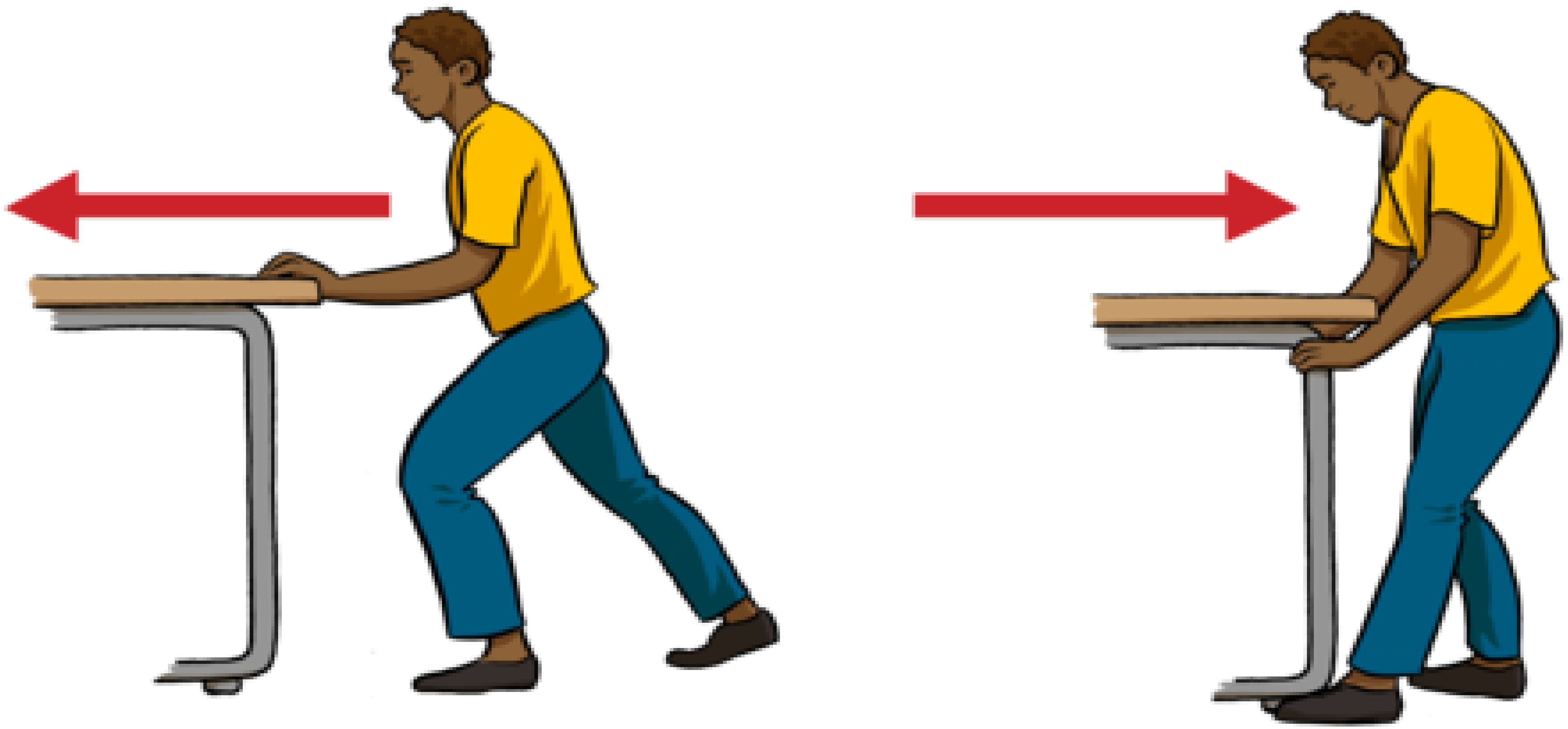
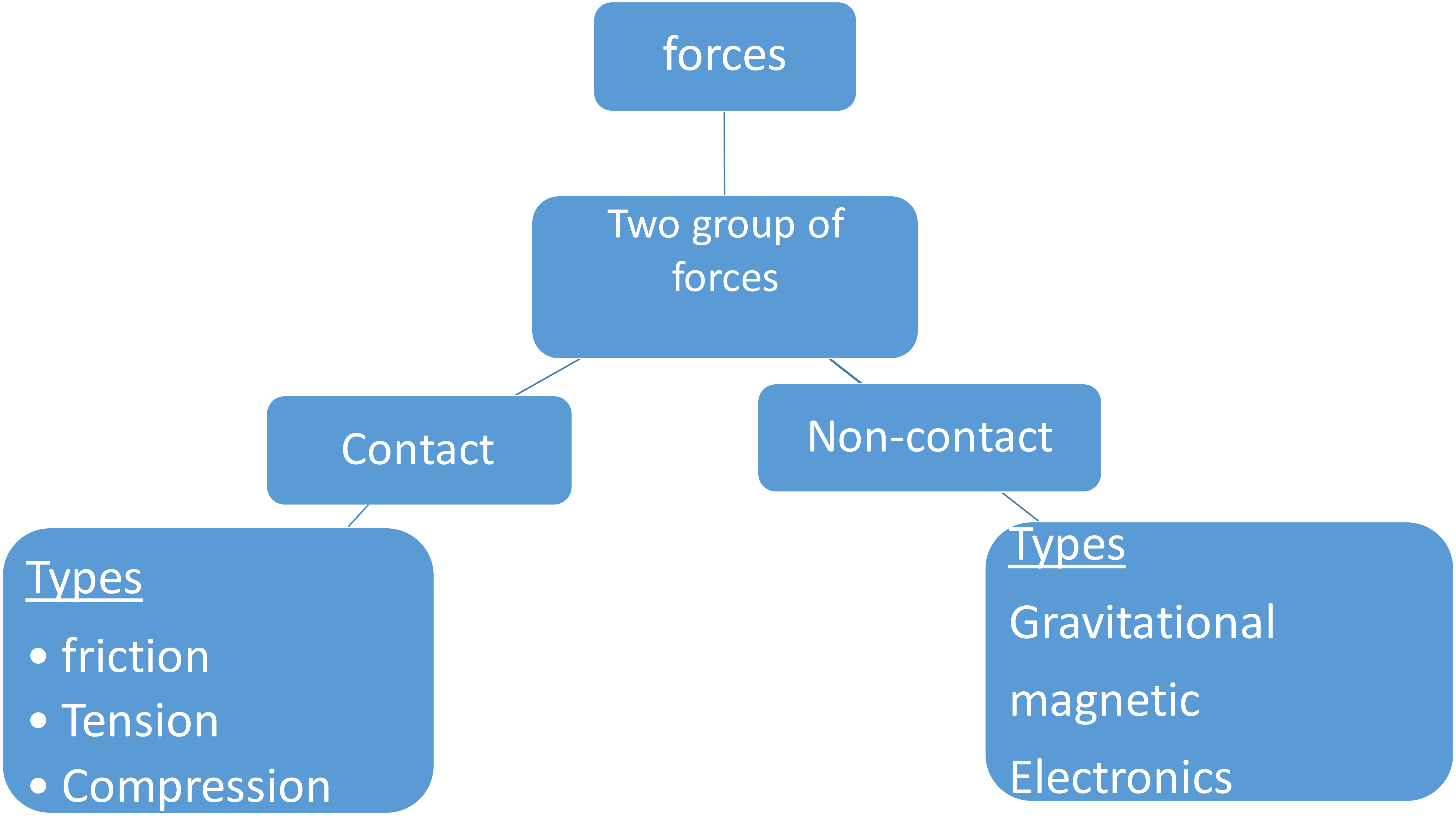
Term 3: Energy and Change

Ms Ramuhashi

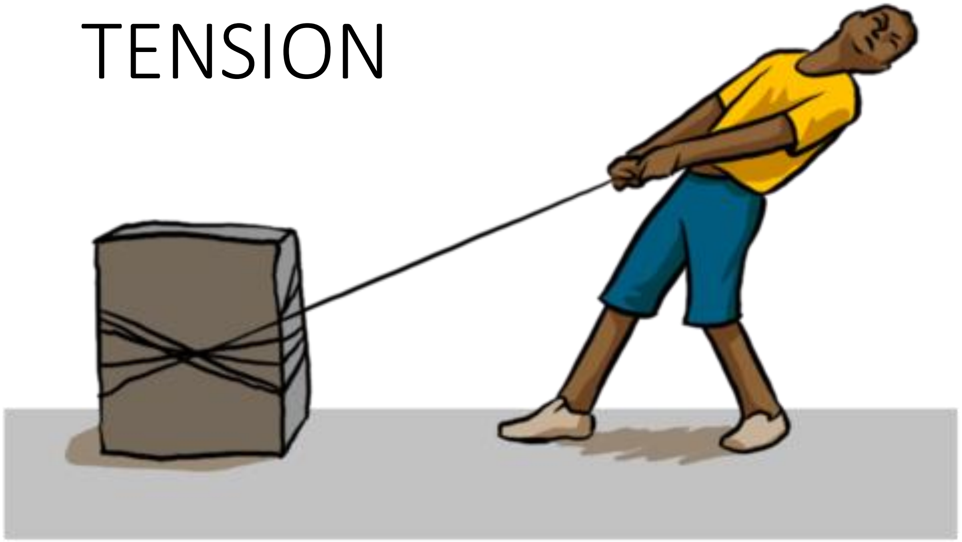
force is any interaction that, when unopposed, will change the motion of an object. A **force** can cause an object with mass to change its velocity (which includes to begin moving from a state of rest), i.e., to accelerate. **Force** can also be described intuitively as a push or a pull.

- A force is defined as a push or a pull on an object.
- Forces are measured in newtons(N).
- A force can change the shape, direction and motion of an object.
- Forces act in pairs. The force acting on the object is called the action and the force that the object exerts back in the opposite direction and equal in magnitude is the reaction.
- More than one force can act on an object. The net or resultant force is the sum of all the forces acting on the object.
- The forces acting on a body can be represented as a free-body diagram where the arrows indicate the direction and magnitude of the different forces.

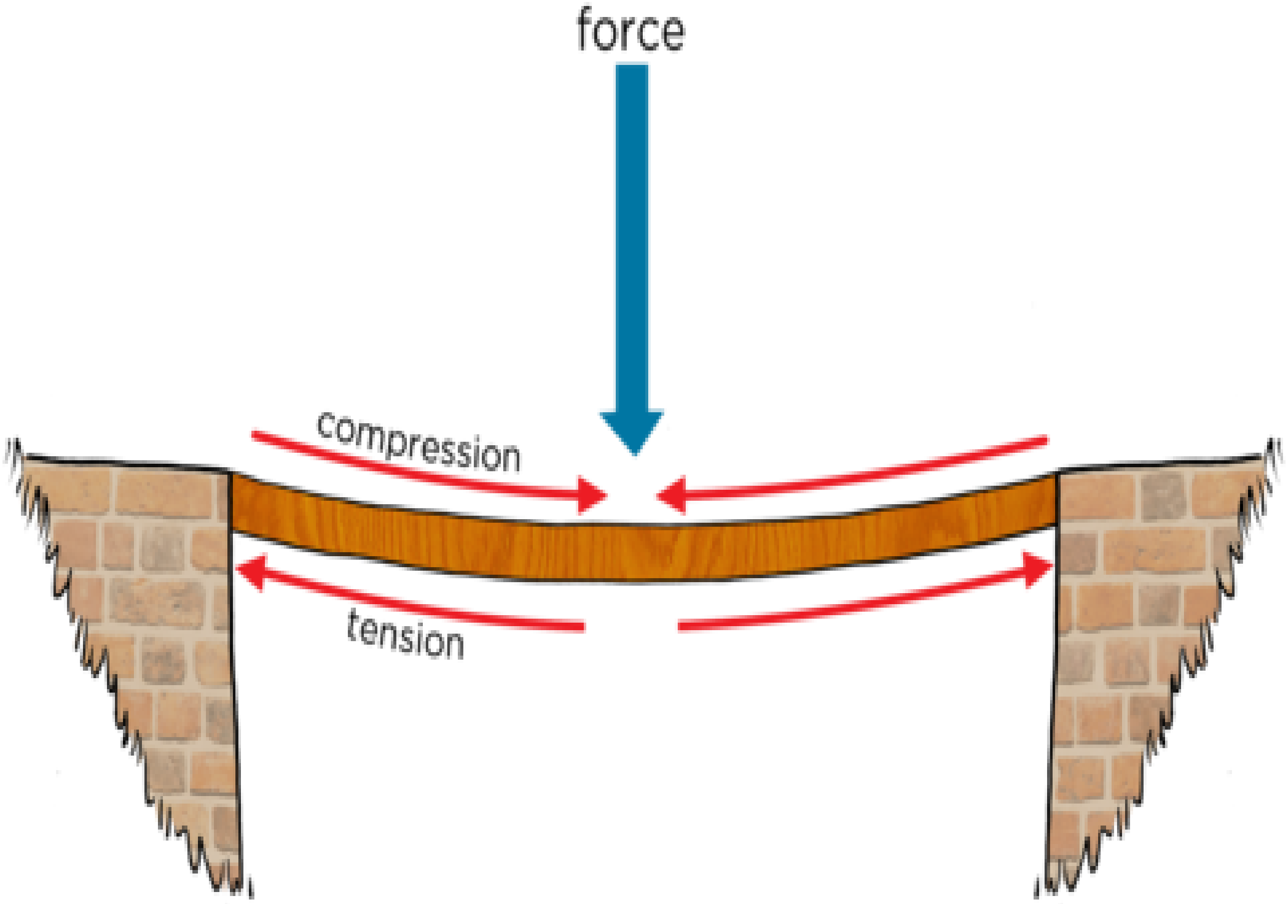



forces
Two group of forces
Contact
Non-contact
Types
• friction
• Tension
• Compression
Types
Gravitational
magnetic
Electronics

TENSION

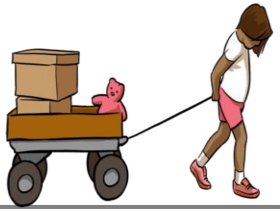
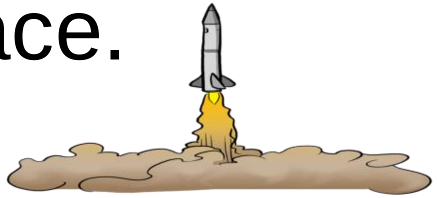


COMPRESSION



Two main groups of forces; contact and non-contact (field) forces.

- Contact forces act when objects are in contact (touching) with each other. Friction, tension and compression are examples of contact forces.
- Friction is the force opposing motion between two surfaces as they rub against each other.
- Compression forces are two forces acting on one object, moving in opposite directions (towards each other) to compress or deform the object.
- Tension forces are two forces acting on one object, moving in opposite directions (away from each other) to stretch the object.

CLASSWORK		
Action	**Push or pull?**	**Effect**
Kicking a ball. 		
Moulding clay. 		
Playing with a toy wagon. 		
A rocket blasting off into space. 		
Exercising on a bar. 		

- Non-contact forces can act over a distance and objects do not have to be touching each other. Common examples of field forces are magnetic, electrostatic and gravitational forces.
- Non-contact forces are known as field forces. A field is a region in space where a certain object with certain properties will experience a force.
- Gravitational force is a force of attraction between two bodies due to their mass. The gravitational force increases with mass and decreases with the distance between the bodies.

- The weight of a body is the gravitational force exerted on an object by the Earth (or Moon or other planet). The weight will vary depending on where it is measured.
- The mass of an object is a measure of how much matter it contains. The mass stays constant no matter where it is determined.
- Weight is calculated as $W = m \times g$, where g is the gravitational acceleration. On Earth, $g = 9{,}8 m/s^2$

Jabu pulls Rod's arm with a force of 10 N, while Viantha pulls Rod's other arm with a force of 6 N.

We can represent the forces acting on Rod in the following way: we use a circle to represent Rod and different length arrows to represent the forces acting on him. This is called a free-body diagram.

What is the net force acting on Rod? We can calculate it as follows:
net force = 10 N + (- 6 N) = _____N to the left.

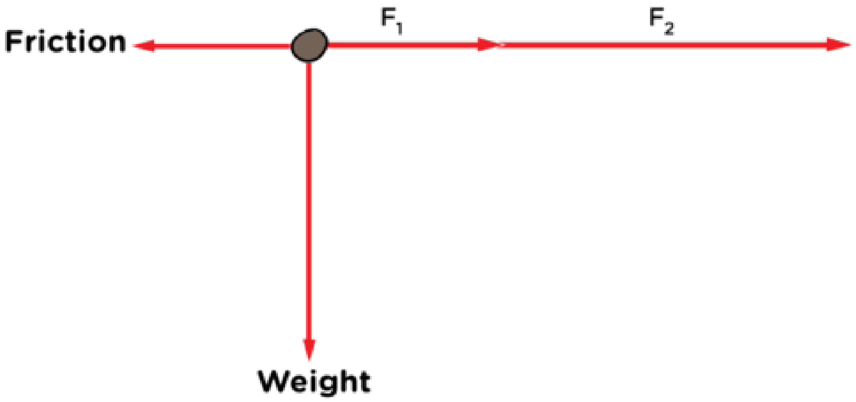
If the forces all act in the same direction then the net force is the sum of the different forces.
Imagine you are pushing someone in a go-cart, and your friend comes to help you push harder. There are now two forces acting on the person in the go-cart. These forces are acting in the same direction so they are added together to produce a net force which is the sum of the two smaller forces.

