

Chapter – 12: Electricity and Circuits

- Electricity – very clean form of energy
- Very useful – easily converted to many different forms – heat, light, mechanical, sound, magnetism, etc
- We use electricity – everyday – many functions
- All the home appliances – use electricity
- Fans, coolers, refrigerators, water pumps, etc
- Large number of machines – run on electricity – inside shops and factories
- Electricity – generated at power stations
- From there – brought to homes – through thick wires and electric poles
- Very useful – BUT – very dangerous – cause damage of life – cause fire
- Inside labs – do not use electricity from sockets – dangerous
- Safer source of electricity – electric cell – known as dry cell
- Electric cell – 1.5 V – source of electricity in our homes – 220 V
- Join some cells together – forms a battery
- Many electronic items – use cells (batteries) – TV remote, cameras, torches, etc

Electric cell (dry cell)

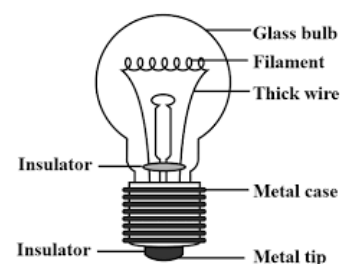
- Device – produces small amounts of electricity
- Safe and portable source of electricity
- Also called – dry cell – no liquid chemical
- Cylindrical device – metal cap on one side – metal disc on the other
- Metal cap – positive side – marked ‘+’ – metal disc – negative side – marked ‘-’
- Electric cell – lots of chemical inside – produce electricity
- Some electric cells – can be recharged – car batteries, mobile batteries, etc
- WARNING – never join the 2 terminals of a cell together – cell gets damaged easily – may also cause fire

Torch bulb

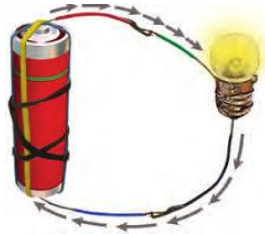
- Small electric bulb – produces light – torch switched on
- Small glass bulb – fixed on a metal case
- Inside the glass bulb – thin wire fixed between 2 thick wires
- Thin wire – filament – heats up and glows when electricity passes through it
- Both thick wires – support the filament – completes the circuit
- Lower ends of the thick wires – connected to metal case and metal tip of the bulb
- Metal case and metal tip – 2 terminals of the bulb
- Both the terminals – separated by some insulations
- Terminals of bulb – connected to terminals of cell – bulb lights up
- Electric bulb – similar to torch bulb

Electric circuit

- Path – electricity flows through it
- Simple electric circuit – cell, torch bulb, 2 pieces of wire



- Connect torch bulb to positive and negative terminals of the cell – bulb lights up
 - Ends of one wire – positive terminal of cell – TO – metal tip of bulb
 - Ends of another wire – negative terminal of cell – TO – metal case of bulb
- Electric circuit – complete path – flow of electricity
- Closed circuit – no gap in the connection between all the parts
- Open circuit – some gap in the connection somewhere – no electricity flows here
- Flow of electricity in a circuit – always – positive terminal of cell to negative terminal of cell – BUT – this flow – outside the cell in the wires

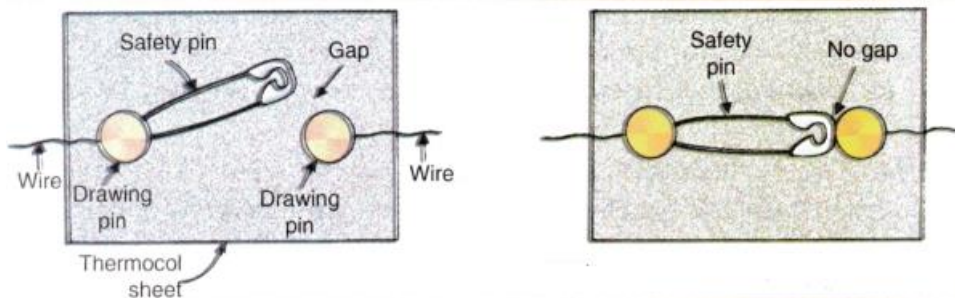


The case of fused bulb

- Sometimes – electric bulb – does not glow – even if circuit is complete (closed)
- Filament of bulb – breaks down – bulb is fused
- Filament – breaks down – normal wear and tear OR too much electricity is passed
- Conductors – electricity passes through them easily
- Insulators -no electricity pass through them
- Electricity – only flows – circuit made of conductors

