

### 1. Definition of Electrical Power

Power is the energy transformed per second

$$P = \frac{E}{t}$$

Symbol	Name	Unit	Unit Symbol
P	Power	watts	W
E	Energy	joules	J
t	time	seconds	s

#### Example 1

What is the power of a television which transforms 0.5 MJ of energy in 1 hour?

$$P = \frac{E}{t}$$

$$P = \frac{0.5 \times 10^6}{1 \times 60 \times 60}$$

$$P = 139W$$

#### Example 2

A 1500 W hairdryer is used for 5 minutes, how much energy is transformed?

$$P = \frac{E}{t}$$

$$1500 = \frac{E}{5 \times 60}$$

$$E = 1500 \times 300$$

$$E = 4.5 \times 10^5 J$$

#### Power Ratings

- 3A fuse should be selected for most appliances rated up to 720 W.
- 13A fuse for appliances rated over 720 W.

### 2. Power, Current & Potential Difference

We can also relate power to current and potential difference. Lets examine this using the units:

$$P = IV$$

*P = current x voltage*

*P = (coulombs/second) x (joules/coulombs)*

$$P = \frac{\text{joules}}{\text{second}} = E/t$$

Two further power equations can be determined:

$$P = IV = I(IR) = I^2R \quad \text{Since } V = IR \quad P = I^2R$$

$$P = IV = \left(\frac{V}{R}\right)V \quad \text{Since } I = V/R \quad P = \frac{V^2}{R}$$

## 6. ELECTRICAL POWER

#### N5 Past Papers HW

2015 → MC Q4 Section B Q2  
2017 → Section B Q1

### 3. Examples

1. A vacuum cleaner is connected to the UK mains (rated at 230 V) and 8.9 A of current flows through the circuit. What power is being transformed?

$$P = ?$$

$$I = 8.9A$$

$$V = 230V$$

$$P = IV$$

$$P = 8.9 \times 230$$

$$P = 2047W$$

2. The elements of a toaster have a total resistance of 15 Ω, the toaster is rated at 1650 W. What current does it draw?

$$P = 1650W$$

$$I = ?$$

$$R = 15\Omega$$

$$P = I^2R$$

$$1650 = I^2 \times 15$$

$$I^2 = \frac{1650}{15} = 110$$

$$I = \sqrt{110} = 10.5A$$