

PHYSICS 6370 version 4
Describe and construct simple electrical systems

Revision

Describe a simple electrical system; Draw a circuit diagram for a simple electrical system; and Construct a simple electrical circuit from a circuit diagram.

Distinguish between conductors and insulators by considering *the movement of charges*. Remember, electrical current is due to the flow of charged particles called electrons.

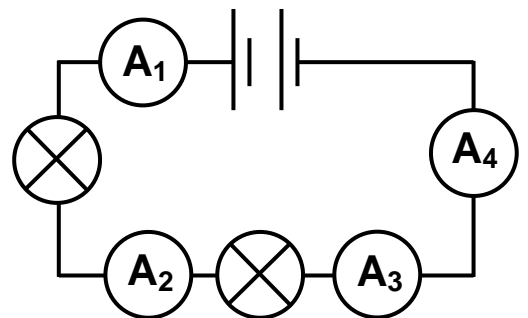
- conductors allow electrons to move through them easily
 - examples:
 - metals, and
 - the non-metal graphite – a form of carbon
- insulators do not allow electrons to move through them easily
 - examples:
 - plastic
 - wood
 - glass

Identify the function of components in a circuit in terms of

- current and/or energy transfer
 - resistors affect the current flowing in a circuit.
 - big resistance = small current flows
 - small resistance = big current flows
 - bulbs (lamps) convert electrical energy of electrons (from a power supply or battery) into light and heat energy.
 - switches complete a circuit providing a pathway for the current / flow of electrons. The components will only work if there are no gaps in the circuit.
 - ammeters measure the current in a circuit.
 - voltmeters measure voltage drop or potential difference across a component
 - fuses restrict the amount of current flowing through a circuit. If too much current passes through a fuse, it will warm up and melt, breaking the circuit

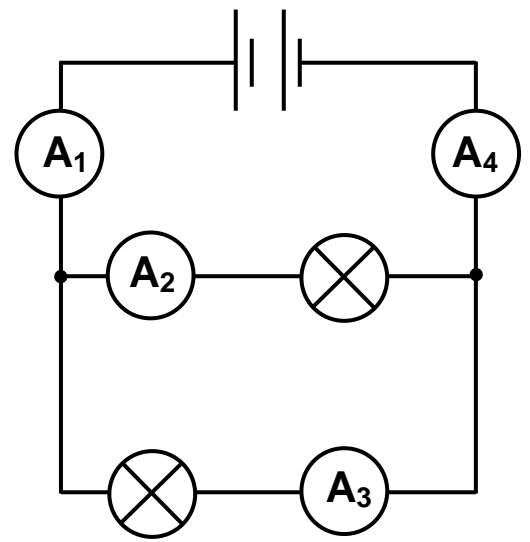
Describe the relationship between current measurements at various points in a circuit.

- Series circuit: Components which are connected in a line in a circuit are connected in series.
 - The current is the same everywhere in a series circuit.
 - $A_1 = A_2 = A_3 = A_4$



- Parallel circuit: Components which are in separate branches of a circuit are connected in parallel.

- The current flowing through the main circuit is the same as the sum of the currents flowing through the separate branches.
- $A_1 = A_2 + A_3 = A_4$

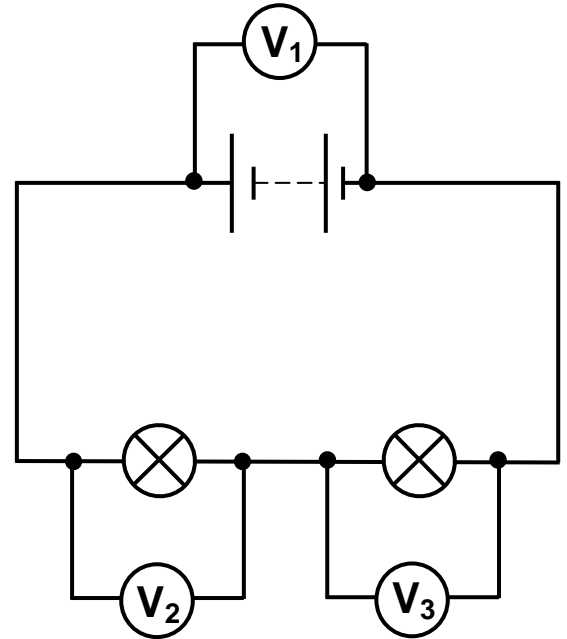


- Describe the relationship between the supply voltage and the voltage across components in a circuit.

- Voltage is related to how much energy the electrons flowing around a circuit have.
- The potential energy of the electrons decreases as the current passes through each component in the circuit. This is because some of the energy of the electrons is converted into other forms: eg light and heat in a lamp.

