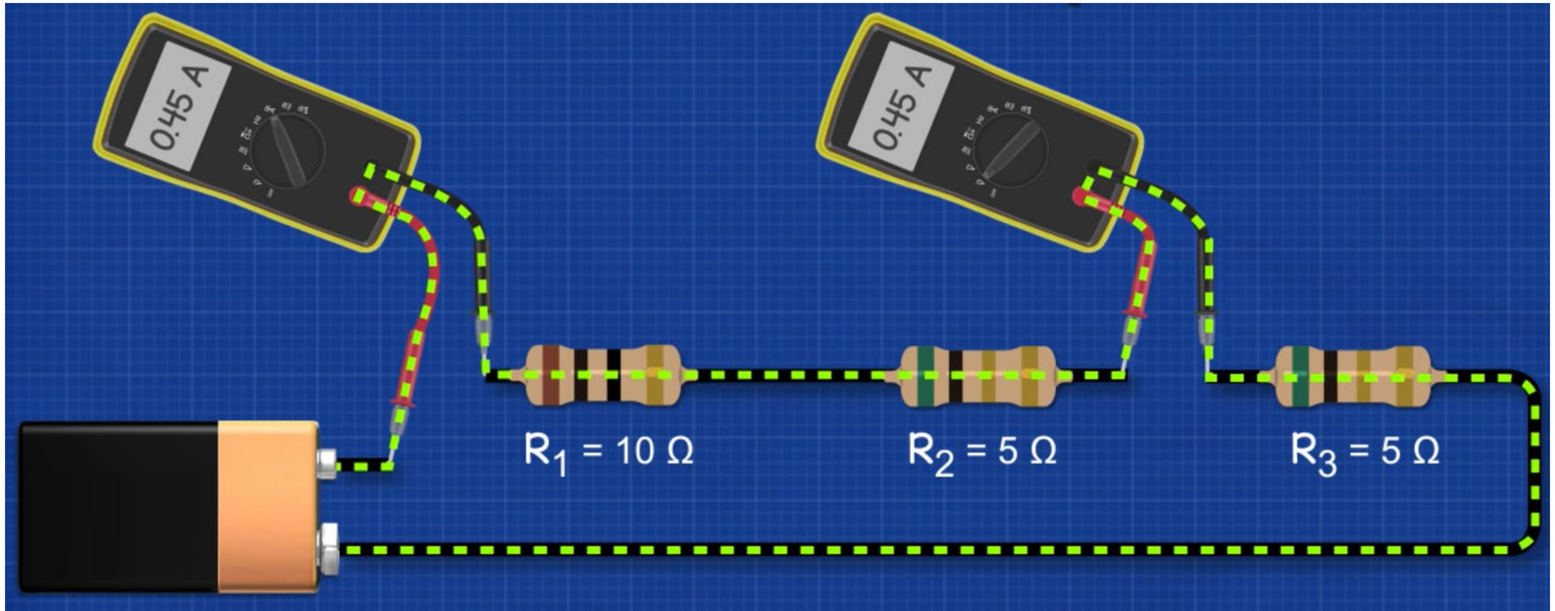




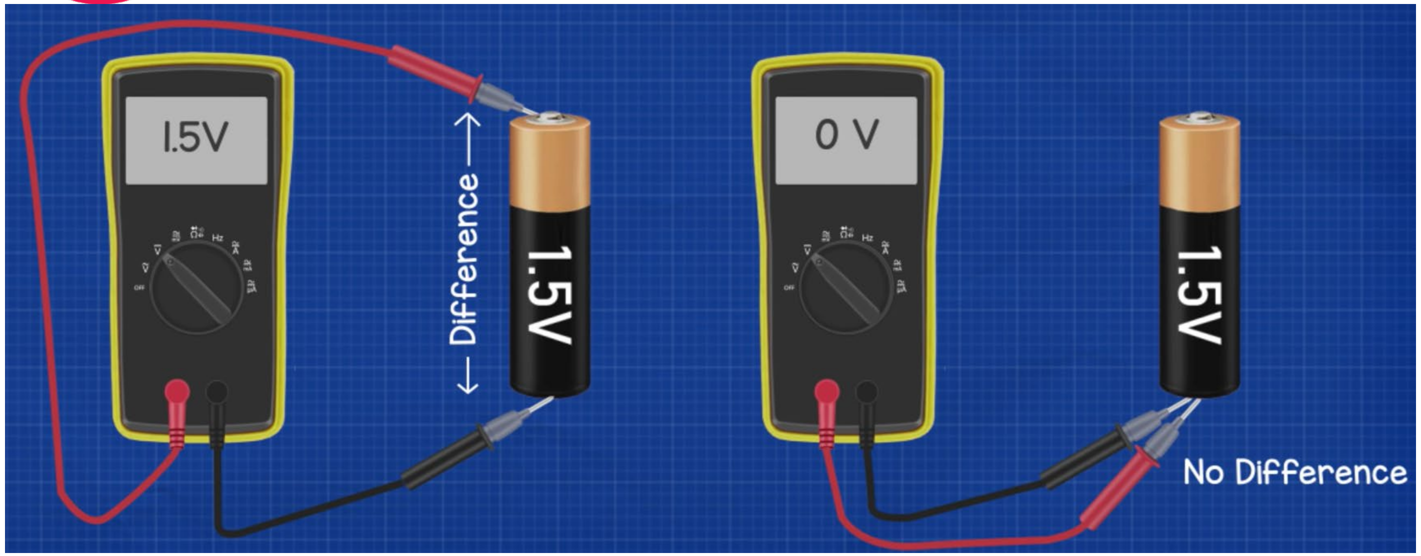
Resistor Application

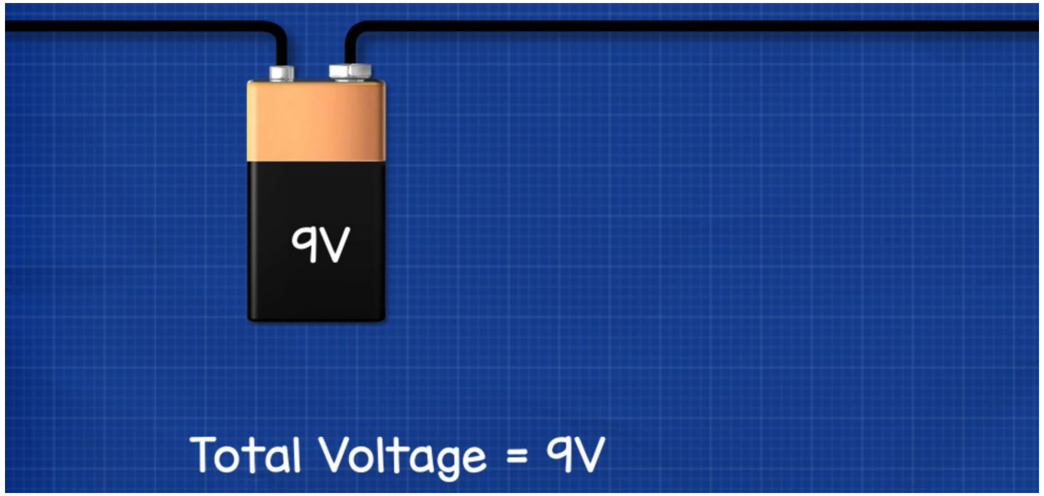


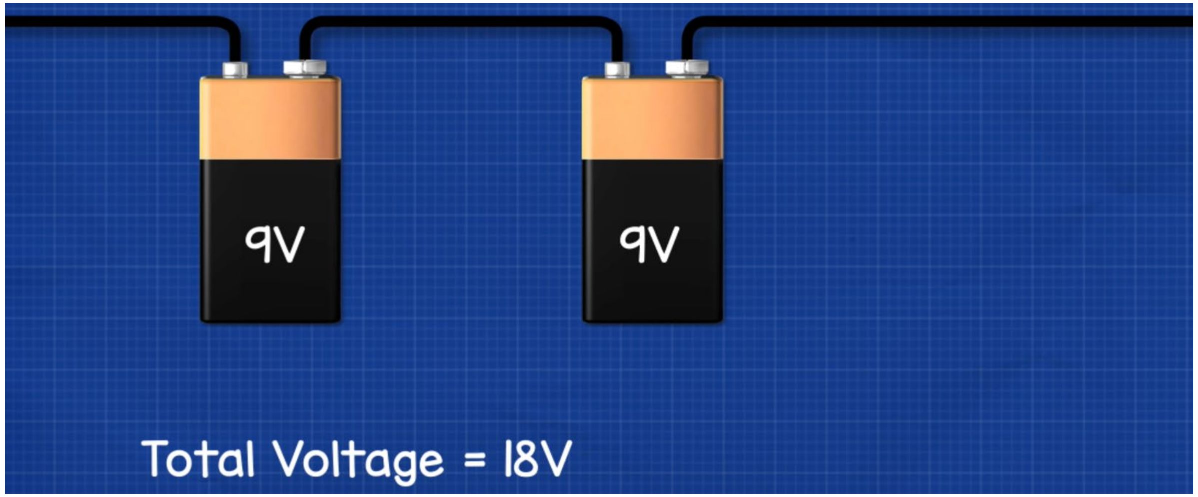


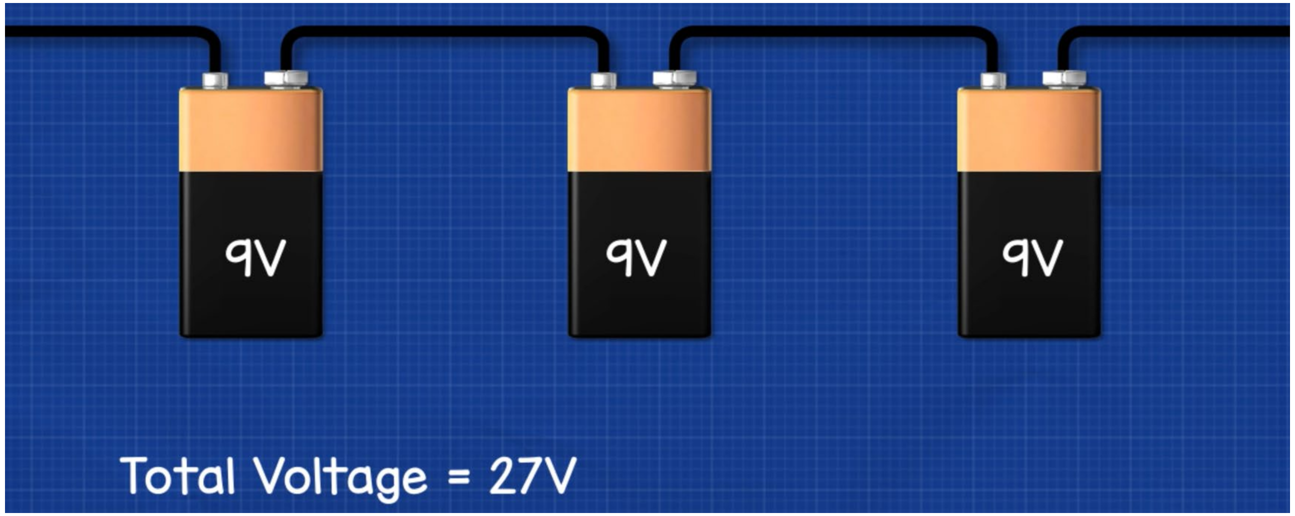


Voltage Calculation

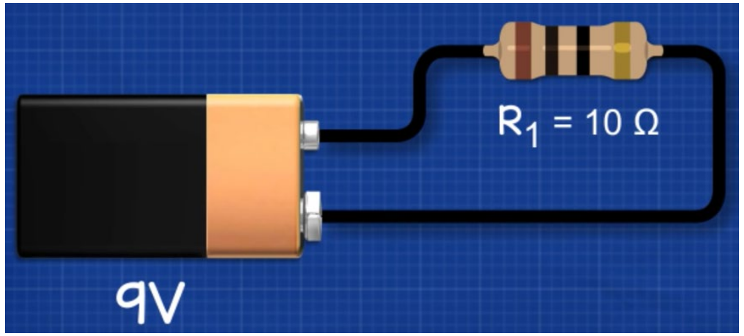


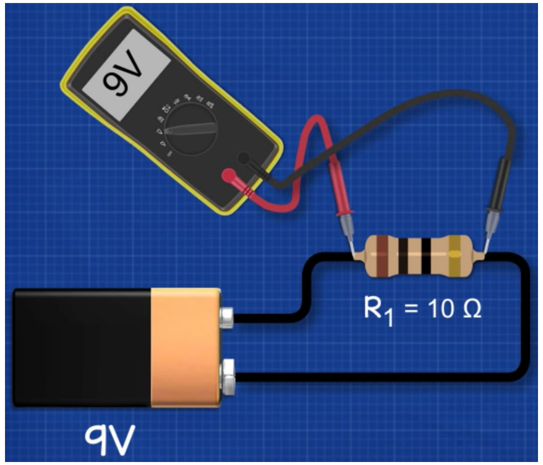


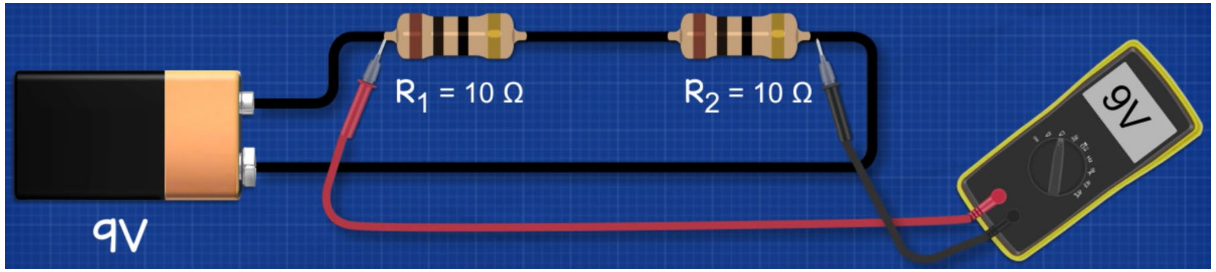


