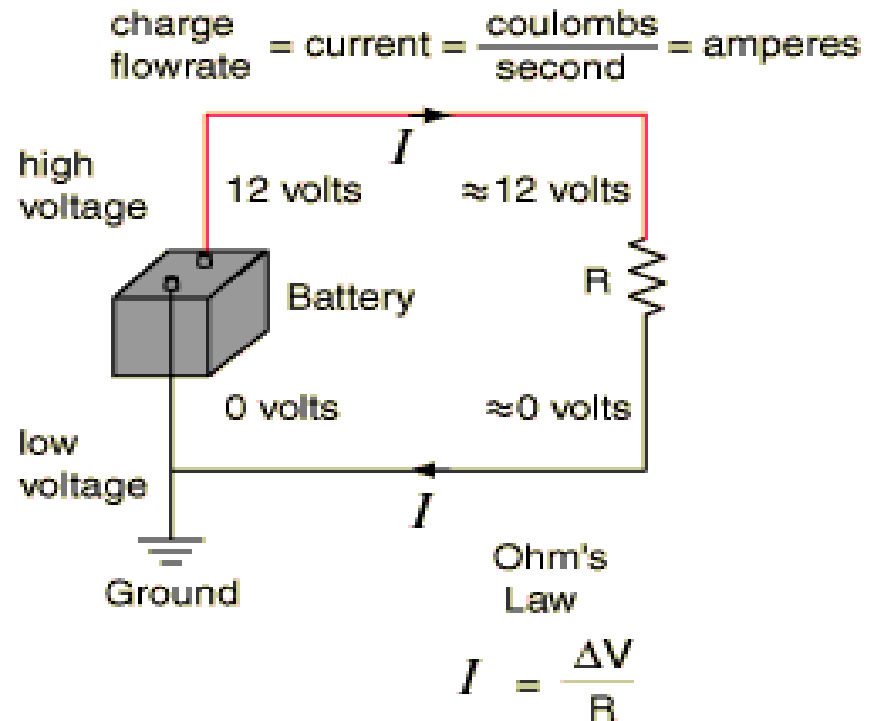
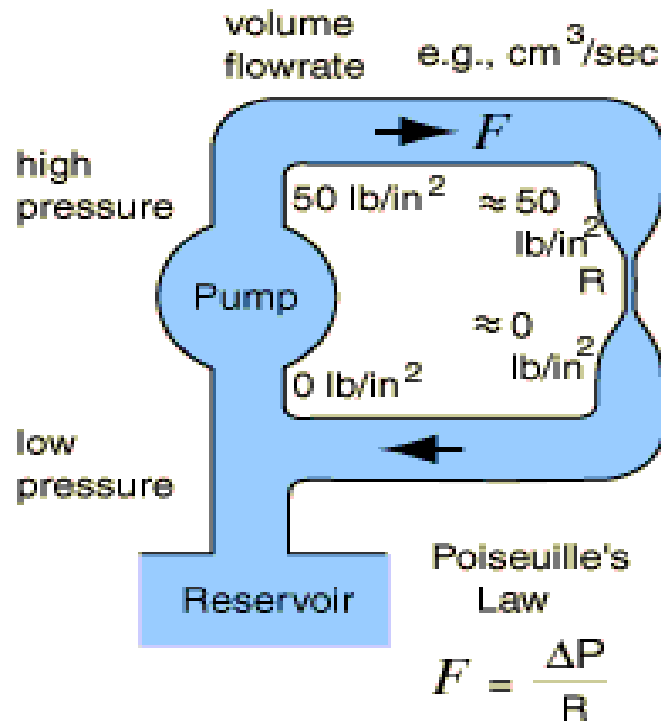