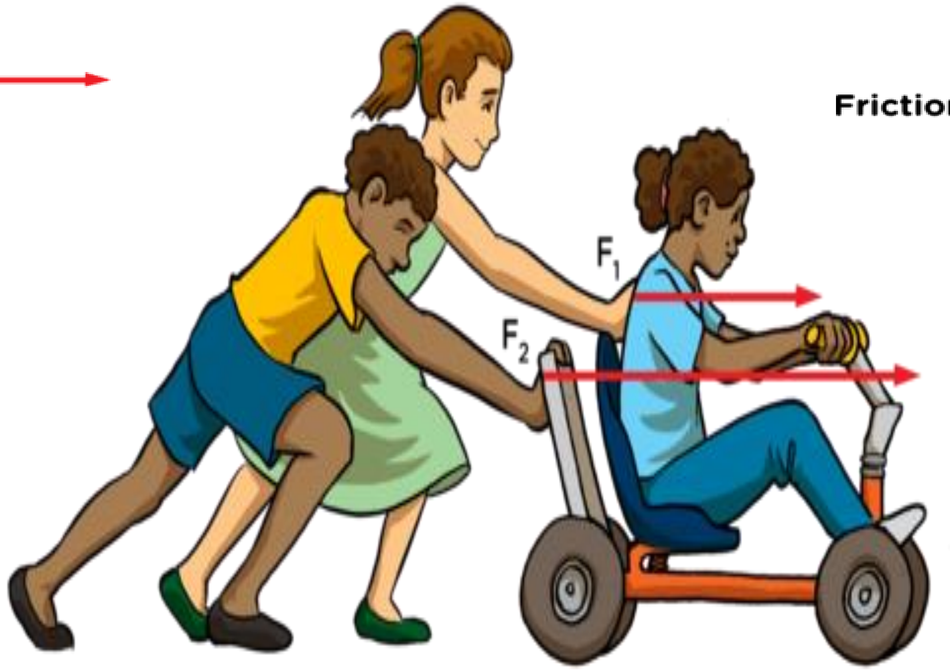
There is another force acting on the go-cart. Think of when you stand on the ground: you feel the ground beneath your feet. This contact force is preventing you from penetrating the ground. This is called the normal force. The normal force always acts perpendicularly to the surface that the object is resting on.

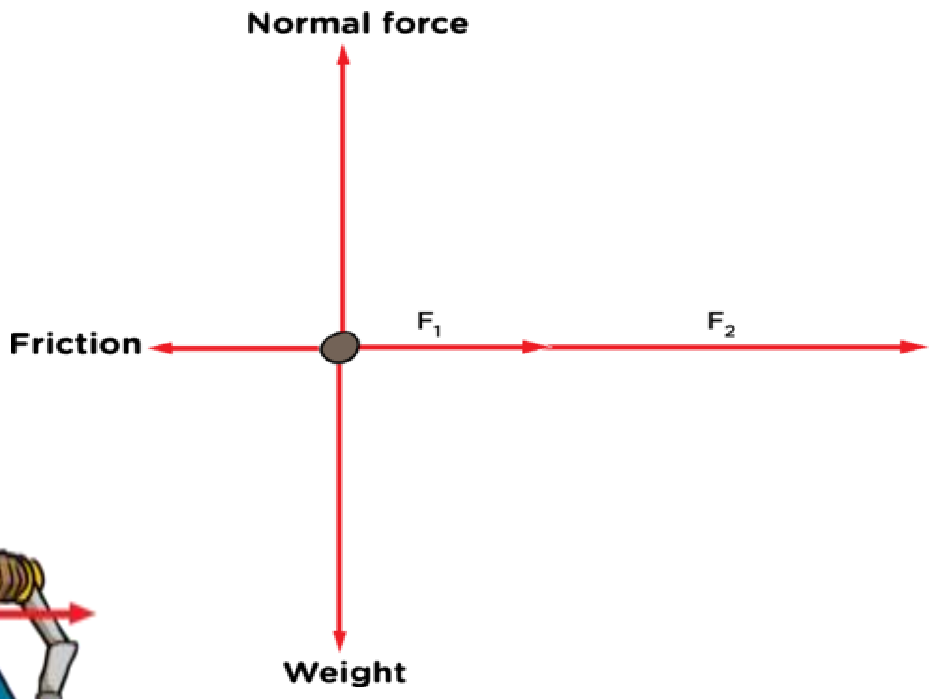
In simple situations such as when you are standing on the ground or the go-cart is travelling along a level surface, then the normal force is equal to the weight of the object, but in the opposite direction. Think back to what we learnt about forces acting in pairs. On a flat, level surface, the normal force is the reaction force to the weight of the object. This is shown in the diagram for a box resting on the floor

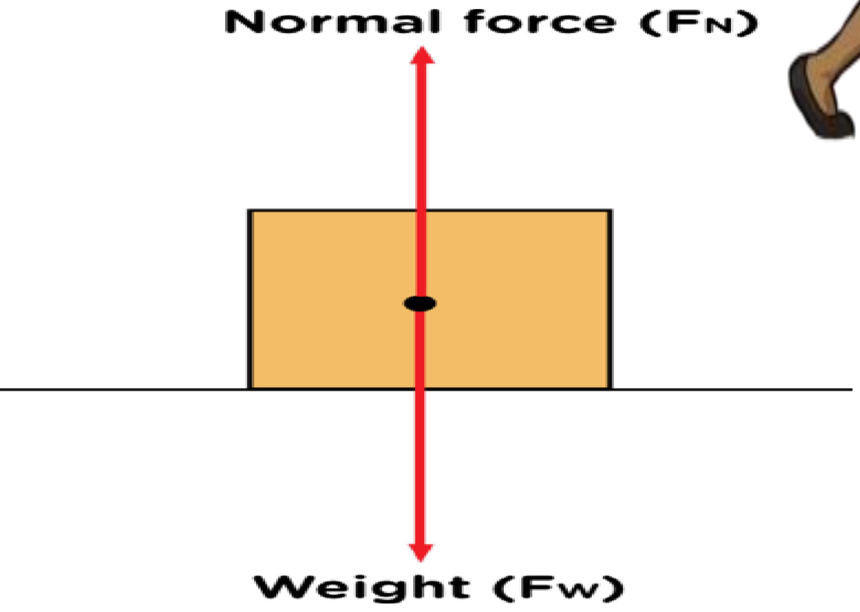
For this investigation, calculate the weight using the formula $W = m \times g$, where m is the mass of the object in kg and g is 9,8 m/s^2.

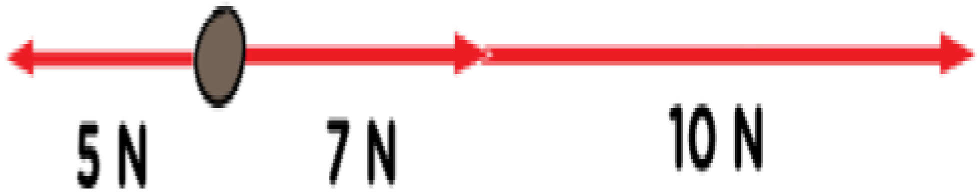
We can now draw the friction and weight in the free-body diagram of the forces acting on the go-cart as follows.





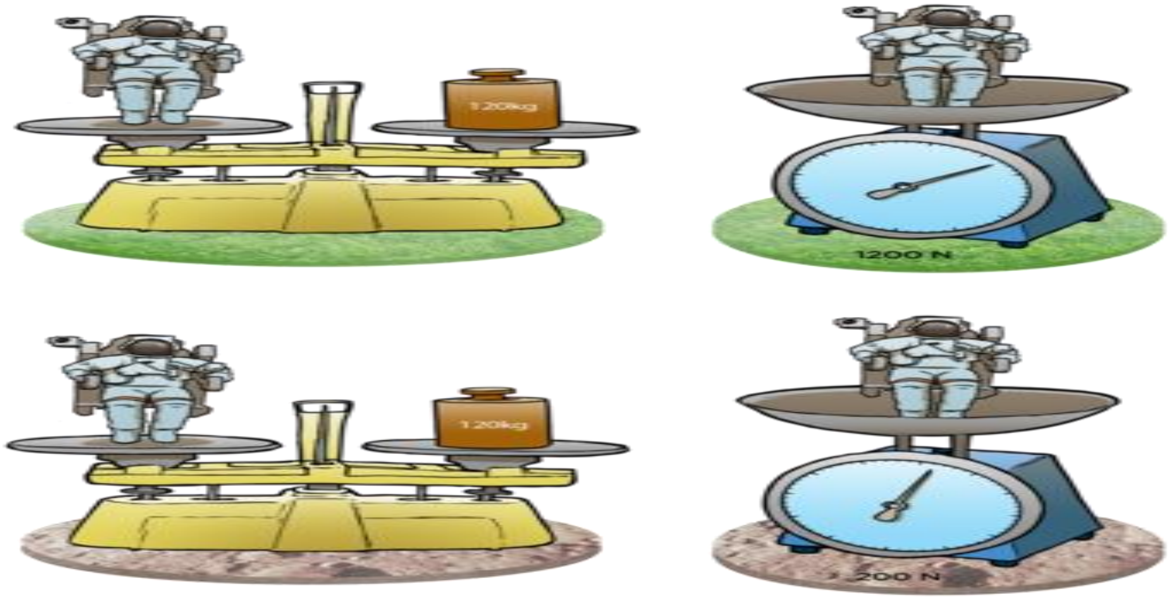






• Gravitational force is a force of attraction between two bodies due to their mass. The gravitational force increases with mass and decreases with the distance between the bodies.

The Moon also has its own gravity. The strength of gravity on the surface of the Moon is one-sixth that on the surface of the Earth, and so you would weigh one-sixth of what you do on Earth on the Moon. On Jupiter you would weigh 2.5 times more than you do on Earth as Jupiter's gravity is 2.5 times that of the Earth's. Even though you would weigh different amounts (and feel lighter on the Moon and heavier on Jupiter) your actual mass would stay the same in both cases.



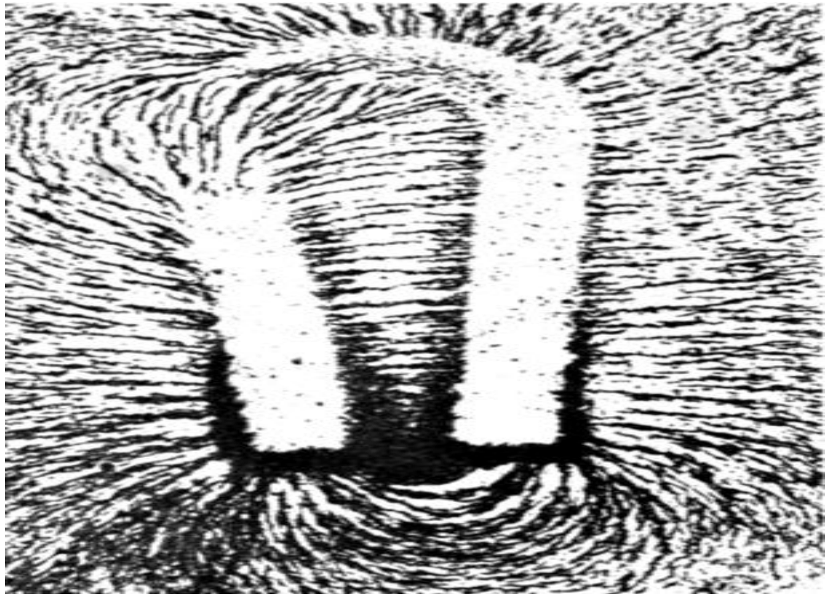
An astronaut's mass remains the same wherever it is measured. The astronaut's weight however depends on where you measure it, as you can see the astronaut weighs 1200 N on Earth but only 200 N on the Moon.

So how much would you weigh on the Moon? Imagine you have a mass of 60 kg. Your weight on Earth would be 60 x 9,8 = 588 N. The gravitational acceleration on the Moon is 1,6 m/s^2, so your weight would be 60 x 1,6 = 96 N on the Moon.

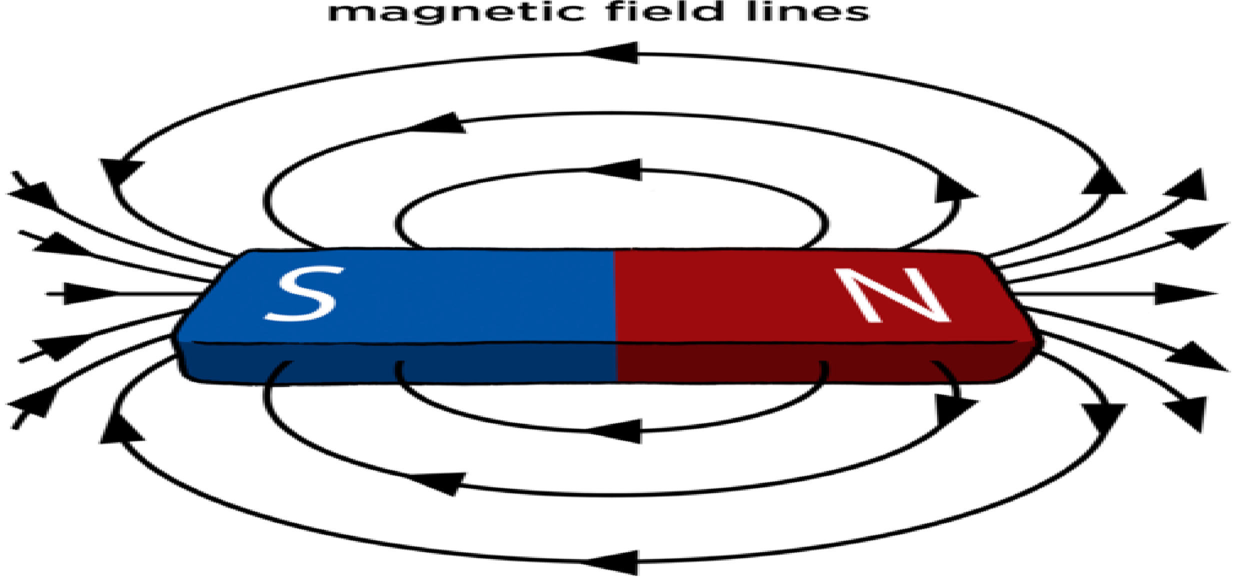
Magnetic force

- A magnet is a material which has a strong magnetic field around it.
- Magnetic forces of attraction exist between a magnet and a magnetic substance, such as iron, steel, cobalt and nickel.
- A magnet has two poles, a north and south pole. Opposite poles attract each other and like poles repel each other.
- The Earth has a magnetic field around it. We can use compasses to tell direction as the needle is a magnet which points to magnetic North.

The pattern you saw with your magnets can be represented by **field lines**. Field lines are used to show something we can't actually see. The closer the field lines are drawn together, the stronger the field being described. The more field lines that are drawn, the stronger the field. The field lines go from the north pole to the south pole. The following diagram shows the field lines around a bar magnet.