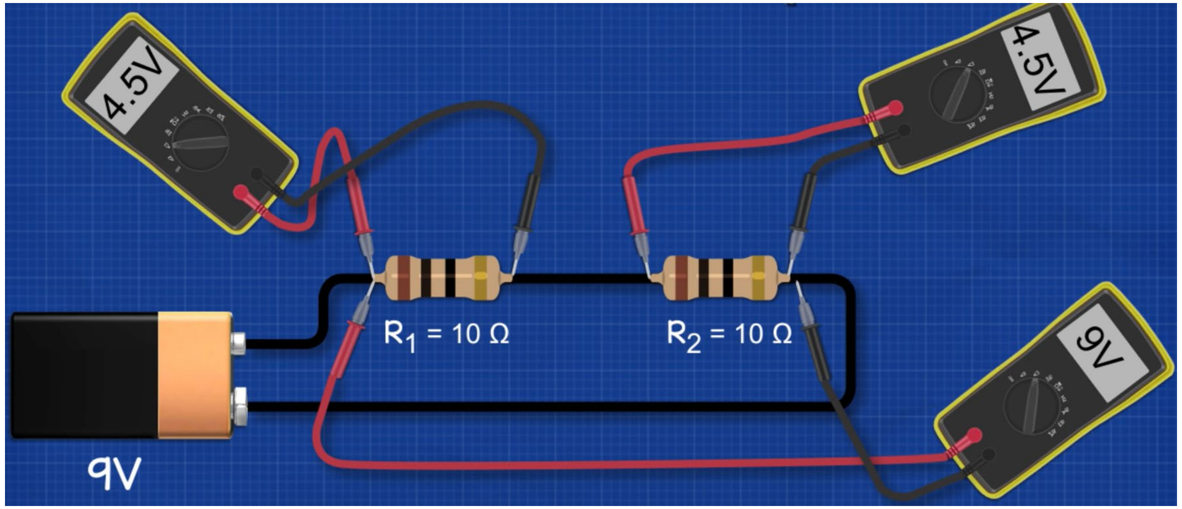


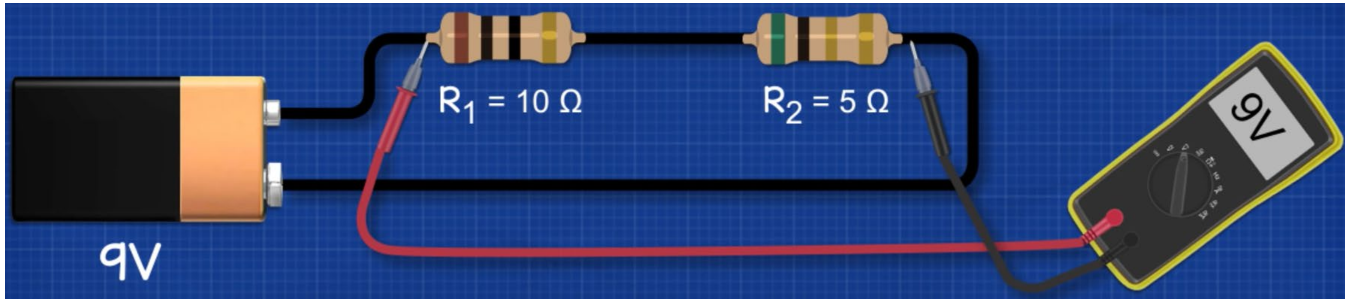
Resistor Application

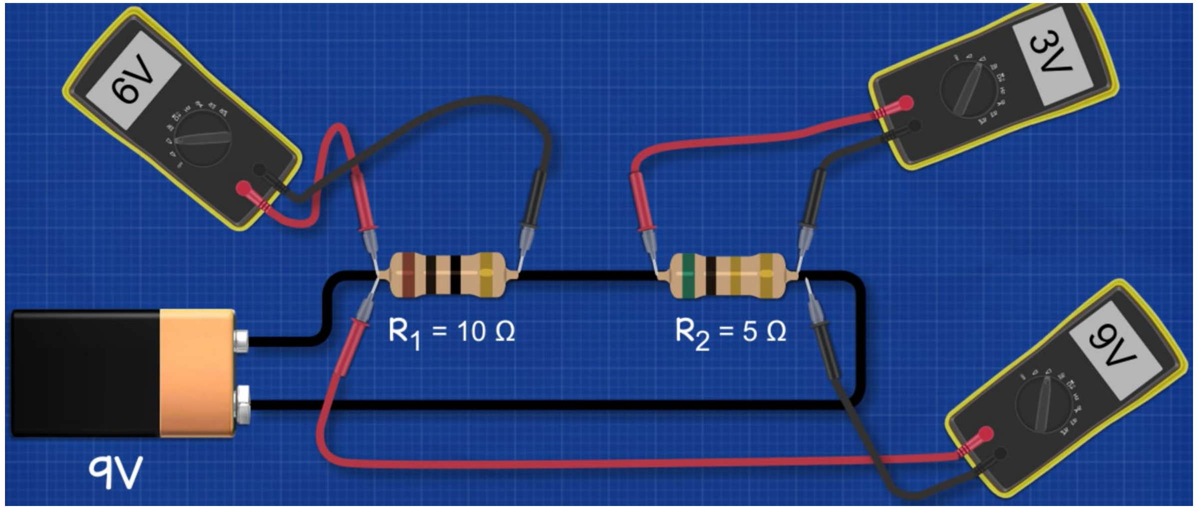




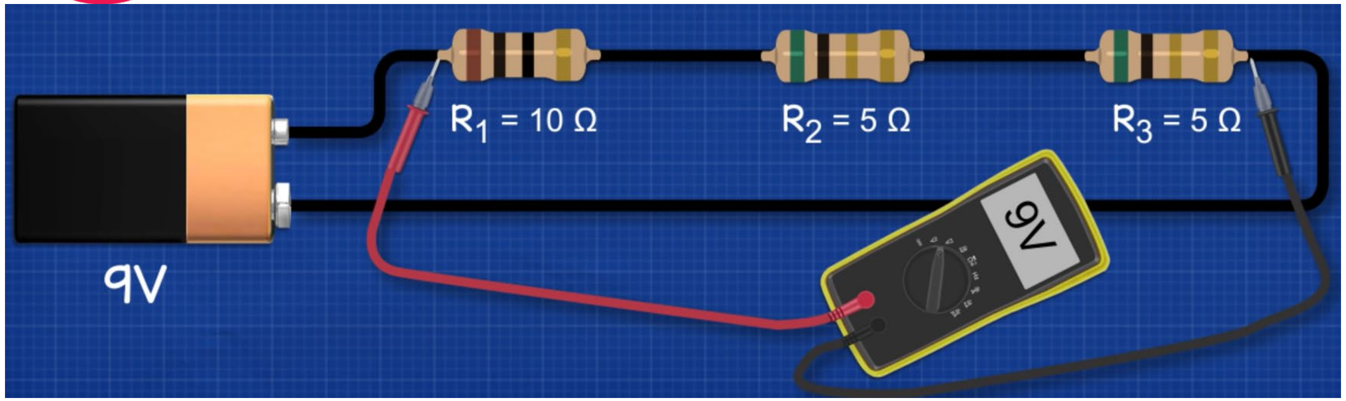


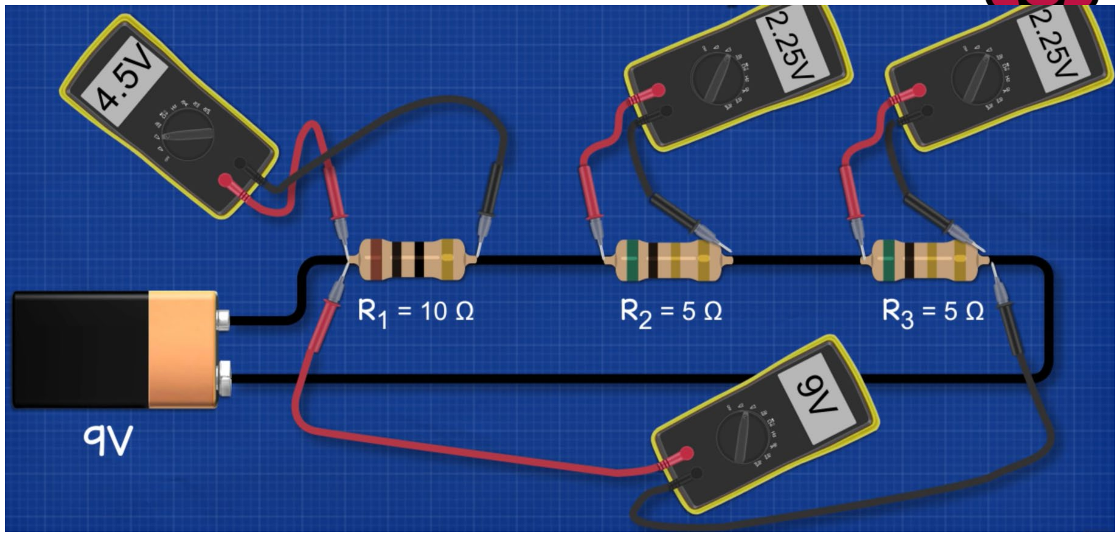


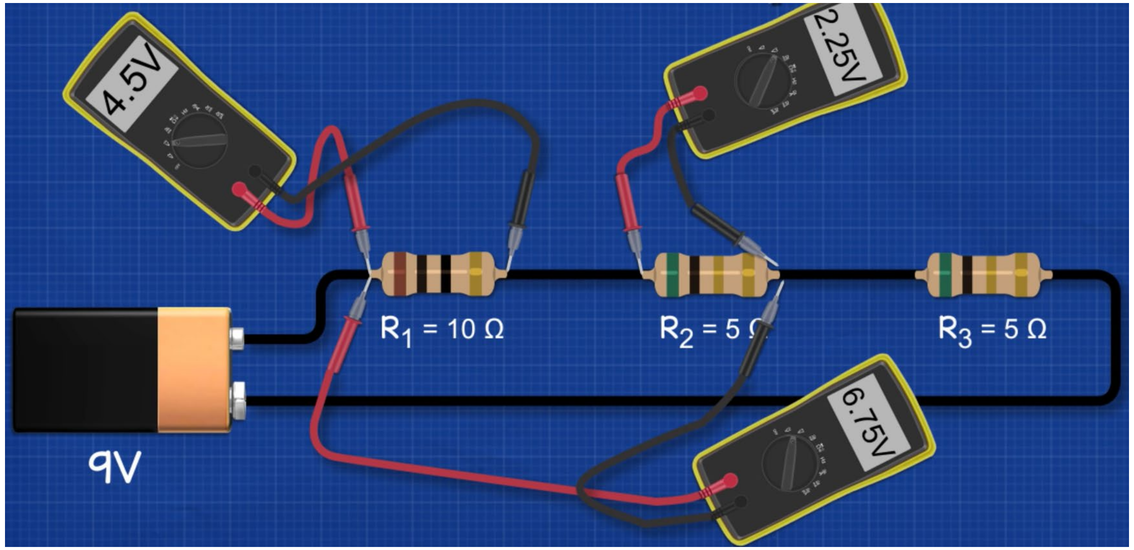


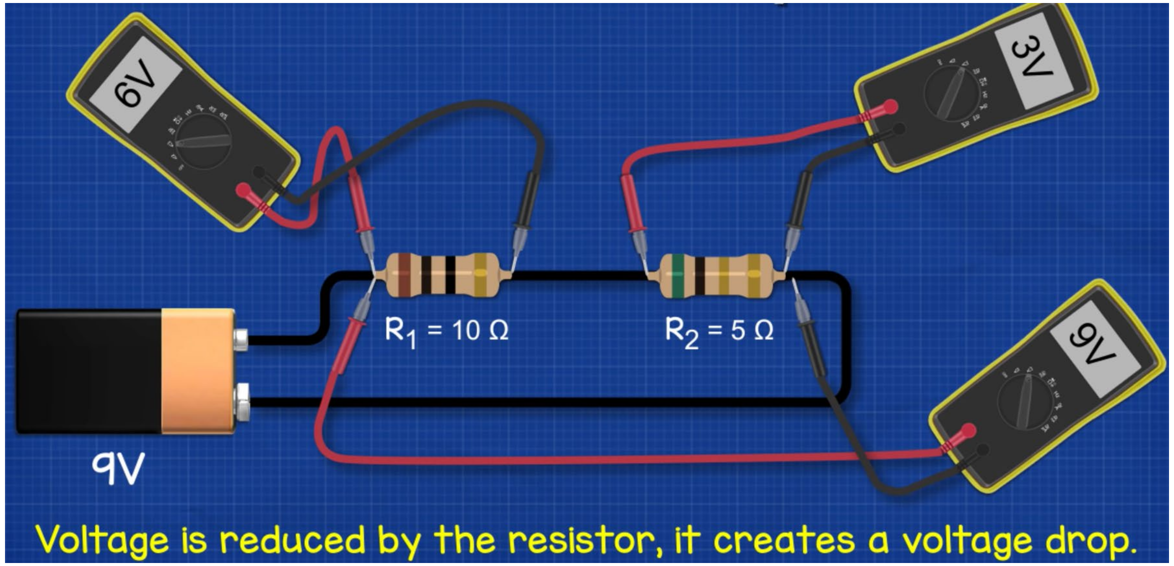


Resistor Application



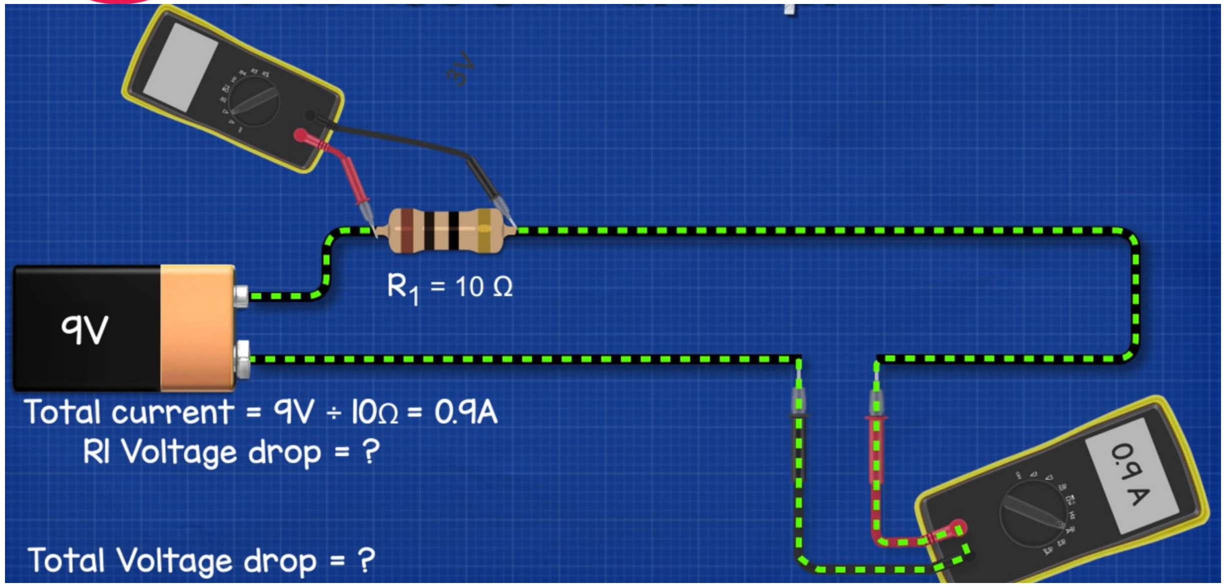


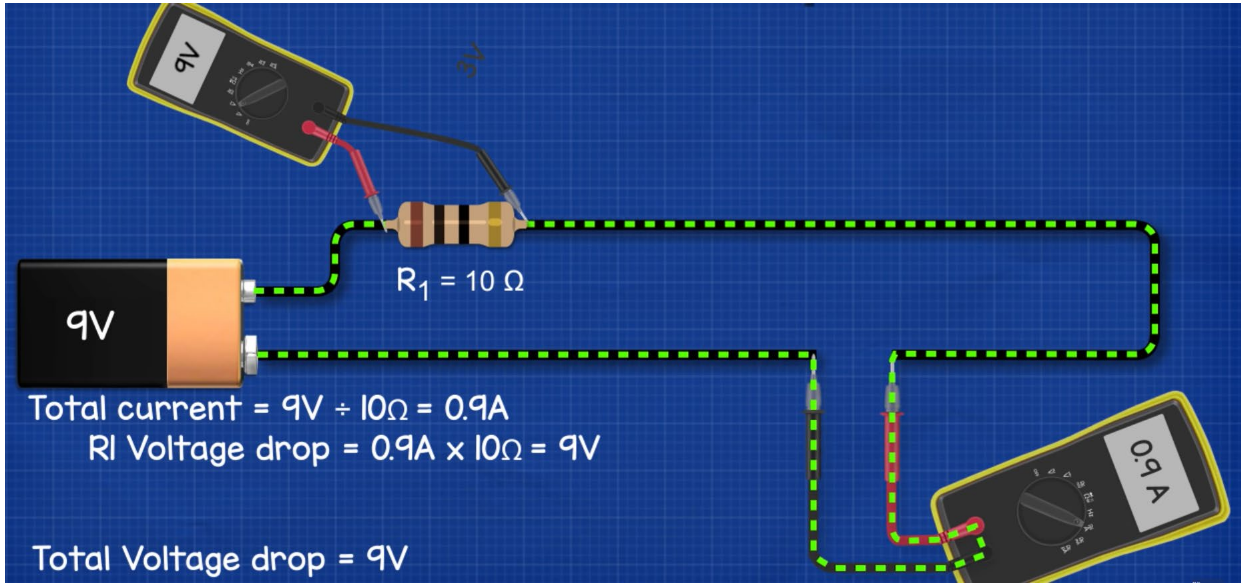


