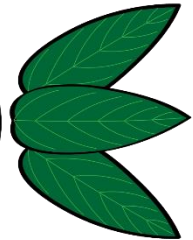
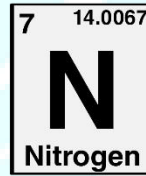
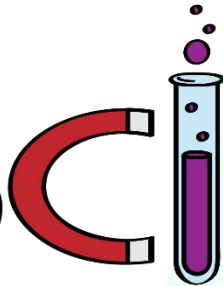
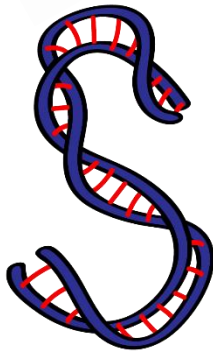




ASPIRE
INTERNATIONAL SCHOOL



Science Department

2023/2024

Year 7

Term 1, Revision Pack (Unit 9)

ASPIRE

INTERNATIONAL SCHOOL

Name:

Class:

9.1 Flow of electricity

A **cell** stores chemical energy that can be changed to electrical energy in a circuit.

A **battery** contains two or more cells joined together.

- The cell in the circuit has two connections, called **terminals**.

All cells, batteries, power supplies and many other **components** have two terminals.

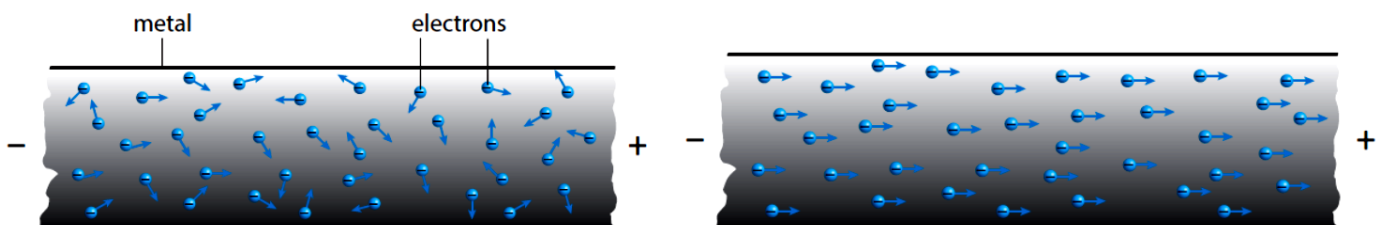
The terminals are labelled with positive (+) and negative (-).

- When connected to a circuit, the negative terminal of a cell, battery or power supply pushes **electrons** around in the wires.

All materials contain atoms. Atoms contain smaller particles. An electron is one type of smaller particle in an atom. The flow of electrons in the circuit is called **current**.

Some of the electrons in a metal are **free to move**. That means they can move through the metal.

In a metal, these electrons move randomly, when the metal is placed into a circuit, the electrons move in the same direction.



Electrons in a metal move randomly.

Electrons are negatively charged so they move toward the positive terminal in a circuit.







Electrons have a **negative charge**. Opposite charges **attract**, and like charges **repel**. To attract means to pull together and repel means to push apart.

Therefore, electrons will be attracted towards the positive terminal of the power supply and be repelled from the negative terminal.

If there is a break in the circuit, all the electrons stop flowing. Electrons can only flow in a complete circuit.

9.2 Electrical circuits

Circuits are not easy to draw, so we use symbols to draw a diagram.

Name	Symbol	Function
Ammeter		measures current in the circuit
Cell		provides energy to make current flow
Lamp		gives out light
Switch (open)		stops the flow of current when opened
Switch (closed)		starts the flow of current when closed
Buzzer		makes a buzzing sound

In the circuit symbol for a cell, the positive is the longer of the two lines.
The negative is the shorter line.



Take care when drawing circuit diagrams. Make sure:

- there are no gaps in the lines, especially at the corners and where wires meet components
- wires are not drawn through components.

A light bulb, a buzzer or a motor in a simple circuit are used to be evidence for the flow of the current.

We measure the current in a circuit using **Ammeter**.

9.3 Measuring the flow of current

When electrons move more quickly, the current increases.

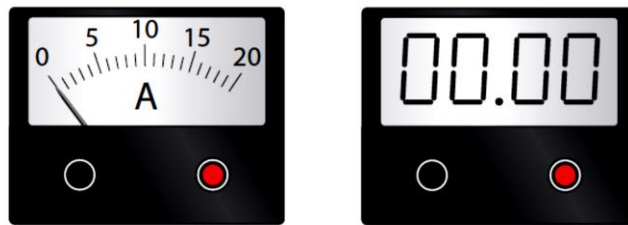
When electrons move more slowly, the current decreases.

We can use an ammeter to measure current. Current is measured in units called **amps**.

Amps have the symbol A.

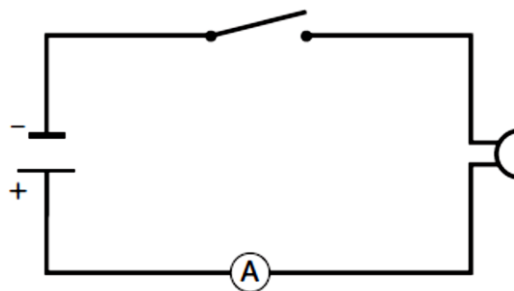
- In a circuit, the red terminal of the ammeter must be connected to the positive terminal of the power supply.
- The black terminal of the ammeter must be connected to the negative terminal of the power supply.

(The red terminal may be connected directly, or through other components, to the positive terminal of the power supply.)



There are different types of ammeter but they all do the same job.

- Ammeters are always connected in series with other components in a circuit. If the components are connected in series, they are all connected end-to-end, one after another, and there are no branches in the circuit.



