# Practice - Ohm's Law, Resistivity and Power

Name: _____   **Date:** _____

1. The current in a wire is 4.0 amperes. The time required for 2.5×10^{19} electrons to pass a certain point in the wire is

   A. 1.0 s   B. 0.25 s   C. 0.50 s   D. 4.0 s

2. What is the current in a wire if 3.4×10^{19} electrons pass by a point in this wire every 60. seconds?

   A. 1.8×10^{-18} A   B. 3.1×10^{-11} A

   C. 9.1×10^{-2} A   D. 11 A

3. A charge of 30. coulombs passes through a 24-ohm resistor in 6.0 seconds. What is the current through the resistor?

   A. 1.3 A   B. 5.0 A   C. 7.5 A   D. 4.0 A

4. What is the current in a 100.-ohm resistor connected to a 0.40-volt source of potential difference?

   A. 250 mA   B. 40. mA

   C. 2.5 mA   D. 4.0 mA

5. The current through a 10.-ohm resistor is 1.2 amperes. What is the potential difference across the resistor?

   A. 8.3 V   B. 12 V   C. 14 V   D. 120 V

6. The resistance of a wire is determined by the voltmeter-ammeter method. If the voltmeter reads 10 volts and the ammeter reads 2.0 amperes, the resistance is

   A. 20 ohms   B. 5.0 ohms

   C. 2.5 ohms   D. 0.20 ohm

7. The resistance of a circuit remains constant. Which graph best represents the relationship between the current in the circuit and the potential difference provided by the battery?

   A.

   B.

   C.

   D.
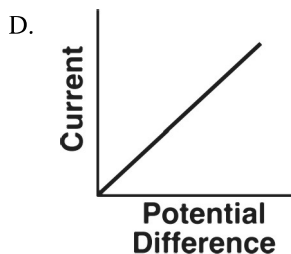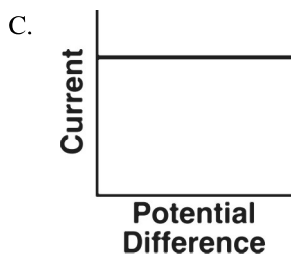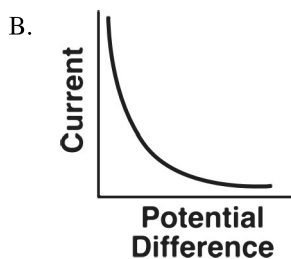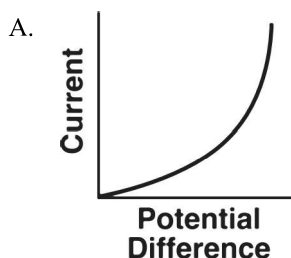
8. A constant potential difference is applied across a variable resistor held at constant temperature. Which graph best represents the relationship between the resistance of the variable resistor and the current through it?

A.

B.

C.

D.
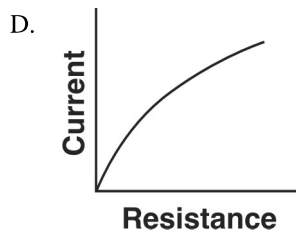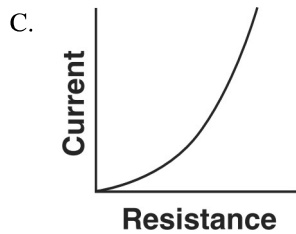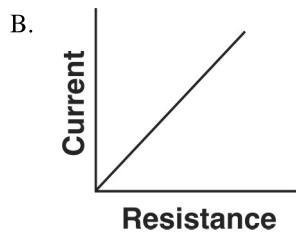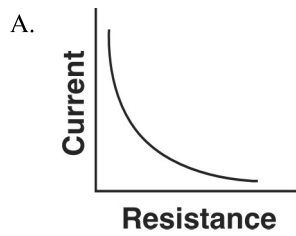
9. The electrical resistance of a metallic conductor is inversely proportional to its

A. temperature
B. length

C. cross-sectional area
D. resistivity

10. At 20°C, four conducting wires made of different materials have the same length and the same diameter. Which wire has the *least* resistance?

