

Name: \_\_\_\_\_

# VOLTAGE, CURRENT AND RESISTANCE Worksheet

$$\text{resistance} = \frac{\text{potential difference}}{\text{current}}$$

$$R = \frac{V}{I}$$

Units: R is measured in ohms ( $\Omega$ )  
 V is measured in volts (V)  
 I is measured in amperes (A)

1. Solve for the unknown measurement.

a) $I = 10 \text{ A}$ $R = 1500 \Omega$ $V = ?$	done b) $I = ?$ $R = 200 \Omega$ $V = 240 \text{ V}$  $I = \frac{V}{R}$ $= \frac{240 \text{ V}}{200 \Omega}$ $= 1.2 \text{ A}$	c) $I = 15 \text{ A}$ $R = ?$ $V = 110 \text{ V}$
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$V = IR$   
 $\frac{V}{R} = I \frac{R}{R}$   
 $I = \frac{V}{R}$

2. Find the unknown quantity (CONVERT to the base unit FIRST, then solve).

a) $I = ?$ $R = 20 \Omega$ $V = 350 \text{ mV} = \underline{\hspace{2cm}} \text{ V}$	done b) $R = ?$ $I = 25 \text{ mA} = \underline{0.025} \text{ A}$ $V = 110 \text{ V}$  $R = \frac{V}{I}$ $= \frac{110 \text{ V}}{0.025 \text{ A}}$ $= 4400 \Omega$	c) $I = 15 \text{ A}$ $R = 7333 \text{ m}\Omega = \underline{\hspace{2cm}} \Omega$ $V = ?$
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$V = IR$   
 $\frac{V}{I} = \frac{I}{I} R$   
 $R = \frac{V}{I}$

### WORD PROBLEMS → Be sure to check your units before solving the following questions!

3. How much resistance does a light bulb create if it has a current of 25 mA around it in a 9 V circuit?

$I = 25 \text{ mA} = \dots\dots\dots$

$V = \dots\dots\dots$

$R = ?$

done 4. How much current flows through a 16 V battery that has a resistance of 5.1  $\Omega$ ?

$$I = \frac{V}{R}$$

$$= \frac{16 \text{ V}}{5.1 \Omega}$$

$$\approx 3.13725 \text{ A}$$

$$\left\{ \begin{array}{l} V = IR \\ \frac{V}{R} = I \\ I = \frac{V}{R} \end{array} \right.$$

5. The human body offers a very small amount of resistance (let's say 1  $\text{m}\Omega$  for argument). If a lightning bolt (said to have 1.21 GV of potential according to a famous movie called *Back to the Future* released in 1984) hits you, how much current is flowing through your body? PS. It takes a mere 50 mA of current to kill a human being.

## Resistance and Ohm's Law

Complete the following questions using the equation:  $V = I \times R$  or  $R = V \div I$  or  $I = V \div R$

6. What is the potential difference across an electrical load that has a resistance of  $4 \Omega$  and a current of  $3 \text{ A}$  flowing through it?

7. Calculate the current an electric clothes dryer draws when it is connected to a  $230 \text{ V}$  source and has a resistance of  $9.2 \Omega$ .

8. What is the resistance in a circuit if a potential difference of  $110 \text{ V}$  causes a current of  $10 \text{ A}$ ?

done 9. What is the potential difference across a hand-held fan that has a resistance of  $120 \Omega$  and a current of  $50 \text{ mA}$  flowing through it?

$$\begin{aligned} V &= IR \\ &= 120 \Omega (0.050 \text{ A}) \\ &= 6 \text{ V} \end{aligned}$$

Use  
 $V = IR$

Convert  
 $50 \text{ mA} = 0.050 \text{ A}$

10. An electric toaster has a resistance of  $12 \Omega$ . What current will it draw from a  $120 \text{ V}$  supply?

11. a) A portable radio connected to a  $9.0 \text{ V}$  battery draws a current of  $25 \text{ A}$ . What is the resistance of the radio?

b) What type of energy is the electrical energy from the battery being converted into in this device?

done 12. A heating coil offers a resistance of  $2.5 \text{ k}\Omega$ . What potential difference is required so that  $1.5 \text{ A}$  of current pass through it?

$$\begin{aligned} V &= IR \\ &= 1.5 \text{ A} (2500 \Omega) \\ &= 3750 \text{ V} \end{aligned}$$

Use  
 $V = I \cdot R$

Convert  
 $2.5 \text{ k}\Omega = 2500 \Omega$

13. How much resistance does a heavy duty flashlight have if it has a current of  $25 \text{ mA}$  flowing through it and is being powered by four  $1.5 \text{ V}$  cells?