Switch

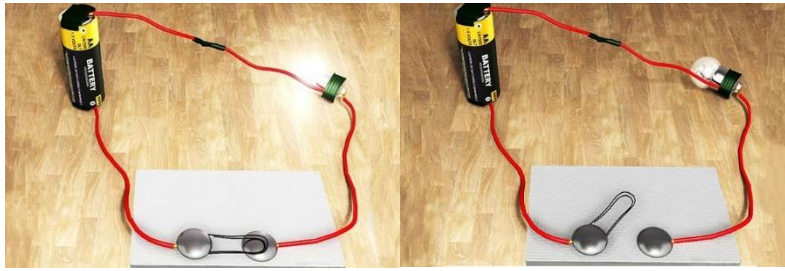
- Simple device – makes a circuit – open or close
- Switch – turned off – creates a gap – circuit becomes open
- Switch – turned on – completes the gap – circuit becomes close (complete)
- Activity – make a simple switch –
 - Take 2 board pins, 2 wires, 1 safety pin
 - Insert one board pin into the ring of safety pin – fix it on a thermocol board – tie a wire to it
 - Insert another board pin – distance between these pins – equal to size of safety pin – tie a wire to it as well
 - Rotate the safety pin – touches the free board pin – circuit closed (completed)



Adding a switch to the electric circuit

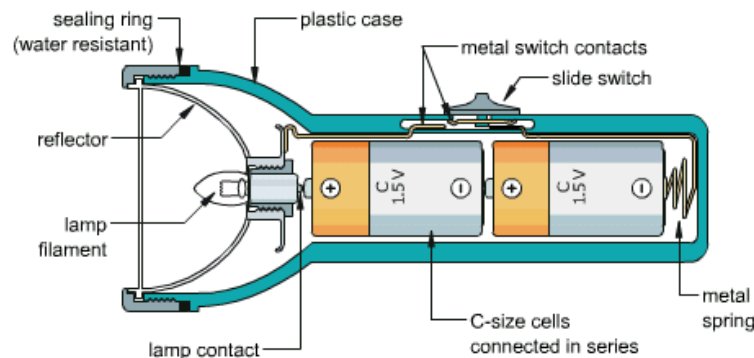
- Simple circuit – bulb stays on
- Add a switch – bulb can be switched on and off accordingly
- Positive terminal of cell – connected to switch – switch connected to bulb – negative terminal of cell – connected to bulb

- Switch – off position – gap in the circuit – no electricity flows – bulb stays off
- Switch – on position – no gap in the circuit – electricity flows – bulb stays on



Torch

- Portable electric lamp – uses multiple cells – light a small bulb
- Used as – temporary source of light
- Simple electric circuit – bulb, 2 cells, sliding switch
- Switch – turned on – circuit completes – bulb lights on
- Switch – turned off – circuit breaks – bulb light off



Electric Conductors and Insulators

- Conductors –
 - Materials – allow electric current to pass through
 - All metals – conductors – silver – best conductor
 - Electric wires – made of copper and aluminium
 - Some metal alloys – conductors – steel, brass, bronze
 - Non-metal – carbon (graphite) – good conductor
 - Human body – bad conductor – electricity passes through them – BUT – not so easily
 - Water – also a bad conductor
 - WARNING – never touch a switch with wet hands
- Insulators –
 - Materials – do not allow electric current to pass through
 - Rubber, plastic, ceramics, wood, glass, wax, paper, air, etc
 - Products made of insulators – also insulators
 - Rubber – eraser, balloon
 - Plastic – scales, nylon ropes
 - Outer coverings – electric wires – made of plastic – insulators
 - Switch – off position – air gap between ends of wire

Importance of insulators and conductors

- Conductors – carry electricity

- Insulators – do not carry electricity
- Our homes – copper wires carry electricity
- Electricity in homes – dangerous – covered with plastic – insulators
- This knowledge – important – choosing materials – electrical appliances
 - Parts of appliances – electric current has to pass – made of conductors
 - Parts of appliances – touched by us – made of insulators
- Electric switches –
 - Made of plastic on the outside – touched by us
 - Made of metal in the inside – electric current has to pass
- Electrician – wear rubber gloves – protected from electric current