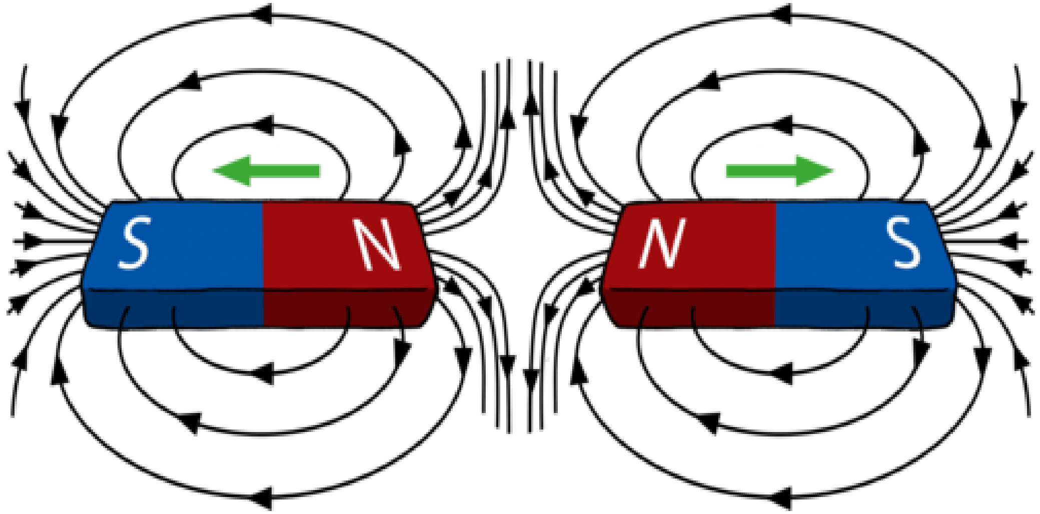


The magnetic field around a horseshoe magnet

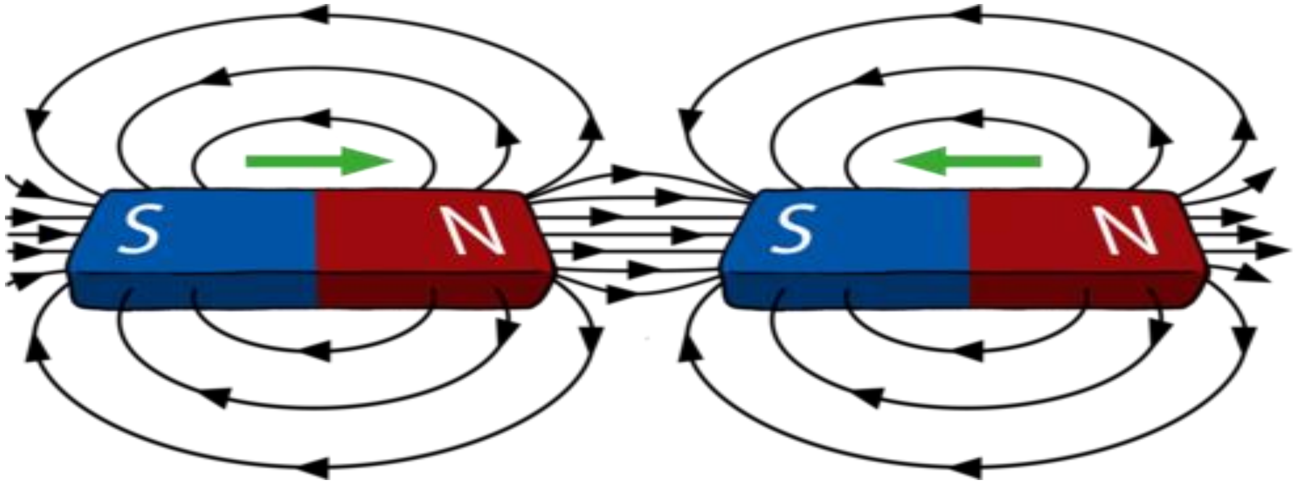


The diagrams show the field lines between bar magnets which are attracting and those which are repelling.

Like poles repel.

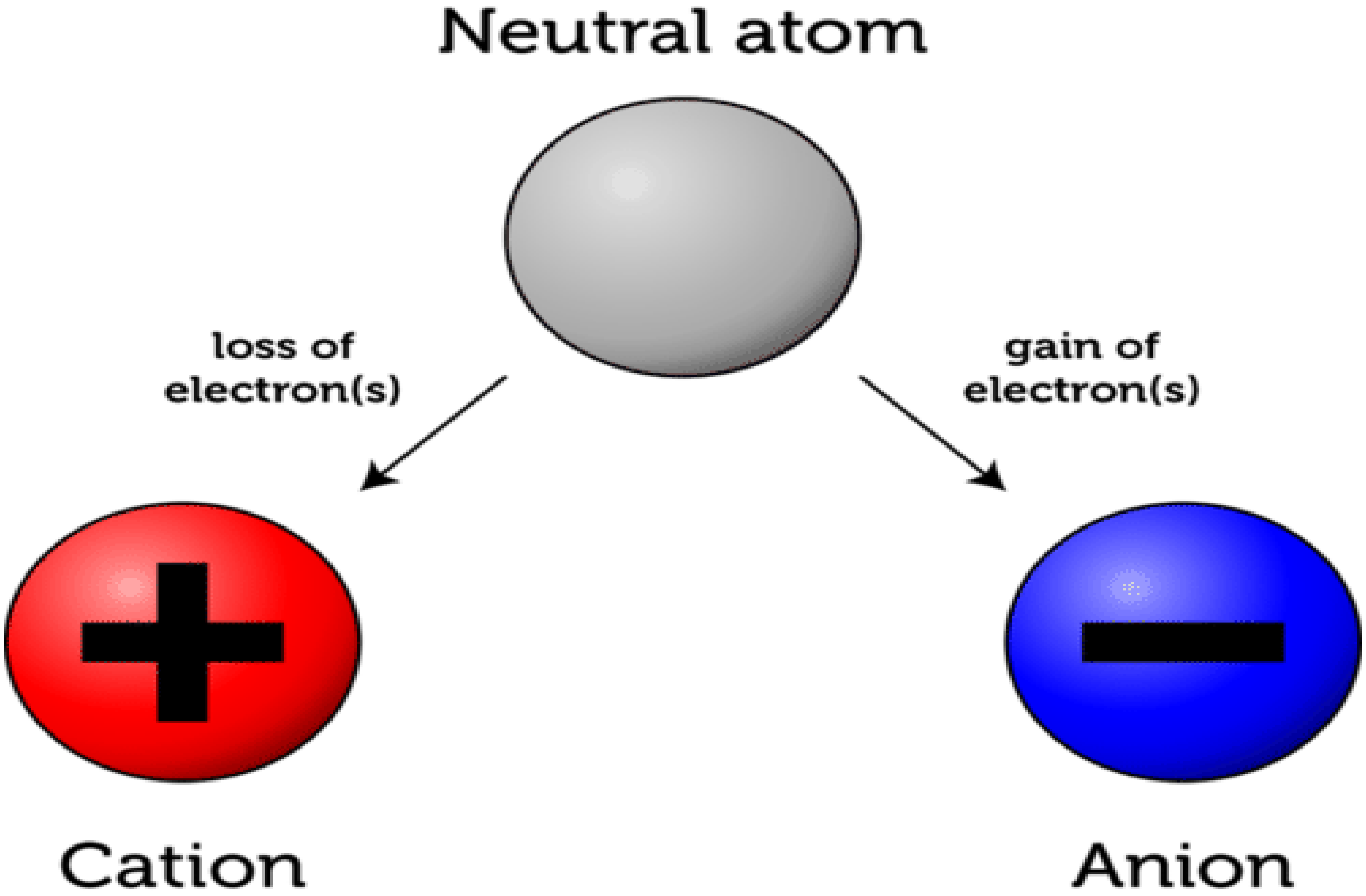


Opposite poles attract



- There is an electrostatic force of attraction between objects with opposite charges, and repulsion between objects with like charges.
- Thunder clouds can become charged as the water and air particles rub against each other. A lightning strike occurs when there is a huge discharge between the thunderclouds and the ground.
- Lightning is dangerous and safety precautions should be adhered to during lightning storms.

- When certain materials are rubbed together, the friction between them causes electrons to move from one material to the other. The objects then have an electrostatic charge, due to either the loss or gain of electrons.
- A charge is a fundamental property of matter. Electrons carry negative charges and protons carry positive charges.
- An object which has gained electrons will be negatively charged. An object which has lost electrons will be positively charged

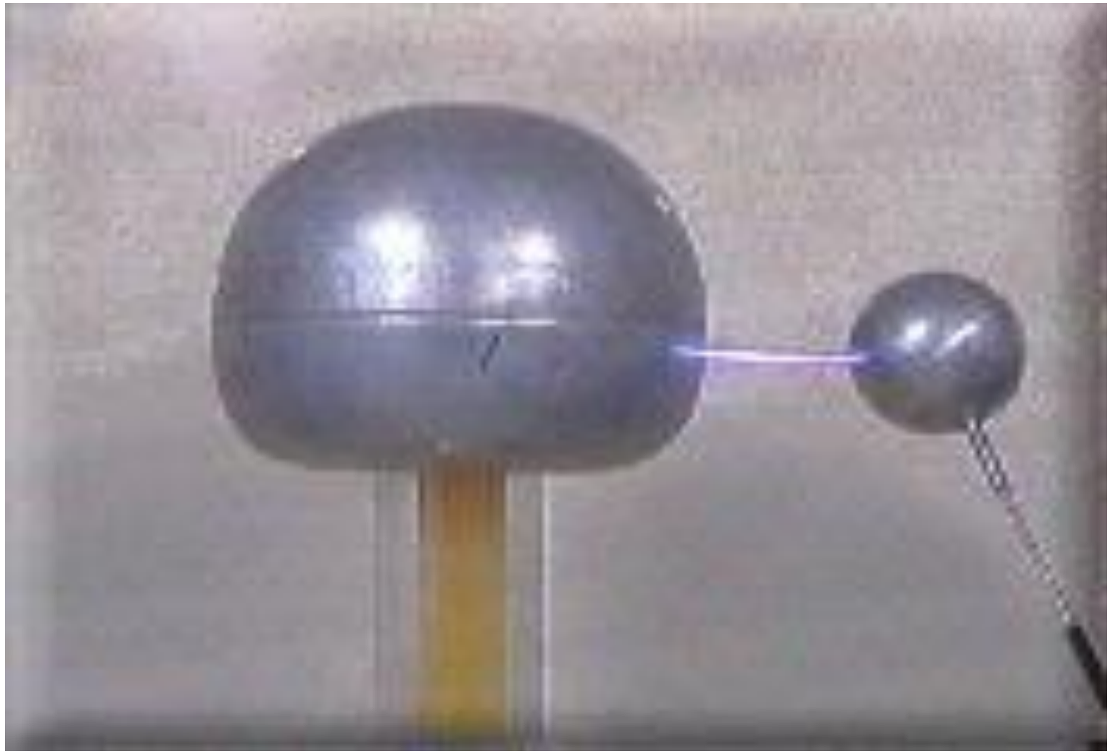

Neutral atom
loss of electron(s)
gain of electron(s)
Cation
Anion

The atom is held together by the **electrostatic attraction** between the positively charged nucleus and the negatively charged electrons. Within an atom, the electrons closest to the nucleus are the most strongly held, whilst those further away experience a weaker attraction. Normally, atoms contain the same number of protons and electrons. This means that atoms are normally **neutral** because they have the same number of positive and negative charges, so the charges balance each other out. All objects are made up of atoms and since atoms are normally neutral, objects are also usually neutral.

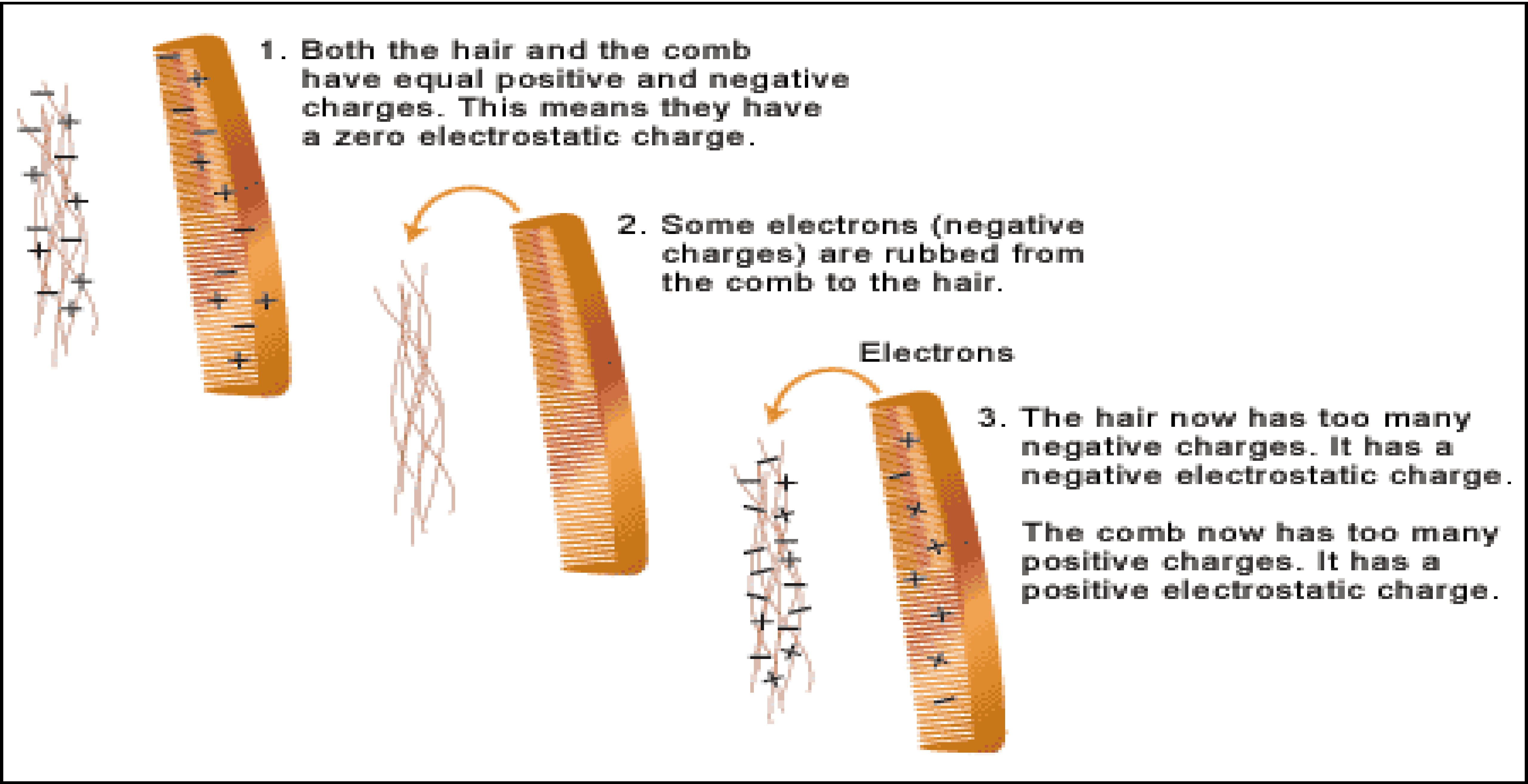
However, when we rub two surfaces together, like when you comb your hair or rub a balloon against your hair, the friction can cause electrons to be transferred from one object to another. Remember, the protons are fixed in place in the nucleus and so they cannot be transferred between atoms. Only electrons can be transferred between atoms. Some objects give up electrons more easily than other objects.

A Van de Graaff generator.

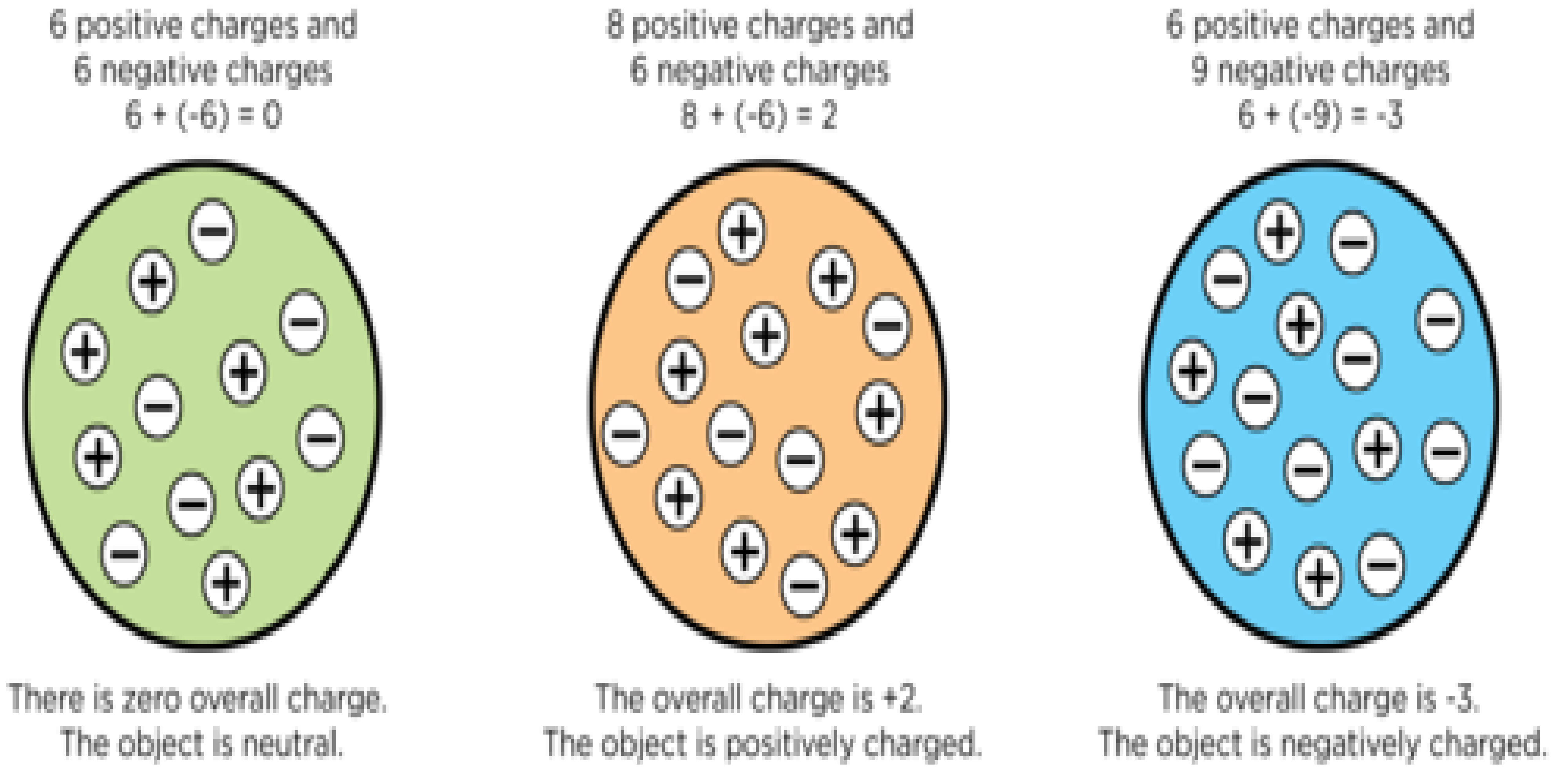
Did you see sparks? The Van de Graaff generator can be used to demonstrate the effects of an electrostatic charge. The big metal dome at the top becomes positively charged when the generator is turned on. When the dome is charged it can be discharged by bringing another insulated metal sphere close to the dome. The electrons will jump to the dome from the metal sphere and cause a spark.