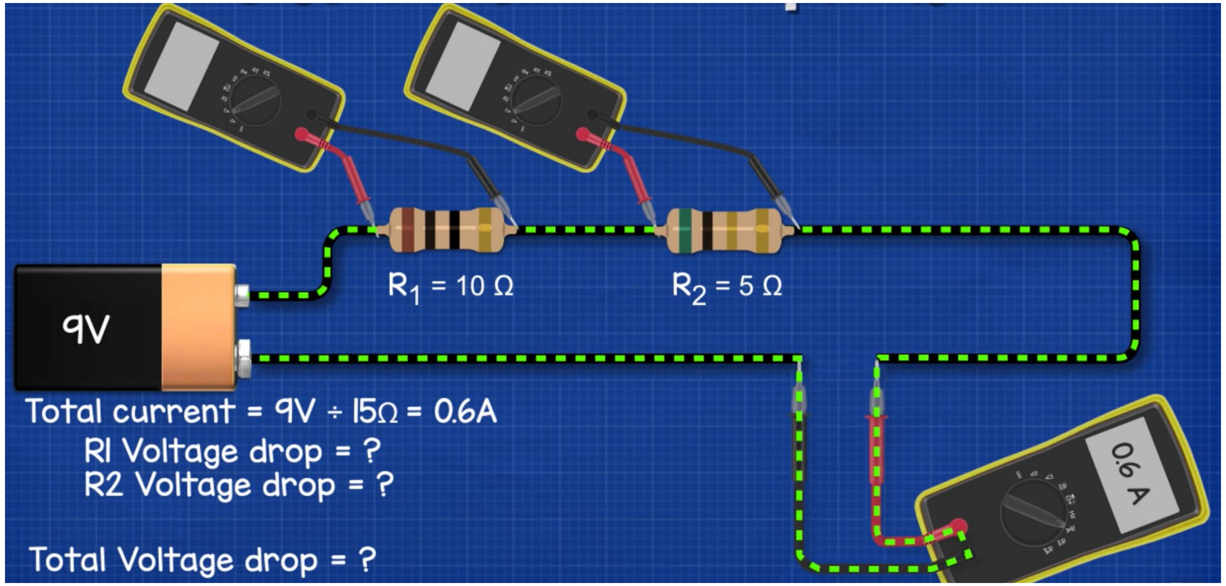


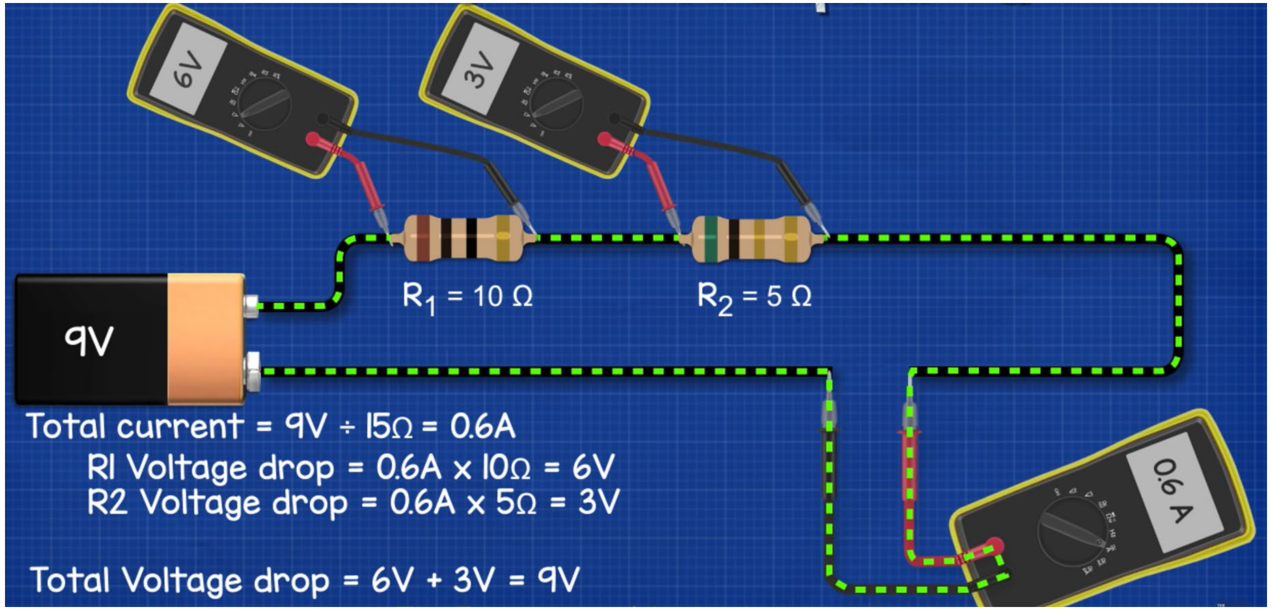
Unlike current, where it's the same throughout the circuit
Voltage will be different throughout in a series circuit

Voltage Calculation

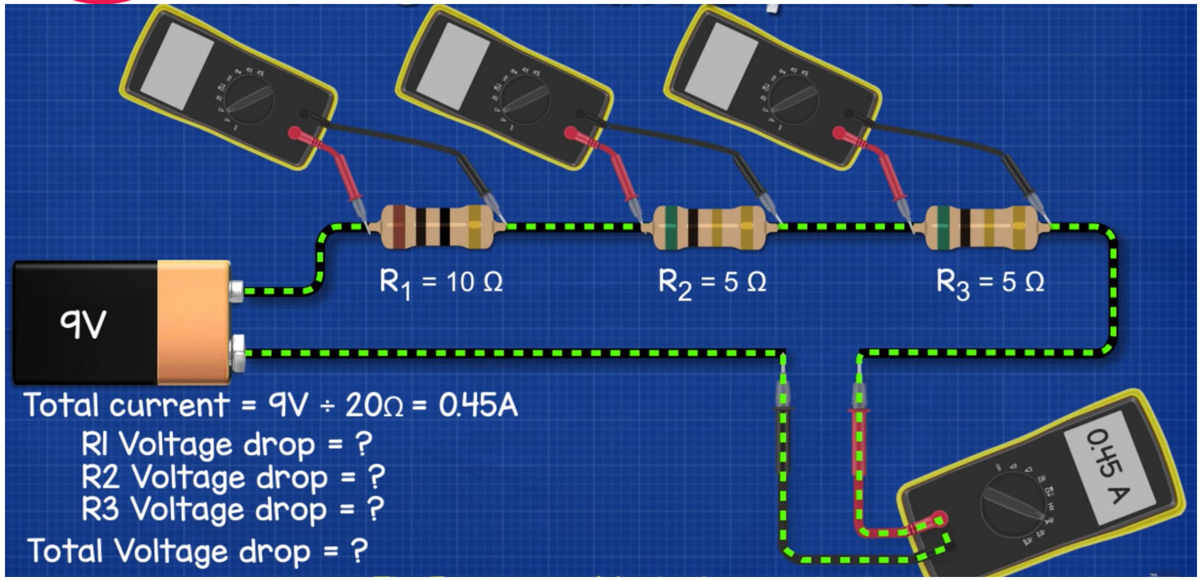


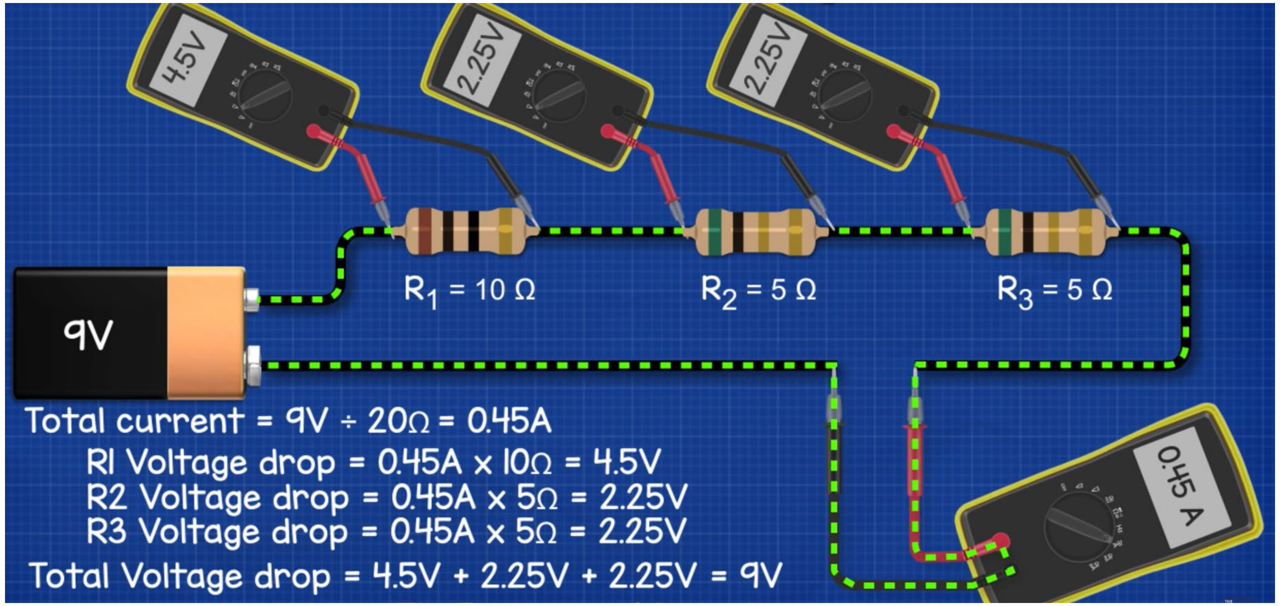






Voltage, Current and Power Calculation





How do we calculate power consumption?

