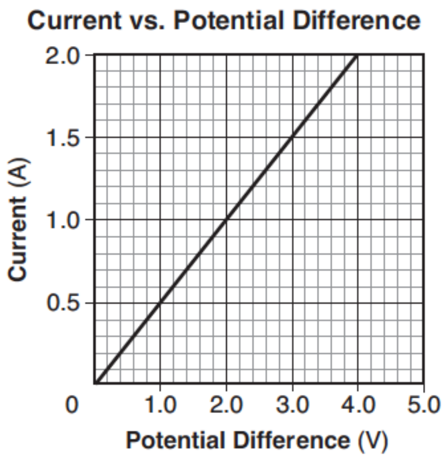
Name: ______________________________ Period: ____________

Circuits-Resistance

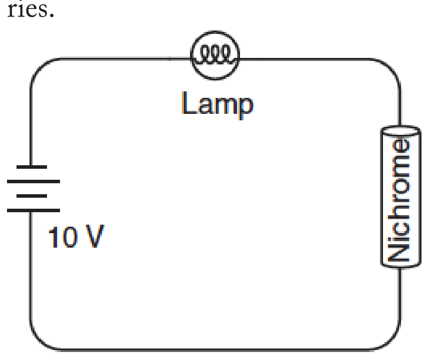
1. At 20°C, four conducting wires made of different materials have the same length and the same diameter. Which wire has the least resistance?
   1. aluminum
   2. gold
   3. nichrome
   4. tungsten

2. The graph below represents the relationship between the current in a metallic conductor and the potential difference across the conductor at constant temperature.



   The resistance of the conductor is
   1. 1.0 Ω
   2. 2.0 Ω
   3. 0.50 Ω
   4. 4.0 Ω

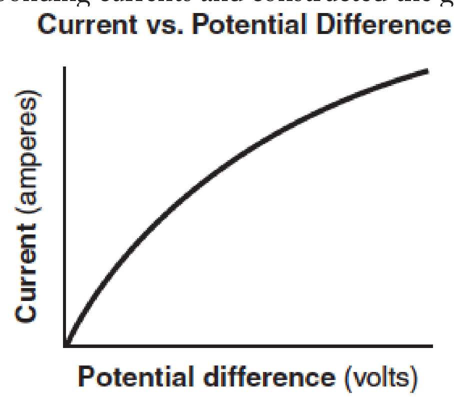
3. The diagram below represents a lamp, a 10-volt battery, and a length of nichrome wire connected in series.



   As the temperature of the nichrome is decreased, the brightness of the lamp will
   1. decrease
   2. increase
   3. remain the same

Base your answers to questions 4 through 6 on the information and graph below.

A student conducted an experiment to determine the resistance of a lightbulb. As she applied various potential differences to the bulb, she recorded the voltages and corresponding currents and constructed the graph below.



4. The student concluded that the resistance of the lightbulb was not constant. What evidence from the graph supports the student's conclusion?

5. According to the graph, as the potential difference increased, the resistance of the lightbulb
   1. decreased
   2. increased
   3. changed, but there is not enough information to know which way

6. While performing the experiment the student noticed that the lightbulb began to glow and became brighter as she increased the voltage. Of the factors affecting resistance, which factor caused the greatest change in the resistance of the bulb during her experiment?

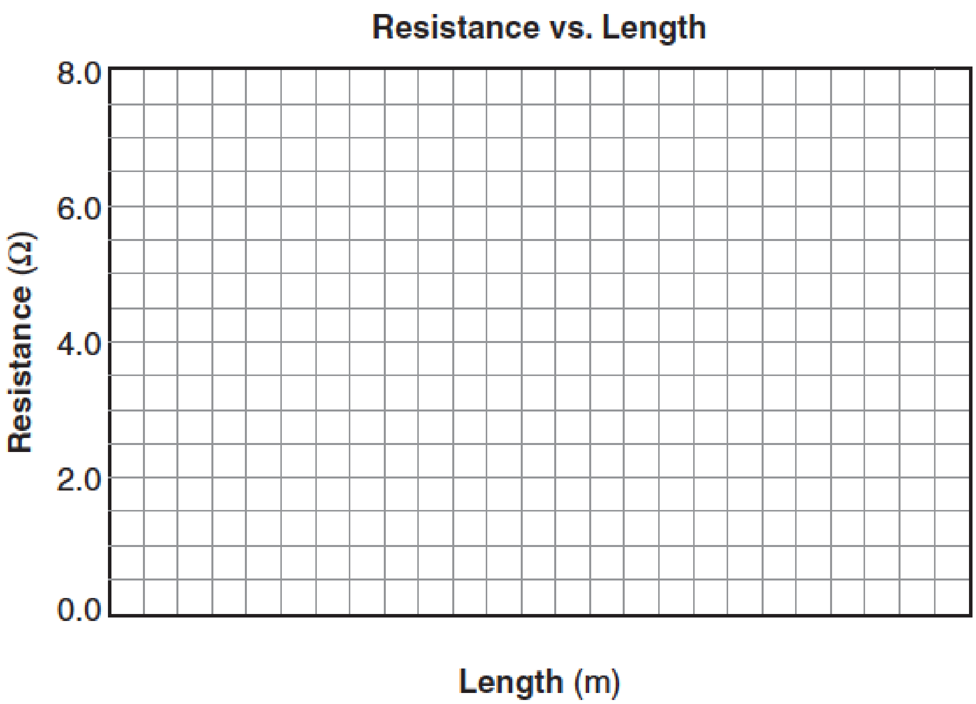
Name: ______________________________ Period: __________

