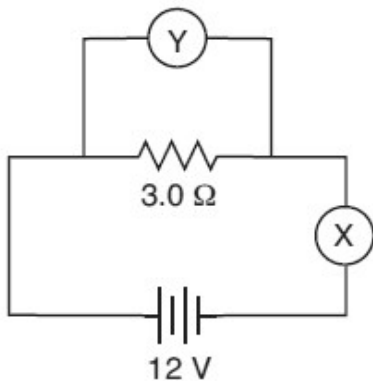


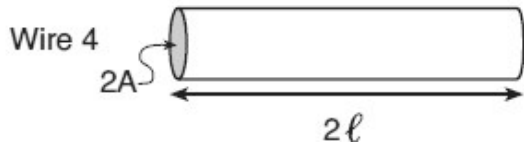
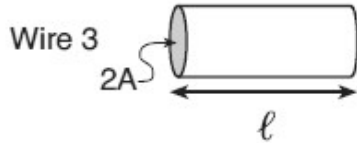
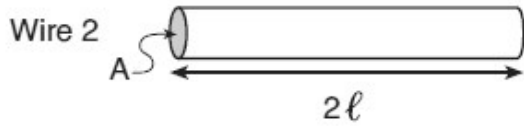
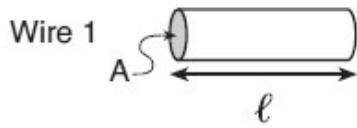
Name: \_\_\_\_\_

1. A lightbulb with a resistance of 2.9 ohms is operated using a 1.5-volt battery. At what rate is electrical energy transformed in the lightbulb?
  - A. 0.52 W
  - B. 0.78 W
  - C. 4.4 W
  - D. 6.5 W
2. In an operating electrical circuit, the source of potential difference could be
  - A. a voltmeter
  - B. a battery
  - C. an ammeter
  - D. a resistor
3. A total charge of 100. coulombs flows past a fixed point in a circuit every 500. seconds. What is the current at this point in the circuit?
  - A. 0.200 A
  - B. 5.00 A
  - C.  $5.00 \times 10^4$  A
  - D.  $1.25 \times 10^{15}$  A
4. The diagram below represents a 3.0-ohm resistor connected to a 12-volt battery. Meters *X* and *Y* are correctly connected in the circuit.



- A.  $X = 12$  V and  $Y = 0.25$  A
- B.  $X = 12$  V and  $Y = 4.0$  A
- C.  $X = 0.25$  A and  $Y = 12$  V
- D.  $X = 4.0$  A and  $Y = 12$  V

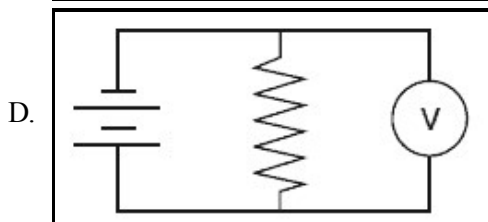
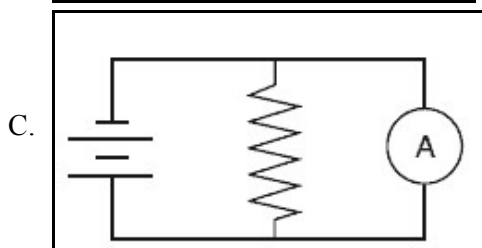
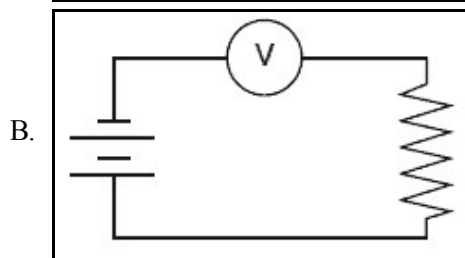
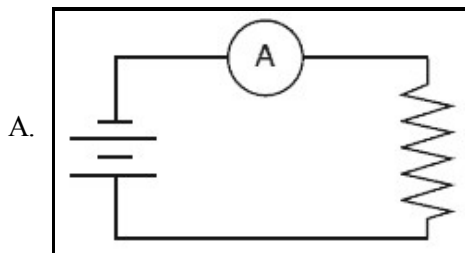
5. The diagrams below represent four pieces of copper wire at 20.°C. For each piece of wire,  $\ell$  represents a unit of length and  $A$  represents a unit of cross-sectional area.