HAIR AND COMB CHARGE



Have a look at the following diagrams which illustrate this.



CLASSWORK

What do you think these two girls are touching on the left of the photo? Explain your answer and what is happening to them. [3 marks]

Write a short paragraph to explain how lightning forms. [4 marks]

What is wrong with the following scene? Explain your answer. [2 marks]

ELECTRIC CELL AS ENERGY SYSTEM

Electric cell is a device that converts chemical energy to electrical energy. Cell comprises of two electrodes and an electrolyte. Electrodes are made of materials that participate in chemical reaction with the electrolyte. There are two kind of chemical reactions happening within the cell at ,**oxidation** and **reduction**.
Oxidation implies the electrode material loses electron and positive ions dissolves into the electrolyte.

This happens at one electrode(called anode) and this electron can flow out if the anode to external conducting wire provided there is a strong pulling force(called reduction potential) at the other electrode where this electron is accepted by the ion and deposits as metal in the electrode (called cathode). This two half cell reaction when combined (i.e. oxidation and reduction) is called redox chemical reaction. This is responsible for the flow of electrons in the external circuit which can be used to drive different electrical load.

Activity 1 TERM 3

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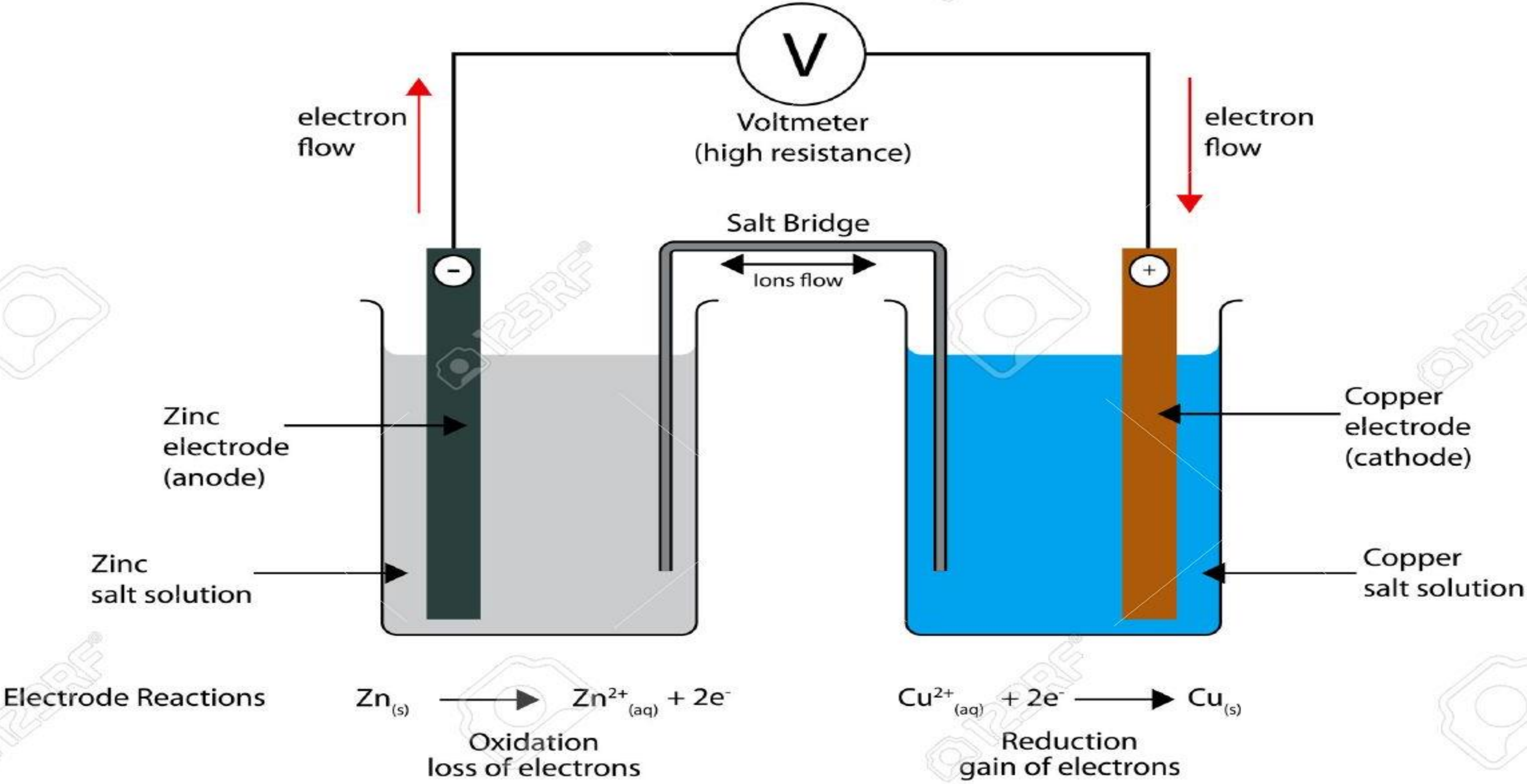
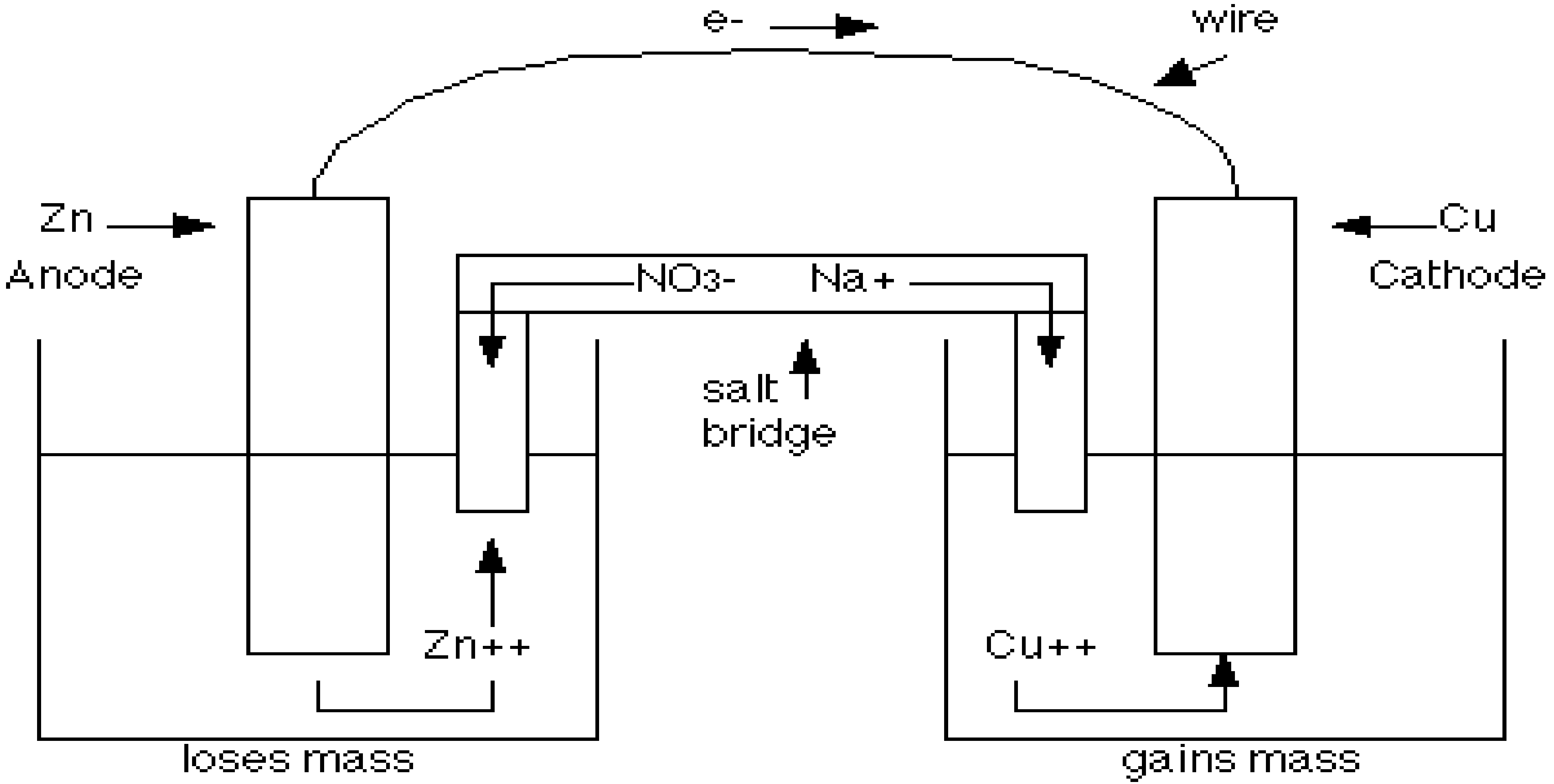
SIMPLE CELL

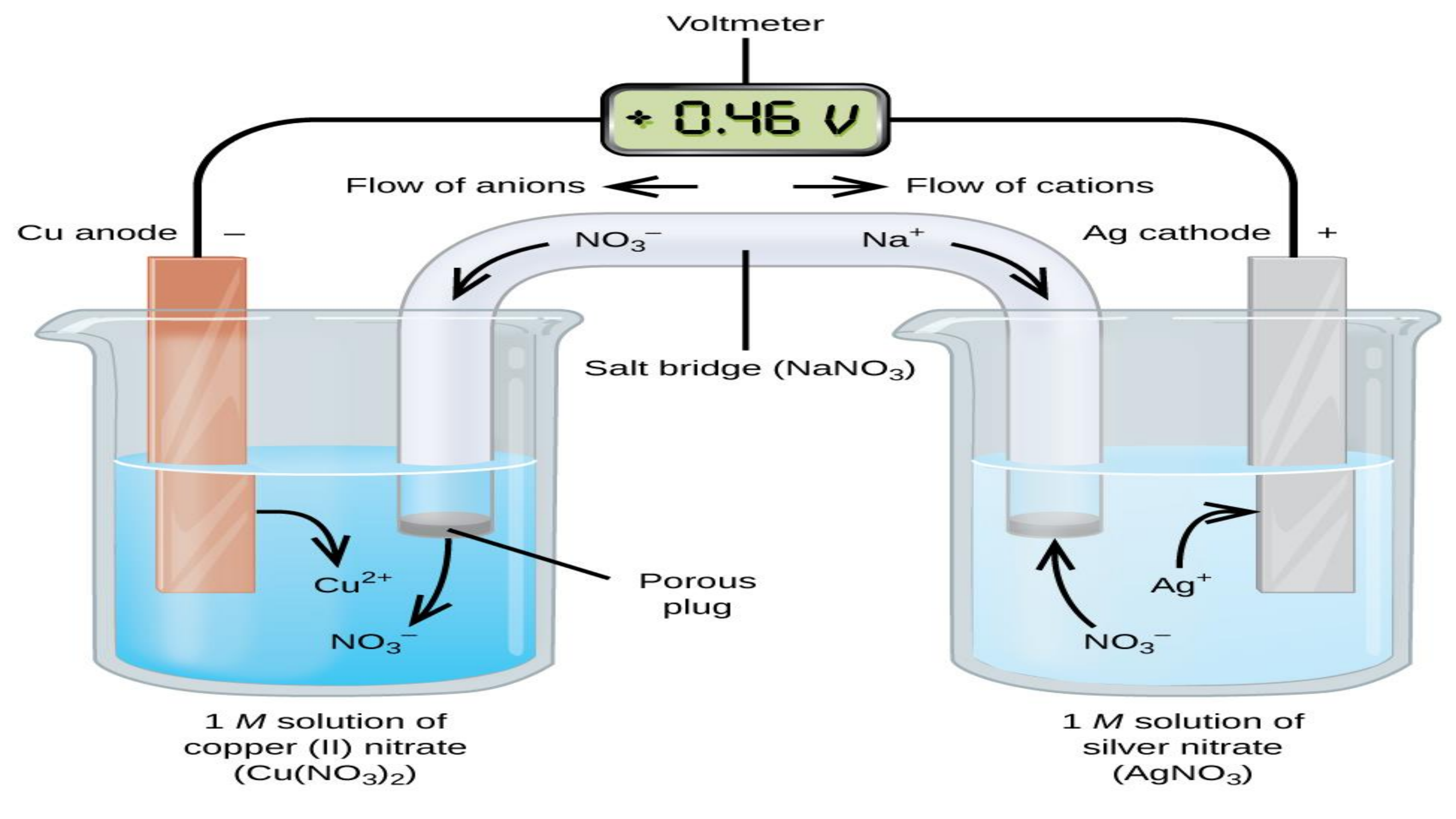


V
Voltmeter
(high resistance)
electron
flow
electron
flow
Salt Bridge
Ions flow
Zinc
electrode
(anode)
Copper
electrode
(cathode)
Zinc
salt solution
Copper
salt solution
Electrode Reactions
$Zn_{(s)} \rightarrow Zn^{2+}_{(aq)} + 2e^-$
Oxidation
loss of electrons
$Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$
Reduction
gain of electrons

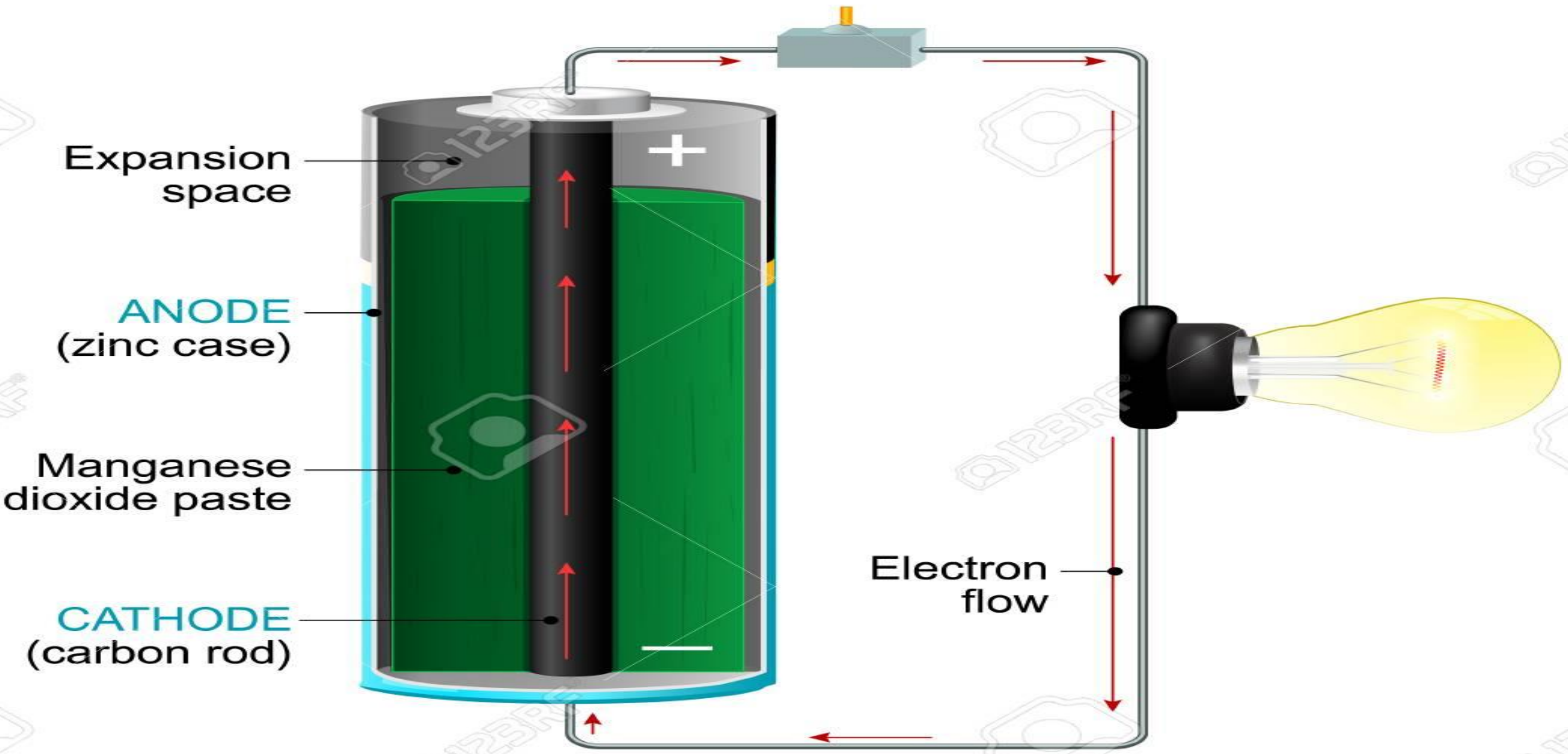


An electrochemical cell of the reaction:

$$Zn(s) + Cu^{++}(aq) \longrightarrow Zn^{++}(aq) + Cu(s)$$


Voltmeter
+ 0.46 V
Flow of anions
Flow of cations
Cu anode
–
Ag cathode
+
NO_3^-
Na^+
Salt bridge ($NaNO_3$)
Cu^{2+}
NO_3^-
Porous plug
Ag^+
NO_3^-
1 *M* solution of copper (II) nitrate ($Cu(NO_3)_2$)
1 *M* solution of silver nitrate ($AgNO_3$)

Dry cell battery



USES OF ELECTRIC CELL

Electrical cell is the one which generates electricity independently. It converts stored **chemical energy** into **electrical energy**. Cells are used in hand held instruments. Your mobile phone is powered by an electric cell. Also your laptop computer.

