Tishk International University
Faculty of Applied Science
Medical Technical Radiology

General Physics

1-Electricity

First Grade- 2025-2026

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What do you use electricity for?

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Electricity

ELECTRICITY

- ✓ Electricity is a convenient and clean form of energy that is very commonly used in our everyday lives.


lamp


electric toothbrush


air aconditioning banner


remote control garage door


fan


glass ceramic hob

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Electricity

ELECTRICITY

- ✓ Electricity is a **form of energy**, like thermal/heat, light, mechanical or acoustic/sound energy.

- ✓ But Electric Energy:
  - Iluminates bulbs (light energy)
  - Heats up the food (thermal energy)
  - Moves engines (mechanical energy)
  - Is transformed into sound waves in the loudspeakers (acoustic energy)

Static electricity

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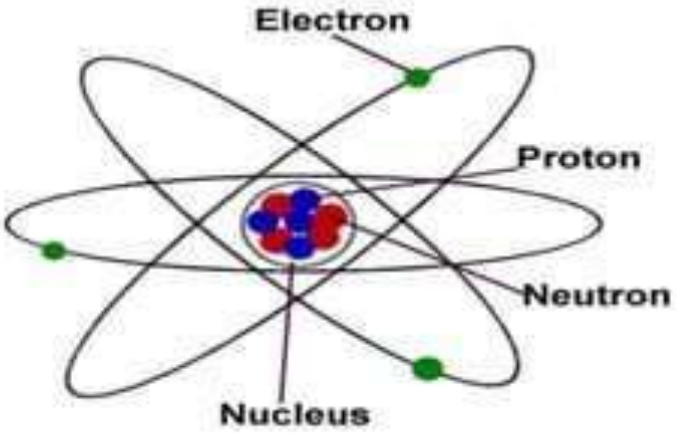
Atomic particles

- ✓ All matter is composed of **atoms**, and atoms are made up of other smaller particles:
  - **Electrons**: which have negative charge and are responsible for electric forces and interactions.
  - **Protons**: which have positive charge.
  - **Neutrons**: which don´t have charge.



- ✓ In general, matter is neutral.

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Electric charges

- ✓ Two objects with the **same** charge **repel** each other.
- ✓ Two objects with **different** charge **attract** each other.

In the world of static electricity…

Oppositely charged objects attract

Objects with like charges repel

Electrical current

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Electrical current

✓ **Electrical current** is the continual movement of electrical charges (electrons) through an appropriate path.

✓ This path must be done with a **good conductor** material, not with an **insulator**

Conductor Insulator

✓ **Metals** are good conductor materials.

✓ **Wires** are made of copper and are covered with a plastic cover (plastic is a electrical insulator and protects us).

Electrical circuit

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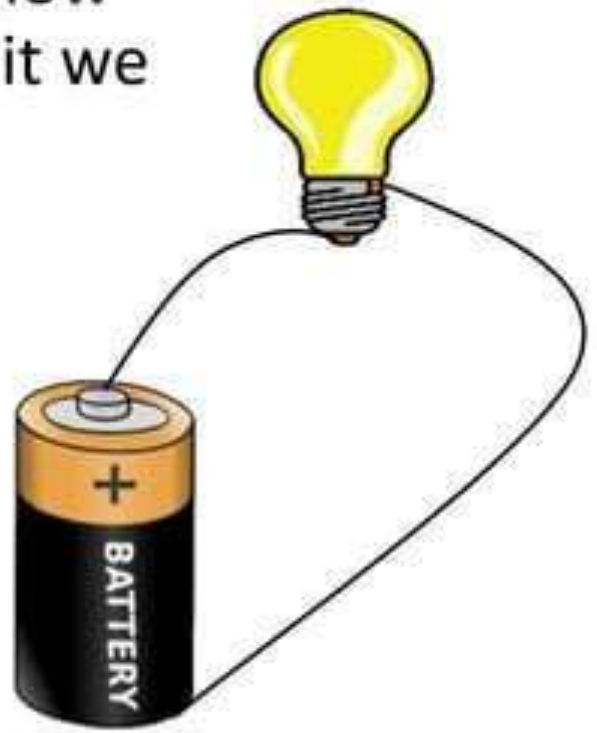
Electrical current

✓ **Electrical circuit** is a set of elements connected to one another so that electrical current can circulate through them.