The piece of wire that has the greatest resistance is

- A. wire 1
- B. wire 2
- C. wire 3
- D. wire 4

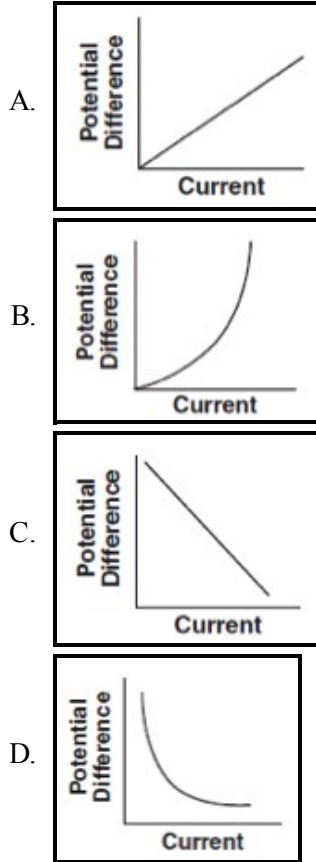
6. Which circuit diagram represents the correct way to measure the current in a resistor?



7. An electric toaster is rated 1200 watts at 120 volts. What is the total electrical energy used to operate the toaster for 30. seconds?

- A.  $1.8 \times 10^3$  J
- B.  $3.6 \times 10^3$  J
- C.  $1.8 \times 10^4$  J
- D.  $3.6 \times 10^4$  J

8. Which graph represents the relationship between the potential difference applied to a copper wire and the resulting current in the wire at constant temperature?



9. A hair dryer with a resistance of 9.6 ohms operates at 120 volts for 2.5 minutes. The total electrical energy used by the dryer during this time interval is

- A.  $2.9 \times 10^3$  J
- B.  $3.8 \times 10^3$  J
- C.  $1.7 \times 10^5$  J
- D.  $2.3 \times 10^5$  J

10. A net charge of 5.0 coulombs passes a point on a conductor in 0.050 second. The average current is

- A.  $8.0 \times 10^{-8}$  A
- B.  $1.0 \times 10^{-2}$  A
- C.  $2.5 \times 10^{-1}$  A
- D.  $1.0 \times 10^2$  A

11. 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

- A.  $7.9 \times 10^{-8}$  m<sup>2</sup>
- B.  $1.1 \times 10^{-7}$  m<sup>2</sup>
- C.  $4.6 \times 10^0$  m<sup>2</sup>
- D.  $1.3 \times 10^7$  m<sup>2</sup>

12. A radio operating at 3.0 volts and a constant temperature draws a current of  $1.8 \times 10^{-4}$  ampere. What is the resistance of the radio circuit?
- A.  $1.7 \times 10^4 \Omega$
  - B.  $3.0 \times 10^1 \Omega$
  - C.  $5.4 \times 10^{-4} \Omega$
  - D.  $6.0 \times 10^{-5} \Omega$
13. What is the resistance of a 20.0-meter-long tungsten rod with a cross-sectional area of  $1.00 \times 10^{-4}$  meter<sup>2</sup> at 20°C?
- A.  $2.80 \times 10^{-5} \Omega$
  - B.  $1.12 \times 10^{-2} \Omega$
  - C. 89.3  $\Omega$
  - D. 112  $\Omega$
14. Moving 4.0 coulombs of charge through a circuit requires 48 joules of electric energy. What is the potential difference across this circuit?
- A. 190 V
  - B. 48 V
  - C. 12 V
  - D. 4.0 V
- 

**Figure 1**

Base your answer to this question on the information below.

