

Electrical Power Energy

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

A kettle on 230 V mains draws a current of 10 A. Calculate its power. (2 marks)

Step 1 · Write the equation

power = potential difference × current, $P = VI$

Step 2 · Substitute and calculate

$P = 230 \times 10 = 2300 \text{ W (2.3 kW)}$

Answer: 2300 W

Check: Volts × amps = watts.

2. Now try one with the steps

The 2.3 kW kettle is on for 3.0 minutes. Calculate the energy transferred. (3 marks)

Step 1 · Convert

Step 2 · Equation

Step 3 · Calculate

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Write the equation that links power, potential difference and current. [1]

2. A lamp on 230 V mains takes a current of 0.25 A. Calculate its power in watts. [2]

3. A 12 V motor takes a current of 2.0 A. Calculate its power in watts. [2]

4. A 60 W lamp is on for 5.0 minutes. Calculate the energy transferred in joules. [2]

5. State what is meant by a power rating of 1.5 kW. [1]
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6. Describe the useful and wasted energy transfers in an electric hairdryer. [2]
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7. A current of 3.0 A flows through a 4.0 Ω resistor. Calculate the power in watts. [2]
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8. A charger at 5.0 V transfers 1200 C of charge to a phone. Calculate the energy transferred in joules. [2]
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9. An 1150 W microwave oven runs on 230 V mains. Calculate the current in amperes. [2]
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10. A 2.0 kW heater is used for 3.0 hours. Electricity costs 25p per kilowatt-hour. Calculate the cost. [3]
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11. A 2.3 kW heater runs on 230 V mains. Calculate its resistance in ohms. [3]
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12. A resistor of 25 Ω transfers 100 W. Calculate the current through it, in amperes. [3]
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13. Use $P = I^2 R$ to explain why doubling the current through a resistor makes it heat up four times [2]
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14. A 3.7 V phone battery stores 41 000 J. Calculate the charge it can deliver. Give your answer in coulombs to 2 significant figures. [3]

4. Before you hand it in

$P = I \times R$

$P = V I$ or $P = I^2 R$. ($I \times R$ gives the p.d., not the power.)

$P = 0.5 \times 40 = 20 \text{ W}$ for 0.5 A in 40 Ω

$P = I^2 R = 0.5^2 \times 40 = 0.25 \times 40 = 10 \text{ W}.$

$E = 2300 \times 3$ for 3 minutes

Use seconds for joules: 3 minutes = 180 s. (Use hours only when working in kilowatt-hours.)

Mixing kW with seconds, or W with hours

kW $\times$ h gives kWh; W $\times$ s gives J. Never mix them.