For an electric current to flow through an electrical circuit we need to things:

- ✓ Something to make **electricity flows.**
- ✓ A **complete** path



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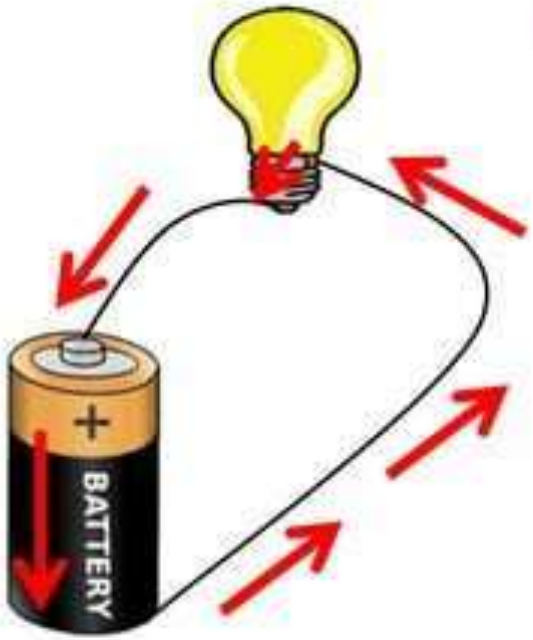
Electrical current

In this circuit we have:

- ✓ Something to make electricity flows, **the battery.**
- ✓ A **complete** path



In this circuit, **electricity flows from the negative side of the battery**, through the wires, and lights the bulb.
Then, the electricity continue traveling around to the positive side of the battery.

This process is continually repeated.

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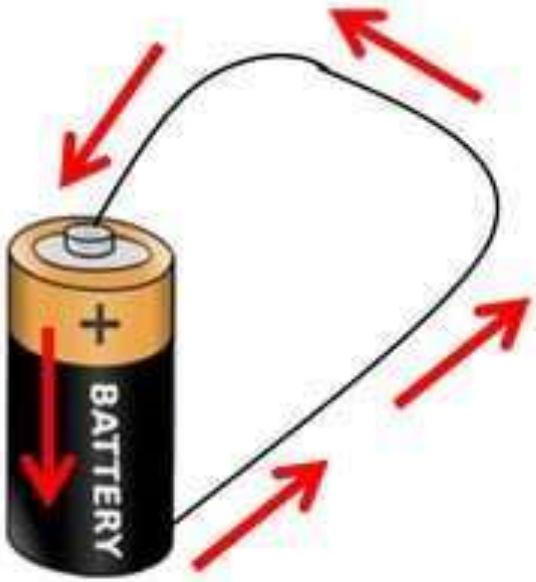
Electrical circuit

- ✓ The simplest circuit is a piece of wire from one end of the battery to the other.



- ✓ An electric current flows in the wire from one end of the battery to the other, but **nothing useful happens.**
- ✓ The wire just **gets hot** and the battery **wears out.**
- ✓ So, ANOTHER ELEMENT IS NECESSARY in this circuit.

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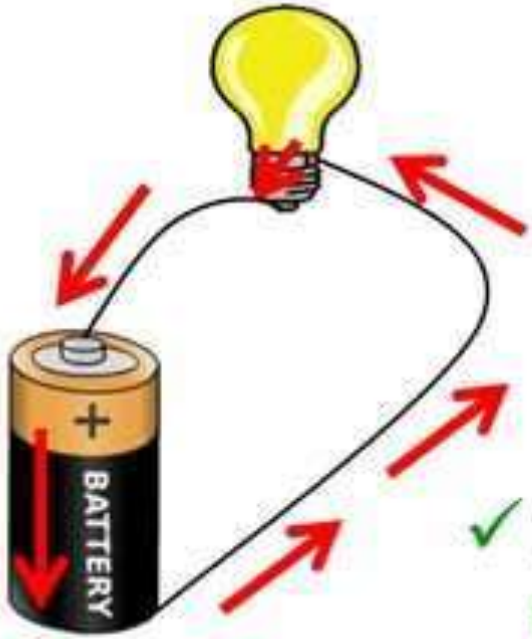
Electrical circuit