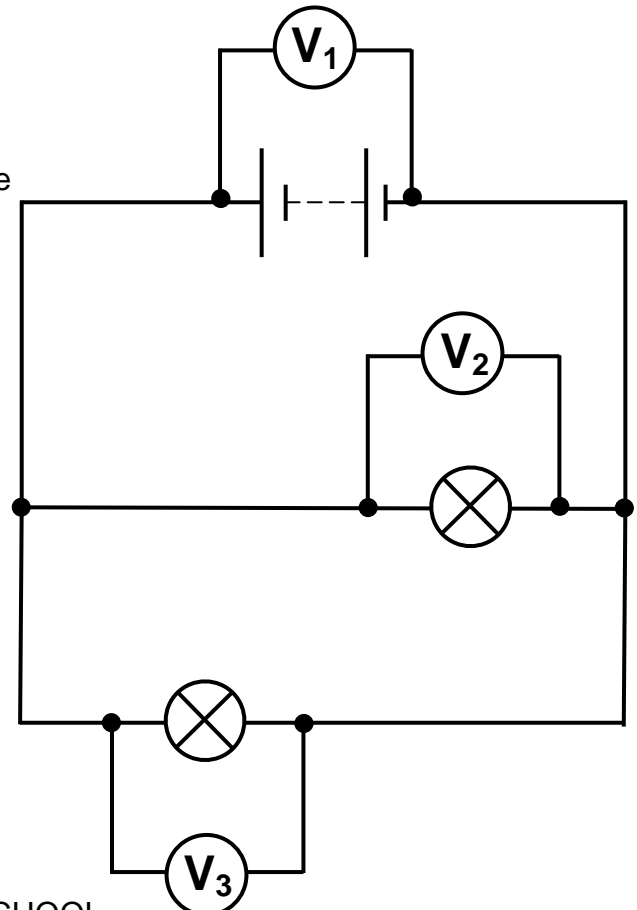
- Series circuit

- In a series circuit, the total voltage is equal to the sum of all the potential differences over each component.
- $V_1 \text{ (supply)} = V_2 + V_3$

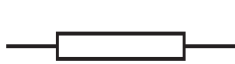


- Parallel circuit

- The potential difference is the same across all components that are connected in parallel.
- $V_1 \text{ (supply)} = V_2 = V_3$



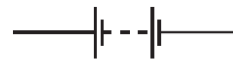
Draw a circuit diagram for a simple electrical system, using approved symbols and format.



resistor



lamp



battery
or power supply



switch



diode



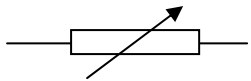
voltmeter



ammeter



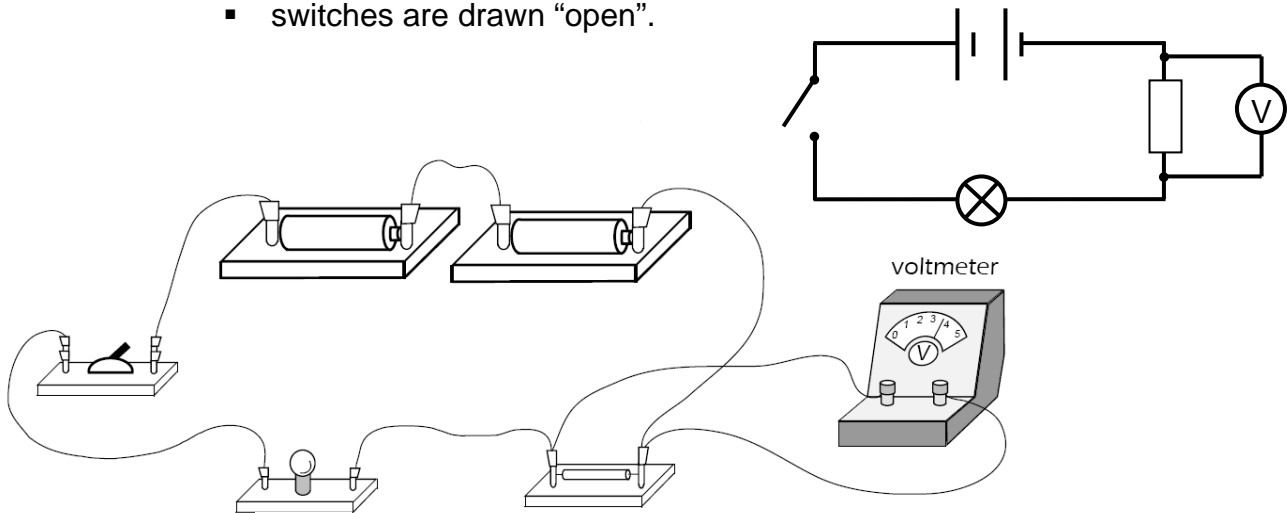
fuse



variable resistor

When drawing circuit diagrams

- use the approved symbols provided
- connecting leads are drawn as straight vertical or horizontal lines
- wires that connect are shown with a dot
- switches are drawn "open".



Draw a circuit diagram that will enable a circuit to perform a prescribed function.

Construct a simple electrical circuit from a circuit diagram.