Electricity Costs

The power of a machine is measured in watts (W) or kilowatts (kW). 1kW = 1000W.

Power is a measure of the amount of energy it transfers in a given time. So the amount of energy transferred by a machine depends on its power and the time it is used.

As you know energy is measured in joules (J) and 1J is the amount of energy transferred by a 1W machine in 1 second.

The formula for this relationship is:

Energy transferred (J) = Power (W) × time (seconds) <u>OR</u> $E = P \times t$

Example: A 2.5 kW kettle is used for 90 seconds. How much energy does it transfer?

$2.5 \times 1000 = 2500W$ → (Because the power was in kW you needed to ×1000 to get watts!)

$E = P \times t$

$E = 2500 \times 90$

$E = 225000J$ → (If you ÷1000 you <u>could</u> write this as 225kJ!)

In real life machines are often on for hours! Power can also be measured in kilowatt hours. (kWh) → (Amount of electrical energy used by a 1kW machine in 1hour)

A 1.5kW heater transfers 115kWh of electrical energy. How long was it on for?

$E = P \times t$ <u>rearranged</u> $t = E \div P$

$t = 115 \div 1.5$

$t = 76.6$ hours

Electricity Costs

Cost of electricity = No. of kWh used × Price per kWh

Example: If the cost of a kWh of electricity is 17p what does it cost to use a 1600W vacuum cleaner for 30mins?

$\frac{1600W}{1000} = 1.6kW$ $\frac{30mins}{60} = 0.5hours$

Cost = 1.6 × 0.5 = 0.8kWh

0.8 × 17p = 13.6p

Example 2: If the cost of electricity per kWh is 17p, how long can the 1600W vacuum cleaner be used for 17p.

$E = P \times t$ rearrange → $t = E \times P$

$\frac{1600}{1000} = 1.6kW$ $\frac{1}{1.6}$

• Remember that for 17p you can use 1kWh.

turns hours into mins.

$\frac{1}{1.6} = 0.625$ hours × 60 = 37.5minutes