ANOTHER ELEMENT IS NECESSARY in the previous circuit, in order **to do something useful** with the electric current



- ✓ We need to add an electrical component into the circuit that can **use the current to make something happen.**
- ✓ In this situation , the **bulb transforms the electrical energy into light energy**, so we can see in the night.
- ✓ We also can use an **engine**, that transforms the electrical energy into mechanical energy, so we can make a fan works.

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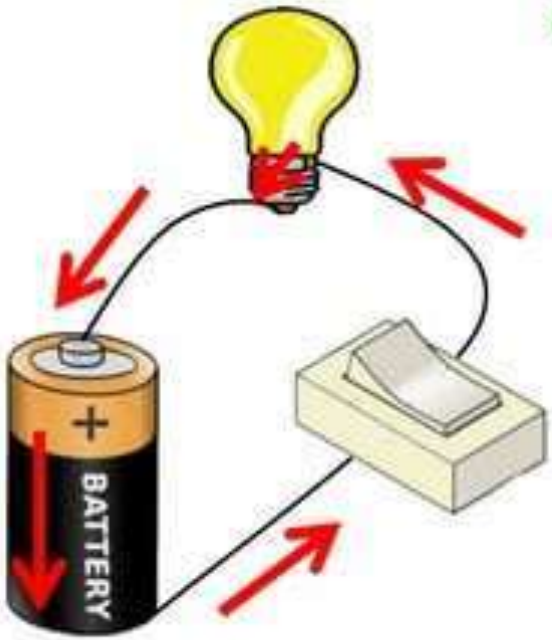
Electrical circuit

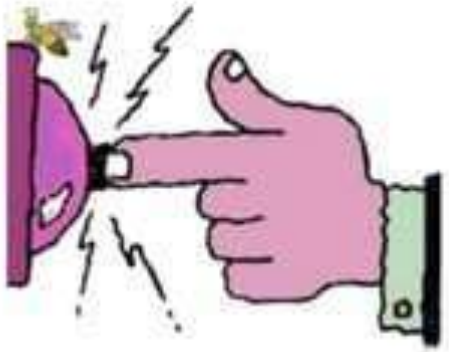
But in this circuit, ANOTHER ELEMENT IS NECESSARY, in order **to avoid the bulb is always working.**



✓ We need to add an electrical component that allow us to turn the circuit on or off when we want, that is, **to control the circuit.**

✓ We can control the circuit with:

- **Switches**
- **Commutator switches**
- **Push buttons**



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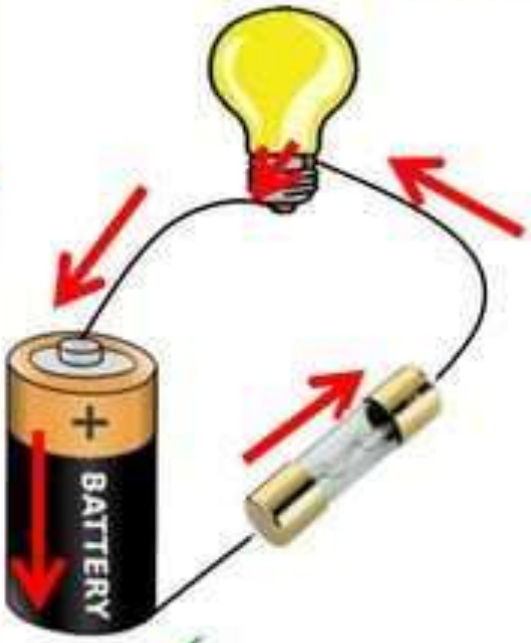
Electrical circuit

And ANOTHER ELEMENT IS NECESSARY (but less necessary), in order **to avoid the components of the circuit to be damaged.**



- ✓ A high current will break the fine wire in the **fuse**, so the circuit is broken an electricity doesn´t flow, so, nothing can be damaged.