Circuits-Resistance

Base your answers to questions 7 through 10 on the information and data table below.

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

Using the information in the data table, construct a graph on the grid below, following the directions provided.



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

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

8. Plot the data points for resistance versus length.

9. Draw the best-fit line.

10. Calculate the slope of the best-fit line. [Show all work, including the equation and substitution with units.]

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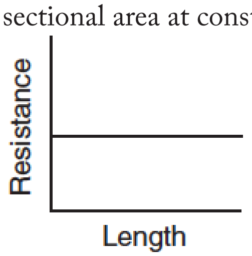
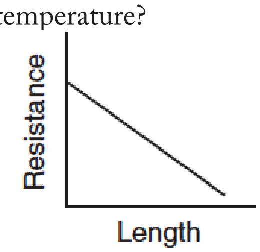
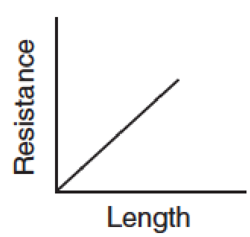
11. Which graph best represents the relationship between resistance and length of a copper wire of uniform cross-sectional area at constant temperature?



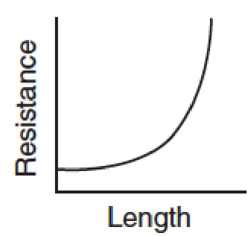
(1)



(2)



(3)



(4)

Name: ____________________ Period: __________

Circuits-Resistance

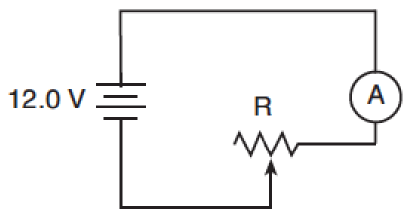
12. The table below lists various characteristics of two metallic wires, A and B.

Wire	Material	Temperature (°C)	Length (m)	Cross-Sectional Area (m^2)	Resistance (Ω)
A	silver	20.	0.10	0.010	R
B	silver	20.	0.20	0.020	???

If wire A has resistance R, then wire B has resistance
1. R
2. 2R
3. R/2
4. 4R

Base your answers to questions 13 through 15 on the information and diagram below.

A circuit contains a 12.0-volt battery, an ammeter, a variable resistor, and connecting wires of negligible resistance, as shown below.



The variable resistor is a nichrome wire, maintained at 20°C. The length of the nichrome wire may be varied from 10 centimeters to 90 centimeters. The ammeter reads 2 amperes when the length of the wire is 10 centimeters.

13. Determine the resistance of the 10-centimeter length of nichrome wire.

14. Calculate the cross-sectional area of the nichrome wire. [Show all work, including the equation and substitution with units.]

15. 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?
    1. 1.87×10^{-3} Ω
    2. 2.28×10^{-2} Ω
    3. 3.74×10^{-2} Ω
    4. 1.33×10^{6} Ω

16. A complete circuit is left on for several minutes, causing the connecting copper wire to become hot. As the temperature of the wire increases, the electrical resistance of the wire
    1. decreases
    2. increases
    3. remains the same

17. Which changes would cause the greatest increase in the rate of flow of charge through a conducting wire?
    1. increasing the applied potential difference and decreasing the length of wire
    2. increasing the applied potential difference and increasing the length of wire
    3. decreasing the applied potential difference and decreasing the length of wire
    4. decreasing the applied potential difference and increasing the length of wire

18. A length of copper wire and a 1.00-meter-long silver wire have the same cross-sectional area and resistance at 20°C. Calculate the length of the copper wire. [Show all work, including the equation and substitution with units.]