A. aluminum
B. gold

C. nichrome
D. tungsten

11. A copper wire of length L and cross-sectional area A has resistance R. A second copper wire at the same temperature has a length of $2L$ and a cross-sectional area of $\frac{1}{2}A$. What is the resistance of the second copper wire?

A. R B. $2R$ C. $\frac{1}{2}R$ D. $4R$

12. What is the resistance at 20°C of a 1.50-meter-long aluminum conductor that has a cross-sectional area of 1.13×10^{-6} meter^2?

A. $1.87 \times 10^{-3}\,\Omega$ B. $2.28 \times 10^{-2}\,\Omega$

C. $3.74 \times 10^{-2}\,\Omega$ D. $1.33 \times 10^{6}\,\Omega$

13. A 0.686-meter-long wire has a cross-sectional area of 8.23×10^{-6} meter^2 and a resistance of 0.125 ohm at 20° Celsius. This wire could be made of

A. aluminum
B. copper

C. nichrome
D. tungsten

14. The watt · second is a unit of

A. power

B. energy

C. potential difference

D. electric field strength

15. A 3.6-volt battery is used to operate a cell phone for 5.0 minutes. If the cell phone dissipates 0.064 watt of power during its operation, the current that passes through the phone is

A. 0.018 A
B. 5.3 A

C. 19 A
D. 56 A

16. An electric heater operating at 120. volts draws 8.00 amperes of current through its 15.0 ohms of resistance. The total amount of heat energy produced by the heater in 60.0 seconds is

A. 7.20×10^{3} J   B. 5.76×10^{4} J

C. 8.64×10^{4} J   D. 6.91×10^{6} J

17. An electric dryer consumes 6.0×10^6 joules of electrical energy when operating at 220 volts for 1.8×10^3 seconds. During operation, the dryer draws a current of

    A. 10. A   B. 15 A

   C. 9.0×10^2 A   D. 3.3×10^3 A

18. A 4.50-volt personal stereo uses 1950 joules of electrical energy in one hour. What is the electrical resistance of the personal stereo?

    A. 433 Ω B. 96.3 Ω

   C. 37.4 Ω D. 0.623 Ω

19. To increase the brightness of a desk lamp, a student replaces a 50-watt incandescent lightbulb with a 100-watt incandescent lightbulb. Compared to the 50-watt lightbulb, the 100-watt lightbulb has

    A. less resistance and draws more current

    B. less resistance and draws less current

    C. more resistance and draws more current

    D. more resistance and draws less current

20. The potential difference applied to a circuit element remains constant as the resistance of the element is varied. Which graph best represents the relationship between power (P) and resistance (R) of this element?

    A.   B.

    C.   D.
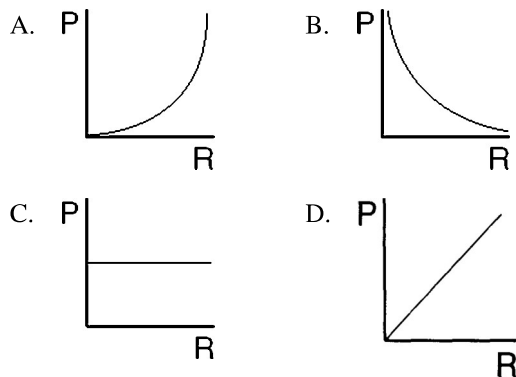
21. Which graph best represents the relationship between the electrical power and the current in a resistor that obeys Ohm's Law?

    A.

    B.

    C.