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Elements of an electrical circuit

GENERATORS

- Batteries
- Alternators or dynamos.
- Photovoltaic solar cells.
- Hydrogen cells

CONDUCTORS

- Conductors
- Junctions
- Crossings

RECEPTORS

- Bulb
- Motor
- Resistor
- Bell
- Buzzer

CONTROL DEVICES

- Switch
- Commutator switch
- Push button

PROTECTION DEVICES

- Fuse

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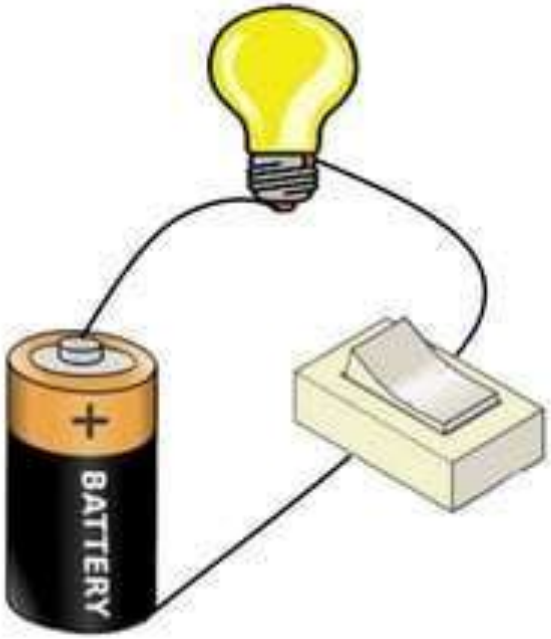
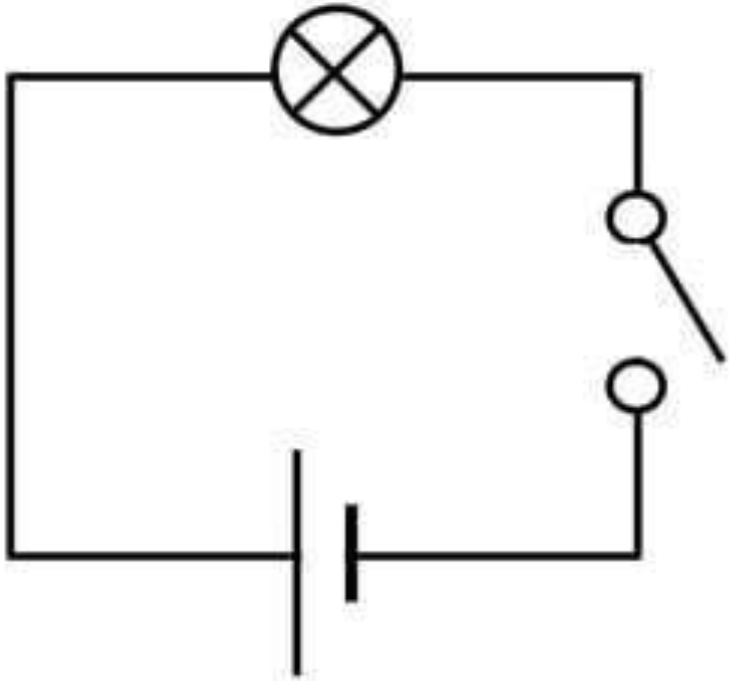
Circuit diagrams

- They are used **circuit symbols** to draw diagrams of electrical circuits instead of drawing each component in it.





- Wires always must be **straight lines** and not wiggly.

