

Summary

$$1 \text{ watt (W)} = 1 \text{ joule per second (J/s)}$$

$$\text{power(W)} = \text{voltage(V)} \times \text{current(A)}$$

$$P = VI$$

$$\text{energy} = \text{power} \times \text{time}$$

If you want the energy in joules the unit of power must be given in watts and the time in seconds:

$$\text{energy(J)} = \text{power(W)} \times \text{time(s)}$$

If you want the energy in kilowatt-hours the unit of power must be given in kilowatts and the time in hours. :

$$\text{energy(kWh)} = \text{power(kW)} \times \text{time(hr)}$$

1 kilowatt-hour is the amount of electrical energy consumed by a 1 kW device in 1 hour.

$$1 \text{ kWh} = 3.6 \text{ MJ}$$

Question

1. Samson washes his long dark locks every day. He spends half an hour each day drying his hair with an electric hair dryer with a power rating of 1.5 kW. If the unit cost of electricity is 9 pence how much does Samson spend on drying his hair each week?

Solution:

$$\text{Time spent drying hair in hours} = 7 \times 0.5 = 3.5 \text{ hours}$$

energy used in kWh:

$$\begin{aligned} \text{energy(kWh)} &= \text{power(kW)} \times \text{time(hr)} \\ &= 1.5 \times 3.5 \\ &= 5.25 \text{ kWh} \end{aligned}$$

$$\begin{aligned} \text{total cost} &= \text{number of kilowatt-hours} \times \text{unit cost} \\ &= 5.25 \times 9 \\ &= 47\text{p} \\ &= \text{£}0.47 \end{aligned}$$

Electricity Bills Worksheet

Questions

- How much does it cost to use a 2.5 kW electric fire for 4 hours if electricity costs 7.5 pence per unit?
- A 120 W electric blanket is left on for 8 hours
 - How many joules electrical energy is transferred?
 - How many kilowatt hours of electrical energy is transferred?
 - If the unit cost of electricity is 8 pence what is the cost (to the nearest penny) of using the electric blanket each evening?
- A 2.6 kW kettle is used 8 times a day for five minutes each time.
 - What is the total time that the kettle is switched on each week?
 - How many units of electricity (i.e. kilowatt-hours) are converted in a week?
 - If the cost of a unit is 8 pence what is the cost of running the kettle for a week?
- A 4 kilowatt cooker is used for 30 minutes.
 - How many joules electrical energy is transferred?
 - How many kilowatt hours of electrical energy is transferred?
 - If the unit cost of electricity is 8 pence what is the cost of using the cooker?
- How long will the following devices run on 1 kWh of energy?
 - Hair dryer (1.5 kW)
 - TV (150 W)
 - Electric cooker (4 kW)
 - vacuum cleaner (800 W)
 - games console (100 W)
- Ianto Fullpelt has had a bill from the electricity company (see below). Unfortunately his pet hamster ravaged the bill before he could read it. Can you work out the total due to the electricity company.

Merthyr Electricity Company
Customer code: Ianto28

METER READING		UNIT COST
PRESENT	PREVIOUS	(pence)
8467	7345	7.000

UNITS USED = _____

STANDING CHARGE (£16)

TOTAL DUE = _____

(Answers) Electricity Bills Worksheet

1. How much does it cost to use a 2.5 kW electric fire for 4 hours if electricity costs 7.5 pence per unit? **£0.75**
2. A 120 W electric blanket is left on for 8 hours
- (a) How many joules electrical energy is transferred? **3.456 MJ**
- (b) How many kilowatt hours of electrical energy is transferred? **0.96 kWh**
- (c) If the unit cost of electricity is 8 pence what is the cost (to the nearest penny) of using the electric blanket each evening? **8p**
3. A 2.6 kW kettle is used 8 times a day for five minutes each time.
- (a) What is the total time that the kettle is switched on each week? **4 hrs 40 mins**
- (b) How many units of electricity (i.e. kilowatt-hours) are converted in a week? **12.13**
- (c) If the cost of a unit is 8 pence what is the cost of running the kettle for a week? **97p**
4. A 4 kilowatt cooker is used for 30 minutes.
- (a) How many joules electrical energy is transferred? **7.2 MJ**
- (b) How many kilowatt hours of electrical energy is transferred? **2 kWh**
- (c) If the unit cost of electricity is 8 pence what is the cost of using the cooker? **16p**
5. How long will the following devices run on 1 kWh of energy?
Use the eChalk "Electricity Bills" resource to check answers to these questions.
- (a) Hair dryer (1.5 kW) **40 min**
- (b) TV (150 W) **6 hr 40 min**
- (c) Electric cooker (4 kW) **15 min**
- (d) vacuum cleaner (800 W) **1 hr 15 min**
- (e) games console (100 W) **10 hr**
6. Ianto Fullpelt has had a bill from the electricity company (see below). Unfortunately his pet hamster ravaged the bill before he could read it. Can you work out the total due to the electricity company. **£78.54 + £16.00 = £94.54**

Merthyr Electricity Company
Customer code: Ianto28

METER READING		UNIT COST
PRESENT	PREVIOUS	(pence)
8467	7345	7.000

UNITS USED = [redacted]

STANDING CHARGE (£16)

TOTAL DUE = [redacted]