

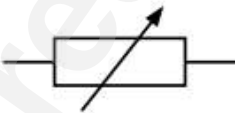
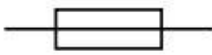
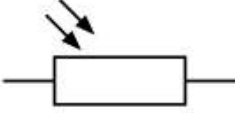
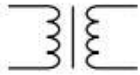
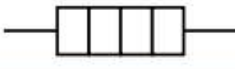


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P18 Electrical quantities

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Appendix

cell		switch	
battery of cells	 or 	earth or ground	
power supply		electric bell	
a.c. power supply		motor	
junction of conductors		generator	
lamp		ammeter	
fixed resistor		voltmeter	
variable resistor		oscilloscope	
thermistor		fuse	
light dependent resistor		transformer	
heater			

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P18.01 Current in electric circuits

charge - electric charge

current - amount of charge that passes per second

cell - battery & power supply - To flow an electric current in order to push the circuit

direct current - current which flows in the same direction all the time

1. Good conductors, bad conductors

- good conductors - **metals**, copper, silver, gold, steel
- good insulators - **plastic**, polymers, minerals, glass

2. Measuring electric current

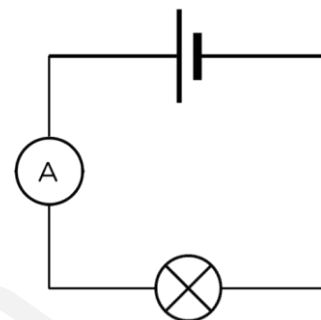
ammeter: device to measure electric current

- current flows in through one terminal and out through the other
- ammeter should be connected **in series**

Charge (C) = current (A) x time (s)

$Q = I t$

- current unit - **Ampere(A)**
- 1 milliamp = 1mA = 10^{-3} A
- charge unit - **C**
- time unit - **S**



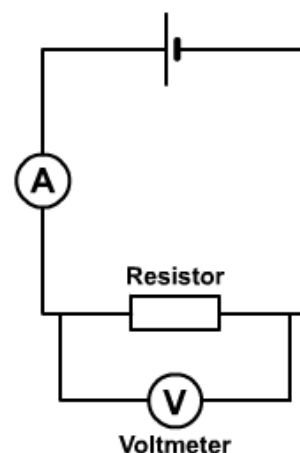
P18.02 Electrical resistance

potential difference - difference in electrical potential across the resistor

- unit - **volts(V)**
- voltage needed to push the current through the resistor
- **cell** provides the p.d needed to push the current
- voltmeter must be placed **in parallel** with component
 - to measure the difference in energy between component

electromotive force(e.m.f) - potential difference across the cell

- it's not a force, but a voltage



1. Defining resistance

resistance - how many volts are needed to make 1A

$1\Omega = 1V/A$

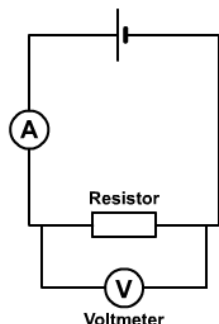
$$\text{Resistance} = \frac{\text{voltage}}{\text{current}}$$

• resistance unit - **ohms(Ω)**

2. Changing current

- resistance $\downarrow$ = current $\uparrow$
- potential difference $\uparrow$ = current $\uparrow$

3. Measuring resistance

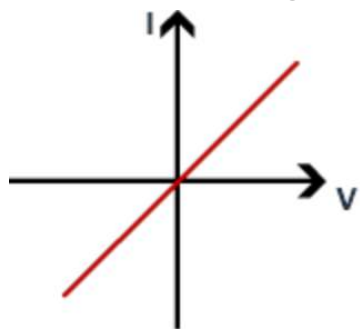


- power supply can be changed to 0V to 12V
- for each value of p.d, current is recorded
- voltage $\div$ current = resistance

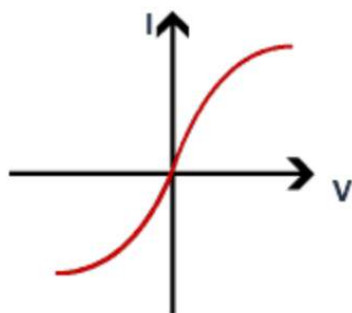
P18.03 More about electrical resistance

- resistance of wire is proportional to its length
 - longer pipe - resistance $\uparrow$
- resistance of wire is inversely proportional to its cross sectional area
 - narrower pipe - resistance $\uparrow$

1. Current - voltage characteristics



- voltage on the x axis, current on the y-axis
- ← **ohmic resistor**
- easy to predict the current because it's directly proportional



- in low voltage, graph is straight
- higher voltage, graph curves over
- current increases more slowly as voltage increased
 - filaments heats up and glows brightly
 - high temperature has higher resistance - 증가율 slower

※ negative voltage can be achieved by connecting the voltage the other way around

P18.04 Electricity and energy

1. What is a volt?

- we use high voltages for our supply
- supply with high e.m.f gives a lot of energy to the charge to push around the circuit
- **1V gives 1J of energy to each coulomb of charge**
 - **volt = Joule per coulomb**

2. Electrical power

$$\text{Power(W)} = \frac{\text{Energy transformed(J)}}{\text{time taken(s)}}$$

$$\text{Power(W)} = \text{current(A)} \times \text{p.d(V)}$$

power - the rate at which energy is transferred from place to place

- **1W = 1J/s**
- **1W = amps x volts**

3. Calculating energy

energy transformed(J) = current(A) x p.d(V) x time(s)

$$E = I V t$$