Ohm's Law Worksheet with answers
$R = \frac{V}{I}$

Name and section: _____

Instructor's name: _____

1. In the formula of Ohm's Law, V = IR, V stands for _____, I stands for _____, and R stands for _____.

2. What is Ohm's Law? Explain.

3. A hairdryer operates with a resistance of 15 ohms. When in use, it draws a current of 10 A. What is the voltage needed to operate the hairdryer?

4. A scientist is studying the electrical conductivity of a jellyfish. The jellyfish offers a very small amount of resistance (let's say 0.5 mΩ). If a voltage of 0.605 GV is applied, how much current is flowing through the jellyfish? Keep in mind that, it takes a mere 10 mA of current to cause the jellyfish to contract.

5. A portable radio operates with a current of 15 mA flowing through it and is powered by three 1.2 V cells. What is the resistance of the radio?

6. A toaster oven operates by passing a current of 50 A through a coiled metal wire, causing it to heat up. If the resistance of the wire is 2.2 ohms, what voltage must be applied to it?

7. If the voltage in a circuit is halved, what happens to the current (assuming the resistance stays the same)?

8. A circuit has a current of 0.25 A and a voltage of 115 V. What is the resistance?

9. Ohm's Law states that the current through a conductor between two points is directly proportional to the _____ across the two points, and inversely proportional to the _____ between them.

10. When you triple the voltage in a simple electric circuit, you
    - ◯ triple the current
    - ◯ triple the resistance
    - ◯ triple the current and halve the voltage
    - ◯ neither triple the current nor the resistance

11. In a circuit, if a voltage of 10 V is applied across a resistor with a resistance of 2 Ω, the current flowing through the resistor would be ___ according to Ohm's Law.

12. A portable heater has a resistance of 150 Ω and a current of 60 mA flowing through it. What is the potential difference across the heater?

13. Consider an electrical circuit that includes a battery with four cells, wires, and a fan. Which of the following would cause the fan to spin less rapidly? Choose all that apply.
    - ◯ Increase the voltage of the battery (add another cell)
    - ◯ Decrease the voltage of the battery (remove a cell)
    - ◯ Decrease the resistance of the circuit
    - ◯ Increase the resistance of the circuit

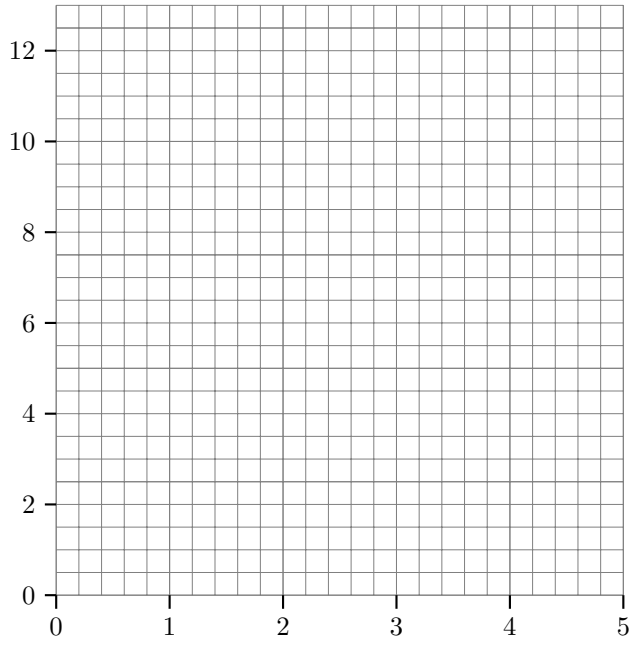
14. Imagine an electrical circuit that consists of a battery with two cells, wires, and a buzzer. Which of the following would cause the buzzer to buzz less loudly? Choose all that apply.
    - ◯ Increase the voltage of the battery (add another cell)
    - ◯ Decrease the voltage of the battery (remove a cell)
    - ◯ Decrease the resistance of the circuit
    - ◯ Increase the resistance of the circuit

15. Lab problem: In an advanced physics lab, a student is experimenting with a newly discovered material that exhibits unique electrical properties. The student constructs a circuit using this material as a resistor of unknown resistance, R. The lab instructor, intrigued by the student's initiative, advises the student to operate the circuit only long enough to take each reading to prevent any damage to the material. The student's measurements are recorded in the following data table:

Current (A)	**Voltage** (V)
0.8	2.4
1.6	4.8
2.4	7.2
3.2	9.6
4	12

Table 1: Data from Lab Problem 1

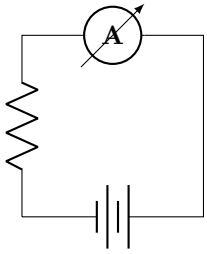
Plot these points on a graph with voltage on the y-axis and current on the x-axis. Analyze the graph and describe the mathematical relationship you observe between voltage and current.



