

Power & Energy Exercises

For each question, use the appropriate equation from:

$$P = V \times I$$

$$P = I^2 \times R$$

$$P = V^2 \div R$$

$$E = P \times t = V \times I \times t$$

Be careful to always use the correct units

Question 1

A small bulb works at 3.5 V and takes a current of 200 mA.

How much power does the bulb dissipate?

Question 2

If the bulb in question 1 is used for 100 seconds, how much energy is transferred?

How much energy is transferred in 1 hour?

Question 3

A mains operated kettle is rated at 1800 W.

If the mains voltage is 230 V, what current flows through the kettle's heating element?

Question 4

A camping kettle takes a current of 20 A and is rated at 240 W.

What voltage should be used with the camping kettle?

Question 5

A current of 0.2 A flows through a 100 Ω resistor.

What power is dissipated by the resistor?

Question 6

A current of 100 mA flows through a resistor which dissipates a power of 2 W.

What is the value of the resistor?

Question 7

A $36\ \Omega$ resistor dissipates $900\ \text{W}$ of power.

How much current flows through the resistor?

Question 8

A toaster works from the $230\ \text{V}$ mains. The heating element has a resistance of $25\ \Omega$.

How much power is dissipated by the heating element?

Question 9

An $8\ \Omega$ loudspeaker dissipates $100\ \text{W}$ of power.

What voltage must be used to drive the speaker?

Question 10

A $24\ \text{V}$ battery powers a $300\ \text{W}$ floodlight.

What is the resistance of the bulb?

Power & Energy Answers

Question 1

$$P = V \times I \quad 200 \text{ mA} = 0.2 \text{ A}$$

$$P = 3.5 \times 0.2 \quad P = 0.7 \text{ W}$$

Question 2

$$E = P \times t \quad 1 \text{ hour} = 60 \times 60 = 3600 \text{ s}$$

$$\text{In } 100 \text{ s} \quad E = 0.7 \times 100 \quad E = 70 \text{ J}$$

$$\text{In } 1 \text{ hour} \quad E = 0.7 \times 3600 \quad E = 2500 \text{ J} \quad (\text{Not } 2520 \text{ J, don't use too many sig. fig})$$

Question 3

$$P = V \times I \quad I = P \div V$$

$$I = 1800 \div 230 \quad I = 7.8 \text{ A}$$

Question 4

$$P = V \times I \quad V = P \div I$$

$$V = 240 \div 20 \quad V = 12 \text{ V}$$

Question 5

$$P = I^2 \times R$$

$$P = 0.2^2 \times 100 \quad P = 4 \text{ W}$$

Question 6

$$P = I^2 \times R \quad R = P \div I^2 \quad 100 \text{ mA} = 0.1 \text{ A}$$

$$R = 2 \div 0.1^2 \quad R = 200 \Omega$$

Question 7

$$P = I^2 \times R \quad I = \sqrt{P \div R}$$

$$I = \sqrt{900 \div 36} \quad I = \sqrt{25} = 5 \text{ A}$$

Question 8

$$P = V^2 \div R$$

$$P = 230^2 \div 25 \quad P = 2100 \text{ W} \quad (\text{Not } 2116\text{W, don't use too many sig. fig.})$$

Question 9

$$P = V^2 \div R$$

$$V = \sqrt{P \times R}$$

$$V = \sqrt{(100 \times 8)} \quad V = 28 \text{ V} \quad (\text{not } 28.28\text{V, don't use too many sig. fig.})$$

Question 10

$$P = V^2 \div R$$

$$R = V^2 \div P$$

$$R = 24^2 \div 300 \quad R = 1.9 \Omega$$