Electrical Safety Awareness

Integral Coach Factory

Voltage, Current and Resistance

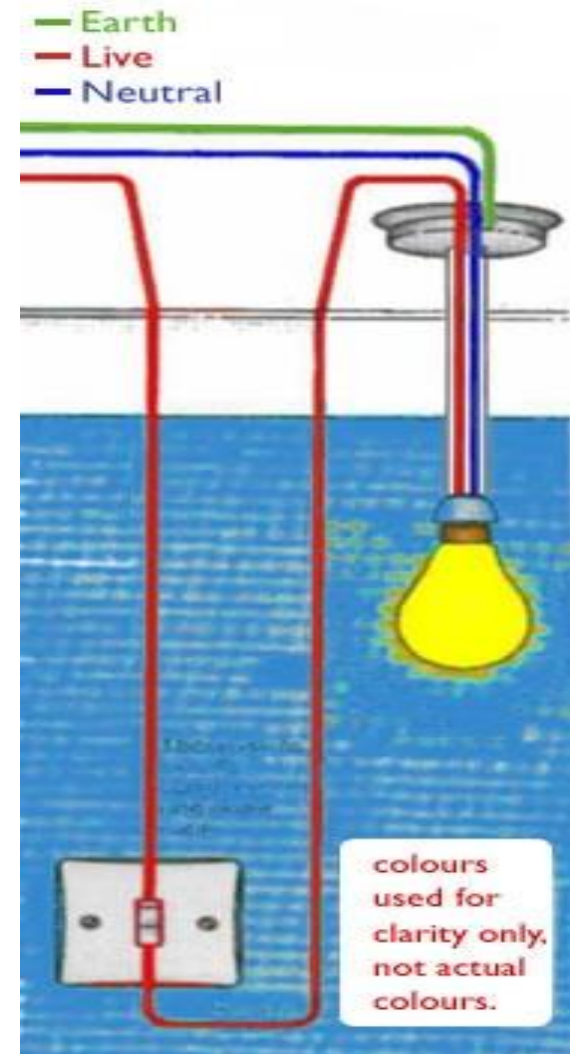
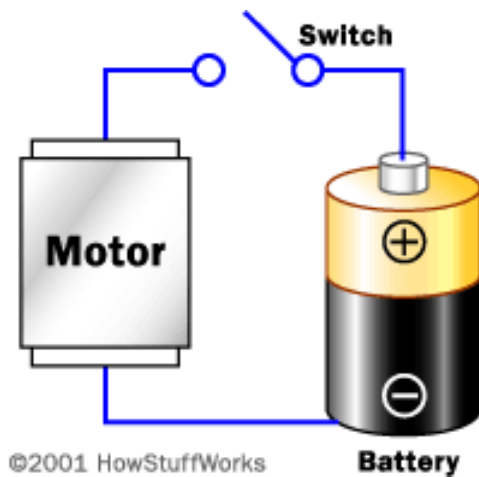
- **Voltage** increases \Rightarrow **Current** increases
- **Resistance** decreases \Rightarrow **Current** increases

Voltage = Current / Resistance - Ohms Law



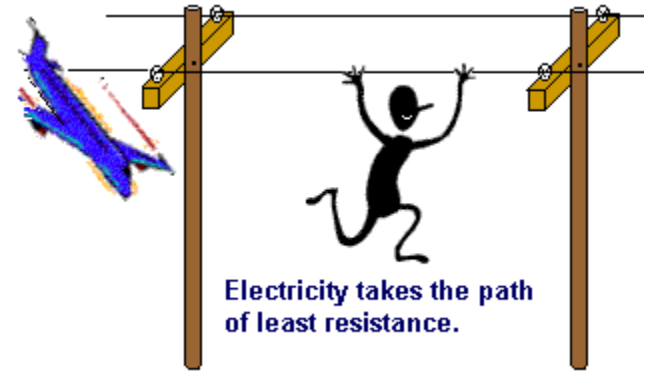
The complete circuit

A complete **Circuit** or **loop** is necessary for current to **flow**

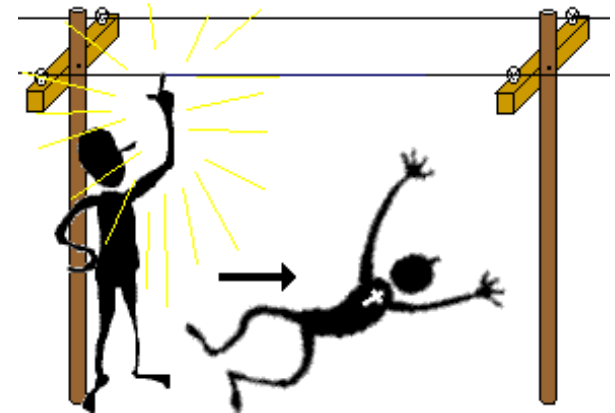
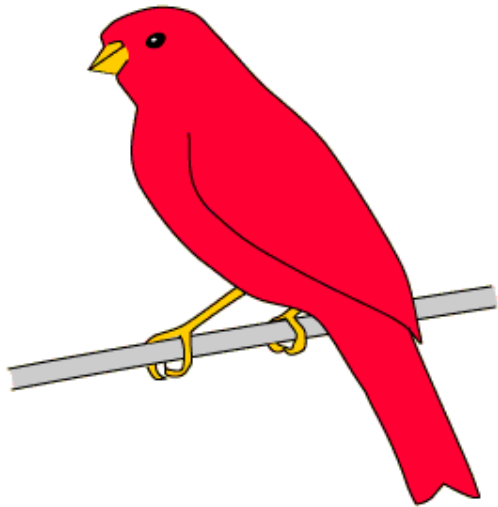


