SNS COLLEGE OF TECHNOLOGY

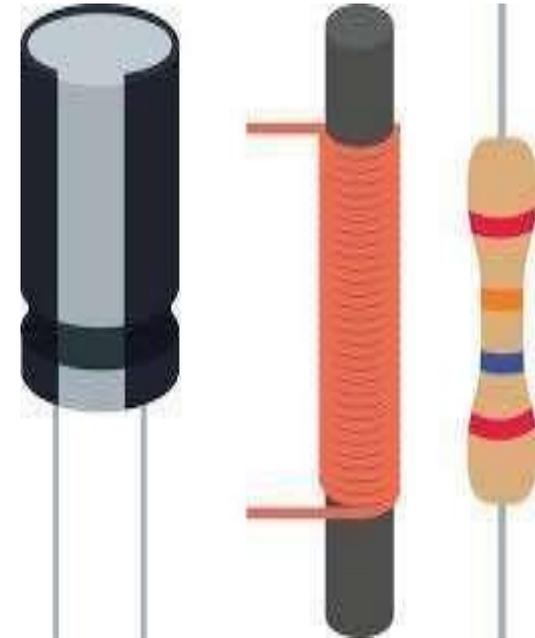**An Autonomous Institution**

Coimbatore-35

Department of Artificial Intelligence and Data Science

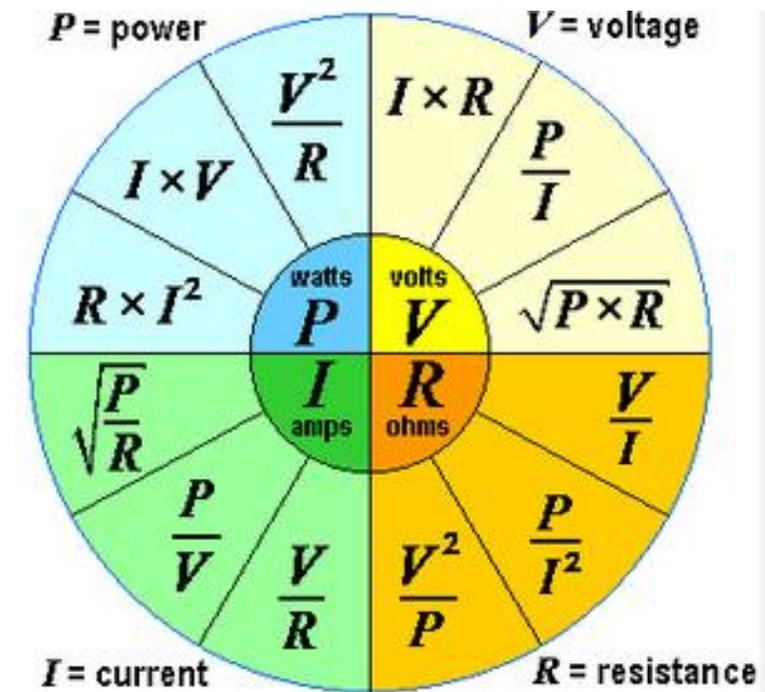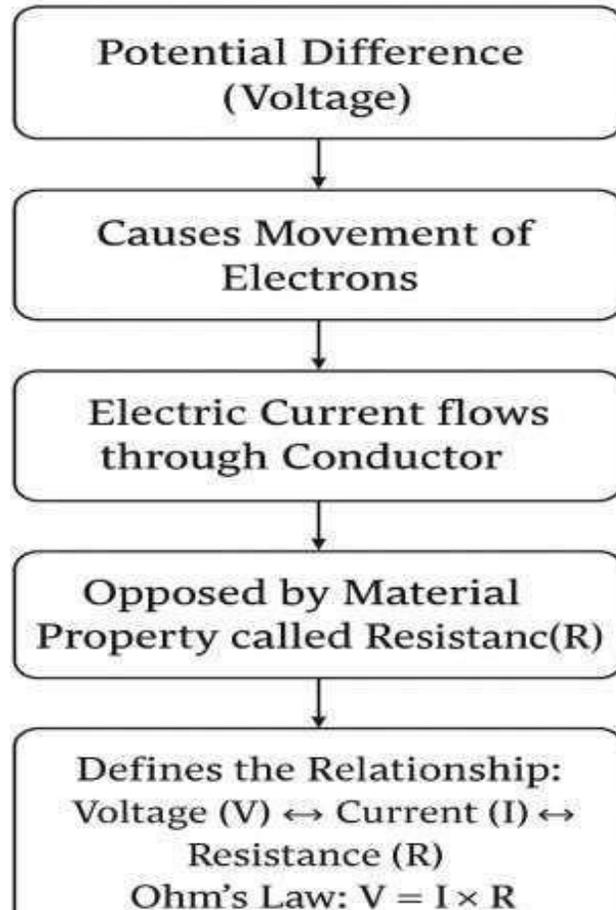### 23EET103-Electric Circuits and Electron Devices

