



Energy and Power in Circuits

Workbook
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- Q1** Indicate whether these statements are **true** or **false**.
- | | True | False |
|---|-------------------------------------|-------------------------------------|
| a) An electric current almost always produces heat. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| b) Cells provide the electrical energy in most portable appliances. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| c) An appliance's fuse rating should be lower than its normal current. | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| d) Components in a circuit can transfer electrical energy to other forms of energy. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Q2 Fill in the gaps using the words in the box. You might need to use some of the words more than once, or not at all.



power	current	lower	higher	how long	voltage
The total energy transferred by an appliance depends on <u>how long</u> it's used for and it's <u>power</u> . The power of an appliance can be calculated using the formula: power = <u>voltage</u> × <u>current</u> . The fuse rating for an appliance should be a little <u>higher</u> than its normal <u>current</u> .					

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Q3 Calculate the **amount** of electrical energy used by the following. For each component, say what **forms** of energy the electrical energy is converted to.

- a) A 100 watt lamp in 10 seconds: $100 \times 10 = 1\,000$ J.
Electrical energy is converted to heat and light energy.
- b) A 500 watt motor in 2 minutes: $500 \times 2 \times 60 = 60\,000$ J.
Electrical energy is converted to kinetic, heat and sound energy.
- c) A 1 kW heater in 20 seconds: $1\,000 \times 20 = 20\,000$ J.
Electrical energy is converted to heat energy.
- d) A 2 kW heater in 10 minutes: $2\,000 \times 10 \times 60 = 1\,200\,000$ J.
Electrical energy is converted to heat energy.

Remember to put time in seconds and power in W.

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Q4 Lucy is comparing three lamps. She connects each lamp in a circuit and measures the current. Her results are shown in the table below.

	Lamp A	Lamp B	Lamp C
Voltage (V)	12	3	230
Current (A)	2.5	4	0.1
Power (W)	30	12	23
Energy used in one minute (J)	1800	720	1380



- a) Complete the table by filling in the missing values.
 b) What rating of fuse would each lamp need? A = **3A**, B = **5A**, C = **3A**.

Common fuse values are 1A, 3A, 5A and 13A

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Q5 An electric heater is rated at 230 V, 1500 W.

- a) Calculate the current it uses.
 $P=IV$ therefore $I = P/V = 1500/230 = 6.5A$
 b) What rating of fuse should be used with this heater? Circle your choice.
 1 A 2 A 3 A 5 A **7 A** 10 A 13 A

Not a common value at all!

In most houses it would be protected by a 13A fuse...

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Q6 Sajid does an experiment to compare how much heat energy is lost by two resistors, A and B, when the same current flows in each. The instructions for his experiment have been mixed up.

- a) Put numbers in the boxes to show the correct order for the instructions.
- 2 Connect the resistor, put it into the water and take the temperature.
 - 4 Keep stirring the water until the temperature stops rising.
 - 1 Measure out exactly 100 ml of water and put it into a plastic beaker.
 - 3 Switch on the power for exactly 5 minutes.
 - 5 Take the temperature of the water again.



- b) The water temperatures Sajid records are shown in the table below.

	Resistor A	Resistor B
Start temperature	7 °C	8 °C
End temperature	10 °C	15 °C

Which resistor, A or B, had the **higher** resistance? **B**

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