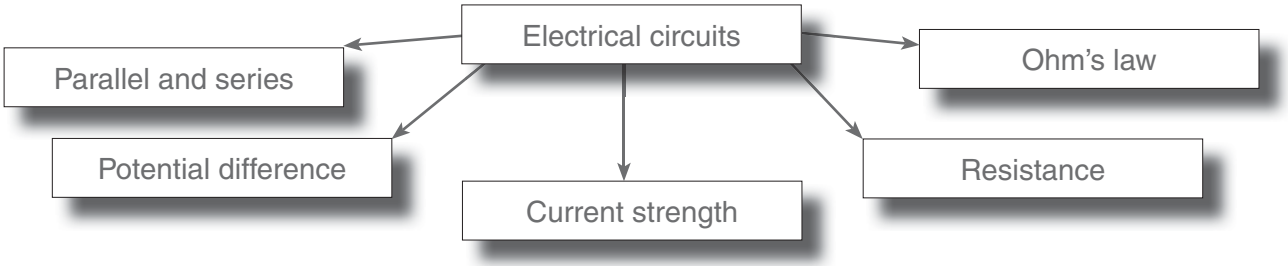
KNOWLEDGE AREA: ELECTRICITY AND MAGNETISM

UNIT 3 ELECTRICAL CIRCUITS



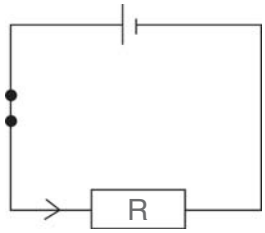
3.1 Circuits

The following conditions are necessary for an electric current to flow:

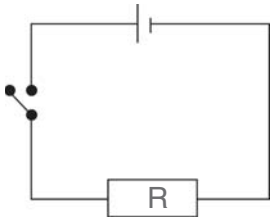
- A source of energy
- Conductors in a circuit
- A closed circuit

A closed circuit allows an electric current to flow, as there are no gaps or spaces in the circuit (this is the path where the current can flow).

If the switch is not closed or if there are any spaces/breakages (e.g. a broken light bulb), the current will not flow. We call this an open circuit.

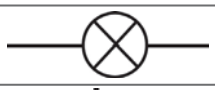
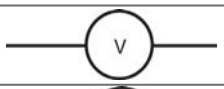
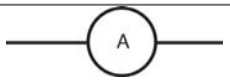
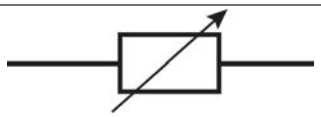


closed circuit



open circuit

Circuit components

Component	Symbol	Component	Symbol
Conductor		Open switch	
Resistor		Closed switch	
Light bulb		Voltmeter	
A cell		Ammeter	
Variable resistor			

Quick facts

In the past, the term battery was used only if two or more cells were connected in series. In practice, this is no longer the case. The term battery can be used even if there is only one cell.

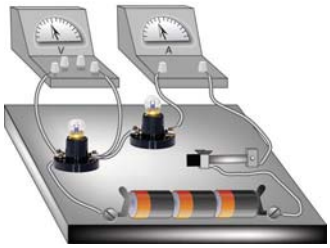
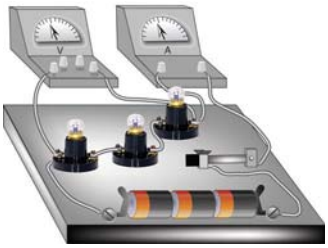
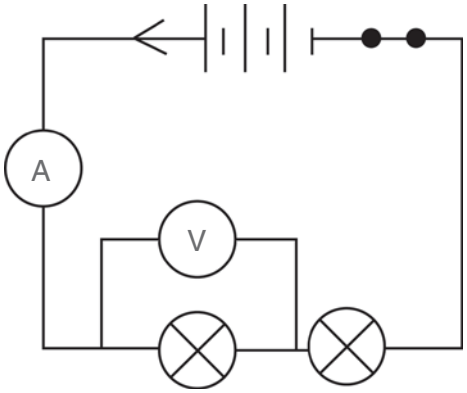
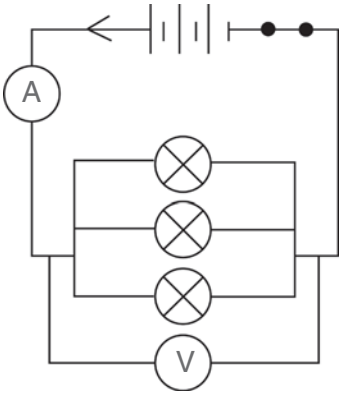
Components can be connected in a circuit in two ways, either in series or in parallel. Most circuits contain a combination of series and parallel components.

In a series circuit:

- there is only one path for the current to flow through all the components.
- the current strength is the same at all points.
- the total potential difference is divided. The potential difference across the resistors is divided in the same ratio as the resistance of each resistor.
- $V \propto R$. Therefore the greatest resistor will have the greatest potential difference across it.

In a parallel circuit:

- there is more than one path for the current to flow.
- the potential difference across the parallel components is the same.
- the total current is divided. The current divides according to the resistance of each resistor.
- $I \propto \frac{1}{R}$. The resistor with the greatest resistance will have the smallest current flowing through it.

Series circuit	Parallel circuit
	
	

Series circuit	Parallel circuit
Description: Three cells in series Connecting wires Two light bulbs in series Closed switch Ammeter Voltmeter	Description: Three cells in series Connecting wires Three light bulbs in parallel Closed switch Ammeter Voltmeter

Activity 1

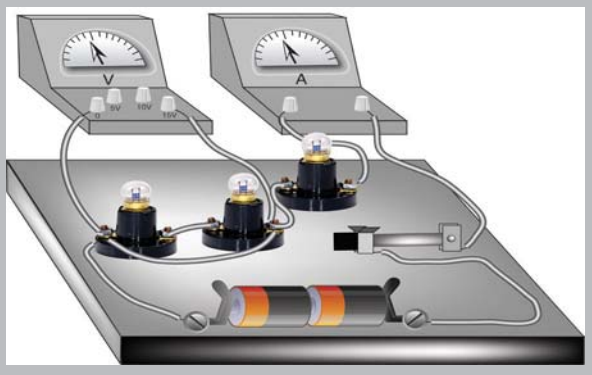
Date:

Draw the following circuit diagrams:

1. Three cells in parallel
   Three light bulbs in series
   One resistor in series
   Closed switch

2. Two cells in series
   Three light bulbs in parallel
   An open switch
   Two resistors in series

3. Circuit board



4. Circuit board