Source of electricity in an electric cell

Cells using **electricity**

An **electrical cell** (or an "electrolytic **cell**") is used for these reactions. It is a container which has to have a chemical reaction involving electrodes. The chemical substances are exposed to **electrical power**, and the electrolysis reaction happens inside the **electrical cell**.

Two **types** of electrochemical **cells**:

A Galvanic **Cell** or Electrolytic **Cell** and Voltaic **Cell** induces a spontaneous redox reaction to create a flow of **electrical** charges, or **electricity**. Non-rechargeable batteries are examples of Galvanic **cells**.

Voltaic cell

- Spontaneous
- Chemical → Electrical
- Uses activity differences between two metals to create electricity
  - Voltage generated = VOLTaic

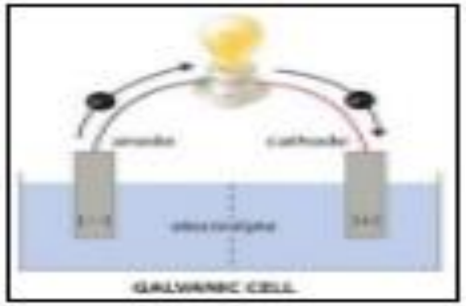
Electrolytic cell

- Non-spontaneous
- Electrical → Chemical
- Electrolysis
  - Lyse = break
  - Uses electricity to break ionic compounds

Electrochemistry

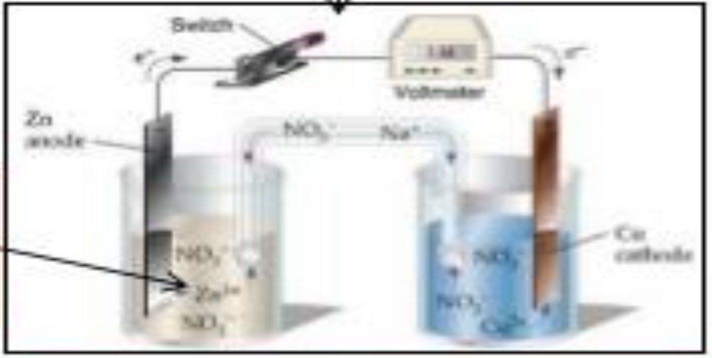
Chemical and electrical energy

Redox rxn
(Oxidation/reduction)
Movement electron
Produce electricity



Voltaic cell

Conversion chemical energy to electrical energy

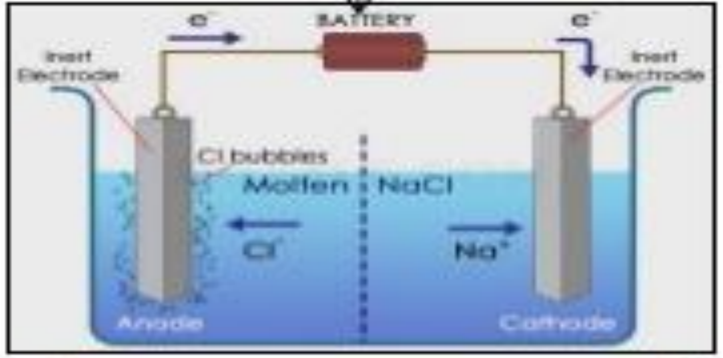


Chemical rxn
↓
Electric current

Electrodes – different metal (Half cell)

Electrolytic cell

Conversion electrical energy to chemical energy

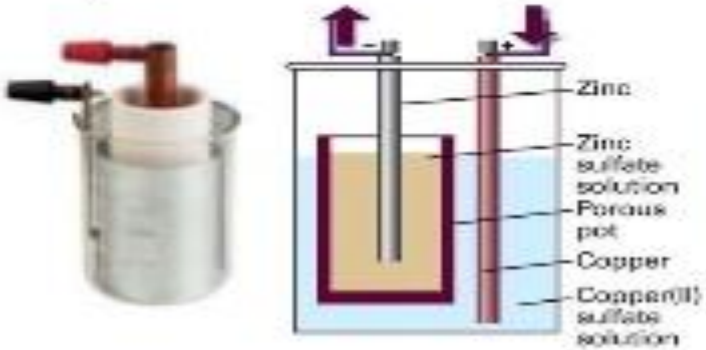


Electrodes – same metal (Half cell)

Types voltaic cell

Primary cell (Non rechargeable)

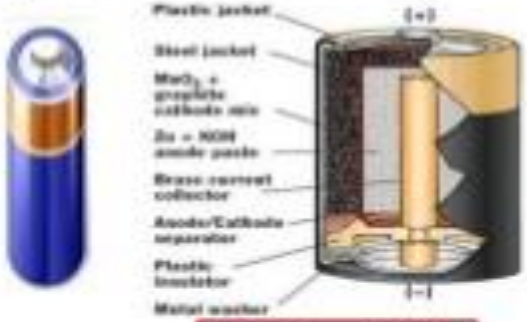
Daniell cell



Dry cell

NH_4Cl and $ZnCl_2$

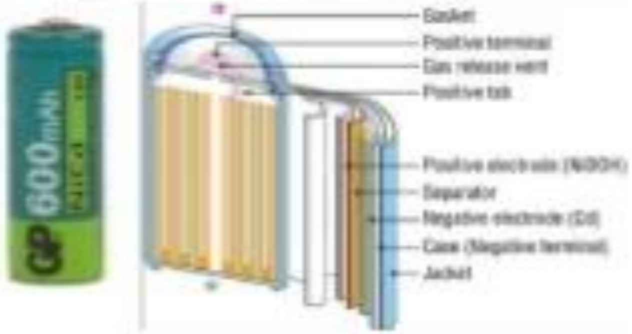
Alkaline cell



MnO_2 and KOH

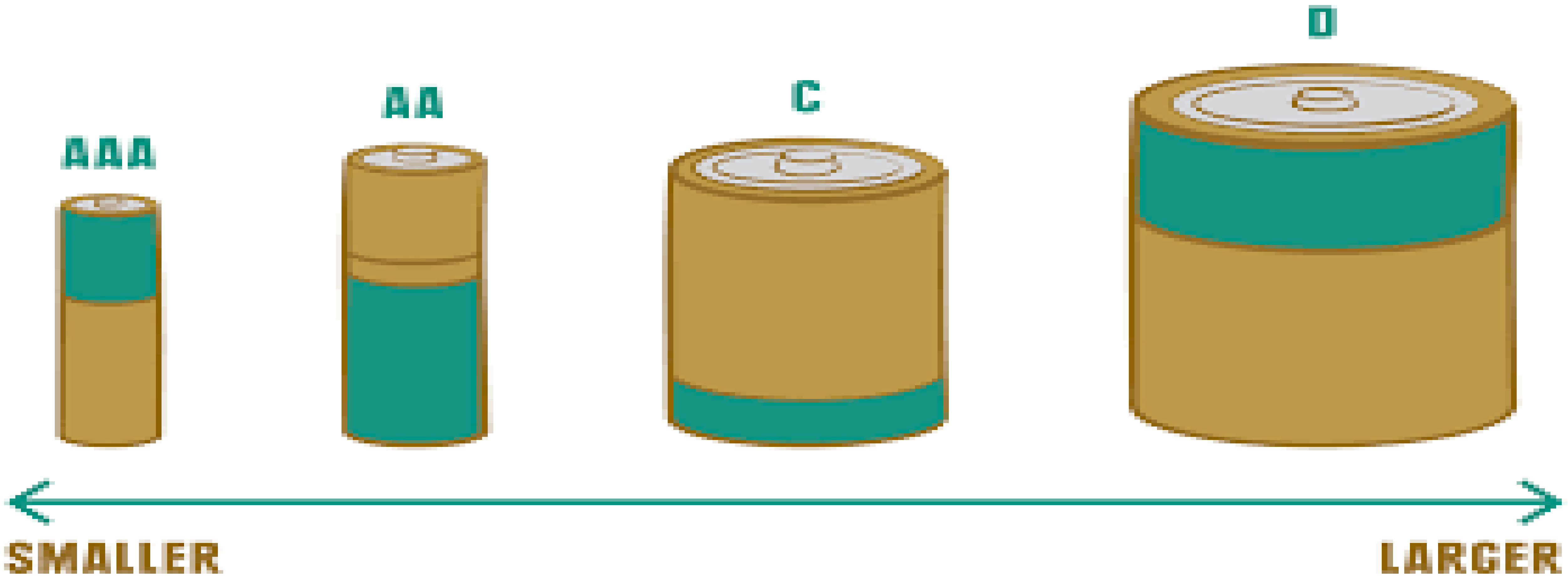
Secondary cell (Rechargeable)

Nickel cadmium cell



Three secondary batteries commonly used for laptops:
Nickel Cadmium, Nickel Metal Hydride, and Lithium Ion

Primary batteries are "single use" and cannot be recharged. Dry **cells** and (most) alkaline batteries are **examples of primary** batteries. **Flashlight or smoke detector** have simple dry **cell** or batteries. In these **cells** Zn acts as anode and graphite electrode acts as cathode. The electrolyte **is** ZnCl2 and ammonium chloride.




AAAA
AAA
AA
C
D
J
N
9B


Types of Battery
Different Types of Battery and their Advantages and Disadvantages
AA
ALKALINE
Panasonic
D
ALKALINE

Li-ion
ENERGY
ACCUMULATOR 3000
ACCUMULATOR 2500
Li-ion
A23
Alcline
A23
BATTERY
ACCUMULATOR
Alcaline
9v
Battery
4.5v
ACCUMULATOR
Battery
Battery
1.5v
C
Li-ion
AAA
Alcline
AAA
12V
Battery
Li-ion
ALCALINE
ENERGY
12v
4.5v
1.5v
3v
ENERGY
AA
ALCALINE
AA
ENERGY
9V

Activity 2 TERM 3

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QUESTIONS FOR REVISION

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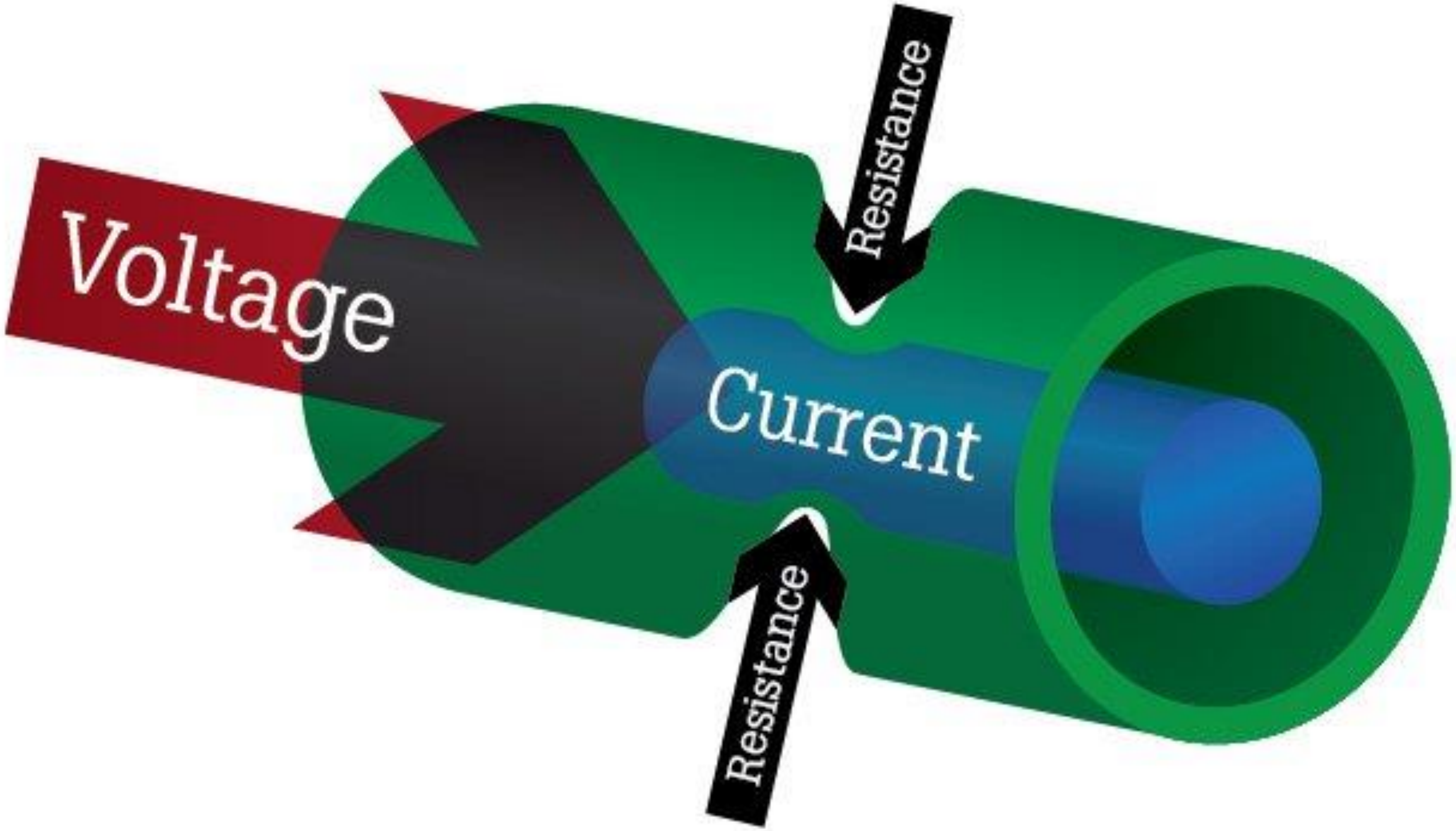
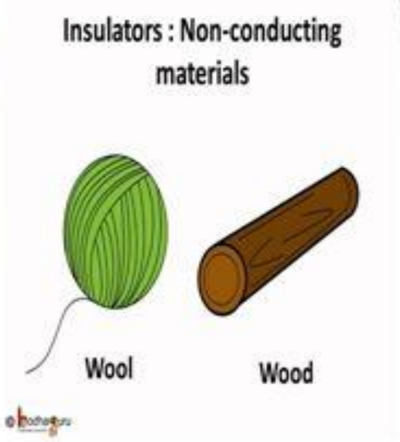
Resistance and Ohms law

