Science Unit 8

Three conditions for electricity to flow through

Source of energy: Main socket or electric cell

Main socket is a source of electricity energy

Electric cell is a source of chemical energy. Chemical energy is converted into electricity energy when is it is using.

Electrical appliance using electrical energy

Wire connecting:

Materials that allow electricity to flow through is called electrical conductors.

Metals usually are electrical conductors

Such as copper (electric wires) , aluminium (overhead power lines) and iron.

Some non-metals are also electrical conductor but not as well as metal such as graphite and alt solution.

Materials that not allow electricity to flow through are called electrical \*insulators.

Such as plastic, wood and glass.

A circuit with a source of energy and a complete path for electricity to flow through is called closed circuit.

Open circuit it the circuit with a gap and electricity cannot flow through.

We use circuit symbol to \*represent circuit component.

We use circuit diagram to represent actual circuit.

We can use switch to control the open and closed of the circuit.

When the switch closed, the conductive parts of switch touch each other to from complete path for electricity to flow through from closed circuit.

When the switch open, the is a gap between the conductive parts and the electricity cannot flow through from open circuit.

Resistance:

Resistance measures the opposition of a material to the flow of electric current

It unit is ohm(Ω).

Different materials have different resistance and resistance of different materials is fixed

The higher the resistance, the smaller the current.

Factors effect the resistance: the material of wire, the length of wire and the area of cross section (thickness) of wire.

The longer the wire, the higher the resistance. The larger the area of cross section (thicker) of wire, the higher the resistance.

Resistor is a circuit component with fixed resistance. We use resistor to control or limit the sizes of current in the circuit of electrical appliances

Current (I / A):

Each atom has a nucleus and surrounded by electrons.

The nucleus carry positive charge and electrons carry negative charge.

Some electrons can escape from the atom and move freely within the metal called free electrons.

In the closed circuit, the free electrons flow from negative charge to the positive charge of the cell called electric current.

The flow from positive charge to the negative charge of the cell called conventional current.

We use ammeter to measure the current. The unit is ampere (A).

Each ammeter have a pointer, positive terminal (red) and negative terminal (black).

Measure the number of free electrons pass through a point of the circuit in a second

Ammeter should be connect so that the electric current flows into the ammeter from positive terminal and leave from it negative terminal.

First, we should use a positive terminal with a larger range of measurement. If the reading is smaller than the maximum reading of the positive terminal with a smaller range, we should use the positive terminal range. If the reading is larger than the reading range of the terminal, the ammeter may broke.

It can’t connect into the circuit without any electrical appliance using energy. It will cause short circuit and the circuit will be very hot and may catch fire because ammeter normally no influence to the circuit and has very small resistance. It will cause short circuit and the circuit may become very hot and may catch fire.

The heating effect occurs when an electric current flow through a conductor (nichrome wire), some electrical energy is converted into thermal energy.

The heating effect is larger if the current is larger.

Application: Iron

When an electric current flow through a wire or coil, it can attract other metal like a magnet called magnetic effect. The coil called electromagnet.

The higher the current, the larger the magnetic effect.

We can make the coil by winding the copper wire on a long iron nail and use a sandpaper to remove the insulating part of two ends of the wire and connect to the cell

Application: electric bell and electric door lock

Electric bell: when the switch closed, the circuit become closed and electricity flow through the coil and the coil produce magnetic effect. It attract the iron bar and the hammer hit the gong. When the iron bar is attracted, the circuit and the iron bar is separate and there is a gap and electricity can’t flow through the circuit and the coil. The coil do not have the magnet effect and the iron bar move back and the circuit closed again.

Voltage:

Voltage is measure the amount of energy provide to the free electrons by a source of electricity energy.

\*The voltage also related to the ‘electric push’ that makes free electrons to flow in circuit. The higher the voltage, the larger the electric energy.

We use voltmeter to measure the voltage. Its unit is volt (V).

The voltmeter should be connect so that the positive terminal connect to the positive charge and negative terminal connect to the negative charge of the cell.

The voltmeter can’t connect into the main loop because it has a very high resistance and electricity cannot flow through it.

Series circuit and parallel circuit

Series circuit

The circuit only have one path for electricity to flow through.

If there is a gap in the circuit, there will be no electricity to flow through.

if more appliance is connect into the circuit, the resistance may become higher

The higher the resistance, the lower the current. The current all along the path is the same.

The sum of the voltage across each appliance is equal to the voltage across the cell. Using the ohm’s law, in a series circuit, the voltage across the appliance with higher resistance have higher voltage.

Parallel circuit has more than one path for electric current to flow through. Different circuit components are connect in different branches. The path of circuit before divided called main loop and the path of circuit after divided called branches.

The resistance is lower when more branches is add into the circuit because there are mora paths for electric current to flow through. The sum of current in each branch is equal to the current in the main loop. The voltage across each branch is equal to the voltage across the cell