I B.Tech. AIDS / II SEMESTER

UNIT I : DC CIRCUITS

Topic 3 : Ohm's Law

Let's Recall !!

Potential Difference (Voltage)

↓

Causes Movement of Electrons

↓

Electric Current flows through Conductor

↓

Opposed by Material Property called Resistanc(R)

↓

Defines the Relationship:
Voltage (V) ↔ Current (I) ↔ Resistance (R)
Ohm's Law: $V = I \times R$

P = power
V = voltage
I = current
R = resistance

watts P
volts V
amps I
ohms R

$I \times V$
$\dfrac{V^2}{R}$
$I \times R$
$\dfrac{P}{I}$

$R \times I^2$
$\sqrt{P \times R}$

$\sqrt{\dfrac{P}{R}}$
$\dfrac{V}{I}$

$\dfrac{P}{V}$
$\dfrac{V}{R}$
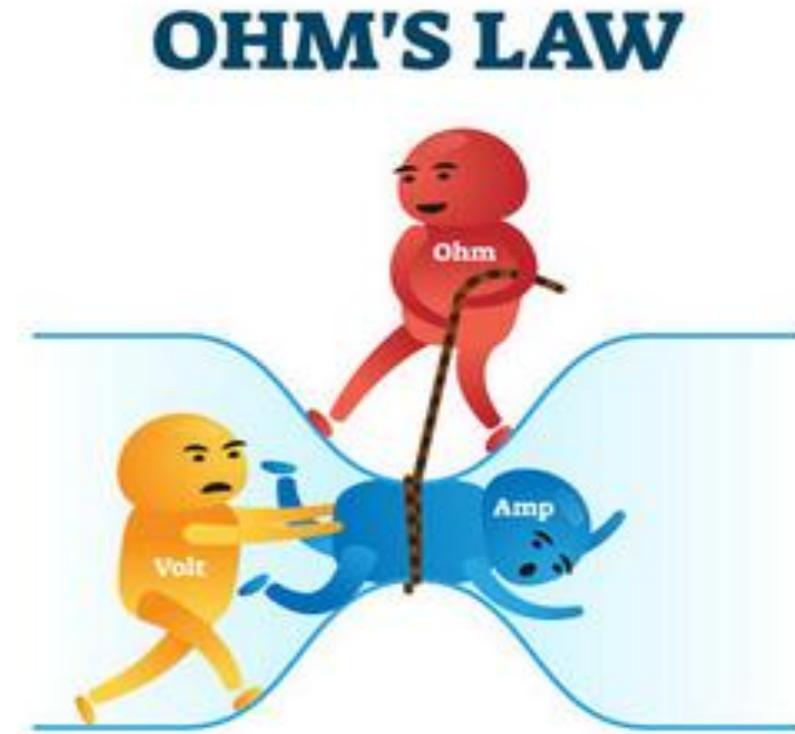$\dfrac{V^2}{P}$
$\dfrac{P}{I^2}$

Topics for discussion

- ➤ Why Ohm's Law?