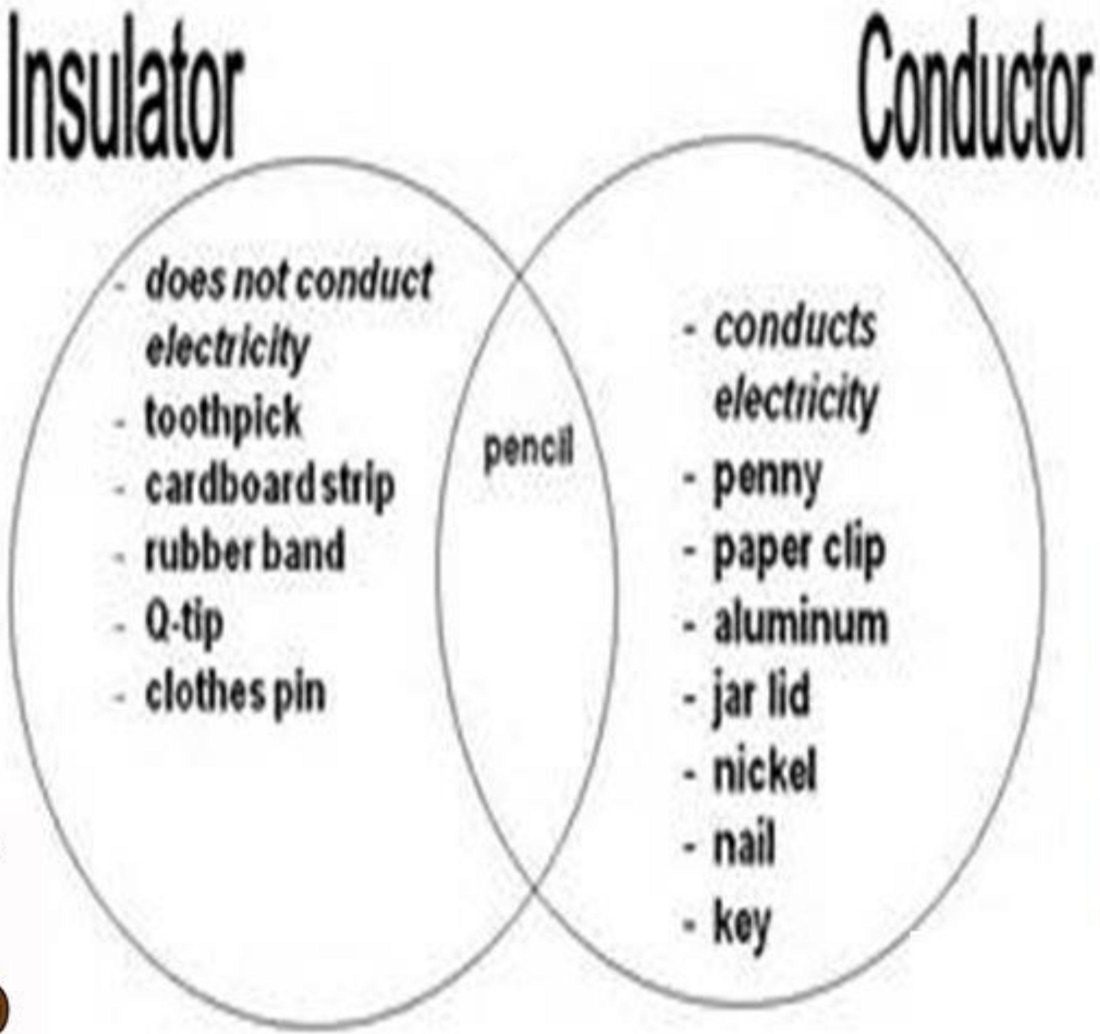
Resistance is a measure of the opposition to current flow in an electrical circuit. **Resistance** is measured in ohms, symbolized by the Greek letter omega (Ω). Ohms are named after Georg Simon Ohm (1784-1854), a German physicist who studied the relationship between voltage, current and **resistance**.

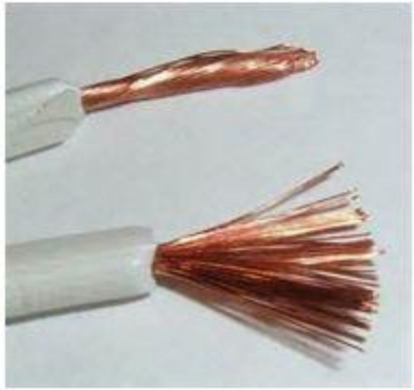
An electric current flows when electrons move through a conductor, such as a metal wire. The moving electrons can collide with the ions in the metal. This makes it more difficult for the current to flow, and **causes resistance**.


Voltage
Current
Resistance
Resistance

Insulators
Conducto





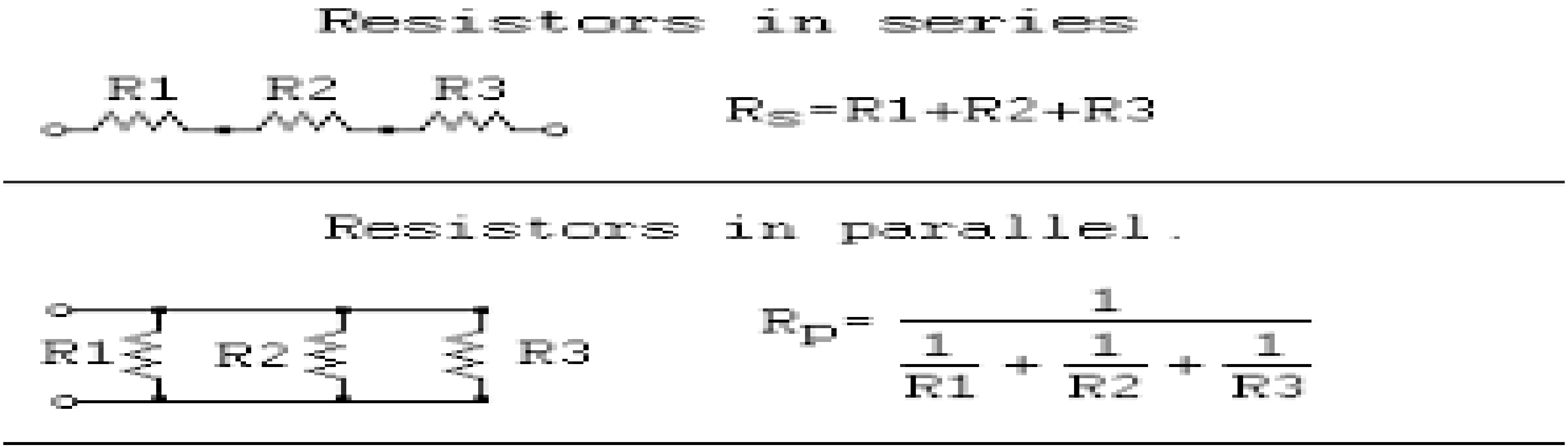


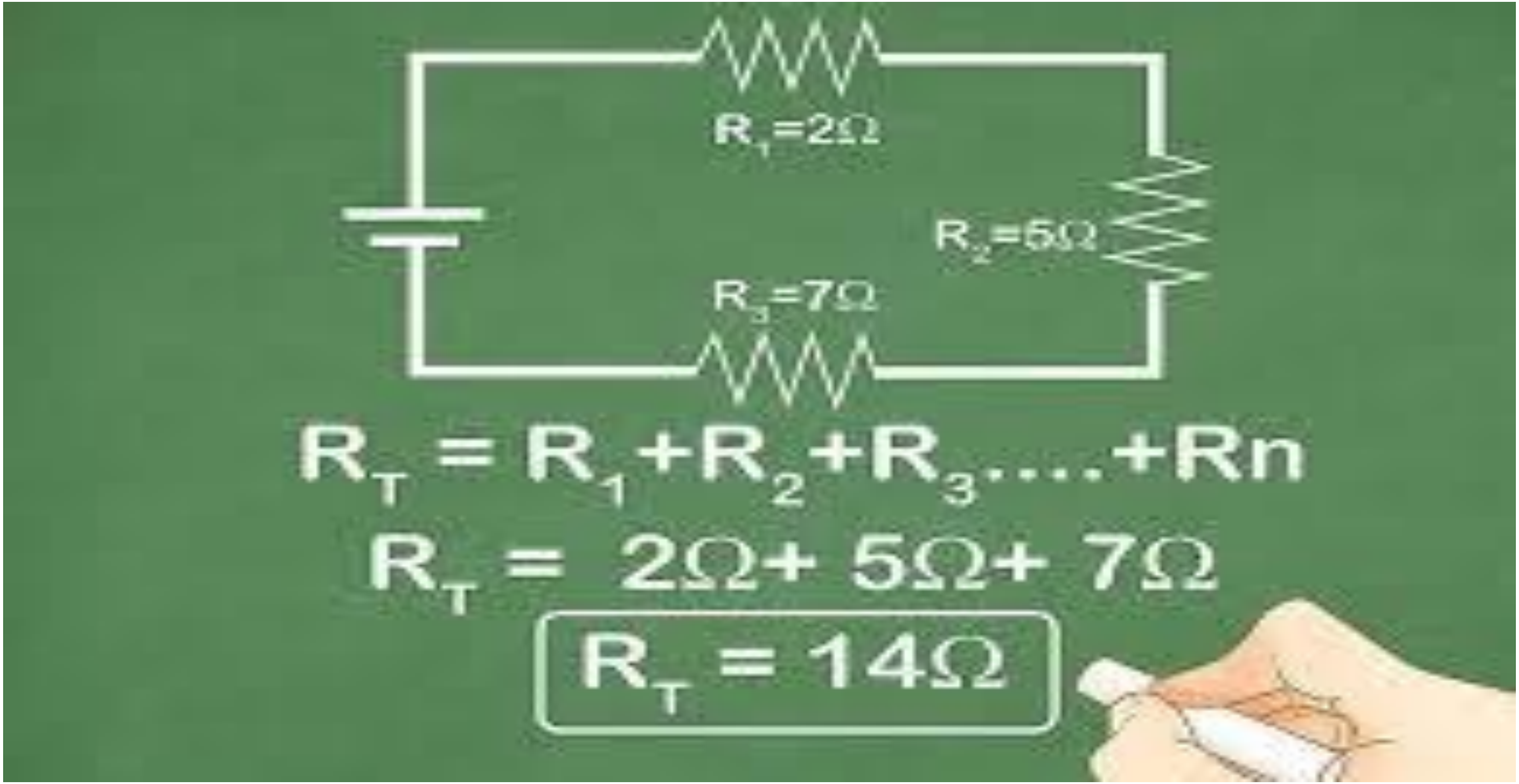
Resistance is the measure of opposition to electric current. • A short **circuit** is an electric **circuit** offering little or no **resistance** to the flow of current. Short **circuits** are dangerous with high voltage power sources because the high currents encountered can cause large amounts of heat energy to be released.

In **electrical** terms, this is represented by two **circuits** with equal voltages and different resistances. The **circuit** with the higher **resistance** will allow less charge to flow, meaning the **circuit** with higher **resistance** has less current flowing through it.

The total **resistance** of an electrical circuit with resistors wired in a **series** is the sum of the individual resistances: ... Each **resistor** in a **parallel** circuit has the same full voltage of the source applied to it. The current flowing through each **resistor** in a **parallel** circuit is **different**, depending on the **resistance**.

To **calculate** the total overall **resistance** of a number of **resistors** connected in this way you add up the individual resistances. This is done using the following **formula**: R total = R1 + R2 +R3 and so on. Example: To **calculate** the total **resistance** for these three **resistors in series**.

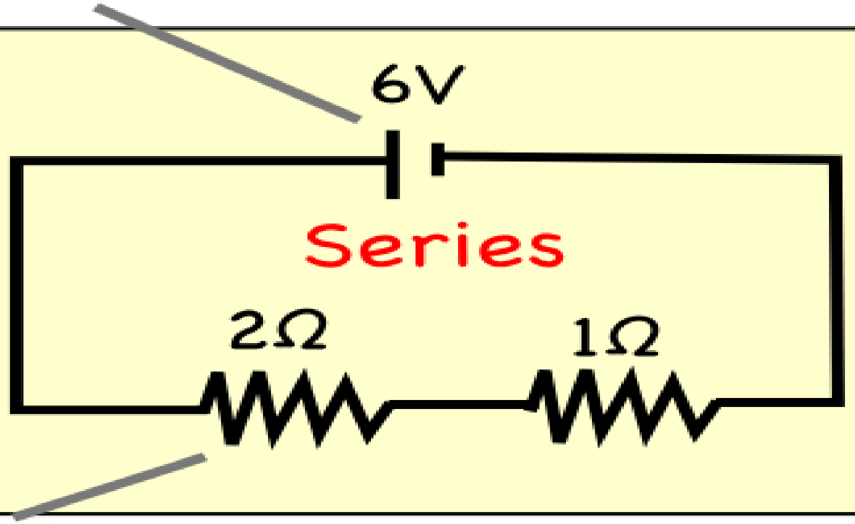



$R_1=2\Omega$
$R_2=5\Omega$
$R_3=7\Omega$
$R_T = R_1+R_2+R_3....+Rn$
$R_T = 2\Omega+ 5\Omega+ 7\Omega$
$R_T = 14\Omega$

Battery (6 Volts)

total resistance

$$R = R_1 + R_2$$
$$= 2\Omega + 1\Omega$$
$$= 3\Omega$$



$$\text{Current} = \frac{\text{Voltage}}{\text{Resistance}}$$

$$I = \frac{V}{R} = \frac{6V}{3\Omega}$$
$$= 2\ A$$

Resistor (2 Ohms)

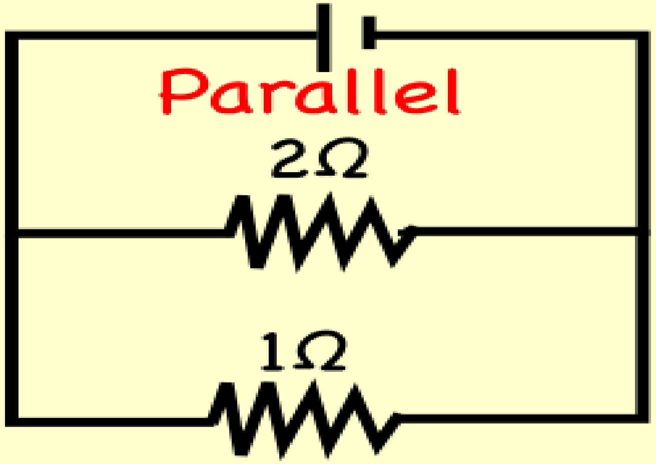
total resistance

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R} = \frac{1}{1\Omega} + \frac{1}{2\Omega}$$

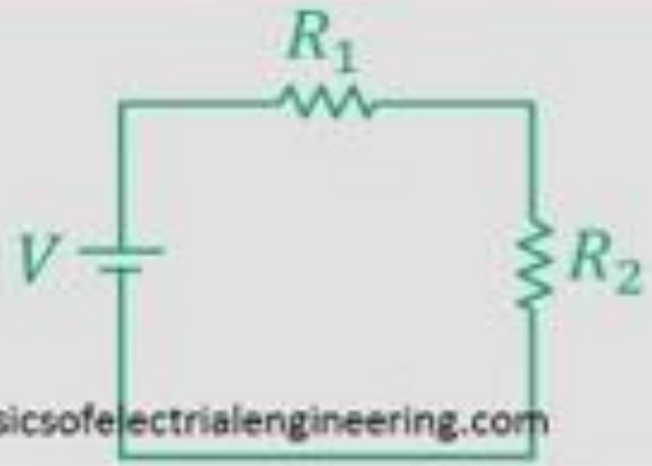
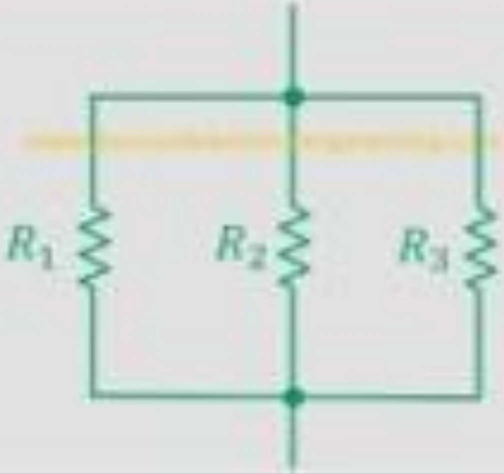
$$\frac{1}{R} = \frac{3}{2\Omega}$$