A complete circuit

complete **Circuit** or loop
is necessary for current to **flow**



Current takes the path of least resistance



Electricity in the body

■ *Muscles*

- ❑ Muscles control all the body movements
- ❑ Including & importantly those that keep us alive -
Breathing and **Heart**
- ❑ The brain controls voluntary muscles using
Current pulses along nerves

Electricity Shock

- ***External current*** *through the body causes*
 - Loss of muscle control
 - Spasms & Involuntary movement
 - Inability to let go
 - Burns - external & internal

Electrical Appliances

Safety guiding principle

*“keep currents and voltages **inside** apparatus and **away** from our bodies”*

- Inherently safe - Low voltage / low current
- Enclosures
- Insulation
- Safe & secure connections

Electrical cables & plugs

Mains cable

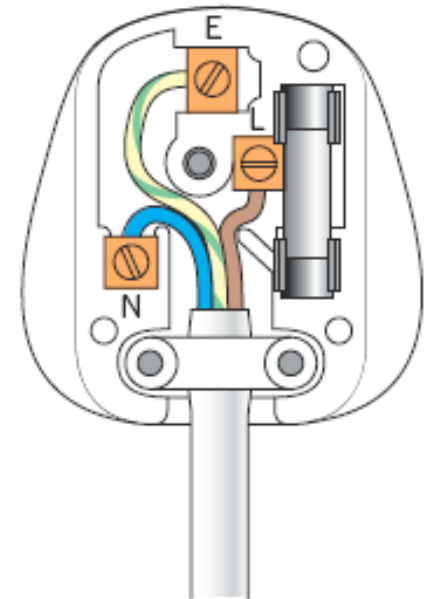
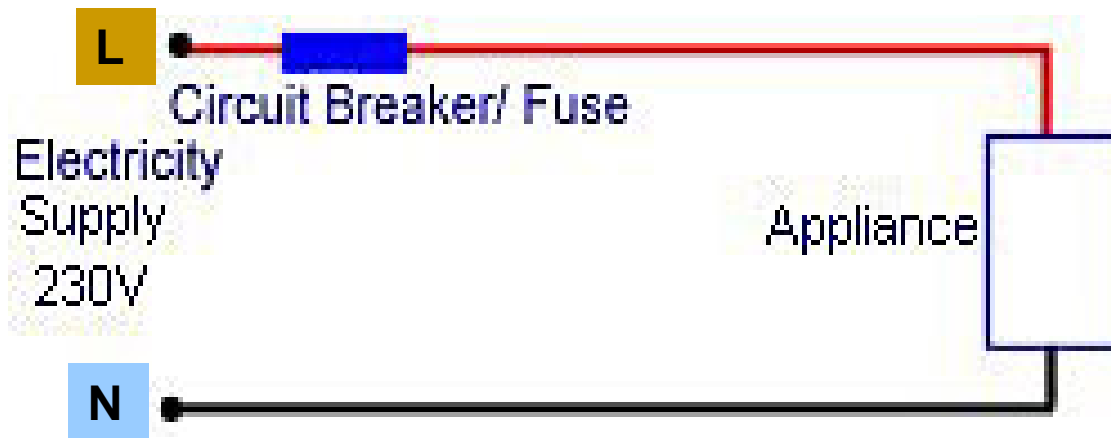
- **Brown** Live - power
- **Blue** Neutral
- **Green/yellow** Earth



