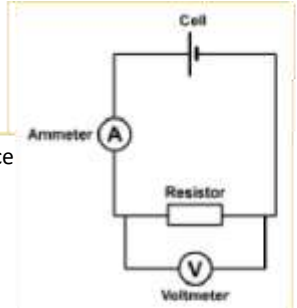
KS3 Physics Knowledge - Organiser: Electricity



Measuring current and potential difference

- Current is measured with an ammeter. An ammeter is included in the circuit (in series with the other components).
- Potential difference (voltage) is measured with a voltmeter. Since voltmeters measure the difference in potential energy between two points and must be added across the component whose potential difference you want to measure.

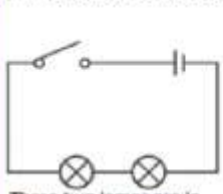
Key Terms	Definitions
Circuit	A complete loop of conductors
Current	The rate of flow of charge
Potential difference	p.d. for short, and also known as voltage. This is the measure of the difference in electrical potential energy between two points
Resistance	The property of materials that determines how much current they will carry and how much work they do
Work	Transfer of energy from one store to another
Component	Part of a circuit. See symbols below
Series	Linking components one after another, making one loop
Parallel	Linking components so they are in separate loops

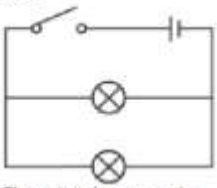
The greater the resistance in a circuit, the lower the current in the circuit. The greater the resistance of a component, the more work it will do.

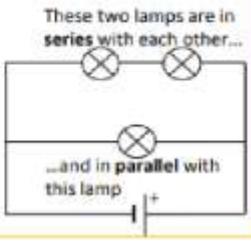
Equation	Meanings of terms in equation
$V = I R$	V = potential difference (volts, V) I = current (amperes, A) R = resistance (ohms, Ω)

Arranging Components in Circuits

Components (like bulbs/lamps) can be arranged in series with each other OR in parallel with each other.

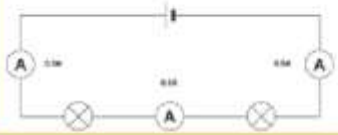

These two lamps are in **series** with each other


These two lamps are in **parallel** with each other

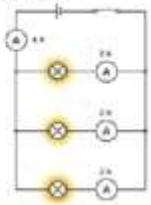


Current in series and parallel

In a circuit with only **one loop**, so all components are in **series**, the current is the same through every part of the circuit. In other words, the electrons flow at the same rate everywhere in the circuit. The diagram shows some example readings.



If a circuit includes components on different loops (in **parallel**), the current splits at the junctions in the circuit. The total current in all the separate loops adds up to the current before or after the split, as the diagram shows.

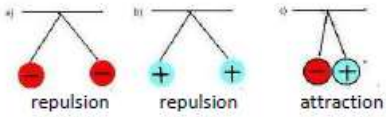


Circuit Symbols

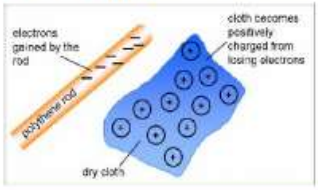
When drawing an electric circuit, we use different symbols to represent different components, the symbols you need to memorise are:

Charge and static electricity

- Electric charges are positive or negative. For example, electrons have a negative charge. Opposite charges attract each other (+ and -), whereas charges that are alike repel each other (+ and +, OR - and -). This is because there is a force of attraction between opposite charges, but a force of repulsion between like charges.



- If a material has a charge, but the charge is not moving anywhere, we call this static electricity. This will only happen if the material is an insulator. To get a positive or negative charge on an insulator, all you have to do is rub it with a different material (use the force of friction).
- For example: rubbing a balloon on your hair will produce a charge on the balloon and the opposite charge on your hair. This causes them to attract each other.
- When a static charge is produced like this, it is because electrons from one material are transferred to the other material (see first diagram).
- The material that gains electrons becomes more negative.
- The material that loses electrons becomes more positive.
- Any time there is a difference in electric charge between two points, there is a difference in electrical potential energy. We call this a potential difference.



Key Terms	Definitions
Charge	A positive or negative property of substances, that causes the substance to feel a force when there are other charges nearby
Conductor	Material that can carry electric current e.g. metals
Insulator	Material that does NOT conduct electric current
Friction	The force caused when two materials move past each other
Potential difference	p.d. for short, and also known as voltage. This is the measure of the difference in electrical potential energy between two points
Static electricity	Electric charges that are <u>not</u> flowing
Electrons	Tiny, negatively charged, particles, found in all atoms
Resistance	The property of materials that determines how much current they will carry and how much work they do

Insulators	Conductors
Can become charged (+ or -), but DO NOT let the charges flow	DO let charges flow (e.g. electrons)
Examples: almost any non-metal materials, like rubber, fabrics, paper, plastics, wood	Examples: all metals, and graphite (in your pencil!)
CANNOT be used in a circuit	To make a circuit, you MUST use conductors, joined in a complete loop
Insulators have extremely HIGH resistance, which is why current can't flow through them	Conductors have LOW resistance, which is why they let charges flow through them