Current Electricity

- The direction of the flow of electrons is from the negative terminal to the positive terminal.
- The flow of electric current is in the direction opposite to that of the flow of electrons.
- Like electrons charges repel each other (for example, an electron has a negative charge and another electron has a negative charge, so they both will repel)
  - Likewise, opposing poles attract, just like a magnet
  -

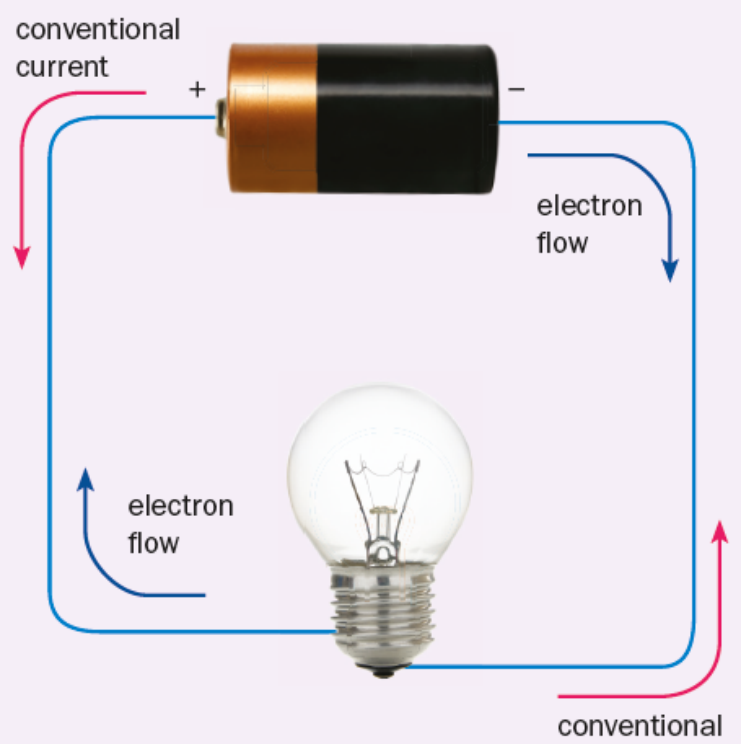
What is Electric Current?

An electric current is formed by **moving charges**.

An electric current is a measure of the **rate of flow** of electric charge through a given cross-section of a conductor.

where I = current;
Q = charge;
t = time taken.

The SI unit of electric current is the **ampere** (**A**).



Flow of Electricity through a Circuit | Electricity and Circuits | Don't Memorise - YouTube

- The negative terminal of the cell repels the electrons near it, and the electrons which get repelled go in the downwards direction
- Electron flow is from negative to positive end of the battery and direction of current is from positive to negative ends of the battery

The formula of electric current is $I = Q/t$

Where,

- I = Charge, Q = Current and t = time

The S.I Unit of Current is Ampere (A)

So, how did a conventional current get its name?

Before the discovery of electrons, scientists believed that electric current was caused by the movement of positive charges.

Although this idea was later proven wrong, the idea remains.

