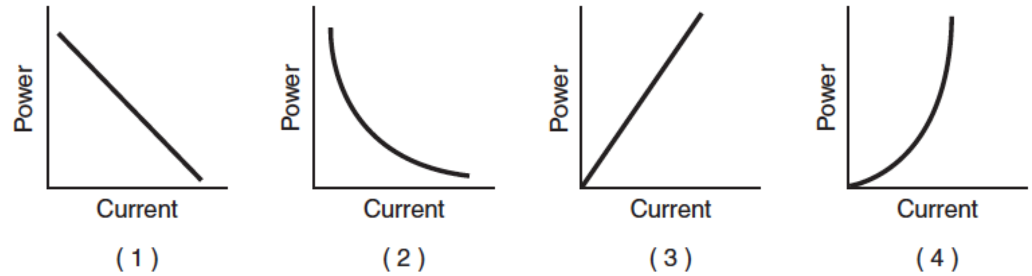
Name: ______________________________ Period: ____________

Circuits-Ohm's Law

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



2. A potential drop of 50 volts is measured across a 250-ohm resistor. What is the power developed in the resistor?
   1. 0.20 W
   2. 5.0 W
   3. 10 W
   4. 50 W

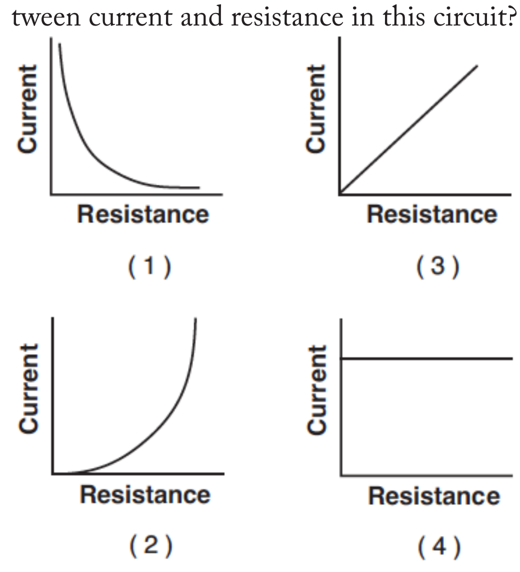
3. How much electrical energy is required to move a 4.00-microcoulomb charge through a potential difference of 36 volts?
   1. 9.00×10^{6} J
   2. 144 J
   3. 1.44×10^{-4} J
   4. 1.11×10^{-7} J

4. A circuit consists of a resistor and a battery. Increasing the voltage of the battery while keeping the temperature of the circuit constant would result in an increase in
   1. current, only
   2. resistance, only
   3. both current and resistance
   4. neither current nor resistance

5. A generator produces a 115-volt potential difference and a maximum of 20 amperes of current. Calculate the total electrical energy the generator produces operating at maximum capacity for 60 seconds. [Show all work, including the equation and substitution with units.]

6. An electric circuit contains a variable resistor connected to a source of constant voltage. As the resistance of the variable resistor is increased, the power dissipated in the circuit
   1. decreases
   2. increases
   3. remains the same

7. An electric circuit contains a variable resistor connected to a source of constant potential difference. Which graph best represents the relationship between current and resistance in this circuit?



8. In a simple electric circuit, a 24-ohm resistor is connected across a 6-volt battery. What is the current in the circuit?
   1. 1.0 A
   2. 0.25 A
   3. 140 A
   4. 4.0 A

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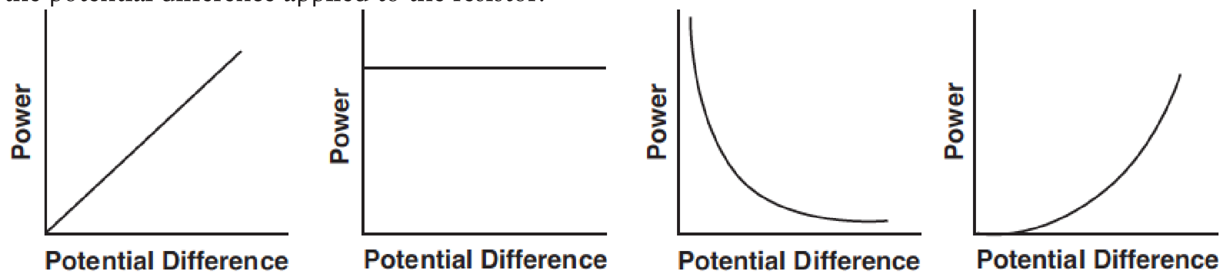
Circuits-Ohm's Law

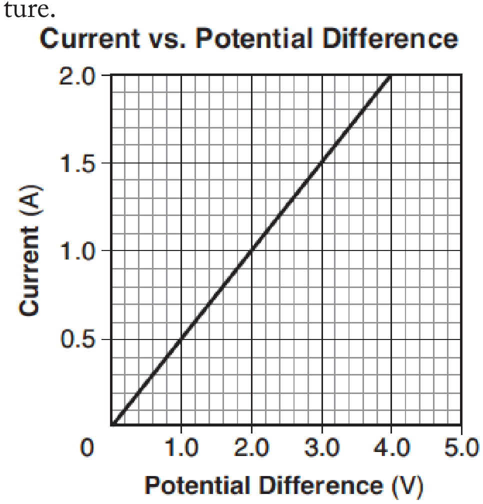
9. Which graph best represents the relationship between the power expended by a resistor that obeys Ohm's Law and the potential difference applied to the resistor?