9.4 Conductors and insulators

- Conductors are materials that **conduct electricity**.

That means conductors **allow current to flow**. Electric current can flow through a conductor. Electrons move when current flows.

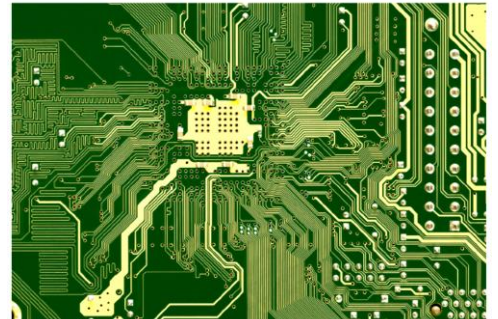
- Therefore, a **conductor** is a material in which electrons are free to move. Conductors allow electrons to flow.

All conductors are metals.

- Most wires in houses and schools are made from copper, with a plastic coating.
- Wires that cover long distances are usually made from aluminium or steel. These metals are cheaper than copper.

Some circuits, such as those in phones and laptops, do not use wires. The circuit board has copper tracks instead of wires.

The tracks are green because the copper is coated with another material.



Insulators

Electrical **insulators** are materials that do **not** allow current to flow through. Most non-metals, such as plastic, wood, air and cotton, are insulators.

- In an insulator, the electrons are **not** free to move. Because the electrons are **not** free to move, current cannot flow. Insulators **inhibit** electron flow.
- Insulators are used to keep people safe from electric shocks.
- Plastic insulation on wires is also useful because the plastic can be coloured differently to identify each wire.

9.5 Adding or removing components

The current is the same around a series circuit.

You can think of the electrons in a series circuit like a train. All parts of the train move at the same speed on the track. The back of the train cannot go faster than the front of the train. As soon as one part of the train moves, all of the train will move.

- Electrons flow at the same speed in the wires of a series circuit. When electrons start to flow in one part of the circuit, they all start to flow.
- That means you can put an ammeter at any **position** in a series circuit and it will give the same result.
- It also means that you can put the same components of a series circuit in a different order and the current will be the same.

Adding components or **removing components** will affect the current. The effect depends on what components are changed.

What affects the
current in
a circuit?

Adding or
removing a cell

Adding or
removing a lamp

1- Adding or removing a cell:

A- Adding a cell:

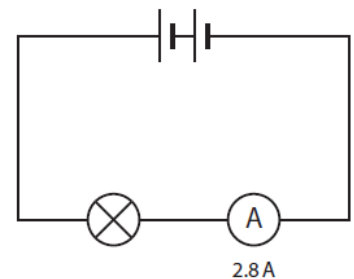
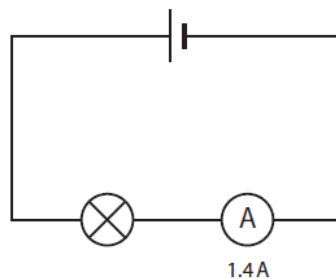
gives more current to the circuit, so the light bulb gets brighter and the ammeter reads more amps (measuring higher current).

(If there is a motor it moves faster, buzzer makes a louder sound)

Reason: A cell transfers the stored chemical energy into electrical energy, more cells mean more chemical energy which gives more electrical energy. Hence, more free electrons flow faster in the circuit and the lamp gets brighter.

Look at the following example, although each component is identical in both circuits. The circuit with two cells has double the electrical energy of the circuit with one cell. The lamp will be brighter. The ammeter in the circuit with two cells shows that the current is doubled.

Safety tip: You need to be careful adding more cells to a circuit. The lamps can be damaged and the wires can get hot.



B- Removing a cell:

decreases the current in the circuit, so the light bulb gets dimmer and the ammeter reads fewer amps (measures less current).

(If there is a motor it moves slower, buzzer makes a quieter sound).

Reason: removing a cell decreases the chemical energy which gives less electrical energy. Hence, fewer free electrons flow in the circuit and the lamp gets dimmer.

2- Adding or removing a lamp:

lamps change electrical energy to light energy and thermal energy.

A- Adding a lamp:

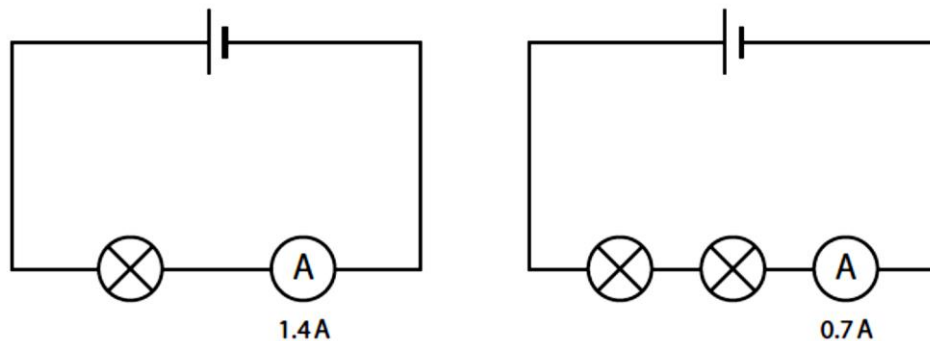
Adding more lamps decreases the current when the other components are kept the same.

Reason: Putting a lamp in a circuit will make the electrons move more slowly the whole way around the circuit.

The circuit with two lamps transfers twice as much energy as the circuit with one lamp. The lamps will be **dimmer**. That means they do not shine as brightly.

This makes the electrons move at half the speed, so the reading on the ammeter is halved.

(The more components in a circuit, the higher the resistance and the less the current the ammeter measures)



B- Removing a lamp:

Removing lamps increases the current when the other components are kept the same.