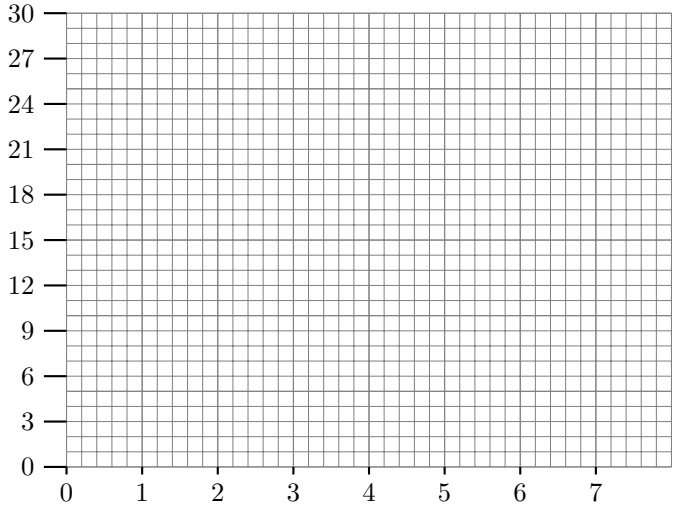
16. Lab Problem 2: You are investigating the relationship between voltage and current in a simple circuit using Ohm's Law. You measure the voltage across the circuit element and the corresponding current flowing through it.

Current (A)	**Voltage** (V)
0.6	3.25
1.45	7.05
2.55	12.75
3.35	16.4
4.05	20.55
6.15	30.75

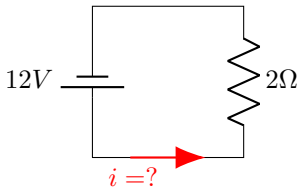
Table 2: Data from Lab Problem 2

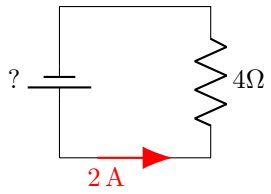


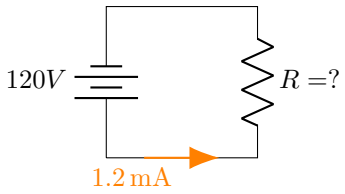
1. Plot the points in the grid provided.
2. what mathematical relationship do you see between current and voltage for this experiment?
3. Calculate the resistance of the circuit. Is this constant?

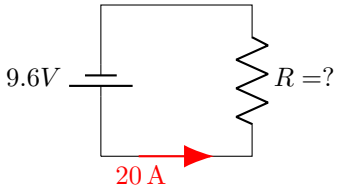


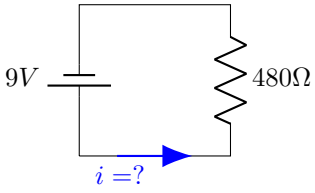
17. In each of the following simple circuits, find the unknown.

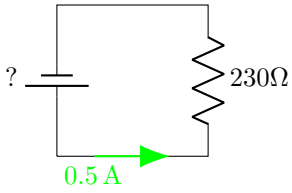












Answers:

(1) Voltage, current, resistance.

(2)

(3) 150 V

(4) I=1.21 GA

(5) 240 V

(6) 110 V

(7) According to Ohm's Law, if the voltage is halved, the current will also be halved, assuming the resistance stays the same.

(8)

$$R = \frac{V}{I} = \frac{115\,\text{V}}{0.25\,\text{A}} = 460\,\Omega$$

(9) voltage, resistance

(10) a

(11) 5 A

(12) 9 V

(13) (b) Decrease the voltage of the battery (remove a cell), (d) Increase the resistance of the circuit

(14) (b) Decrease the voltage of the battery (remove a cell), (d) Increase the resistance of the circuit.

In both problems, decreasing the voltage of the battery or increasing the resistance of the circuit would reduce the current flowing through the circuit according to Ohm's Law, thus causing the fan to spin less rapidly or the buzzer to buzz less loudly.

(16) In this scenario, the raw data was deliberately filled with "noise" to mimic the kind of measurement inaccuracies that occur in real-world situations. Graphing is a powerful tool that can help navigate through the challenges posed by such noise. Despite the presence of noise, the linear nature of the function is still prominently visible.

It's crucial for your students to grasp the concept of using graphs as a means to better comprehend data. When numerical relationships are depicted graphically, it provides an additional way to express the data, making it easier for individuals to recognize patterns compared to sifting through rows and columns of numbers.

According to Ohm's law, the slope of voltage vs. current gives us the resistance. Thus, $R \cong 4.95\,\Omega$.

To practice more on Ohm's law, scan the following QR code. In this resource, you will find numerous solved practice problems related to Ohm's law.