



videos

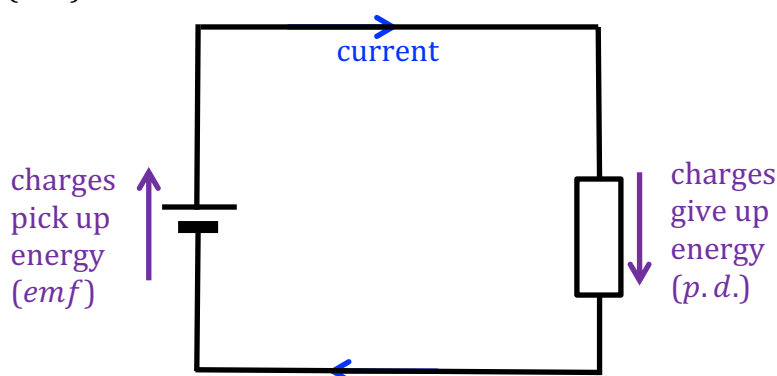
5.1.2 Potential difference and power

Watch the following video:

<https://www.youtube.com/watch?v=u4FpbaMW5sk>

Potential difference (*p. d.*) is the energy per unit charge given up by charges as they pass through a device (e.g. a resistor). The electrical energy given up by the charges is transferred into other forms of energy (e.g. a resistor transfers the energy to heat, a bulb transfers the energy to light and heat).

Energy is picked up by charges as they pass through a power supply (e.g. a battery). The energy per unit charge picked up is called the electromotive force (emf).



Both *p. d.* and emf are measured in volts (V).

Mathematically, the *p. d.* is the change in energy ΔE (in joules) per unit charge:

$$p. d. = \frac{\Delta E}{\Delta Q} \quad \text{where } Q \text{ is charge (in coulombs)}$$

and:

$$emf = \frac{\Delta E}{\Delta Q}$$

(1) From the equations above, what is an alternative unit for the volt?

When the charges pass through a device and give up some energy, we say that the charges have done work. Work has the symbol W and is measure in joules. So, the energy they give up is the work they have done.

Back to GCSE. Remember that power (in watts) is the work done per second.

$$P = \frac{W}{t} \quad \text{where } t \text{ is time in seconds}$$

(2)  Rearrange this formula to find a formula for work done W .

As discussed above the $p.d.$ is the work done per unit charge:

$$p.d. = \frac{W}{Q}$$

(3)  Substitute the formula for work W (from above) in this formula and rearrange to find a formula for power P .

(4)  Have you seen the formula for power before?