$$R = 2/3\ \Omega$$



$$\text{Current} = \frac{\text{Voltage}}{\text{Resistance}}$$

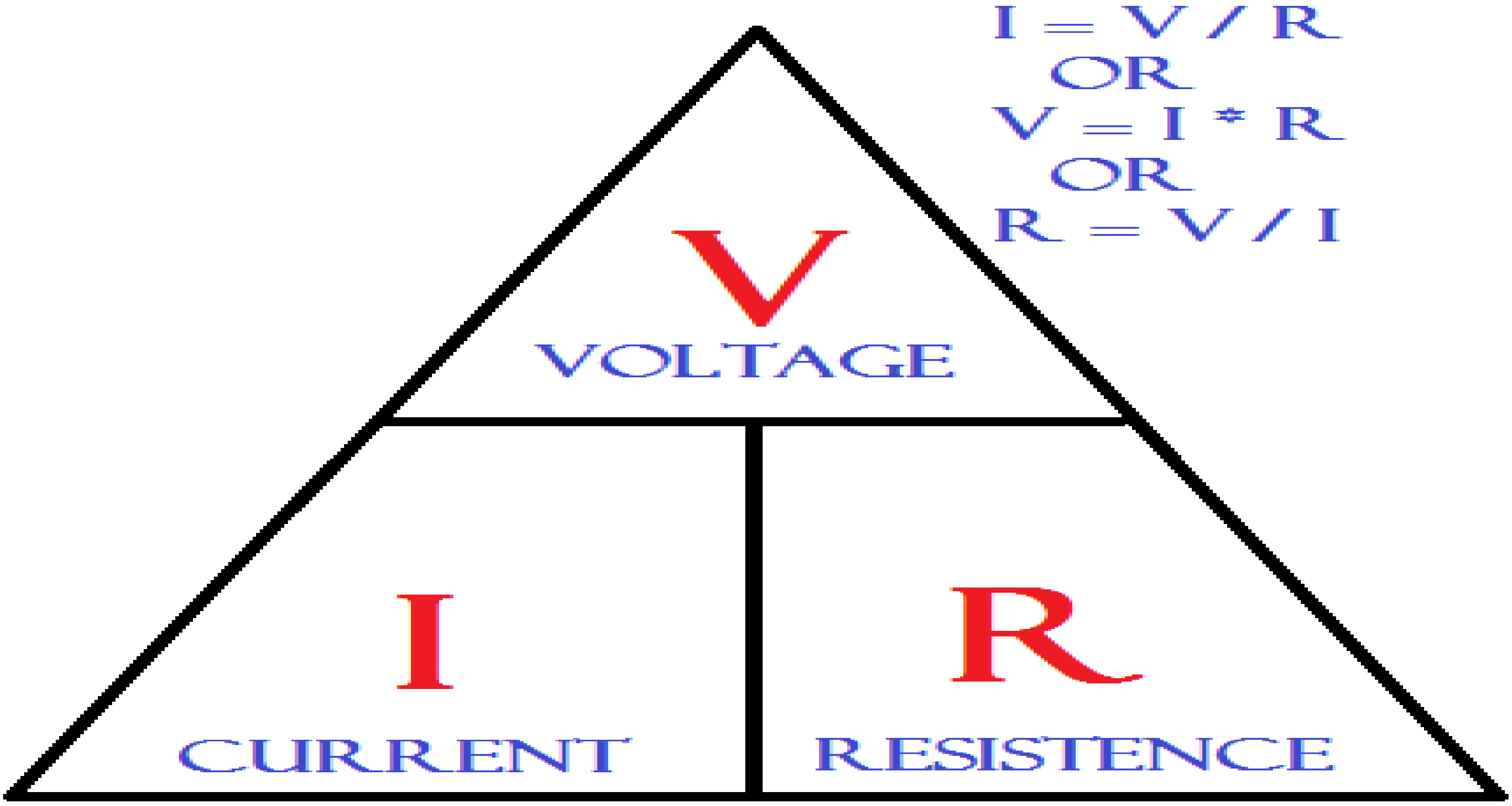
$$I = \frac{V}{R} = \frac{6V}{2/3\Omega}$$
$$= 9\ A$$

	Series	Parallel
How it looks		
Current	Always remains same in series	Divides in parallel
Voltage	Divides in parallel	Remains same in series
Equivalent resistance	$R_{eq} = R_1 + R_2 + R_3$	$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots \frac{1}{R_n}$

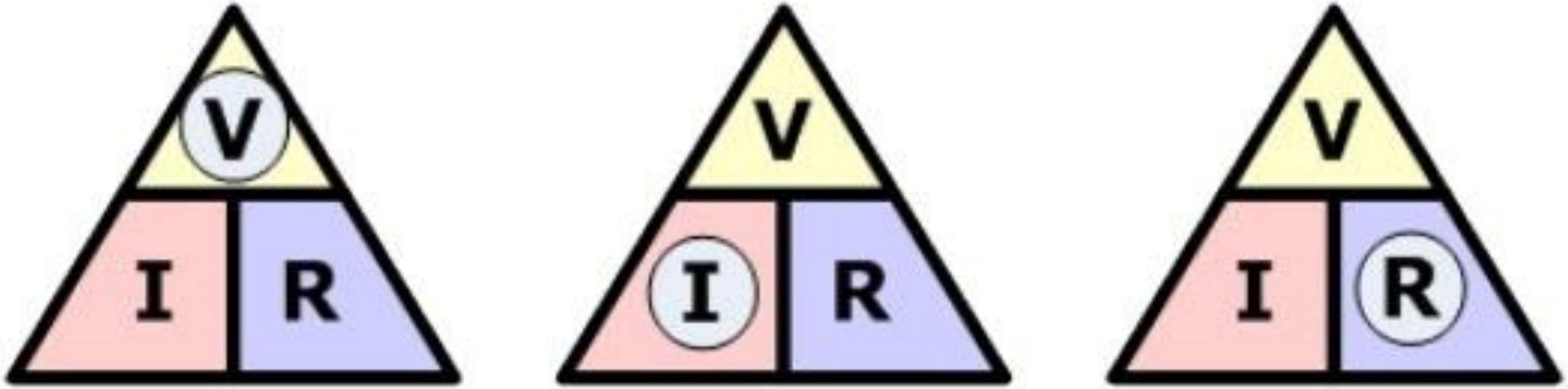
OHM'S LAW

This relationship states that: The potential difference (voltage) across an ideal conductor is proportional to the current through it. The constant of proportionality is called the "resistance", R. **Ohm's Law** is given by: V = I R where V is the potential difference between two points which include a resistance R.

If you **know the** total current and the voltage across the whole circuit, you can find the total **resistance** using Ohm's Law: R = V / I For example, a parallel circuit has a voltage of 9 volts and total current of 3 amps. The total **resistance** R = 9 volts / 3 amps = 3 Ω.


I = V / R
OR
V = I * R
OR
R = V / I
V
VOLTAGE
I
CURRENT
R
RESISTENCE

Ohm's Law Triangle



$V = I \times R$ $I = \dfrac{V}{R}$ $R = \dfrac{V}{I}$

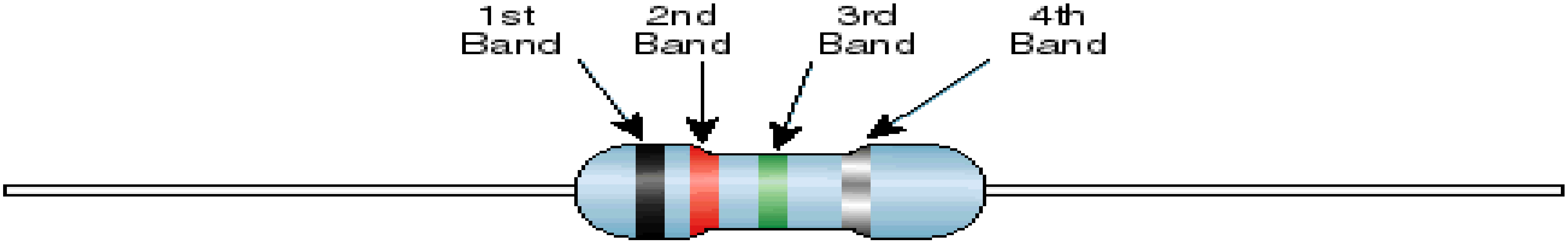
Quantity	Symbol	Unit of Measurement	Unit Abbreviation
Current	I	Ampere ("Amp")	A
Voltage	E *or* V	Volt	V
Resistance	R	Ohm	Ω

RESISTOR

A **resistor** is a passive two-terminal electrical component that implements electrical **resistance** as a circuit element. In electronic circuits, resistors are **used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.**

The main **function** of resistors in a circuit is to control the flow of current to other components. Take an LED (light) for example. If too much current flows through an LED it is destroyed. So a **resistor** is used to limit the current.

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%

Letters as an aid to memory	Colour	Figure (A, B)	Multiplier (C)
B	Black	0	10^0
B	Brown	1	10^1
R	Red	2	10^2
O	Orange	3	10^3
Y	Yellow	4	10^4
G	Green	5	10^5
B	Blue	6	10^6
V	Violet	7	10^7
G	Grey	8	10^8
W	White	9	10^9

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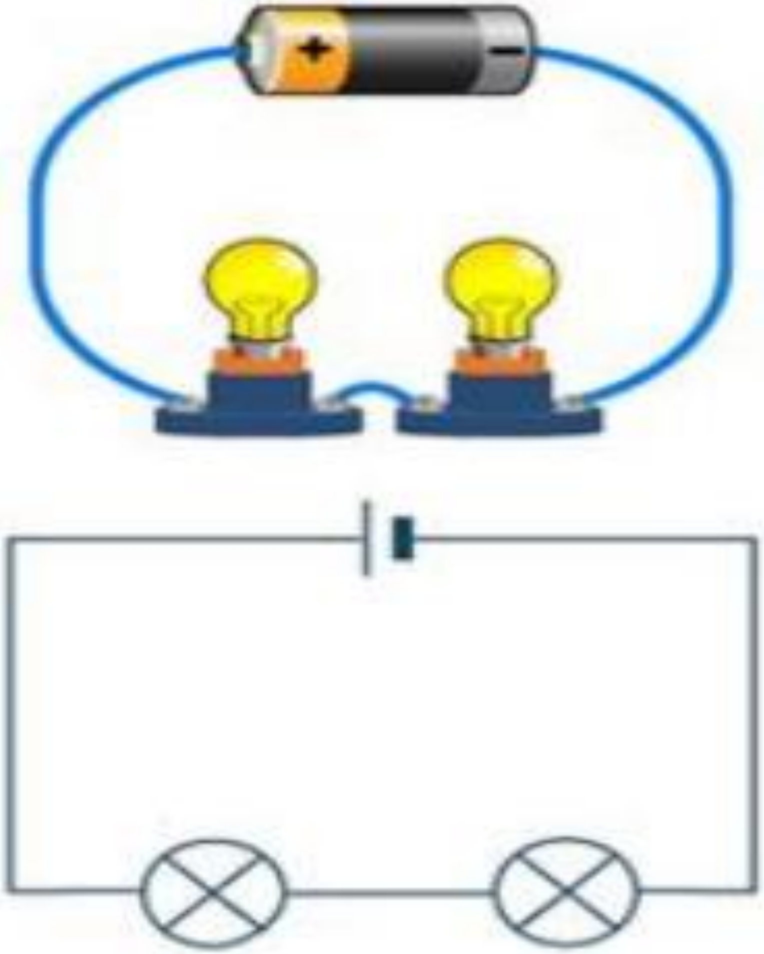
SERIES AND PARALLEL CIRCUIT

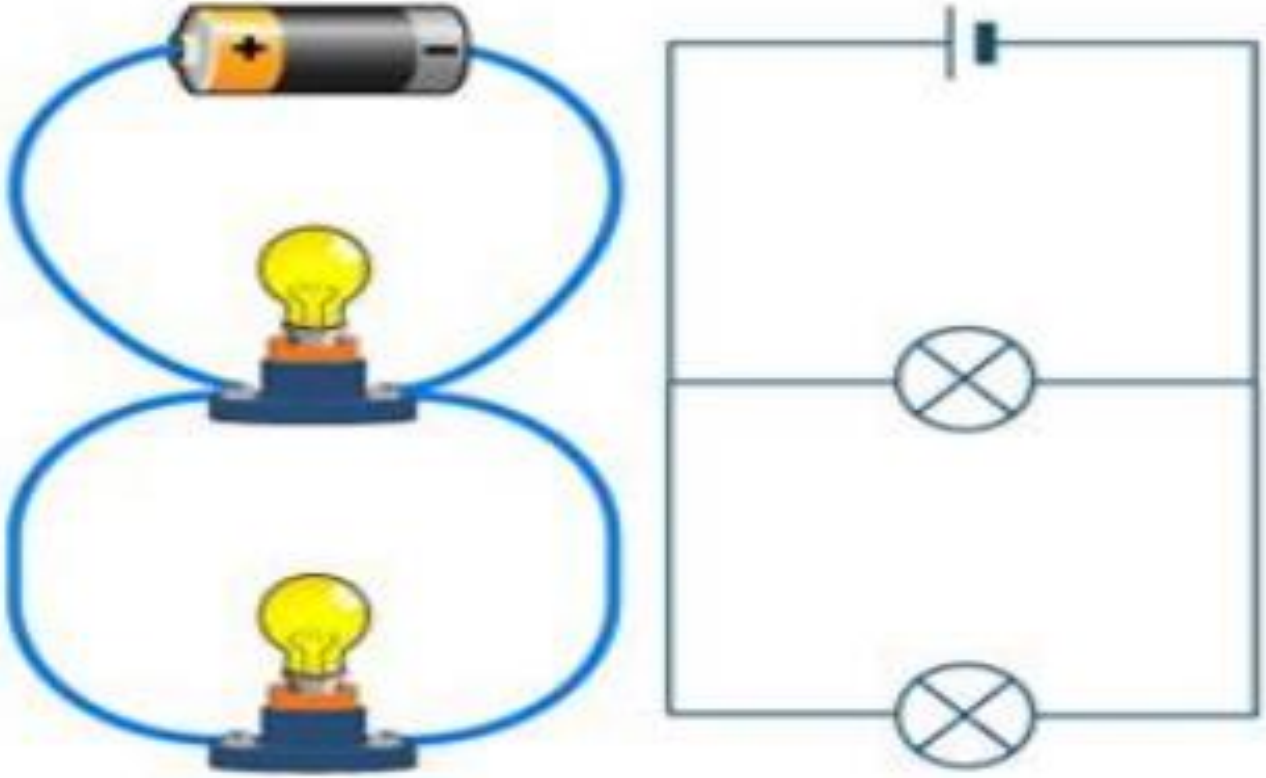
Parallel circuits have multiple branching pathways for electrical current whereas a simple **series circuit** forms a single path. The components of a **parallel circuit** are connected differently than they are **in a series circuit**; the arrangement affects the amount of current that flows through the **circuit**.

Components of an electrical circuit or electronic circuit can be **connected** in many different ways. The two simplest of these are called **series** and parallel and occur frequently. Components **connected** in **series** are **connected** along a single path, so the same current flows through all of the components.