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

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15. [Refer to figure 1]

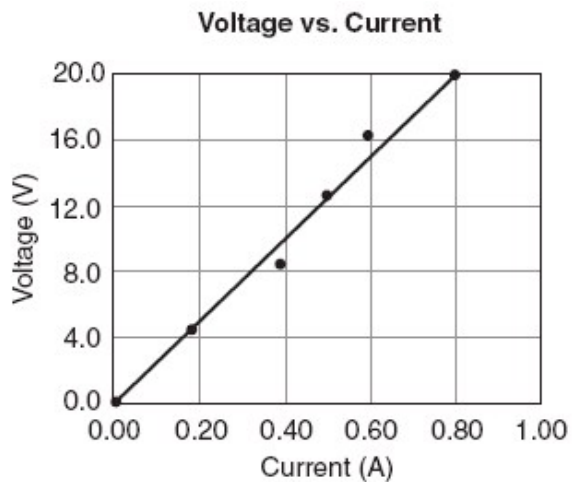
Calculate the resistivity of the wire.

- A.  $5.61 \times 10^{-8} \Omega \cdot \text{m}$
  - B.  $6.51 \times 10^{-8} \Omega \cdot \text{m}$
  - C.  $6.25 \times 10^{-2} \Omega$
  - D.  $5.2 \times 10^{-6} \Omega \cdot \text{m}$
16. Calculate the resistance of a 900.-watt toaster operating at 120 volts.
- A.  $R = 10 \Omega$
  - B.  $R = 120 \Omega$
  - C.  $R = 16 \Omega$
  - D.  $R = 1.6 \Omega$
17. 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?
- A. aluminum
  - B. copper
  - C. gold
  - D. silver
18. The resistance of a 60.-watt light bulb operated at 120 volts is approximately
- A. 720  $\Omega$
  - B. 240  $\Omega$
  - C. 120  $\Omega$
  - D. 60.  $\Omega$

19. In a flashlight, a battery provides a total of 3.0 volts to a bulb. If the flashlight bulb has an operating resistance of 5.0 ohms, the current through the bulb is

- A. 0.30 A
- B. 0.60 A
- C. 1.5 A
- D. 1.7 A

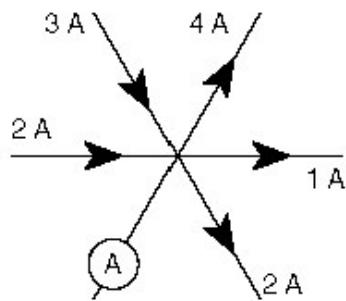
20. A long copper wire was connected to a voltage source. The voltage was varied and the current through the wire measured, while temperature was held constant. The collected data are represented by the graph below.



Using the graph, the resistance of the copper wire is approximately

- A.  $8.0 \Omega$
- B.  $25 \Omega$
- C.  $30 \Omega$
- D.  $2.5 \Omega$

21. The diagram below represents currents in a segment of an electric circuit.



What is the reading of ammeter  $A$ ?

- A. 1 A
- B. 2 A
- C. 3 A
- D. 4 A

22. The table below shows the length and cross-sectional area of four pieces of copper wire at the same temperature.

| Wire | Length<br>(m) | Cross-Sectional Area<br>(m <sup>2</sup> ) |
|------|---------------|---|
| $A$  | 10            | $2 \times 10^{-6}$                        |
| $B$  | 10            | $1 \times 10^{-6}$                        |
| $C$  | 1             | $2 \times 10^{-6}$                        |
| $D$  | 1             | $1 \times 10^{-6}$                        |

Which wire has the *highest* resistance?

- A.  $A$
- B.  $B$
- C.  $C$
- D.  $D$