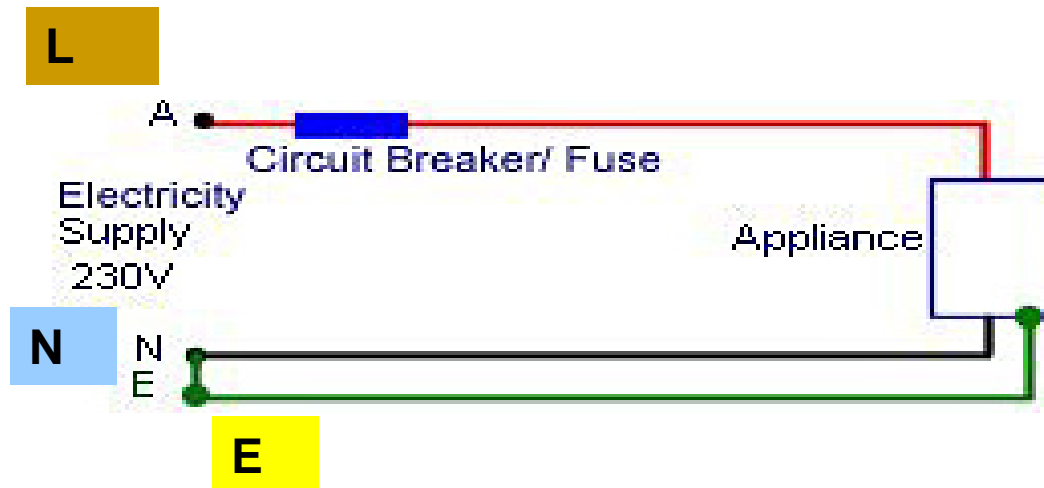
Electrical cables & plugs

Mains cable

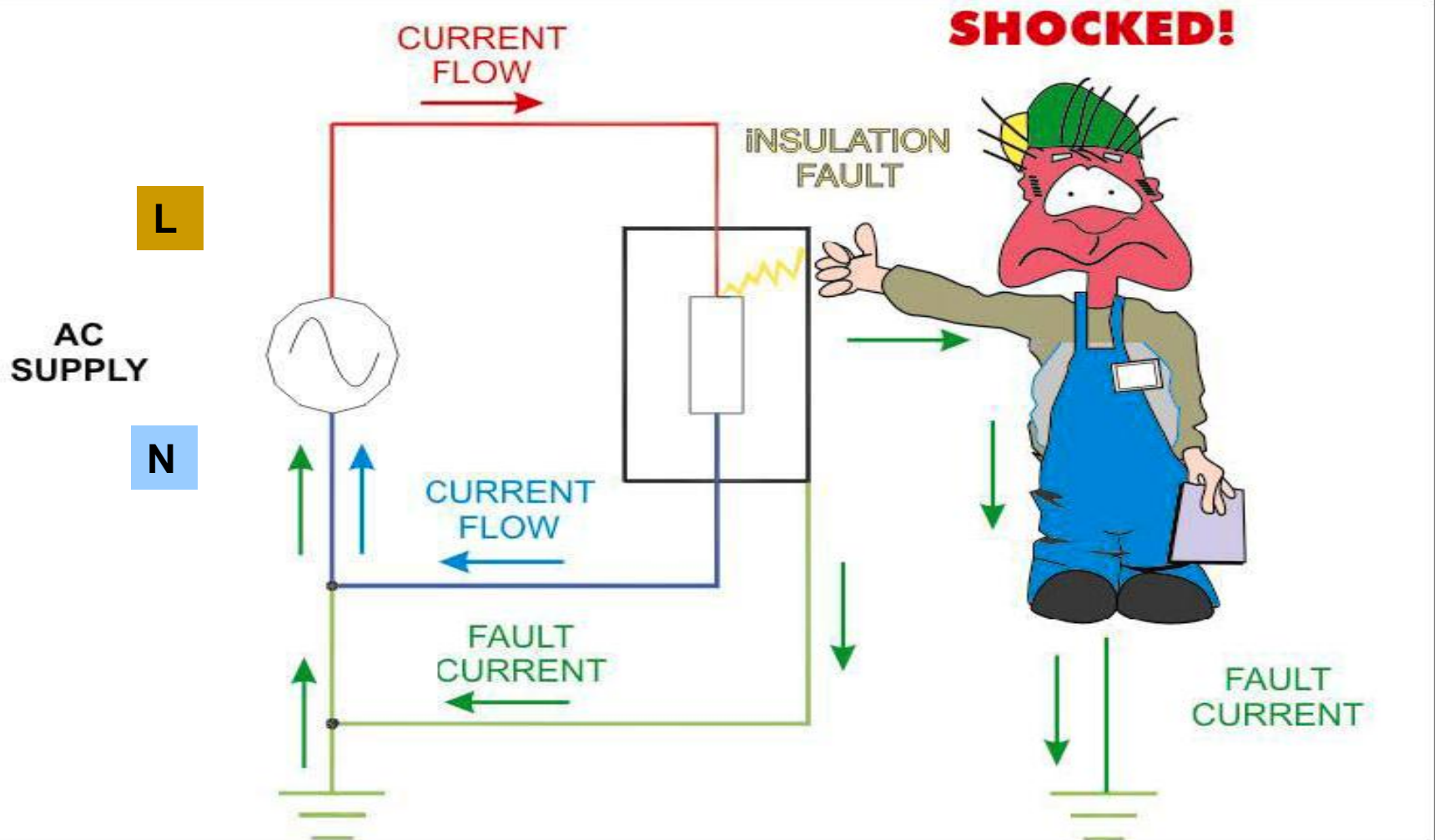
- **Brown** Live power
- **Blue** Neutral
- **Green/yellow** Earth