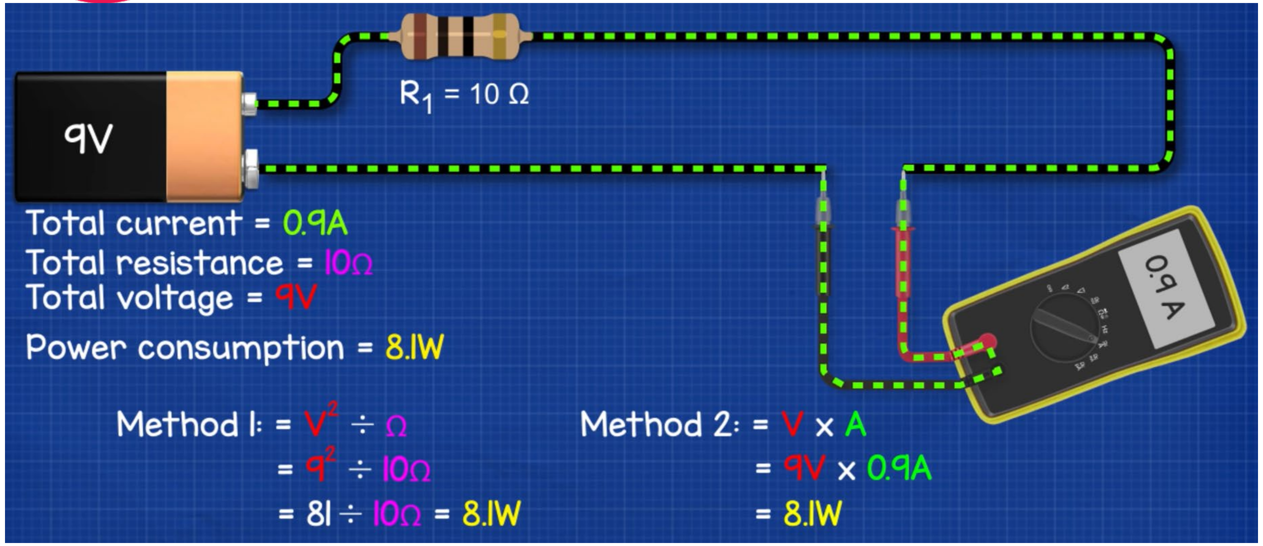
Formulas:

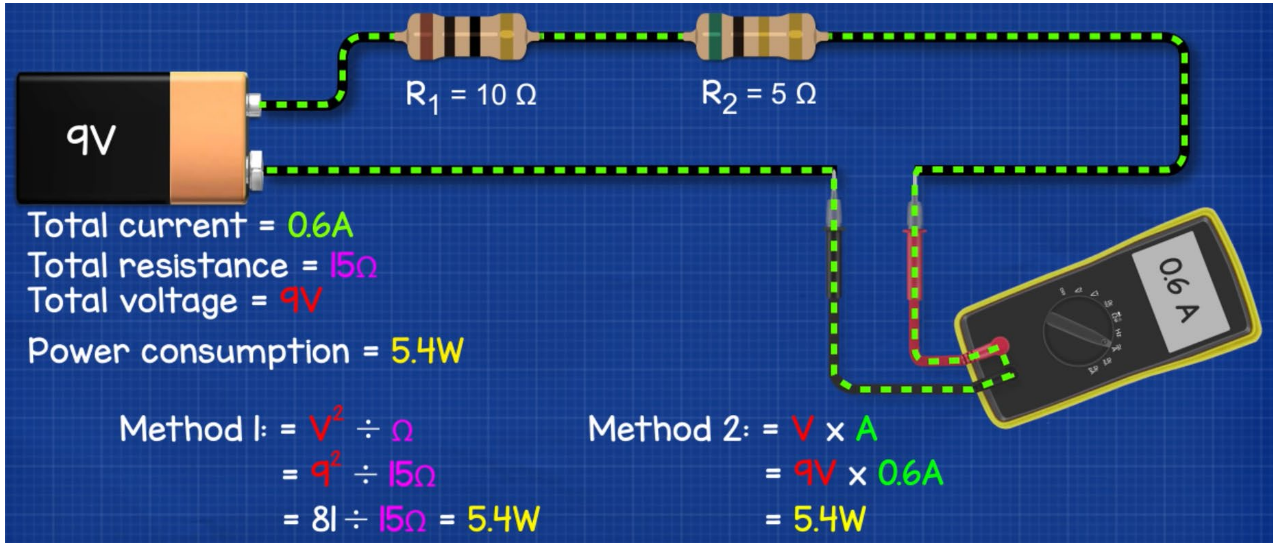
Power (Watts) = Voltage^2 (V) ÷ Resistance (Ω)

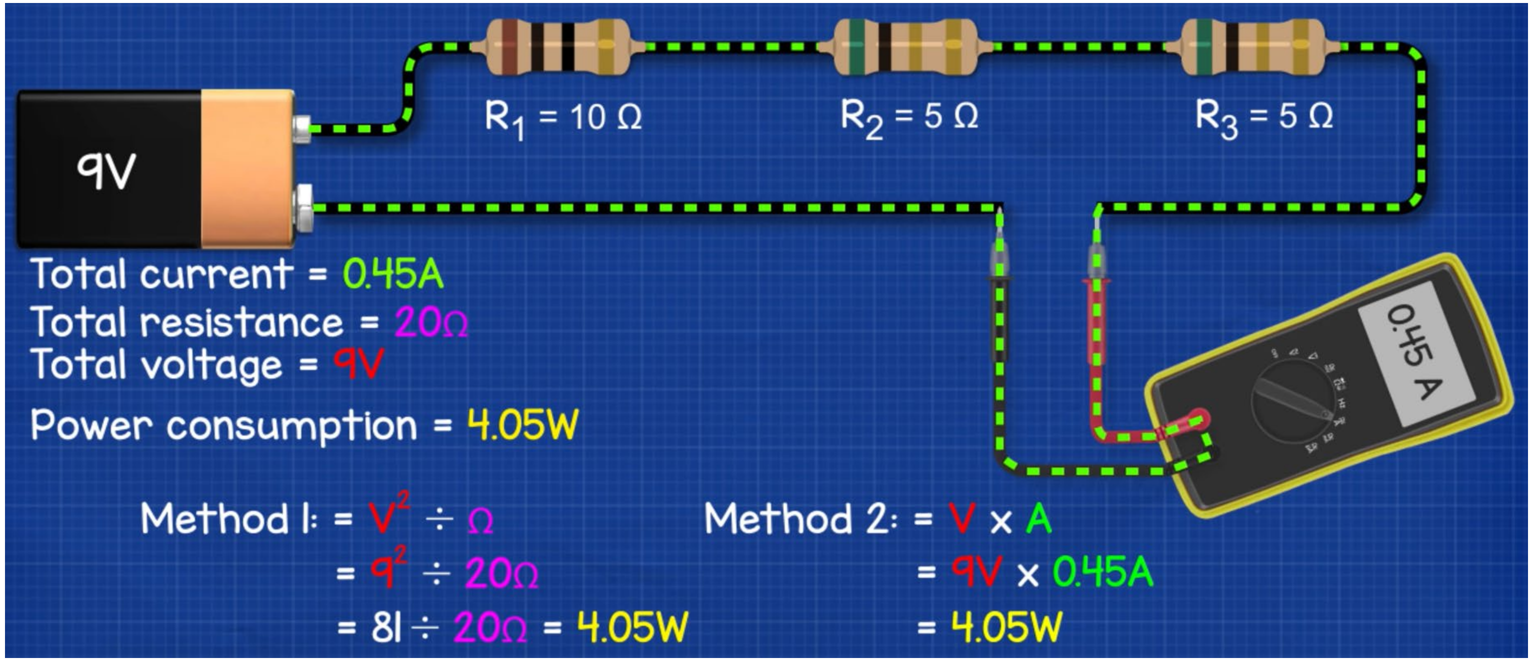
or

Power (Watts) = Voltage (V) x Current (A)

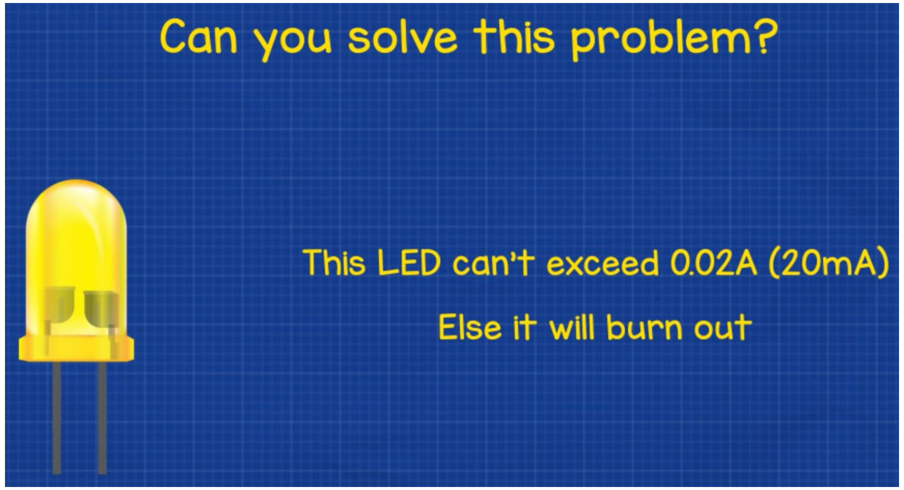
Power Consumption Calculation



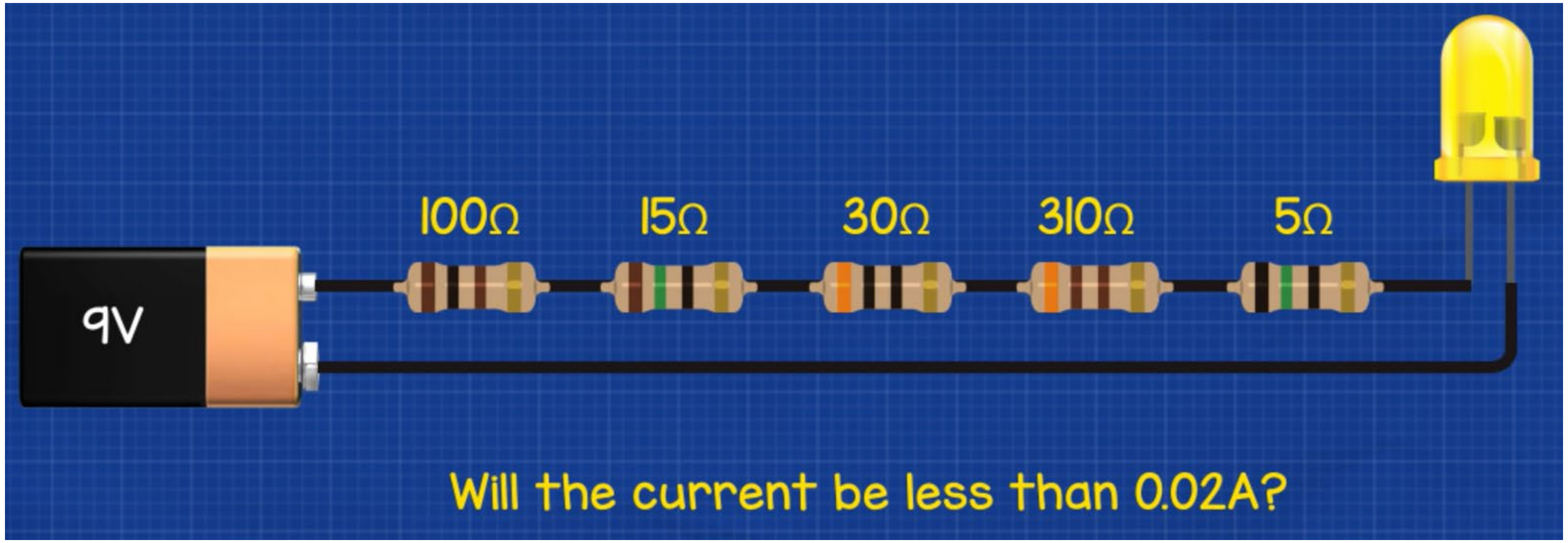




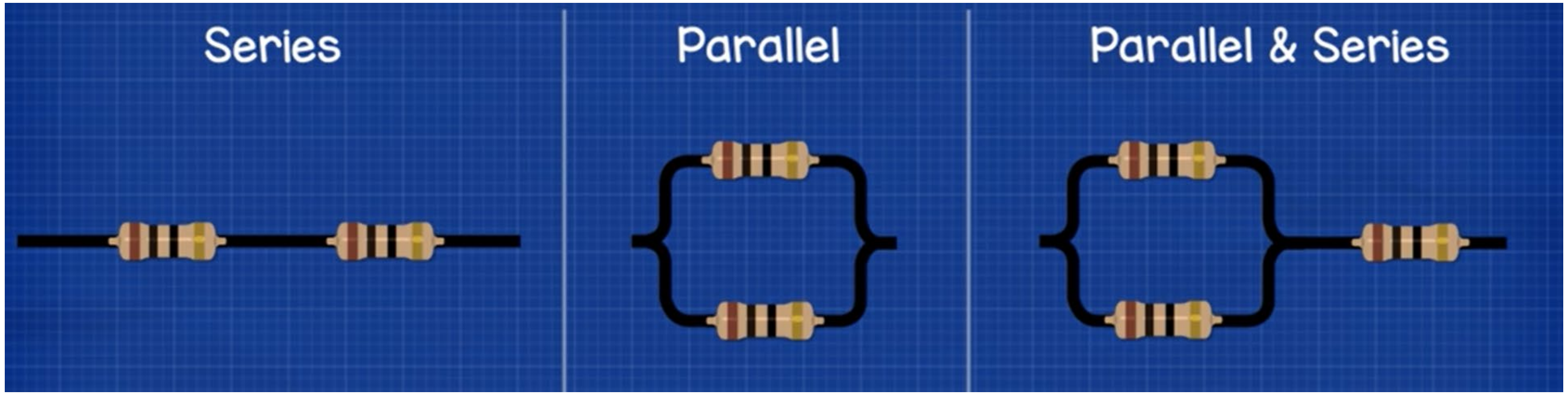
Try to Solve



Can you solve this problem?
This LED can't exceed 0.02A (20mA)
Else it will burn out

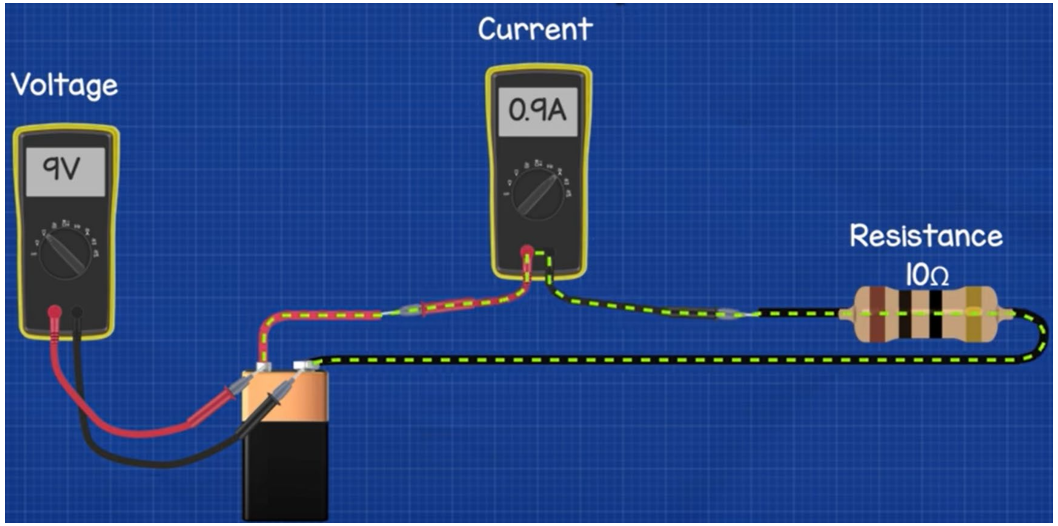


100Ω
15Ω
30Ω
310Ω
5Ω
9V
Will the current be less than 0.02A?

