

Multiple Formulas

Potential difference	Power	Energy 1	Energy 2
$V = RI$	$P = IV$	$E = Pt$	$E = IVt$

1. What is the power of an appliance if it works on 2.5 A and has a 5 Ω resistor?

$$P = IV$$

$$2.5 \times 5 = 12.5 \text{ V}$$

$$P = I \times V = 2.5 \times 12.5 = 31.25 \text{ W}$$

2. What is the resistance of a resistor if it uses 220 V and 300 W of power?

$$R = \frac{V}{I} \quad I = \frac{P}{V} = \frac{300}{220} = 1.4 \text{ A}$$

$$R = \frac{220}{1.4} = 157.1 \Omega$$

3. What is the resistance of a resistor if a circuit is on for 20 minutes, used 20 000 J of energy and had 4 A?

$$R = \frac{V}{I} \quad V = \frac{E}{It} = \frac{20000}{4 \times 20 \times 60} = 4.2 \text{ V}$$

$$R = \frac{4.2}{4} = 1.05 \Omega$$

4. What is the resistance of a resistor if a circuit is on for 2 hours, used 50 000 J of energy and 220 V?

$$R = \frac{V}{I} \quad I = \frac{E}{Vt} = \frac{50000}{220 \times 2 \times 3600} = 0.3 \text{ A}$$

$$R = \frac{220}{0.3} = 733.3 \Omega$$

5. What is the power of an appliance if it works on 5 A and has a 3.5 Ω resistor?

$$P = IV$$

$$5 \times 17.5 = 87.5 \text{ W}$$

$$V = IR = 5 \times 3.5 = 17.5 \text{ V}$$

6. What is the power of an appliance if it works on 2 A and has a 100 Ω resistor?

$$P = IV$$

$$2 \times 200 = 400 \text{ W}$$

$$V = RI = 2 \times 100 = 200 \text{ V}$$

7. The resistance of a heating element is 10 Ω and the potential difference (voltage) across its terminals is 120 V. This element is used for 3 hours. How much electrical energy was used during this period?

- A) 4 320 J B) 259 200 J C) 1440 000 J **D) 5 552 000 J**

$$E = IVt$$

$$12 \times 120 \times 3 \times 3600 = 1555200 \text{ J}$$

$$I = \frac{V}{R} = \frac{120}{10} = 12 \text{ A}$$

8. You connect a fan to a 12-V power source. The total resistance of the wires used is 10 Ω. You operate the fan for 20 min. How much energy is used by the wires during this period?

- A) 4.8 J B) 288 J C) 2 400 J **D) 17 280 J**

$$E = IVt$$

$$1.2 \times 12 \times 20 \times 60 = 17280 \text{ J}$$

$$I = \frac{V}{R} = \frac{12}{10} = 1.2 \text{ A}$$

9. How many joules of heat will the following circuit give off in exactly one hour of use?



$$E = IVt$$

$$1.5 \times 1.5 \times 1 \times 3600 = 8100 \text{ J}$$

$$I = \frac{V}{R} = \frac{1.5}{10} = 0.15 \text{ A}$$

10. To decorate a Christmas tree, you decide to use a string of lights made up of 10 identical light bulbs connected in series. This string of lights is connected to a 120 V power source. The power dissipated by the string of lights is 30 W. What is the resistance of each light bulb?

- A) 0.4 Ω B) 2.5 Ω **C) 48 Ω** D) 480 Ω

$$R = \frac{V}{I} \quad I = \frac{P}{V} = \frac{30}{120} = 0.25 \text{ A}$$

$$R = \frac{120}{0.25} = 480 \Omega$$

$$R_{\text{each}} = \frac{480}{10} = 48 \Omega$$