- ➤ Fundamentals of Voltage, Current, and Resistance

- ➤ Ohm's Law – Definition and Mathematical Relation

- ➤ Ohm's Law Triangle – Finding Unknown Quantities

- ➤ Applications of Ohm's Law in Real Circuits
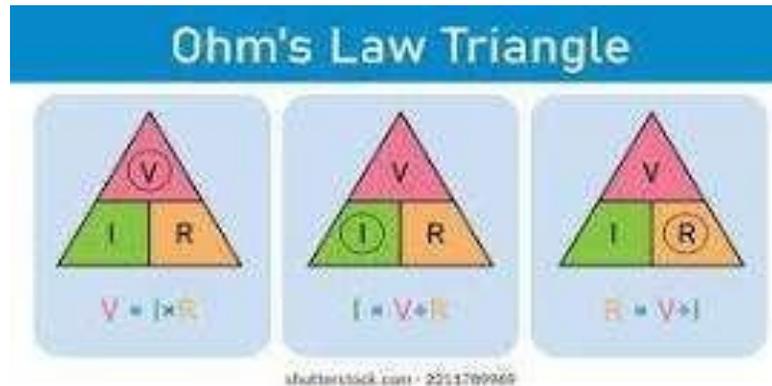
Ohms Law

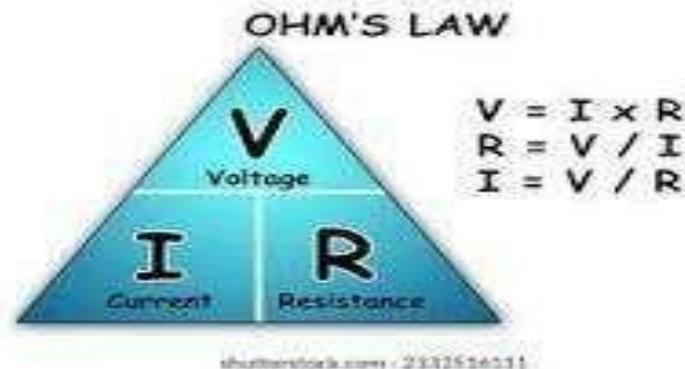German physicist Georg Simon Ohm.

Definition of Ohms Law

Ohm's Law states that the current flowing through a conductor between two points is directly proportional to the voltage across the two points, provided the temperature and physical conditions remain constant.
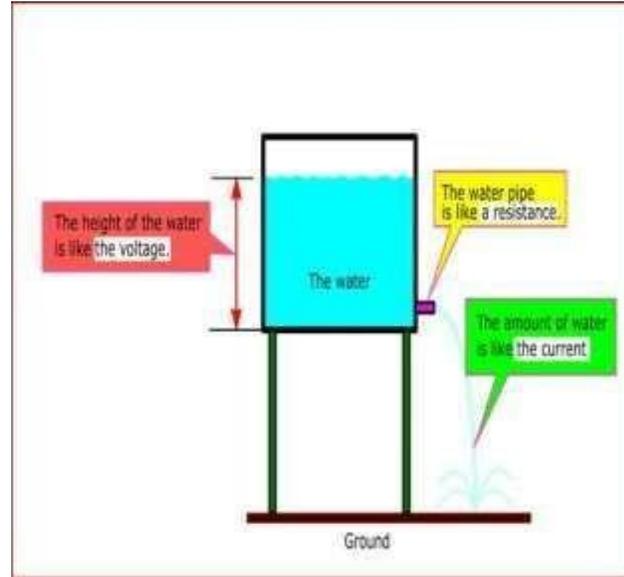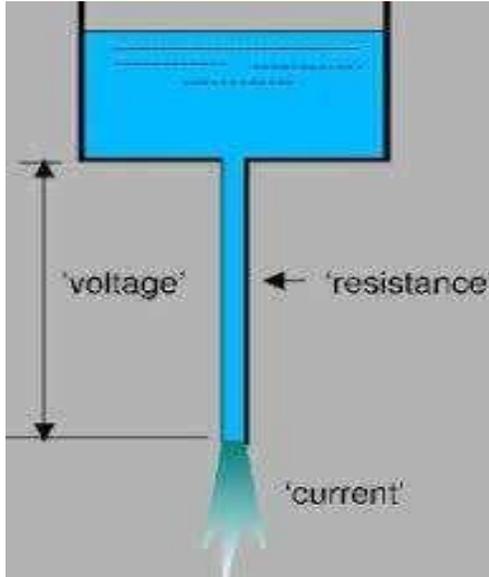
$$V = I \times R$$