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Elements of an electrical circuit

GENERATORS

Batteries

CONDUCTORS

Conductor

Junctions

Crossings

RECEPTORS

Bulb

Motor

Resistor

Bell

Buzzer

CONTROL DEVICES

Switch

Commutator switch

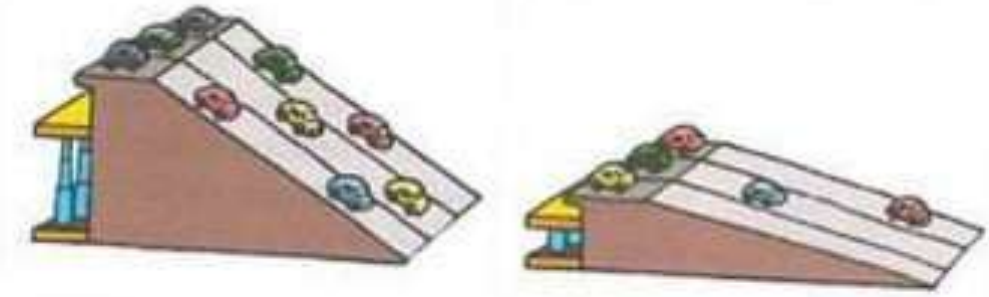
Push button

PROTECTION DEVICES

Fuse

VOLTAGE is the difference between the electrical energy at two points in a circuit.

- ✓ When there is a difference of the electrical energy, charges move from the point where the energy is highest to the lowest point.

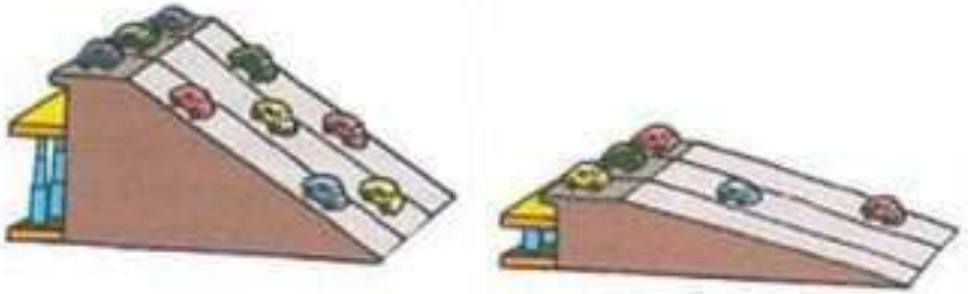


- ✓ Voltage is also called **potencial difference** (p.d.)

Electrical quantities

VOLTAGE is the difference between the electrical energy at two points in a circuit.

- ✓ Voltage is represented by the letter **V** and in the International System of Units (SI) is measured in **volts (V).**



- ✓ Voltage is measured with a **voltmeter**. If we want to measure the voltage of a component in a circuit, the voltmeter must be connected **in parallel.**

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Electrical quantities

The CURRENT is the number of electrons that pass through a specific point in one second.

- ✓ Current is represented by the letter **I** and in the International System of Units (SI) is measured in **amperes** or **amps (A).**

- ✓ Current is measured with an **ammeter**. If we want to measure the current through a receptor, the ammeter must be connected **in series.**

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Electrical quantities

- The **RESISTANCE** is the opposition of the components of a circuit to the flow of electric current.

- Resistance is represented by the letter **R** and in SI units is measured in **ohms (W).**

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Ohm´s law

- The a relationship between voltage, current and resistance is called **Ohm´s law.**

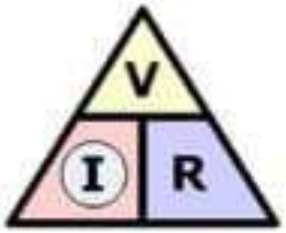
- Ohm´s law is expressed mathematically as:

$$V = I \cdot R$$

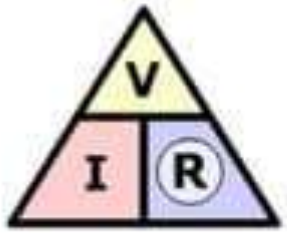
And it can also be expressed as:

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

$V = I \times R$



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



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

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Effects of the electrical current

- ✓ **Electrical current** can cause different effects as it flows through the components of the circuit
  - ✓ **Light**
  - ✓ **Magnetism / Motion**
  - ✓ **Heat**: basically all components heat up when are crossed by an electrical current