

Simulath · Worksheet 1/5

Ohm's law and power

Entry level · Level 2 · Electrical principles

Goal: Relate voltage, current, resistance, power and energy.



Scan: ElectraLab

Name: _____

Group: _____

Date: _____

$$V = I \cdot R \quad P = V \cdot I = I^2 \cdot R = V^2 / R \quad E = P \cdot t$$

Exercises

1. A $23 \, \Omega$ heating element is connected to 230 V. Calculate the current and the power.

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2. A 60 W lamp runs at 230 V. Calculate the current and its operating resistance.

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3. A 2000 W heater runs for 3 hours. How much energy does it use? At €0.15 per kWh, what does it cost?

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4. A current of 0.5 A flows through a $100 \, \Omega$ resistor. Calculate the voltage across it and the power it dissipates.

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5. If the same resistor is connected to half the voltage, what happens to the power?

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6. ElectraLab: build a 12 V source with a $240 \, \Omega$ resistor. Measure the current (meter in series) and calculate the power.

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Simulath · Worksheet 1/5 · Answer key (for the teacher)

Ohm's law and power



Scan: ElectraLab

- 1. A 23 Ω heating element is connected to 230 V. Calculate the current and the power.**
 $I = V/R = 230/23 = 10 \text{ A}$. $P = V \cdot I = 230 \cdot 10 = 2300 \text{ W}$.
- 2. A 60 W lamp runs at 230 V. Calculate the current and its operating resistance.**
 $I = P/V = 60/230 \approx 0.26 \text{ A}$. $R = V^2/P = 230^2/60 \approx 882 \Omega$.
- 3. A 2000 W heater runs for 3 hours. How much energy does it use? At €0.15 per kWh, what does it cost?**
 $E = 2 \text{ kW} \cdot 3 \text{ h} = 6 \text{ kWh}$. $\text{Cost} = 6 \cdot 0.15 = \text{€}0.90$.
- 4. A current of 0.5 A flows through a 100 Ω resistor. Calculate the voltage across it and the power it dissipates.**
 $V = I \cdot R = 0.5 \cdot 100 = 50 \text{ V}$. $P = I^2 \cdot R = 0.25 \cdot 100 = 25 \text{ W}$.
- 5. If the same resistor is connected to half the voltage, what happens to the power?**
 $P = V^2/R$: at $V/2$ the power is $(V/2)^2/R = P/4$. It drops to a quarter.
- 6. ElectraLab: build a 12 V source with a 240 Ω resistor. Measure the current (meter in series) and calculate the power.**
 $I = 12/240 = 0.05 \text{ A} = 50 \text{ mA}$. $P = 12 \cdot 0.05 = 0.6 \text{ W}$. The reading should match the calculation.

Practise these exercises free in ElectraLab: simulath.com/en/electralab/

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