SERIES AND PARALLEL CIRCUIT

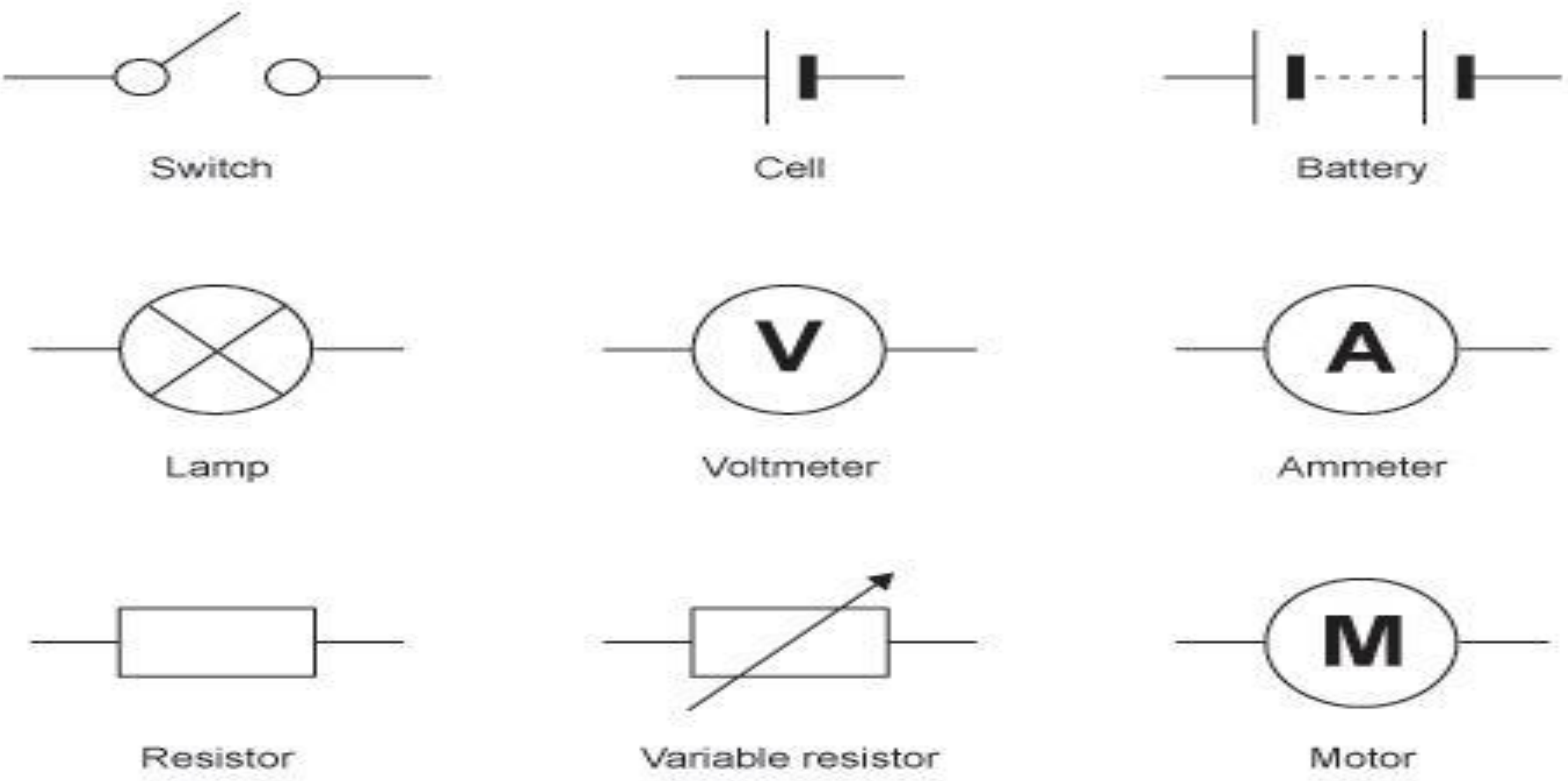


Series Circuit



Parallel Circuit

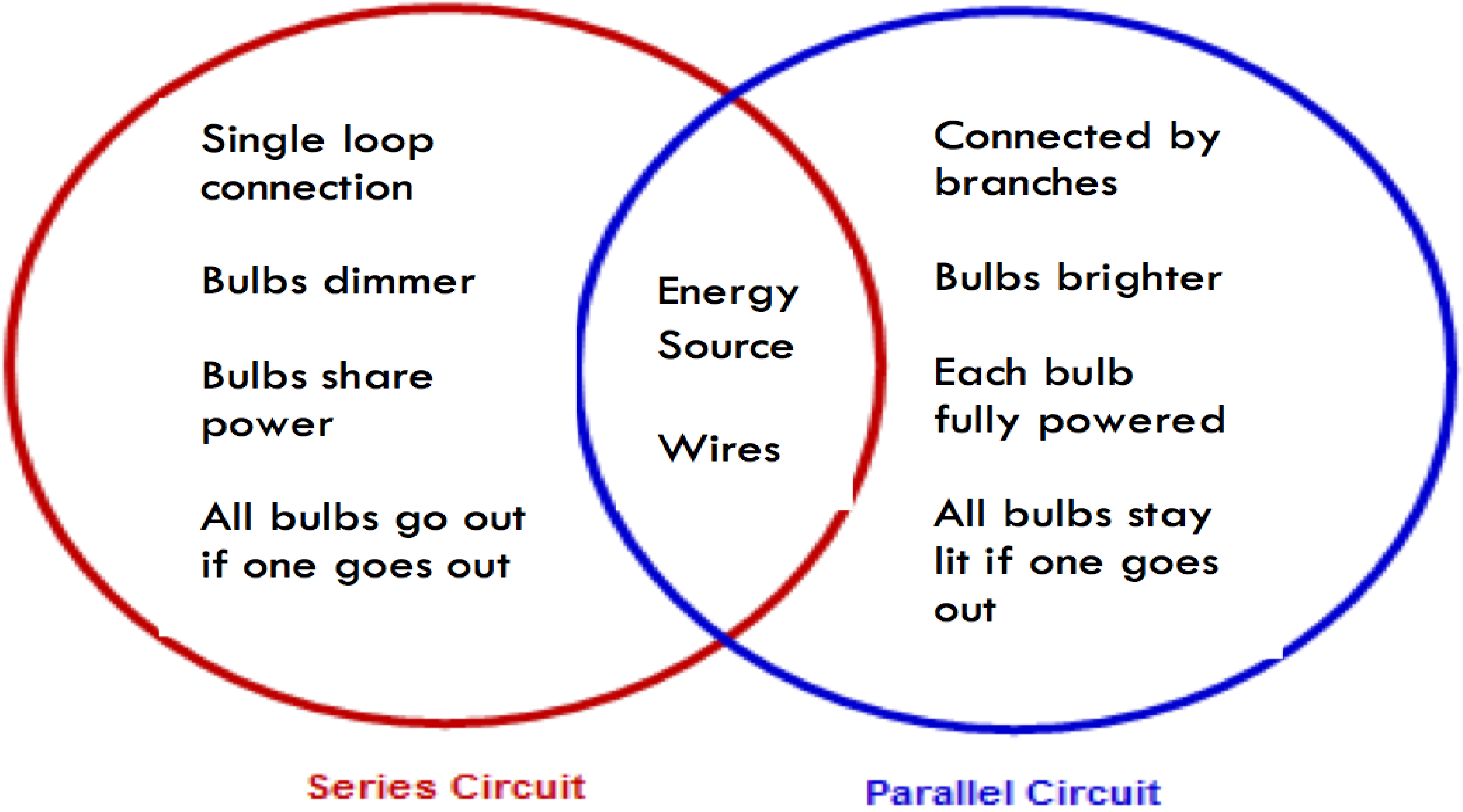
Electrical symbol



DIFFERENCES BETWEEN SERIES AND PARALLEL CIRCUIT

- **One** pathway *(circuit)*
- Current *(flow of electric charge)* **same** anywhere in the circuit
- Voltage (measure of strength of electrical power) **shared** in ratio to resistance

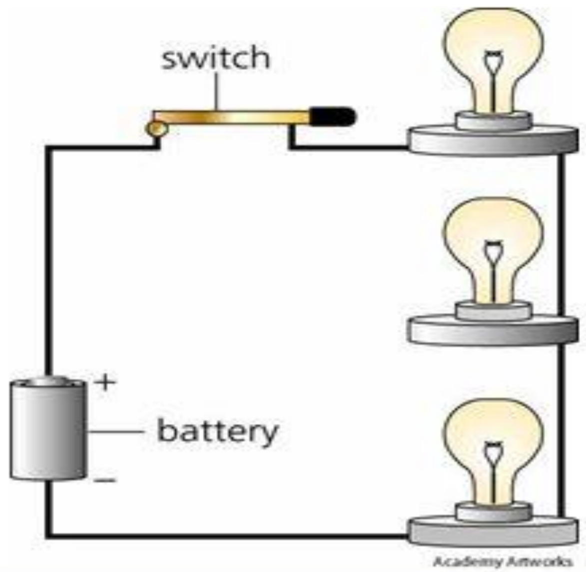
- **Two or more** pathways
- Current **splits**, passes through pathways, and adds up again
- Voltage across **each** pathway equals supply voltage

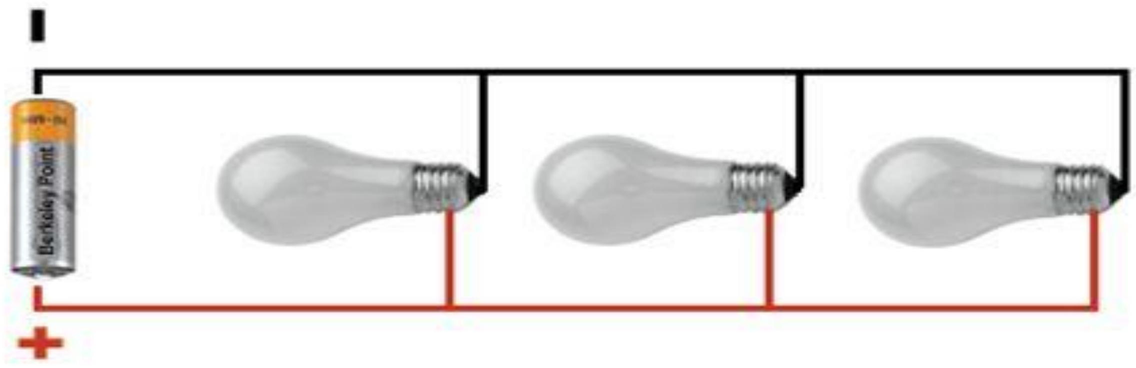

Single loop connection
Bulbs dimmer
Bulbs share power
All bulbs go out if one goes out
Energy Source
Wires
Connected by branches
Bulbs brighter
Each bulb fully powered
All bulbs stay lit if one goes out
Series Circuit
Parallel Circuit

Current and circuits

What is a circuit and where do you see them?

Types of Circuits





Series Circuit

- There is one single loop (one pathway for current to flow)
- Example: old Christmas lights
- When one burns out, they all go out!

Parallel Circuit

- There are loops within a loop (multiple pathways for current to flow)
- Example: Car & home, power bar
- When one burns out, the others still work!

Advantages and Disadvantages of Parallel and Series circuits

	Advantage	Disadvantage
Wiring done in parallel	Other bulbs remain working if one bulb is blown or removes All bulbs glow brightly	More current is needed when extra bulbs added The battery runs out quicker
Wiring done in series	You can turn off all of the appliances / lights with one switch The wiring is simpler	If one bulb is disconnected the circuit is not complete and all the bulbs will go out Resistance of the circuit is greater if more than one bulb – the other bulbs don't glow as brightly Hard to find the blown bulb

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SAFETY WITH ELECTRICITY

<u>OVERLOADING</u>- adding more load or plugging them in parallel circuits by requiring more current to flow than the circuit can safely handle.

Every load connected in a separate path receives the full circuit voltage.

Short circuit –can happen if the insulation covering electricity wires in an appliances becomes worn out.

The copper wire carrying the current becomes exposed and may touch another wire .The circuit has less resistance than the appliance,so it will carry large current.The large current heats the wire causing the insulation to burn ,so starting fire

Dangerous effects of electricity

1. Using wet hands on appliances,
2. Overloading a plug,
3. danger electric shock risk,
4. damage insulation,
5. sticking a naked wire into plug

SYSTEMS THAT ENSURE SAFETY ON ALL CONNECTION OF APPLIANCES

1.CIRCUIT BREAKERS/TRIP SWITCHES-The wire is wound around iron to make an electromagnetic.When a short circuit happens,the large current in the wire makes a strong electromagnetic which pulls open the switch ,stopping the current from flowing.It cannot be replaced as fuse does e.g. are found in stoves, geyser and lights.They are found in switch box.

fuse is an electrical safety device that operates to provide overcurrent protection of an electrical circuit. Its essential component is a metal wire or strip that melts when too much current flows through it, thereby interrupting the current.

The **function of a fuse** is usually to prevent fire - that's the basic protection a **fuse** offers - between power supply and appliance there may be a few feet or metres of cable - if a short circuit occurs in the appliance, the cable could easily become overheated (due to excess current) and burn or rupture its insulation.

2.Main switch is found in the circuit breaker which can cut off all electricity in the house e.g. if there is a problem with the stove will trip and electricity going to stove will trip but the lights, plugs and geyser will not be affected cause the wiring was connected parallel.

RING MAIN-is the common circuit connected parallel in the house,it forms a complete ring or loop within the house. Advantage is that when connected parallel the lights and other plugs can be turned on and off without affecting any of the other lights or socket.

3.EARTH LEAKAGE- is used in many power tools to prevent the person using it from getting a shock.

TWO TYPES OF PIN PLUG

1.THREE PIN PLUG

- has built in safety device as it has an earth line connection.
- It has live-brown wire, neutral-blue , Earth-green and yellow wire,
- Earth is the largest pin of the three pin and has almost zero

2. TWO PIN PLUG

- NO earth wire but it feeds power back to the power source,
- It has only live-brown wire and neutral-blue wire
- Live wire has fuse connected to it .

ILLEGAL CONNECTIONS TO ELECTRICITY MAIN LINE

WHEN DWELLERS GETTING ASSESS TO ELECTRICITY IN THEIR HOUSES ILLEGALLY CONNECTING FROM THE MAIN LINE .

DANGERS OF ILLEGAL CONNECTION

- Electricity theft threatens the life and well-being of innocent victims
- Makes it difficult for Eskom to manage supply and demand which leads to power outrage leading to job losses
- Price increase and lowers down economy of country
- If found ,can include prison sentences, losing any assets and loss of reputation

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ENERGY AND NATIONAL GRID

ELECTRICITY GENERATION

POWER STATION-is a system that we use to generate electricity.

- Coal is used to provide electricity in South Africa.
- Coal is easily available and cheap.
- Coal is a fossil fuel and non-renewable
- Coal can be harmful to environment if burned ,it can give off poisonous gases such as carbon dioxide source of energy and sulphur dioxide which dissolve in moisture in the air to form acid rain.

PROCESS OF HOW ELECTRICITY IS GENERATED

COAL IS CRUSHED

↓

BLOWN INTO BOILER TO BURN

↓

BURNING COAL HEAT WATER TURNS INTO STEAM

↓

BLADES OF SA GIANT FAN OR PROPERLLER BY BOILER-CALLED TURBINE

↓

TURBINE TURNS COIL MADE OF COPPER WIRE INSIDE MAGNET TO MAKE GENERATOR

↓

GENERATOR PRODUCES ELECTRICITY(CHANGES MECHANICAL MOVEMENT ENERGY INTO ELECTRICAL ENERGY)

ALTERNATIVE SOURCES OF ENERGY

1. Wind
2. Falling water
3. Sun-heating steam
4. Sunlight
5. Nuclear fission
6. Waves in the sea

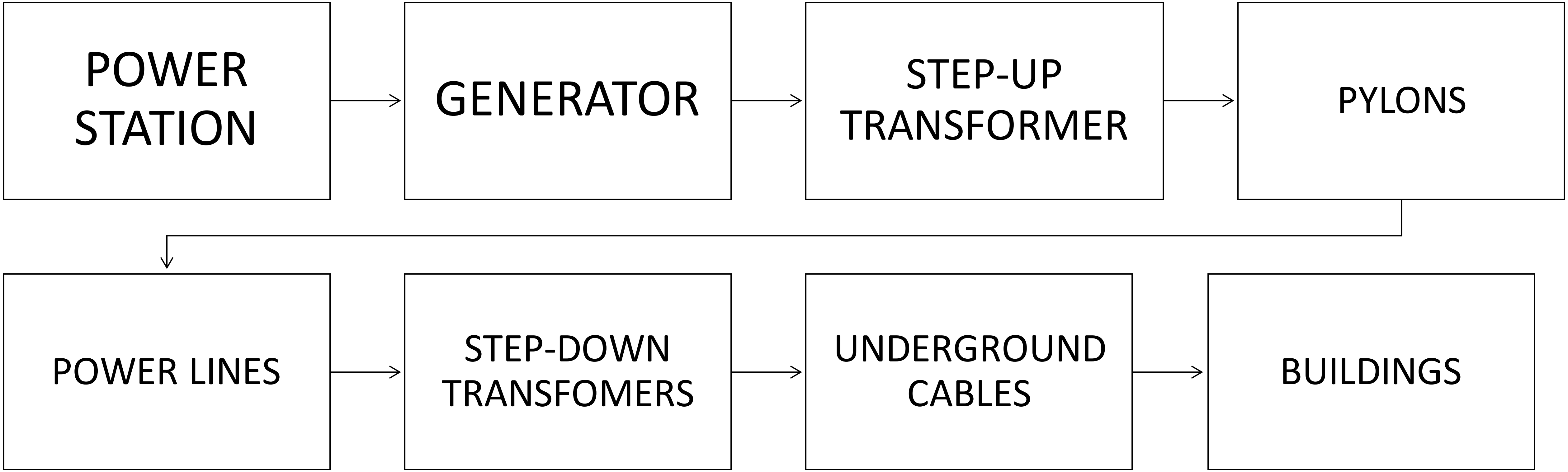
NUCLEAR POWER IN SOUTH AFRICA

NUCLEAR POWER STATION –uses a RADIOACTIVE FUEL called URANIUM.

RADIOACTIVE- self-generated giving off of energy as rays, waves, or in form of particles

NATIONAL ELECTRICITY GRID -is a network or system of interacting parts

STEPS OF MAIN PARTS OF GRID



POWER SURGES- is an oversupply of voltage from the power company

GRID OVERLOAD- it happen when demand for electricity exceeds the capacity of the grid

LOAD SHEDDING- the electricity supply company Eskom has to cut the electricity supply to some areas so that the load was/is reduced to keep the transmission lines safe

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Cost of electricity power

Power is the rate of doing work e.g. lifting a box onto the table and two cars climbing a hill ,one powerful than the other.

Power is the amount of energy used in unit of time.

Power is measured in units called **Watts(W)**.

One watt is equal to one Joule(J) of energy supplied to do work in one second(s).

* **1 watt= 1 joule per second**

Electricity power is the amount of electricity that is used in a given time , can also be measured in power in watts.

Watts is a small quantity of energy .

*   1 kilowatt =1000 watt

CALCULATING THE COST OF ELECTRICITY

FORMULAS :

*Power consumed (KWh)=Power rating(kw) x time used(hours)

1kWh= 200watts/0,2kWx 5 hours

*Cost=Power consumed (KWh) x Price of 1kWh

Cost=1kWh x R0,60 =R0,60

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