Physics Year 13 (Level 8)

Summary Direct Current

Revise last year's chapter on DC

Ohm's law: $V = IR;\ V \rightarrow voltage, I \rightarrow current, R \rightarrow resistance$

Resistors in series share same current: $R_{tot} = R_1 + R_2$

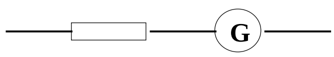
Resistors in parallel share same voltage: $\frac{1}{R_{tot}} = \frac{1}{R_1} + \frac{1}{R_2}$

Current is Charge per Second: in units: $A=Cs^{-1}$
Voltage is Work per Charge: in units: $V = JC^{-1}$
Electric Power is Volt x Current in units: $W = VA$ or $Cs^{-1}xJC^{-1} = Js^{-1}$ or Work per second
Electric Energy is Electric Power x Time in units: J = Ws (household unit is kWh)

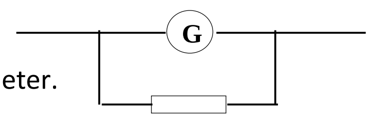
Geometry of Resistance $\boxed{R = \frac{\rho L}{A}}$; R is resistance of a wire,
ρ is resistivity, L is length, A is area of cross section

Multimeters

- Voltmeter is Galvanometer in series with (large) resistor. This leaves low voltage for the galvanometer.

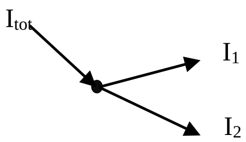


- Ammeter is Galvanometer in parallel with (small) resistor. This shunts off most current and leaves little current for the galvanometer.

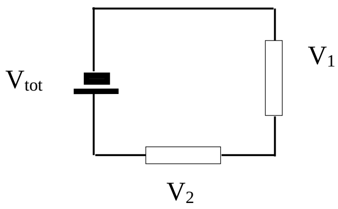


Kirchhoff's laws

- At junction in circuit: $\boxed{\Sigma i = 0}$



- In loop in circuit: $\boxed{\Sigma V = 0}$



See Exercise 2 p 174 as typical example of applying these laws.

EMF, Internal Resistance

A Power Supply has an internal resistance *r*. This means that there is a difference between open circuit voltage of the supply and the supply voltage when connected to a circuit.
The voltage drop depends on the current drawn: $V_{drop} = Ir$

Hence $\boxed{V_{(out)} = E - Ir}$