Where
- V = Voltage (Volts)
- I = Current (Amperes)
- R = Resistance (Ohms)

Fundamentals of Voltage, Current, and Resistance

Voltage (V):
→ The electric potential difference between two points.
→ It pushes electrons through a conductor.
→ Unit: Volt (V)

Current (I):
→ The rate of flow of electric charge through a conductor.
→ Direction: From positive to negative terminal (conventional current).
→ Unit: Ampere (A)

Resistance (R):
→ The opposition offered by a material to the flow of current.
→ Depends on material, length, area, and temperature.
→ Unit: Ohm (Ω)

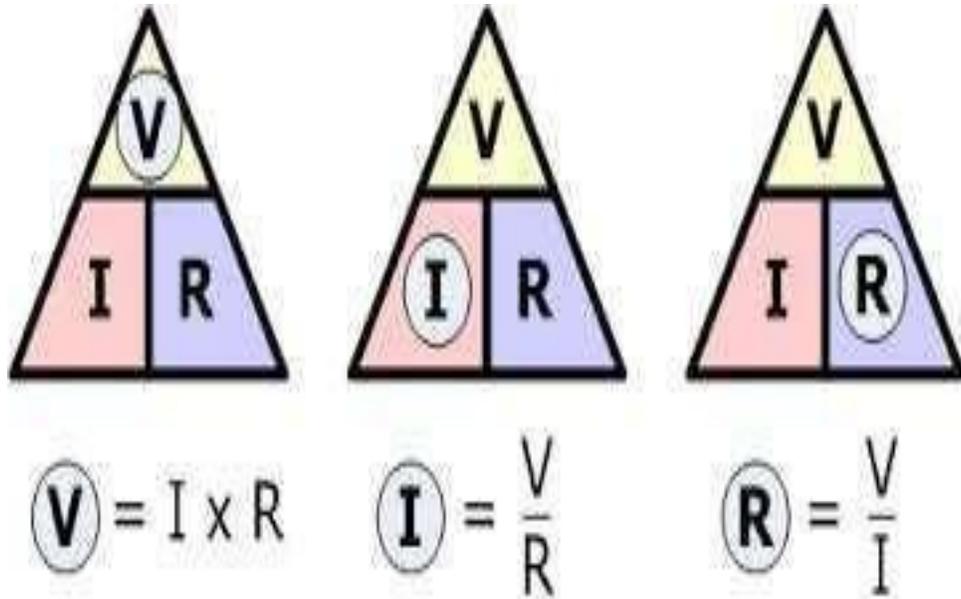# Ohm's Law –Mathematical Relation
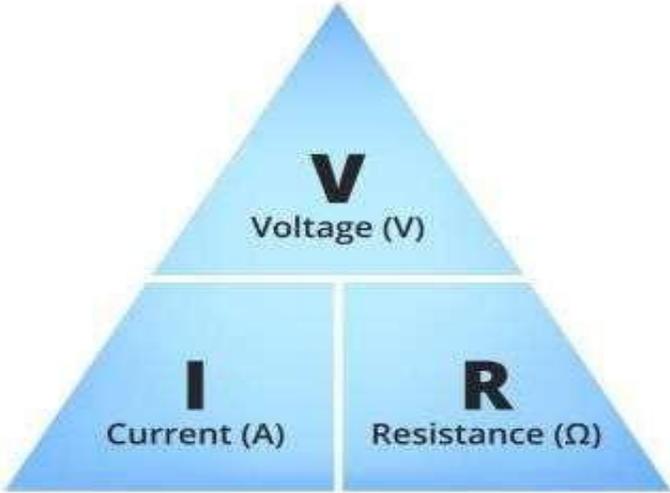
OHM'S LAW