    D.
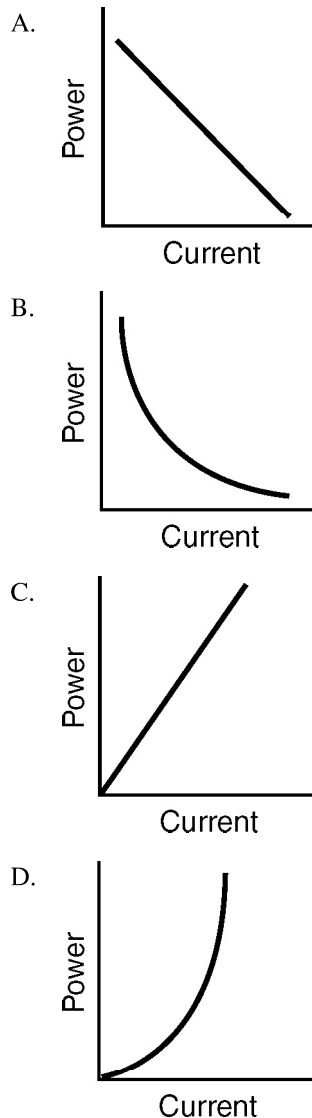
22. A 25.0-meter length of platinum wire with a cross-sectional area of 3.50×10^{-6} meter^2 has a resistance of 0.757 ohm at 20°C. Calculate the resistivity of the wire.

23. Calculate the resistance of a 900.-watt toaster operating at 120 volts. [Show all work, including the equation and substitution with units.]

24. Calculate the resistance of a 1.00-kilometer length of nichrome wire with a cross-sectional area of 3.50×10^{-6} meter^2 at $20°$C. [Show all work, including the equation and substitution with units.]

25. Base your answer(s) to the following question(s) on the information and data table below.

     An experiment was performed using various lengths of a conductor of uniform crosssectional area. The resistance of each length was measured and the data recorded in the table below.

Length (meters)	Resistance (ohms)
5.1	1.6
11.0	3.8
16.0	4.6
18.0	5.9
23.0	7.5

a. Mark an appropriate scale on the axis labeled "Length (m)."

b. Plot the data points for resistance versus length.

c. Draw a line of best fit.

Resistance vs. Length
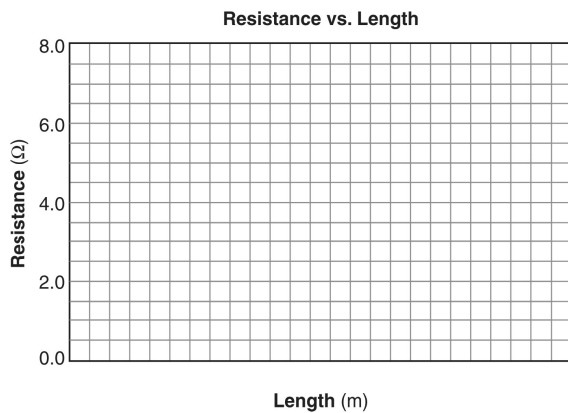
26. A long copper wire was connected to a voltage source. The voltage was varied and the current through the wire measured, while temperature was held constant. The collected data are represented by the graph below.

Voltage vs. Current
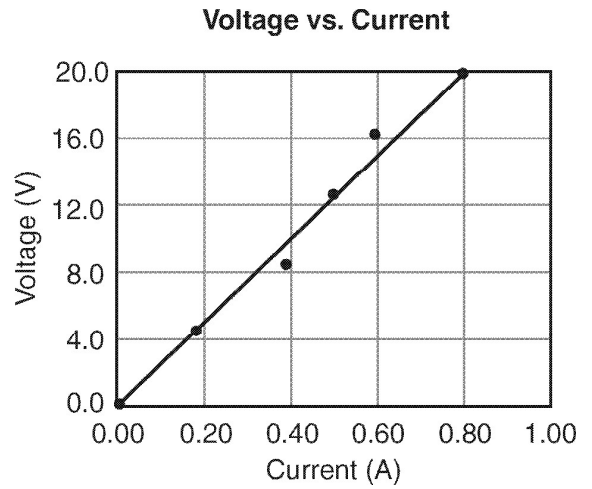
Using the graph, determine the resistance of the copper wire. [1]