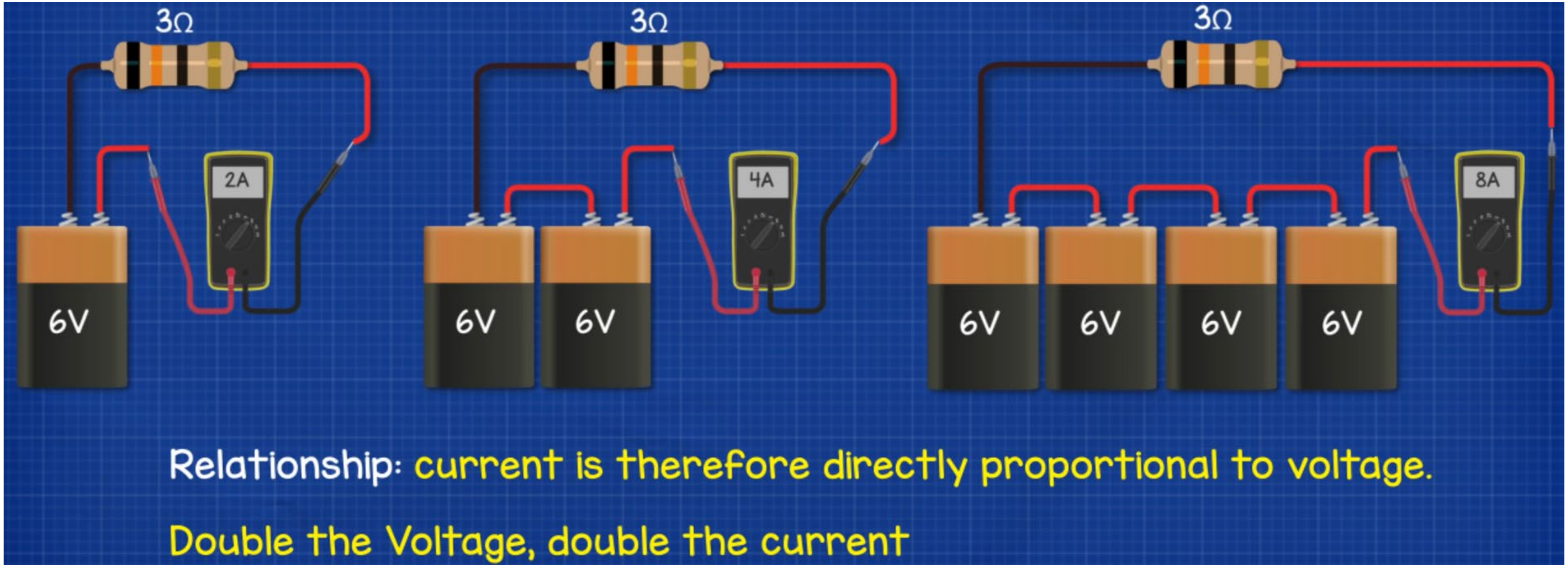


Series
Parallel
Parallel & Series

Ohm's Law

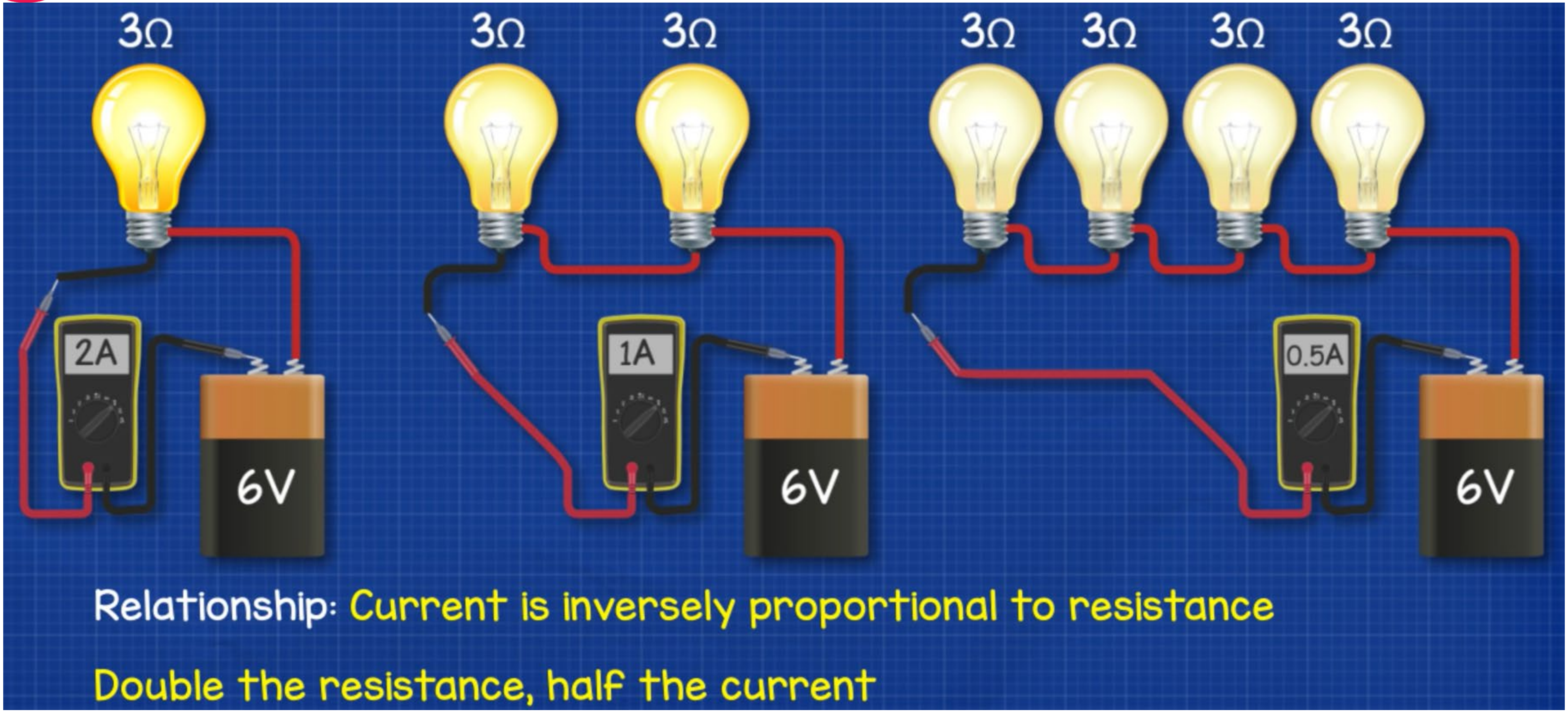


Current
Voltage
9V
0.9A
Resistance
10Ω

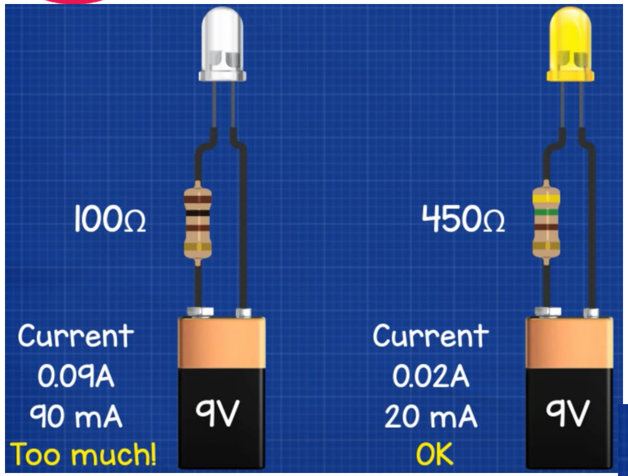


3Ω
3Ω
3Ω
2A
4A
8A
6V
6V
6V
6V
6V
6V
6V
Relationship: current is therefore directly proportional to voltage.
Double the Voltage, double the current

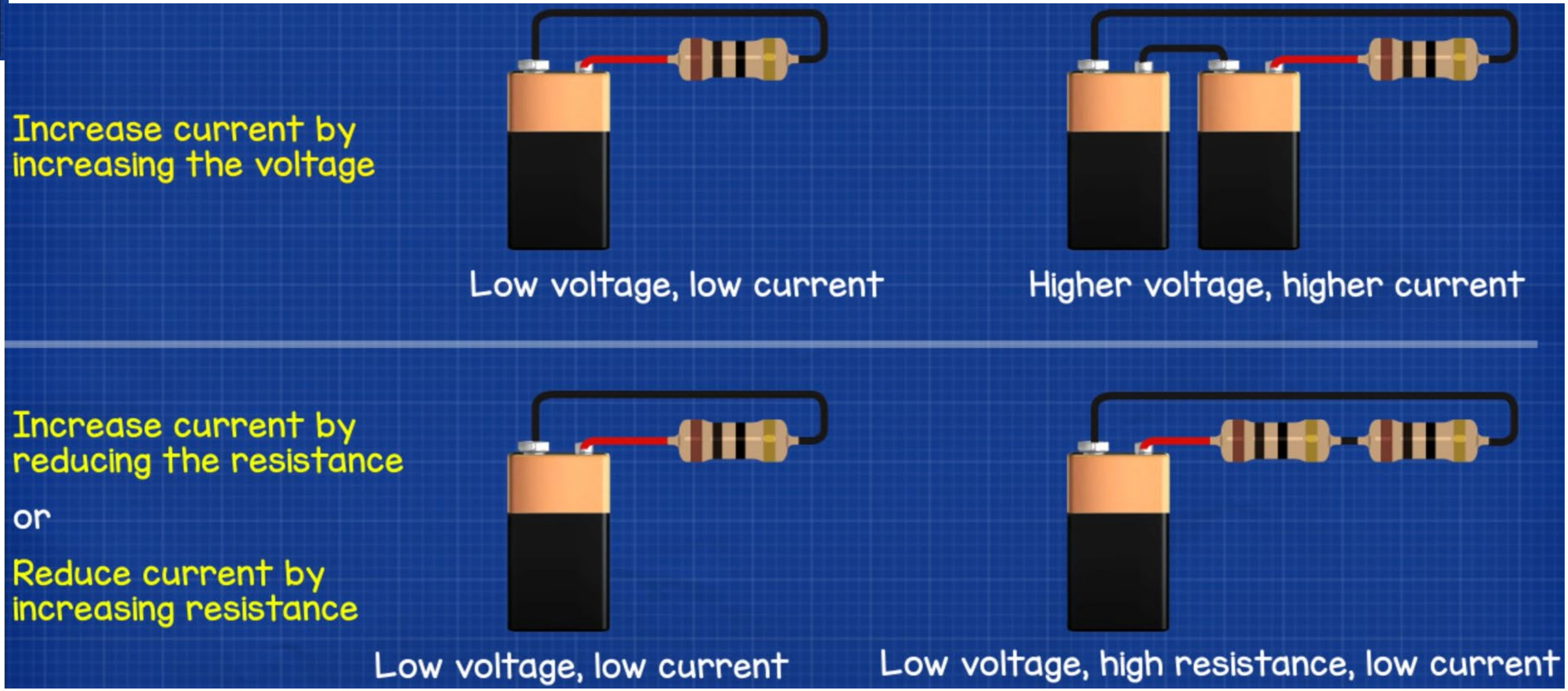
Ohm's Law Application



Ohm’s Law

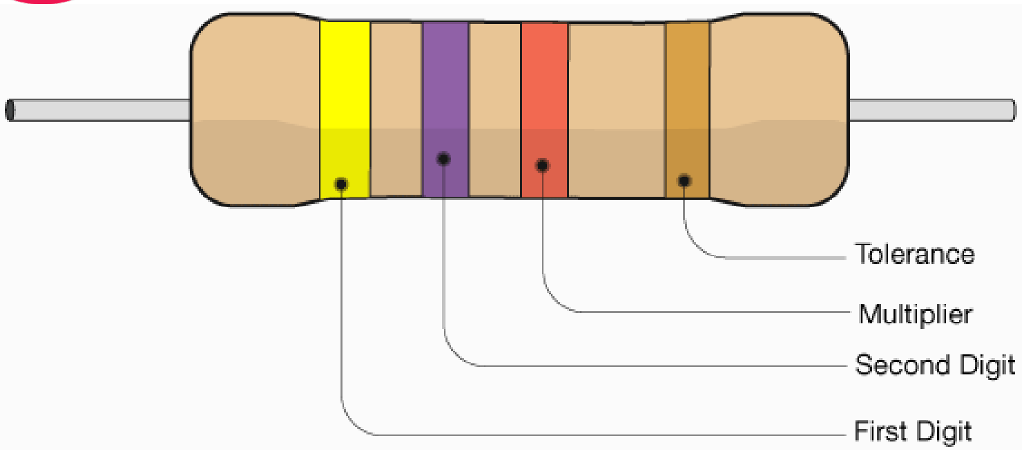


100Ω
450Ω
Current
0.09A
90 mA
Too much!
9V
Current
0.02A
20 mA
OK
9V



Increase current by increasing the voltage
Low voltage, low current
Higher voltage, higher current
Increase current by reducing the resistance
or
Reduce current by increasing resistance
Low voltage, low current
Low voltage, high resistance, low current