$$V = I \cdot R$$
$$R = V : I$$
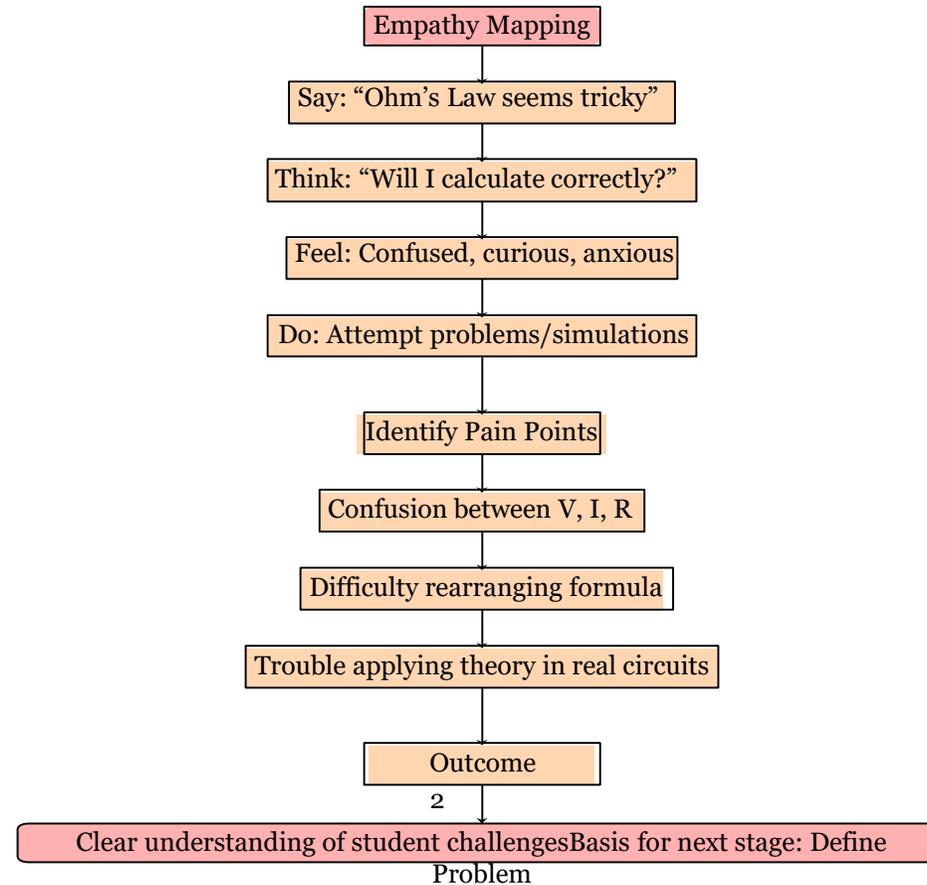$$I = V : R$$

Ohm's Law Triangle – Finding Unknown Quantities

$$V = I \times R$$

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

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

From the triangle:
- Voltage (V) = I × R
- Current (I) = V / R
- Resistance (R) = V / I

Ohm's law

Empathy Mapping

Say: "Ohm's Law seems tricky"

Think: "Will I calculate correctly?"