Live, Neutral, Earth & Fuses



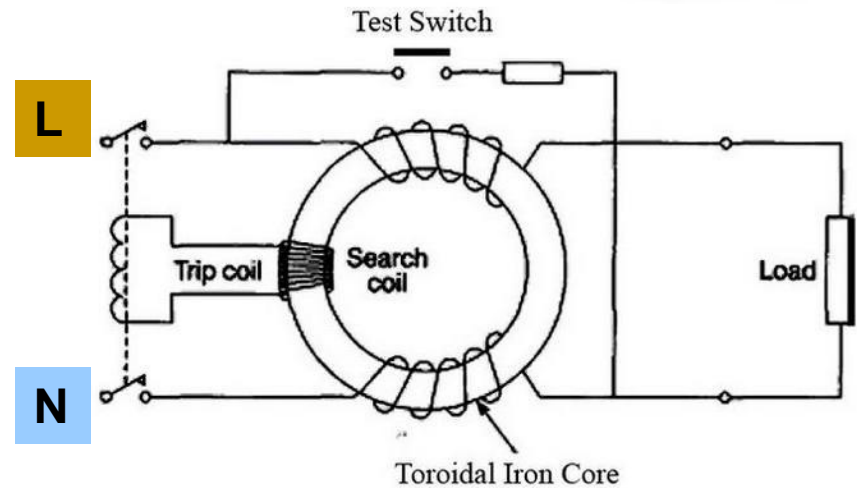
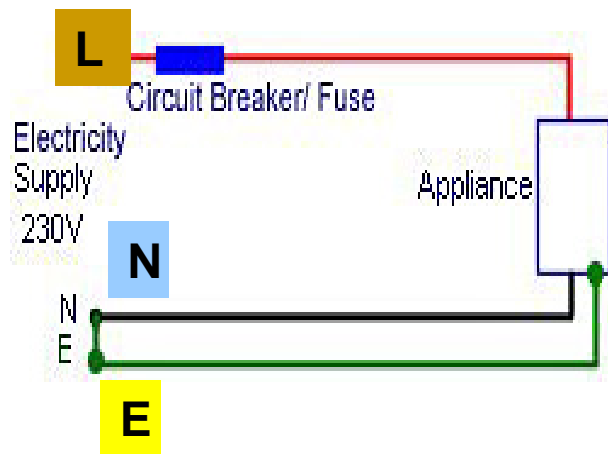
Live, Neutral, Earth & Fuses



RCCB Residual Current Circuit Breaker

ELCB Electric Leakage Circuit Breaker

- current difference of $>30 \text{ mA}$
- for a duration of $>30 \text{ ms}$



Live, Neutral, Earth & Fuses

- ❑ The **Live** and **Neutral** wires carry current around the circuit
- ❑ The **Earth** wire is there to protect you.
 - The Earth wire can act like a back-up **Neutral** wire,
 - Many appliances have metal cases e.g. kettles, toasters, dishwashers, washing machines etc.
- ❑ The **Fuse** is very thin piece of wire.
 - The wire has a quite low melting point. As current flows through the wire it heats up.
 - If **too large a current** flows it **melts**, thus **breaking** the circuit
 - Use appropriate fuse size/rating
- ❑ Additional safety devices - RCDs, ELCBs

Electrical Hazards & Personal Safety

□ Where

- Office & home 95%
- Laboratory 5%
 - Trailing wires, faulty wires

□ Mains

- Avoid direct working with mains. Use only low voltages (tension)
- Check all leads for: Fraying, Proper clamping, Proper earthing.

□ Repairing

- Do not repair, competency required
- One hand behind back, tip cautiously with back of hand
- Trust nobody, remove fuse, use phase tester

Note: Switch Mode PSU, laptop chargers, CF lamps
[high voltages persists on capacitors long after switch off]

What's the problem?