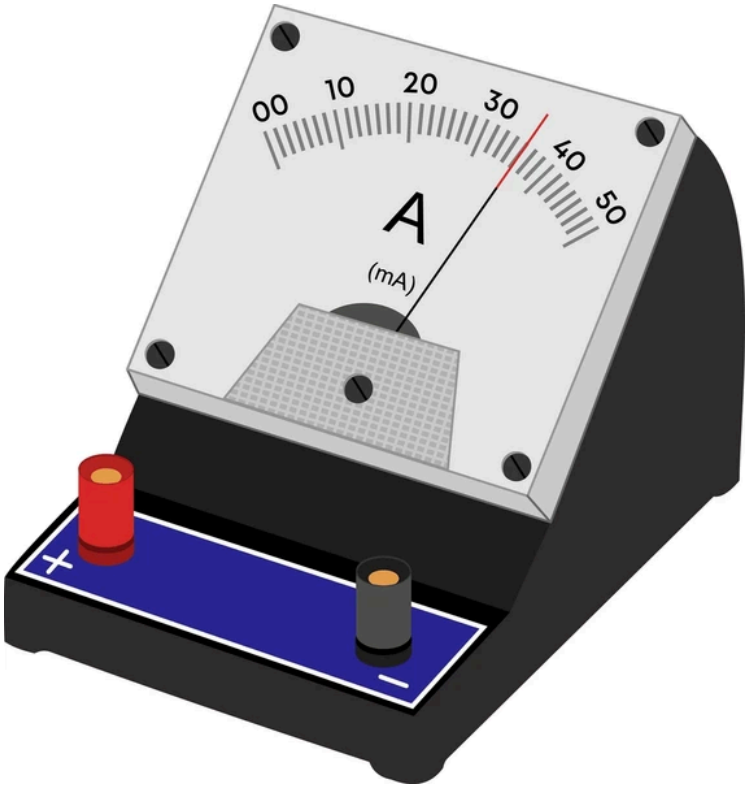
This 'movement' of positive charges is called conventional current.

Electric current is actually caused by the flow of electrons from the negative terminal to the positive terminal.

How do we measure currents?

An ammeter is used to measure current

It should be connected in series to the circuit



Main Components of a Circuit

- A typical electric circuit consists of four main components.

A source of electromotive force that drives electric charges around the circuit.	Wires
Conductors that connect the components together.	Dry cell
A load in which moving charges can do a useful job.	Switch
A method of opening or closing the circuit.	Bulb

Drawing Circuit Diagrams

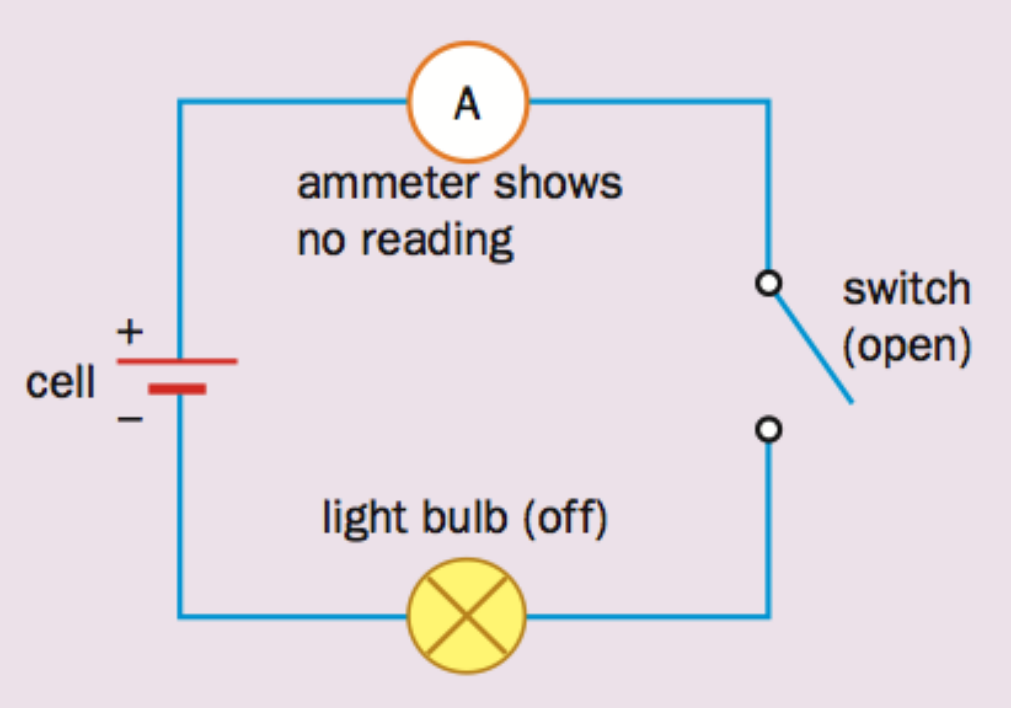
Some common components and their symbols are listed in the tables below.