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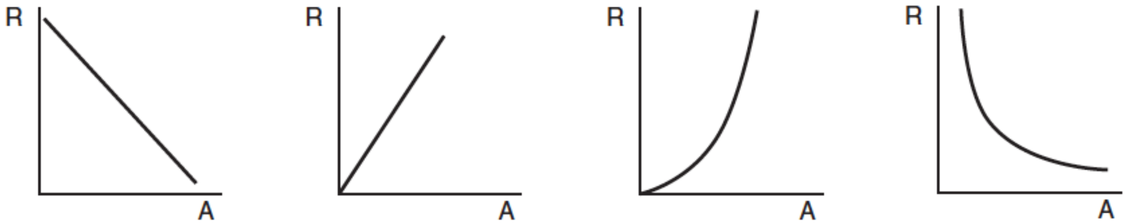
Circuits-Resistance

19. Several pieces of copper wire, all having the same length but different diameters, are kept at room temperature. Which graph best represents the resistance, R, of the wires as a function of their cross-sectional areas, A?



(1) (2) (3) (4)

20. A copper wire at 20°C has a length of 10.0 meters and a cross-sectional area of 1.00×10^{-3} meter^2. The wire is stretched, becomes longer and thinner, and returns to 20°C. What effect does this stretching have on the wire's resistance?

21. 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 0.5A. What is the resistance of the second copper wire?
    1. R
    2. 2R
    3. 0.5R
    4. 4R

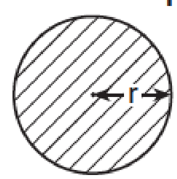
22. Pieces of aluminum, copper, gold, and silver wire each have the same length and the same cross-sectional area. Which wire has the *lowest* resistance at 20°C
    1. aluminum
    2. copper
    3. gold
    4. silver

23. Which quantity and unit are correctly paired?
    1. resistivity and Ω/m
    2. potential difference and eV
    3. current and C·s
    4. electric field strength and N/C

Base your answers to questions 24 and 25 on the information and diagram below.

A 10-meter length of copper wire is at 20°C. The radius of the wire is 1.0×10^{-3} meter.

Cross Section of Copper Wire



$r = 1.0 \times 10^{-3}$ m

24. Determine the cross-sectional area of the wire.

25. Calculate the resistance of the wire. [Show all work, including the equation and substitution with units.]

26. What is the resistance at 20°C of a 2.0-meter length of tungsten wire with a cross-sectional area of 7.9×10^{-7} meter^2?
    1. 5.7×10^{-1} Ω
    2. 1.4×10^{-1} Ω
    3. 7.1×10^{-2} Ω
    4. 4.0×10^{-2} Ω

Name: ____________________ Period: __________

Circuits-Resistance

Base your answers to questions 27 and 28 on the information below.

A 1.00-meter length of nichrome wire with a cross-sectional area of 7.85×10^{-7} meter^2 is connected to a 1.50-volt battery.

27. Calculate the resistance of the wire. [Show all work, including the equation and substitution with units.]

28. Determine the current in the wire.

29. The electrical resistance of a metallic conductor is inversely proportional to its
    1. temperature
    2. length
    3. cross-sectional area
    4. resistivity

30. 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
    1. aluminum
    2. copper
    3. nichrome
    4. tungsten

31. Calculate the resistance of 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.]

Base your answers to questions 32 and 33 on the information below.

A 3.50-meter length of wire with a cross-sectional area of 3.14×10^{-6} meter^2 is at 20° Celsius. The current in the wire is 24.0 amperes when connected to a 1.50-volt source of potential difference.

32. Determine the resistance of the wire.

33. Calculate the resistivity of the wire. [Show all work, including the equation and substitution with units.]

34. Aluminum, copper, gold and nichrome wires of equal lengths of 0.1 meter and equal cross-sectional areas of 2.5×10^{-6} meter^2 are at 20°C. Which wire has the greatest electrical resistance?
    1. aluminum
    2. copper
    3. gold
    4. nichrome

35. A 10-meter length of wire with a cross-sectional area of 3.0×10^{-6} square meter has a resistance of 9.4×10^{-2} ohm at 20° Celsius. The wire is most likely made of
    1. silver
    2. copper
    3. aluminum
    4. tungsten

36. Which change decreases the resistance of a piece of copper wire?
    1. increasing the wire's length
    2. increasing the wire's resistivity
    3. decreasing the wire's temperature
    4. decreasing the wire's diameter

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Circuits-Resistance

37. 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. [Show all work, including the equation and substitution with units.]

38. What is the resistance of a 20.0-meter-long tungsten rod with a cross-sectional area of 1.00×10^{-4} meter^2 at 20° Celsius.
    1. $2.80 \times 10^{-5}\ \Omega$
    2. $1.12 \times 10^{-2}\ \Omega$
    3. $89.3\ \Omega$
    4. $112\ \Omega$

39. During a laboratory experiment, a student finds that at 20° Celsius, a 6.0-meter length of copper wire has a resistance of 1.3 ohms. The cross-sectional area of this wire is
    1. $7.9 \times 10^{-8}\ m^2$
    2. $1.1 \times 10^{-7}\ m^2$
    3. $4.6 \times 10^{0}\ m^2$
    4. $1.3 \times 10^{7}\ m^2$