Resistor Colour Code



	1st Digit	2nd Digit	Multiplier	Tolerance
Black	0	0	x 1	Silver ±10%
Brown	1	1	x 10	Gold ±5%
Red	2	2	x 100	
Orange	3	3	x 1000	
Yellow	4	4	x 10000	
Green	5	5	x 100000	
Blue	6	6	x 1000000	
Violet	7	7		
Grey	8	8		
White	9	9		

Example Shown :

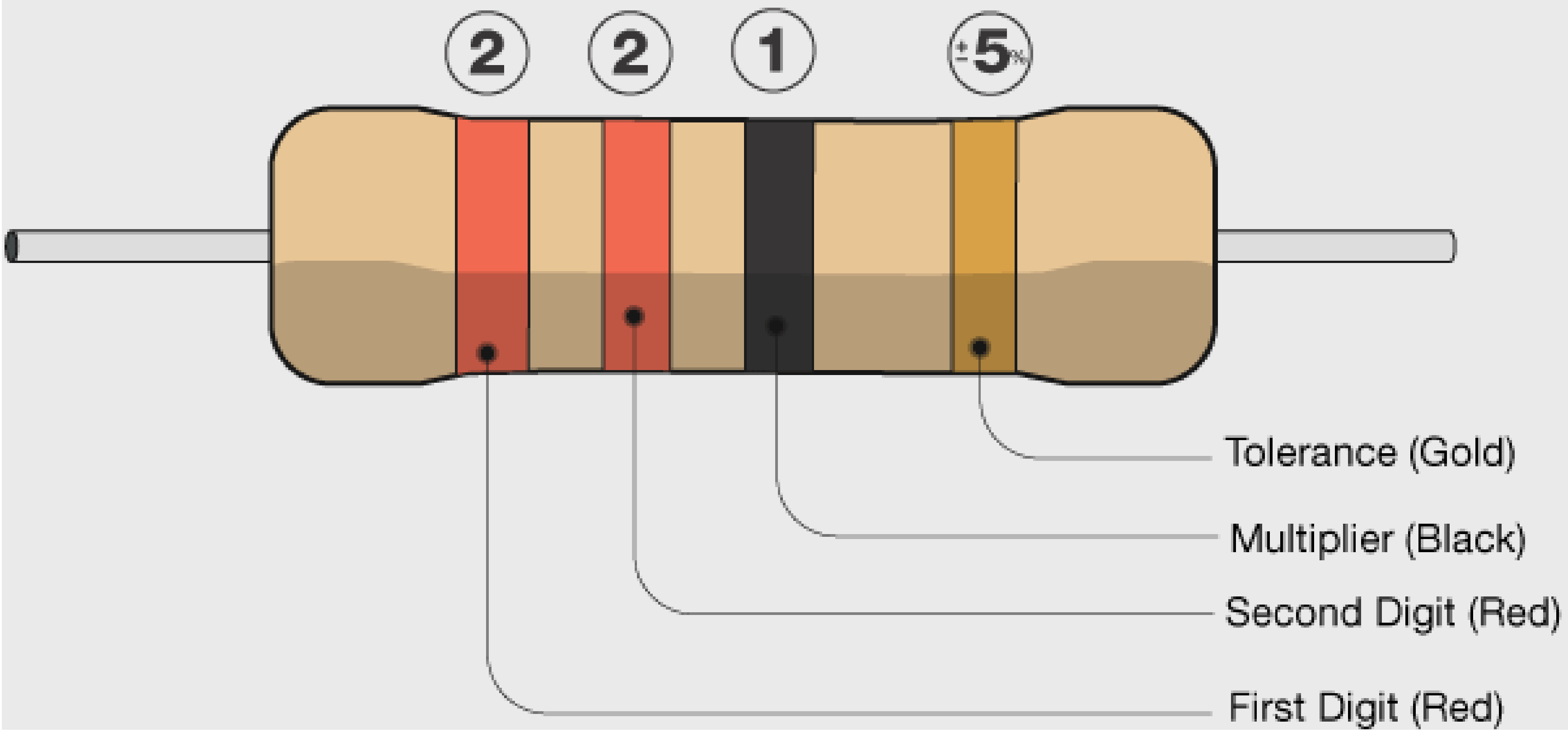
Yellow	Violet	Red	Gold
4	7	⊗ 100	±5%

4700 Ω ±5%

Mnemonic

BB ROY GREAT
BRITAIN VERY
GOOD WIFE

Resistor Colour Code Examples



Band colours in order	RED	RED	BLACK	GOLD
Digit representation	2	2	1	±5%
Value	22 Ω ±5 %			

Tolerance Limit

Band colours in order	RED	RED	BLACK	GOLD
Digit representation	2	2	1	±5%
Value	22 Ω ±5 %			

The tolerance limit values represent by how much the resistance can vary from its mean value in terms of percentage.

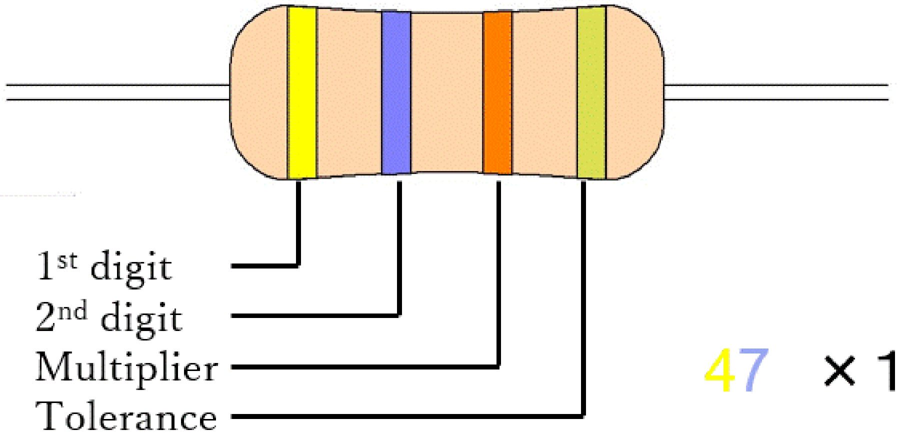
Tolerance=Value of resistor × value of tolerance band

= 22 Ω × 5% = 1.1 Ω

22 Ω resistor with a tolerance value of 1.1 Ω could range from the actual value as much as 23.1 Ω to as little as 20.9 Ω.

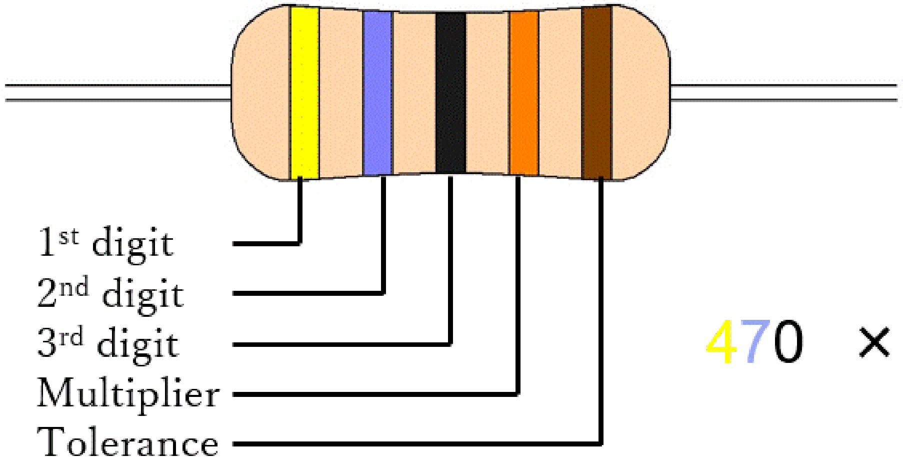
Resistor Colour Code Examples

4-Band Code



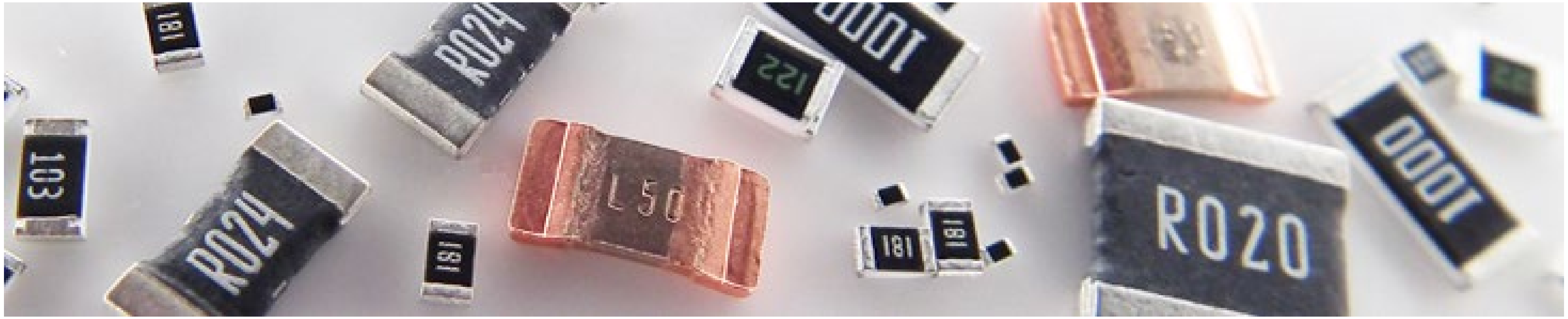
$47 \times 10^{3} = 47000 = 47k\Omega \quad \pm 5\%$

5-Band Code



$470 \times 10^{3} = 470000 = 470k\Omega \quad \pm 1\%$

Chip Resistors conversion rules



102 → 10×10^2 = 1000Ω（1kΩ)

1002 → 100×10^2 = 10000Ω（10 k Ω)

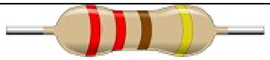
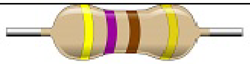
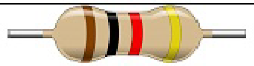
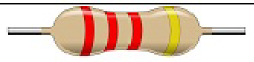
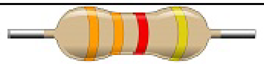
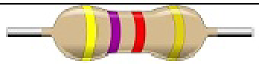
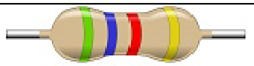
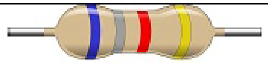
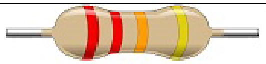
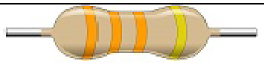
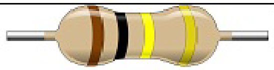
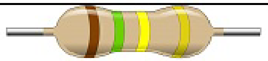
R047 → Read “R” as a decimal point. → 0.047Ω（47mΩ)

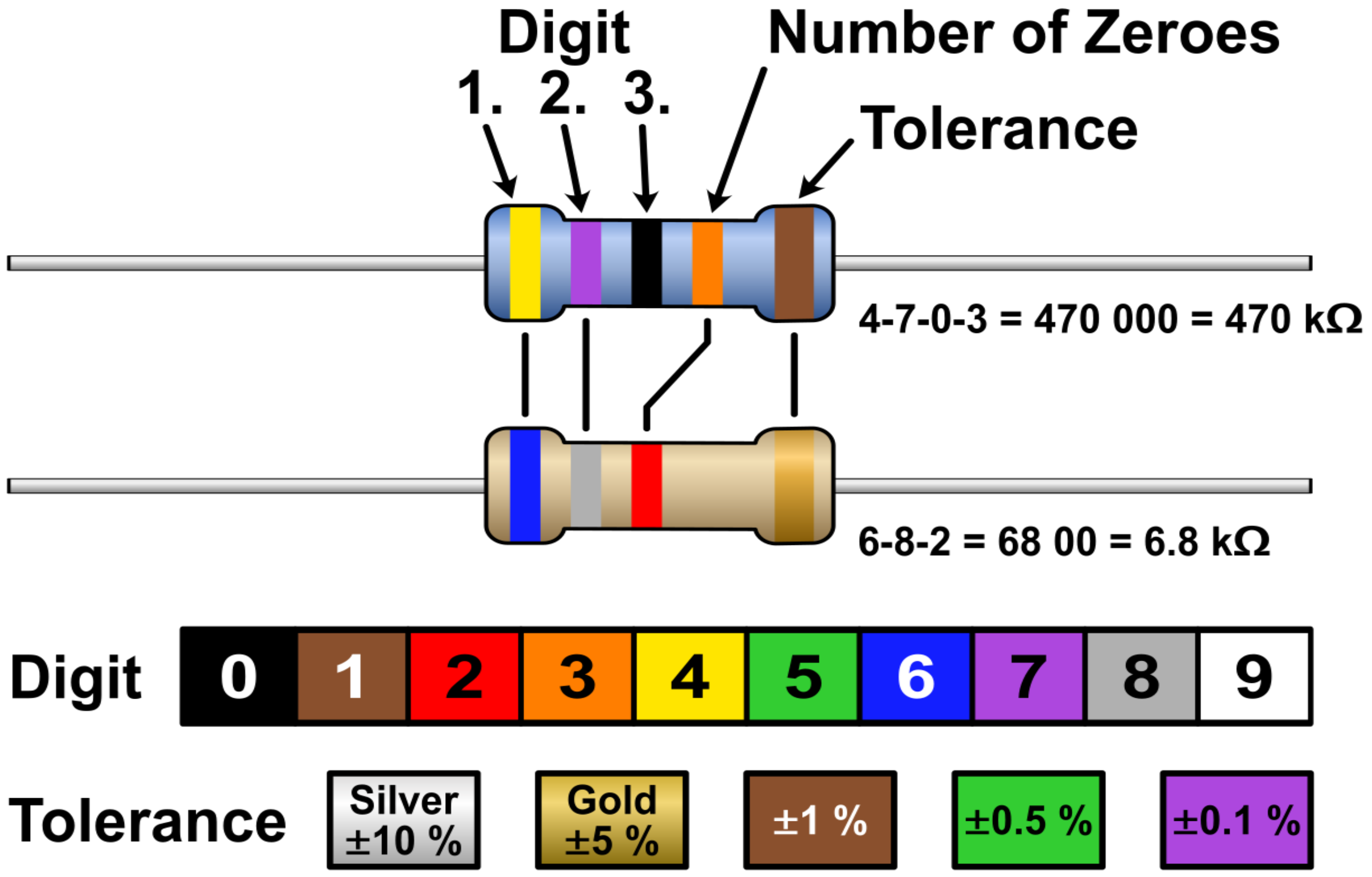
0K47 → Read “K” as a decimal point. → 0.47KΩ