Symbol	Device
or	switch
	cell
	battery
	d.c. power supply
	a.c. power supply
	light bulb

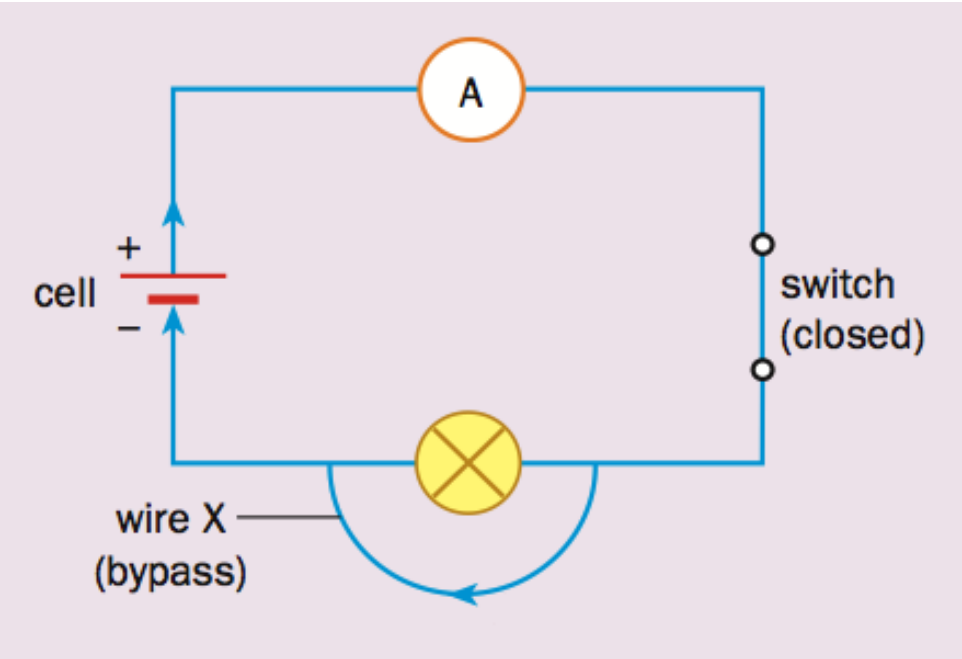
Symbol	Device
or	wires joined
	wires crossed
	fixed resistor
	variable resistor (rheostat)
	fuse
	coil of wire

Symbol	Device
G or	galvanometer
A	ammeter
V	voltmeter
	two-way switch
	earth connector
	capacitor

