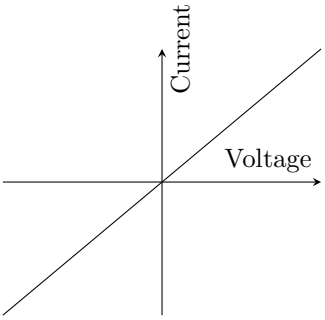
Current electricity

1 Basics of electricity

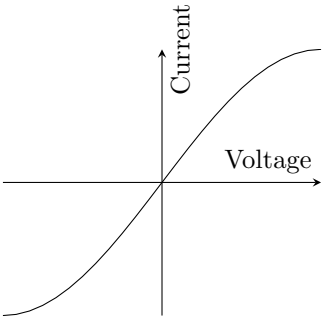
- Current - The rate of flow of charge
- Potential difference - Work done per unit charge

2 Current-voltage characteristics

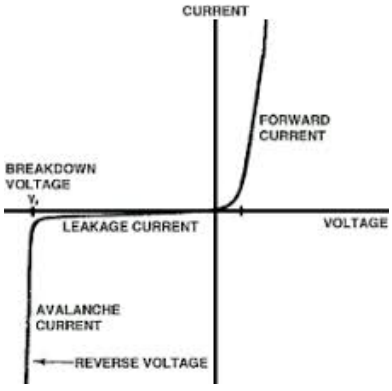
2.1 Ohmic Conductor



2.2 Bulb



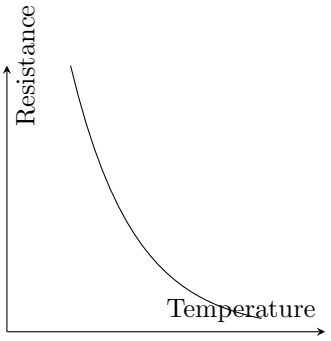
2.3 Diode



Ohm's Law: Current is proportional to voltage

3 Resistivity

↓ Temperature ↓ Resistance of any conductor



4 Superconductivity

Below a certain temperature (critical temperature) the resistance of a material will be zero, this is described as superconductivity. The critical temperature depends on the material.

Applications:

- Producing strong magnetic fields
- The reduction in energy loss when transmitting power

5 Circuits

5.1 Resistors

Series: $R_T = R_1 + R_2 + R_3...$

Parallel: $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}...$

5.2 Current

Series: Current in = Current out. Current through multiple components is the same as through one
Parallel: Current into a junction = current out of a junction

5.3 Voltage

Series: Total voltage = the sum of voltages in the circuit
Parallel: Voltage in parallel components is equal

6 Potential Dividers

A potential divider is used to supply constant or variable potential difference from a power supply

$$V_{Out} = V_{In}\frac{R_1}{R_1 + R_2}$$

Potential dividers can be used as part of sensor circuits to increase or decrease voltage based on environmental conditions

7 Electromotive force and internal resistance

Switch Open	Switch Closed
Voltmeter reads ϵ	Voltmeter reads $\epsilon - IR$

7.1 Voltage Current Graph