4M7 → Read “M” as a decimal point. → 4.7MΩ

10L0 → Read “L” as a decimal point of mΩ → 10mΩ

Most commonly used Resistors

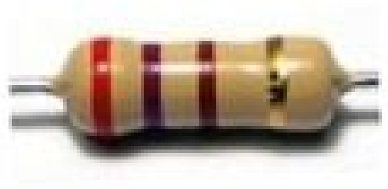
Resistor Value	Common Resistor	Color Band		
100 Ohm		Brown 1	Black 0	Brown 0
220 Ohm		Red 2	Red 2	Brown 0
330 Ohm		Orange 3	Orange 3	Brown 0
470 Ohm		Yellow 4	Violet 7	Brown 0
1 K		Brown 1	Black 0	Red 00
2.2 K		Red 2	Red 2	Red 00
3.3.K		Orange 3	Orange 3	Red 00
4.7 K		Yellow 4	Violet 7	Red 00
5.6 K		Green 5	Blue 6	Red 00
6.8 K		Blue 6	Grey 8	Red 00
10 K		Brown 1	Black 0	Orange 000
22 K		Red 2	Red 2	Orange 000
33 K		Orange 3	Orange 3	Orange 000
47 K		Yellow 4	Violet 7	Orange 000
100 K		Brown 1	Black 0	Yellow 0000
150 K		Brown 1	Green 5	Yellow 0000



Extended Tolerance Limit

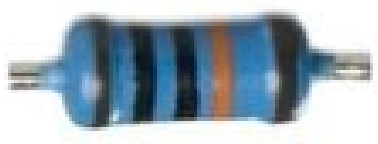
Color	Value	Multiplier	Tolerance
Black	0	$\times10^{0}$	± 20%
Brown	1	$\times10^{1}$	± 1%
Red	2	$\times10^{2}$	± 2%
Orange	3	$\times10^{3}$	± 3%
Yellow	4	$\times10^{4}$	
Green	5	$\times10^{5}$	± 0.5%
Blue	6	$\times10^{6}$	± 0.25%
Violet	7	$\times10^{7}$	± 0.10%
Gray	8	$\times10^{8}$	± 0.05%
White	9	$\times10^{9}$	
Gold	–	$\times10^{-1}$	± 5%
Silver	–	$\times10^{-2}$	± 10%

4-band resistor



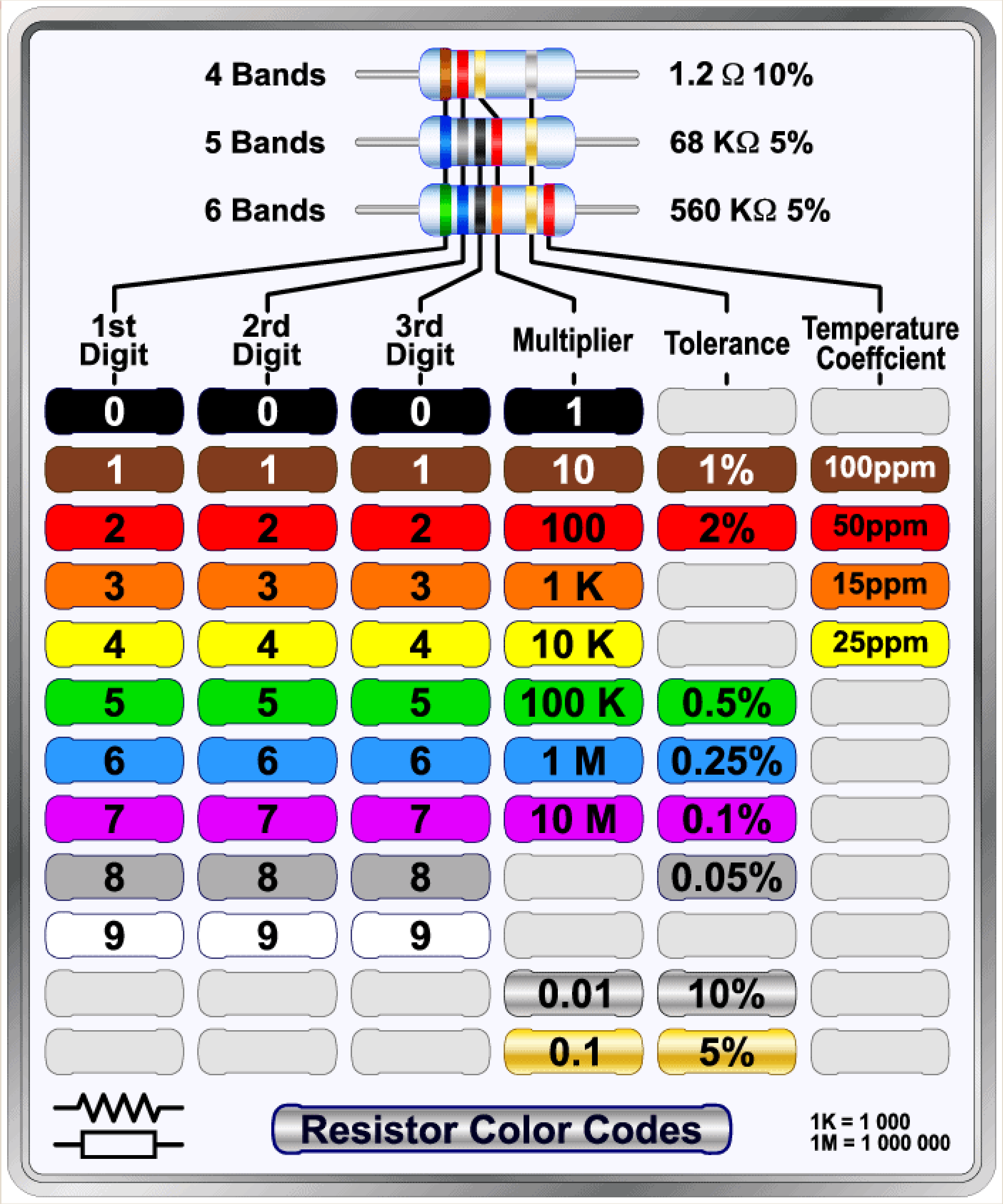
270 ohms ± 5%

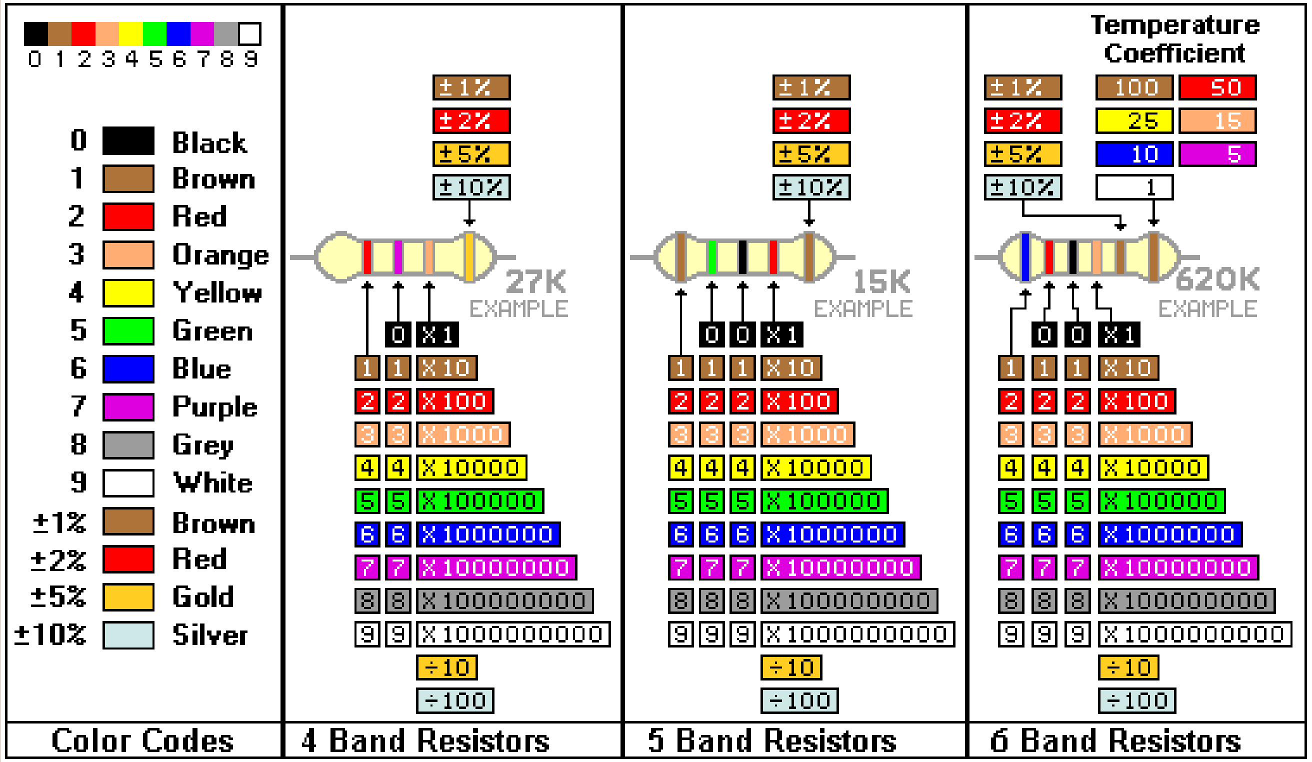
5-band resistor



100k ohms ± 1%

Resistor Colour Code Examples





Quizzzz

1) The Color Coding is used to indicate ________ value/rating of Resistor.

a) Numerical

b) Alphabetical

c) Resistance

d) a & c are correct

2) The Resistor Color Code was developed by ________________________.

a) International Organization for Standardization (ISO)

b) Electronics Industries Alliance (EIA)

c) Radio Manufacturers Association (RMA)

d) a & b are correct

Quizzzz

3) Recently, _______________standard Color Coding is used for Resistor's values.

a) World Standardized Corporation (WSC)
b) Electronics Industries Alliance (EIA)
c) Radio Manufacturers Association (RMA)
d) International Organization for Standardization (ISO)

4) The color code standard was developed in ______________________.

a) 1890
b) 1920
c) 1940
d) 1900

Quizzzz

5) Why is Color Coding used for Resistors ?

a) Small Size

b) Cylindrical Shape

c) Due to Through Hole Component

d) a & b are correct

6) How many colour bands used on Resistors ____________________

a) 4

b) 5

c) 6

d) 7

Quizzzz

7) How to read color bands on Resistors ?

a) Right to Left
b) Left to Right
c) From both sides
d) All are correct

8) The first two bands on the resistors are ______________________________

a) Two digits
b) Decimal Multiplier
c) Tolerance
d) All are incorrect

Quizzzz

9) The tolerance of the Silver band on Resistor is ___________________________

a) 3%

b) 5%

c) 10%

d) 20%

10) The gold band tolerance on Resistor is ___________________________

a) 3%

b) 5%

c) 10%

d) 20%

Quizzzzz

11) If there is no band on Resistor then tolerance is ______________________

a) 3%

b) 5%

c) 10%

d) 20%

12) Which digit is represented by a Green band on a Resistor?

a) 4

b) 5

c) 6

d) 3

Quizzzz

13) The decimal multiplier means, how many ________ add after the first digits.

a) Zeros

b) Digits

c) Tolerance

d) Resistance

14) What color is a 340 KΩ resistor with 5% tolerance?

a) Orange, Yellow and Yellow with Gold

b) Orange, Green and Yellow with Gold

c) Orange, Blue and Orange with Gold

d) Orange, Yellow and Green with Gold

Quizzzz

15) A zero-ohm resistor is indicated by a single black color ring around the body of the resistor.

a) Yes

b) No

c) Zero ohm resistors does not exist

d) None of these

16) Why zero ohm resistors are used?

a) Connect the Tracks

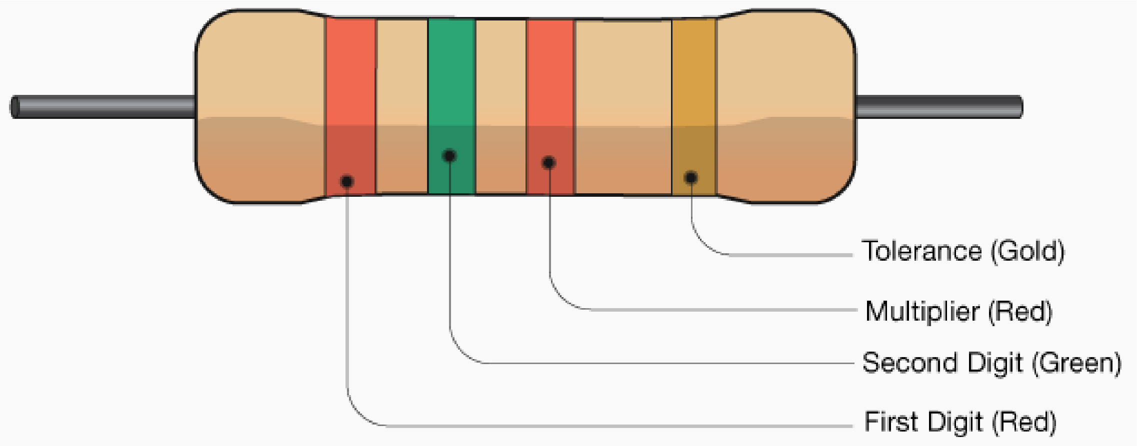
b) As Jumpers

c) Increase Machine Production Time

d) All are correct

Quizzzz

17) Determine the resistance of the given resistor with the given colour sequence (Red, Green, Red, Gold).



a) 250 ± 5% Ω.

b) 25 ± 5% kΩ.

c) 2500 ± 5% kΩ.

d) 2.5 ± 5% kΩ.