Open and closed circuits

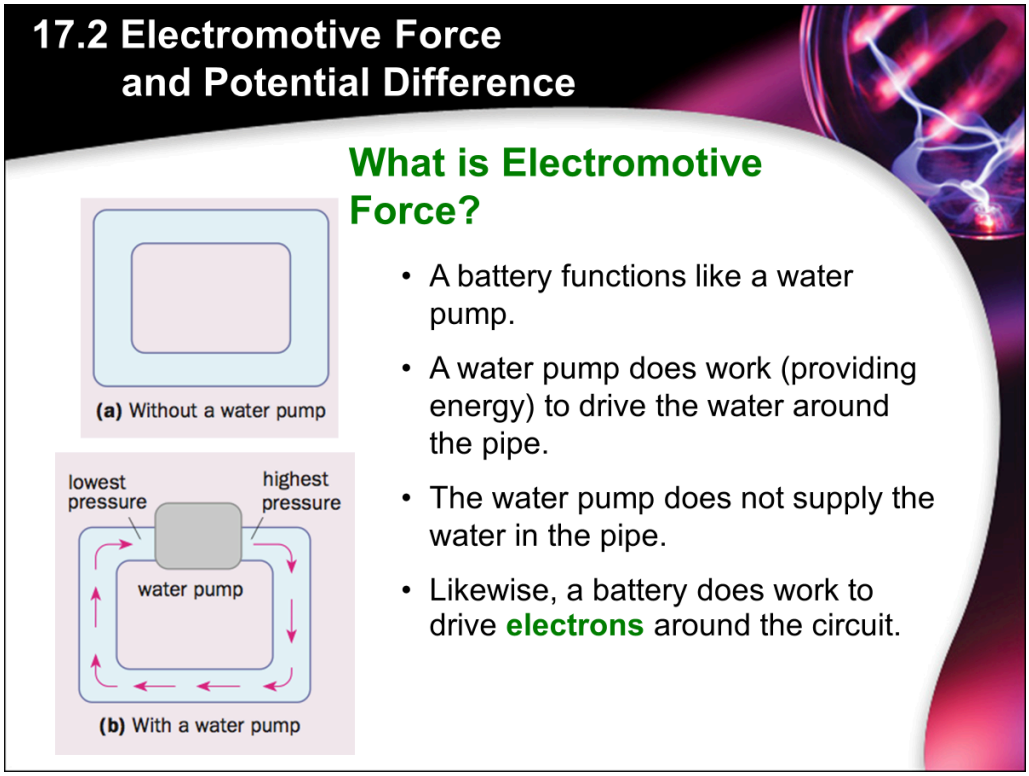


An open circuit is a circuit in which current is unable to flow due to breaks in the circuit



A closed circuit allows electricity to flow through without any interruptions (but in this diagram, the bulb will not light up due to the least resistance being on the bypass)

Electromotive Force and Potential Difference



The electromotive force (e.m.f) of an electrical energy source is defined as the work done by the source in driving a unit charge around a complete circuit.

Formula

$$\varepsilon = \frac{W}{Q}$$

where ε = e.m.f. of electrical energy source;

W = work done (amount of non-electrical energy

converted to electrical energy);

Q = amount of charge.

The SI unit of e.m.f is the **joule per coulomb** (**J C–1**) or **volt** (**V**).

So, e.m.f is basically volt!

How do we measure e.m.f?

We make use of a voltmeter to measure volt, which is the SI unit of e.m.f

Series and Parallel arrangement

- In series, e.m.f resultant is equal to e.m.f 1 + emf 2 ...
- In parallel, e.m.f resultant is equal to e.m.f 1 = e.m.f 2 ...

Potential Difference

What is the main difference between Potential difference and Electromotive Force? (underlined)

The potential difference (p.d.) across a component in an electric circuit is the work done to drive a unit charge through the component.

The electromotive force (e.m.f) of an electrical energy source is defined as the work done by the source in driving a unit charge around a complete circuit.

Formula

where V = p.d. across a component;

W = work done (amount of electrical energy converted to other forms);

Q = amount of charge.

The SI unit of potential difference is the **volt** (**V**).

*Ammeter should be connected to the circuit in series and voltmeter is connected in parallel to the circuit

What is the answer to this question?

The answer

is A and C

Resistance

The resistance of a component is the **ratio** of the **potential difference** across the component to the **current** flowing through the component.

The higher the resistance is, the more difficult it is for the current to flow.

Formula

$$R = V/I$$

where R = resistance of a component;

V = p.d. across a component;

I = current flowing through component.

The SI unit of resistance is the **ohm** (**Ω**).

What are Resistors?

•A resistor is a conductor in a circuit that is used to control the size of the current flowing in a circuit.

•There are two types of resistors — **fixed** resistors and **variable** resistors (or rheostats).

Resistivity formula

$$\rho = RA/l$$

where ρ = resistivity of conductor;

R = resistance of conductor;

A = cross-sectional area of conductor;

l = length of conductor.

The SI unit of resistivity is the **ohm metre** (**Ω m**).

- **Resistivity** is a property of the material and it is **independent** of the dimensions of the material.

- Current Electricity Filter Sort Table

Resistivity of Materials (N...	Material	Resistivity
	Silver	1.6 × 10^-6
	Copper	1.7 × 10^-8
	Tungsten	5.5 × 10^-8
	Iron	9.8 × 10^-8
	Constantan	49 × 10^-8
	Nichrome	100 × 10^-8
	Graphite	3000 × 10^-8
	Polythylene	about 10^16