Feel: Confused, curious, anxious

Do: Attempt problems/simulations

Identify Pain Points

Confusion between V, I, R

Difficulty rearranging formula

Trouble applying theory in real circuits

Outcome

2

Clear understanding of student challengesBasis for next stage: Define Problem

Ohm's Law

➢ In the Define stage of Design Thinking, the goal is to synthesize insights from the Empathy Mapping and Pain Points identified to articulate a clear problem statement that guides the development of solutions.

➢ Based on the provided empathy map and pain points, we will define the problem related to learning and applying Ohm's Law ($V = IR$).

4. Ohm's Law (V–I–R)

Problem

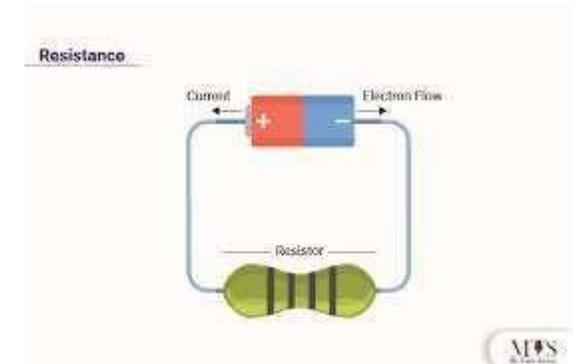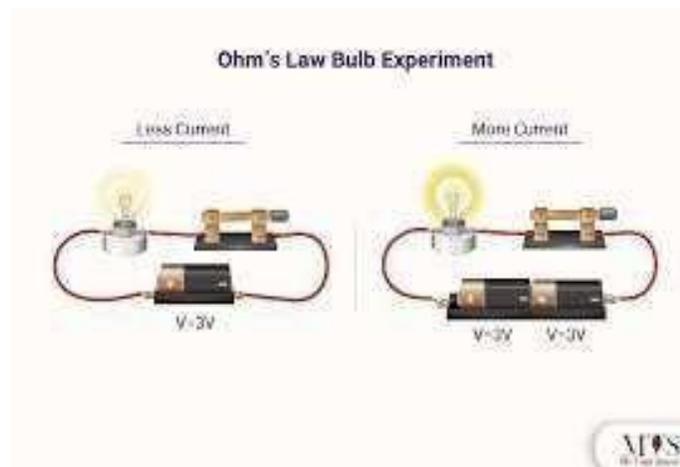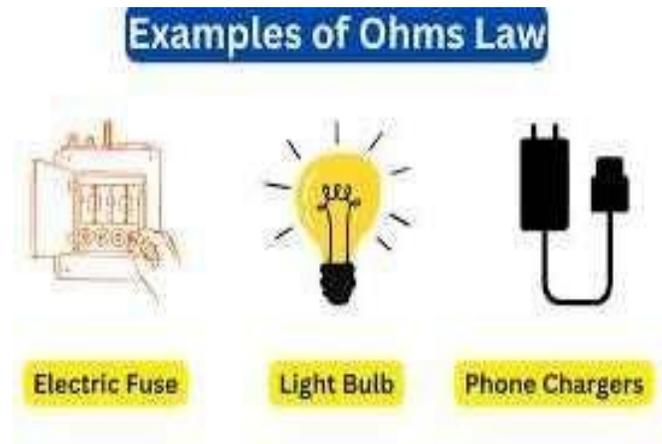Find the current when **20 V** is applied across a **10 Ω** resistor.
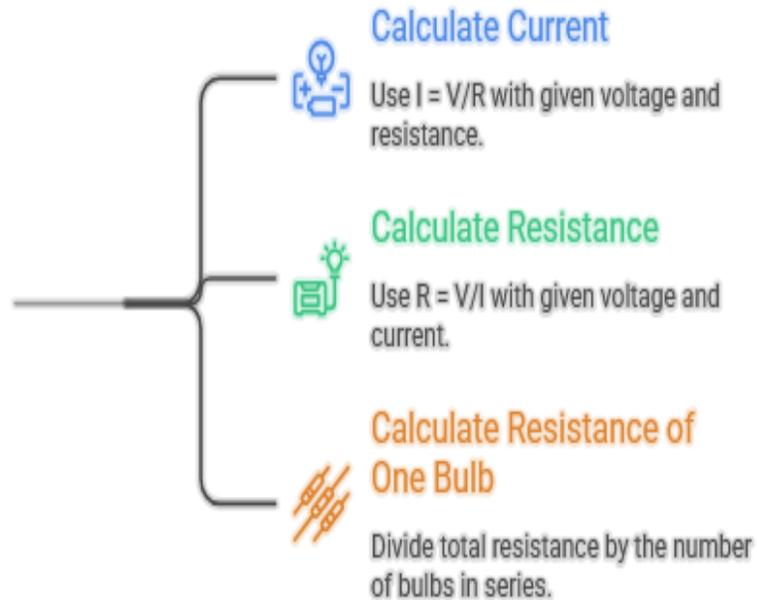
Formula:

I=VR

Solution:

I=20*10=2 A

✅ **Answer: 2 A**

Application of Ohms Law in Real world

Let's Summarize

How to solve problems using Ohm's Law?

Calculate Current
Use I = V/R with given voltage and resistance.

Calculate Resistance
Use R = V/I with given voltage and current.

Calculate Resistance of One Bulb
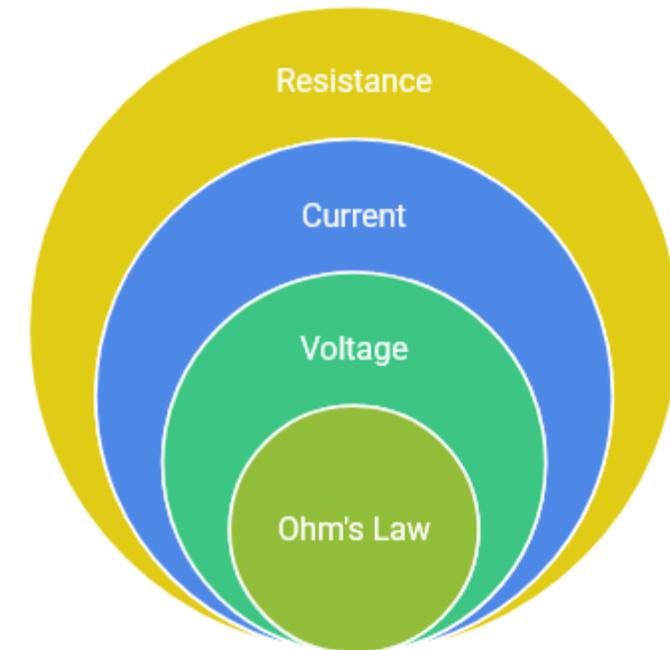Divide total resistance by the number of bulbs in series.

Ohm's Law Triangle

Opposition to current flow

Flow of electrical charge

Electrical potential difference

Fundamental principle of electricity

Resistance
Current
Voltage
Ohm's Law

QUIZ

How does voltage and resistance affect current flow?

ANSWERS

How does voltage and resistance affect current flow?

Increase Voltage
Increases current flow, as current is directly proportional to voltage.

Increase Resistance
Decreases current flow, as current is inversely proportional to resistance.

QUIZ

SI Units Named After Scientists

⌂ Volts →

≋ Amperes →

⊘ Ohms →

ANSWERS

SI Units Named After Scientists

Volts → Alessandro Volta

Amperes → André-Marie Ampère

Ohms → Georg Ohm

OHM'S LAW / 23EET103-ELECTRIC CIRCUITS AND ELECTRON DEVICES / Ms. RANJANI K / AP /CSE_IOT / SNSCT