18) What colour bands would a resistor of resistance value 1000 Ω with a tolerance level ±5% have?

a) Brown, Black and Orange , Gold

b) Black, Brown and Orange, Gold

c) Black, Brown, Black , Red , Gold

d) Brown, Black , Red , Gold

Quizzzz

19) The tolerance of the Brown band on Resistor is ___________________________

a) ± 3%

b) ± 5%

c) ± 1%

d) ± 2%

20) The green band tolerance on Resistor is ___________________________

a) ± 0.3%

b) ± 0.5%

c) ± 1%

d) ± 2%

Quizzzz

21) The tolerance of the Red band on Resistor is ______________________

a) ± 3%

b) ± 5%

c) ± 1%

d) ± 2%

22) The blue band tolerance on Resistor is ______________________

a) ± 0.3%

b) ± 0.5%

c) ± 1%

d) ± 0.25%

Quizzzzz

23) The tolerance of the violet band on Resistor is ______________________

a) ± 0.3%

b) ± 0.5%

c) ± 0.1%

d) ± 0.25%

24) The grey band tolerance on Resistor is ______________________

a) ± 0.3%

b) ± 0.05%

c) ± 0.25%

d) ± 0.1%

Quizzzz

25) Three Resistances of R1=20Ω , R2=57Ω & R1=90Ω are is series then how will the total resistance?

a) 167Ω
b) 157Ω
c) 147Ω
d) 177Ω

26) When current flows through a resistance, electrical energy is converted into ____________ energy.

a) Chemical
b) Heat
c) Light
d) Elastic

Quizzzz

27) The formula to calculate Current (I) in Series Resistance Circuit is ________.

a) I = V/R

b) I = I^2 × R

c) I = V× R

d) I = Vtotal / Rtotal

28) When components are connected in successive order is called ________.

a) Short Circuit

b) Open Circuit

c) Bypassed Circuit

d) All are correct

Quizzzzz

29) __________states that the sum of all resistor voltage drops in a series circuit equals the applied voltage.

a) Ohm's Law

b) Kirchhoff's voltage law (KVL)

c) Kirchhoff's current law (KCL)

d) b & c are correct

30) In a _________Circuit, current is Same in the all part/component.

a) Series

b) Parallel

c) String

d) a & c are correct

Quizzzz

31) A combination of __________ resistances is often called string.

a) Parallel Circuit

b) Series Circuit

c) Series Parallel Circuit

d) all are correct

32) The formula to calculate the power dissipates against any Resistor is ________.

a) P = W/Q

b) P = I^2 × R

c) P = VR

d) P = IR

Quizzzz

33) The resistance of an open series circuit is ______________.

a) High

b) Low

c) Extremely High (Infinity)

d) Extremely Low

34) The resistance of the short circuit (comparing to open circuit**) is __________.**

a) Zero

b) Maximum

c) Infinity

d) Low

Quizzzzz

35) The ______________ of a resistor is determined mainly by its physical size.

a) Resistance

b) Power

c) Current

d) a & b are correct

36) Resistor is an ____________________ component/device.

a) Active

b) Passive

c) Both

d) Sometimes active and sometimes passive

Quizzzz

37) There are two main characteristics of a resistor are ____________________.

a) Current and Voltage

b) Current and Power

c) Resistance and Power

d) Resistance and Current

38) Resistors are generally available in the maximum value of ____________ohm.

a) Mega (M Ω)

b) Gega (G Ω)

c) Kilo (K Ω)

d) Tera (T Ω)

Quizzzzz

39) The power rating of a resistor should be _____________ than from actual power dissipation (Waste) as heat for the reason of Safety factor (Burning).

a) Less

b) More

c) Equal

d) None of these

40) Most common type of Resistor is ___________________________

a) Wire Wound Resistor

b) Carbon Resistor

c) Film Type Resistor

d) Fusible Resistor

Quizzzzz

41) Resistors are ________________ components.

a) Polar

b) Non-Polar

c) Both

d) None of these

42) Power Rating and Physical Size of Resistor is ______________ proportional.

a) Directly

b) In-Directly

c) Both

d) None of these

Quizzzz

43) Resistors Carbon Composition Resistors are most popular because _________

a) Low Price

b) Small Size

c) High inductance

d) a & b are correct

44) Advantages of carbon composition resistor are ____________________

a) Small Size

b) Low Cost

c) Withstand at high energy pulses

d) All are Correct

Quizzzz

45) The value of Carbon Composition Resistor could be changed by ___________

a) If not in use for a year (5%)

b) Soldering (Heat) – 3 %

c) Operate at 70°C Temperature (15%)

d) All are Correct

46) Disadvantages of carbon composition resistor are _____________________

a) Instability of Resistance Value

b) High Temperature Coefficient

c) High Noise

d) All are Correct

Quizzzzz

47) 1mA is equal to ________________.

a) 100µA

b) 10µA

c) 1000µA

d) 10A

48) The electric shock of 0.1 to 0.2 Amp can cause the ________________.

a) Mild sensation

b) Threshold of sensation

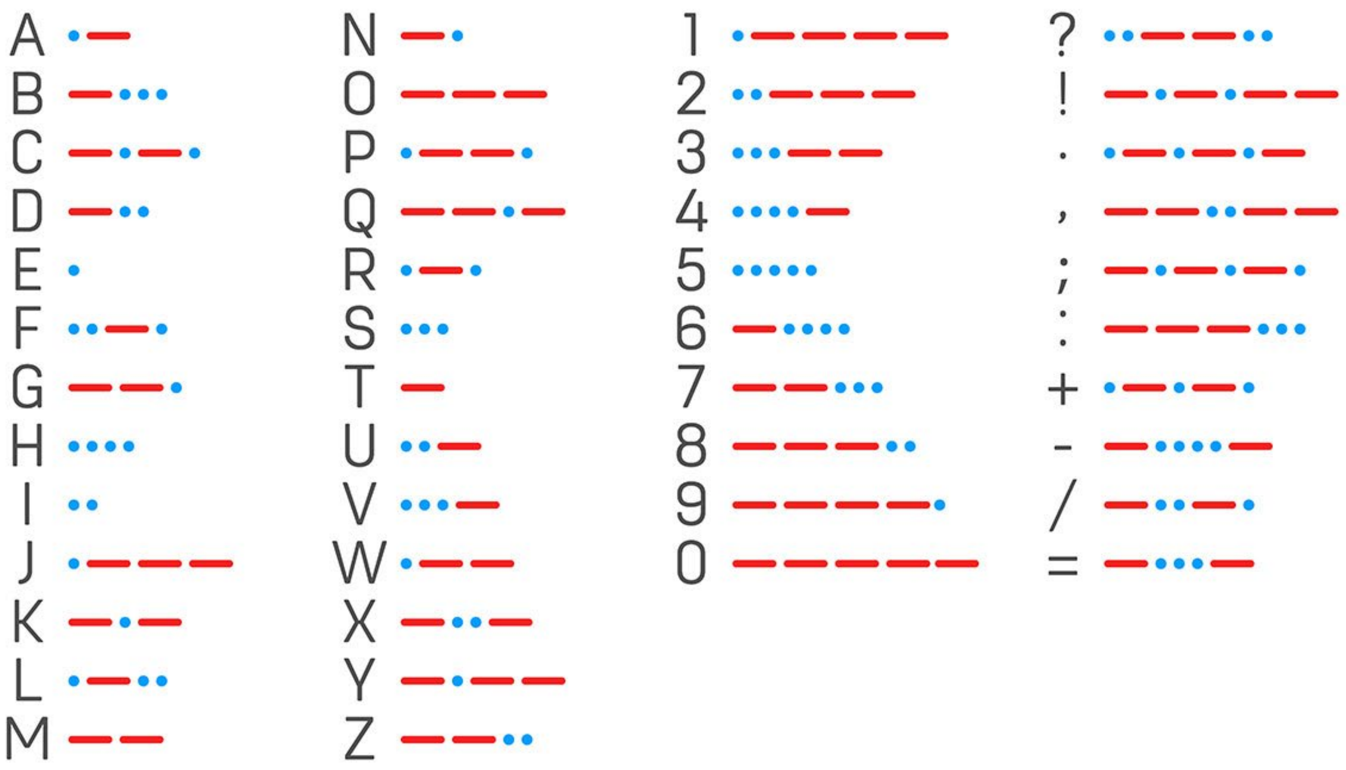
c) Death

d) Painful

Morse Code

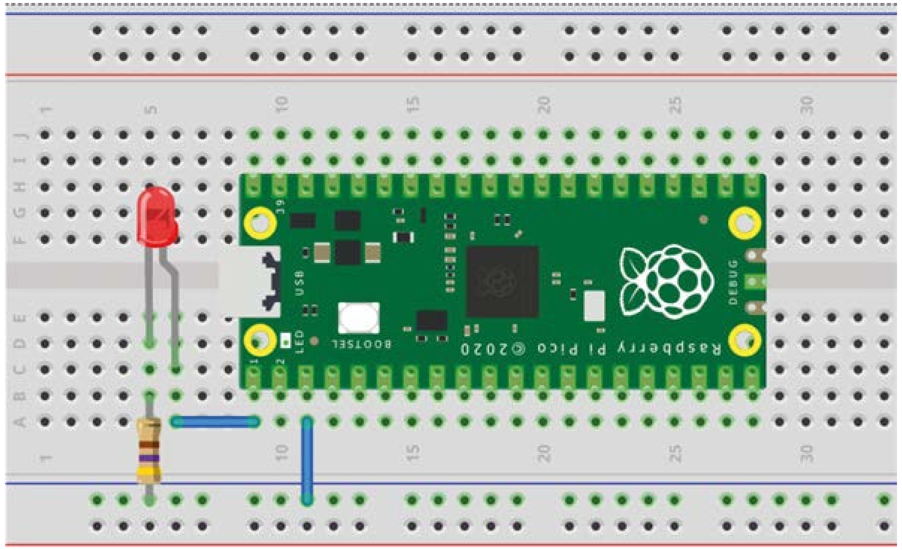
- ✓ Morse code is a method used in telecommunication to encode text characters as standardized sequences of two different signal durations, called dots and dashes, or dits and dahs. Morse code is named after Samuel Morse, one of the inventors of the telegraph.
- ✓ Morse Code uses an alphabet made up of dots and dashes (for instance, the letter "s" is three dots and "o" is three dashes.) It is used by **tapping the combination of dots and dashes needed and pausing for the correct gap duration**. There are longer gaps between words than letters in a word.

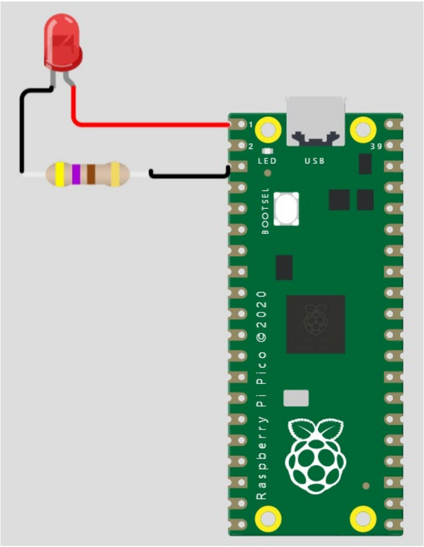
Morse Code: "SOS"



Try to implement a Morse code system by flashing SOS with the help of Electronics Components

Flashing SOS in Morse





- ✓ An external LED flashes the SOS signal in **Morse code (three dots, followed by three dashes, followed by three dots)** continuously.

- ✓ In this experiment, a dot is represented with the LED being ON for **0.25 seconds** (**Dot time**) and a dash is represented with the LED being ON for **1 second** (**Dash time**).

- ✓ The delay between the dots and dashes is set to **0.2 second** (**GAP time**). This process is repeated continuously after **2 seconds of delay**.

LED FLASHING SOS

WOKWI SAVE SHARE Docs

diagram.json main.py Library Manager

```python
from machine import Pin
from utime import sleep

Dot = 0.25                   # Dot time
Dash = 1.0                  # Dash time
Gap = 0.2                    # Gap time
ON = 1                       # ON
OFF = 0                      # OFF
LED = Pin(0, Pin.OUT)        # LED at GP0

while True:                  # DO FOREVER (INFINITE LOOP)
    for i in range(0, 3):
        LED.value(ON)        # LED ON
        sleep(Dot)           # Wait Dot time
        LED.value(OFF)       # LED OFF
        sleep(Gap)           # Wait Gap time

    sleep(0.5)               # 0.5 second delay

    for i in range(0, 3):
        LED.value(ON)        # LED ON
        sleep(Dash)          # Wait Dash time
        LED.value(OFF)       # LED OFF
        sleep(Gap)           # Wait Gap time
    sleep(2)                 # Wait 2 seconds
```

Simulation