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

10. The current through a 10-ohm resistor is 1.2 amperes. What is the potential difference across the resistor?
    1. 8.3 V
    2. 12 V
    3. 14 V
    4. 120 V

11. 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 ohms
    2. 2.0 ohms
    3. 0.5 ohms
    4. 4.0 ohms

12. A 330-ohm resistor is connected to a 5-volt battery. The current through the resistor is
    1. 0.152 mA
    2. 15.2 mA
    3. 335 mA
    4. 1650 mA

13. An immersion heater has a resistance of 5 ohms while drawing a current of 3 amperes. How much electrical energy is delivered to the heater during 200 seconds of operation?
    1. 3.0×10^3 J
    2. 6.0×10^3 J
    3. 9.0×10^3 J
    4. 1.5×10^4 J

14. An operating 100-watt lamp is connected to a 120-volt outlet. What is the total electrical energy used by the lamp in 60 seconds?
    1. 0.60 J
    2. 1.7 J
    3. 6.0×10^3 J
    4. 7.2×10^3 J

15. A 150-watt lightbulb is brighter than a 60-watt lightbulb when both are operating at a potential difference of 110 volts. Compared to the resistance of and the current drawn by the 150-watt lightbulb, the 60-watt lightbulb has
    1. less resistance and draws more current
    2. less resistance and draws less current
    3. more resistance and draws more current
    4. more resistance and draws less current

16. A light bulb attached to a 120-volt source of potential difference draws a current of 1.25 amperes for 35 seconds. Calculate how much electrical energy is used by the bulb. [Show all work, including the equation and substitution with units.]

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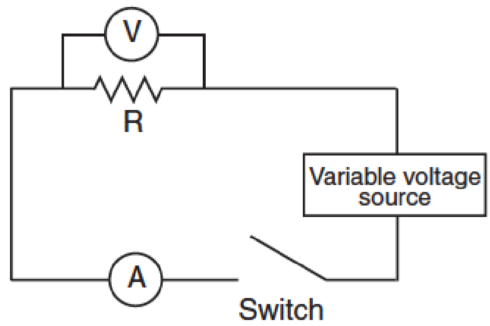
Circuits-Ohm's Law

Base your answers to questions 17 through 20 on the information, circuit diagram, and data table below.

In a physics lab, a student used the circuit shown to measure the current through and the potential drop across a resistor of unknown resistance, R. The instructor told the student to use the switch to operate the circuit only long enough to take each reading. The student's measurements are recorded in the data table.



Data Table

Current (A)	Potential Drop (V)
0.80	21.4
1.20	35.8
1.90	56.0
2.30	72.4
3.20	98.4

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

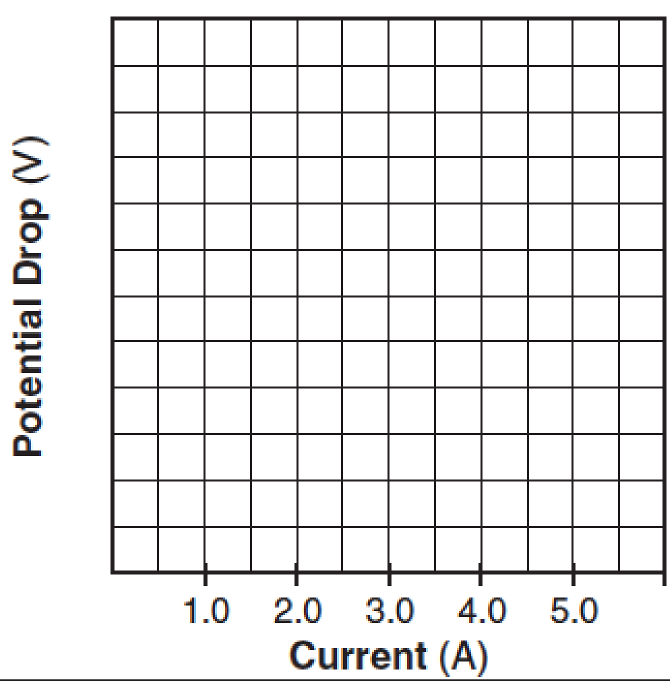
17. Mark an appropriate scale on the axis labeled "Potential Drop (V)."

18. Plot the data points for potential drop versus current.

19. Draw the line or curve of best fit.

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

Potential Drop vs. Current



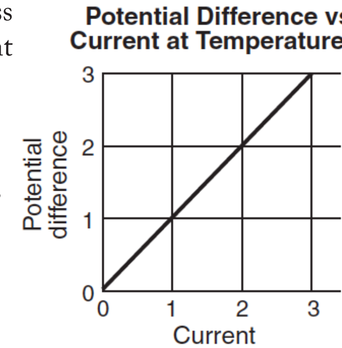
21. A 100-ohm resistor and an unknown resistor are connected in series to a 10-volt battery. If the potential drop across the 100-ohm resistor is 4 volts, the resistance of the unknown resistor is
    1. 50 ohms
    2. 100 ohms
    3. 150 ohms
    4. 200 ohms

22. In a flashlight, a battery provides a total of 3 volts to a bulb. If the flashlight bulb has an operating resistance of 5 ohms, the current through the bulb is
    1. 0.30 A
    2. 0.60 A
    3. 1.5 A
    4. 1.7 A

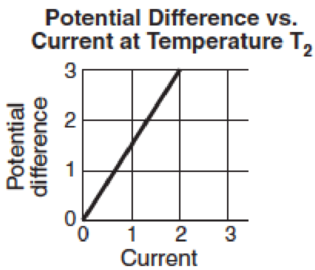
Name: ______________________ Period: __________

Circuits-Ohm's Law

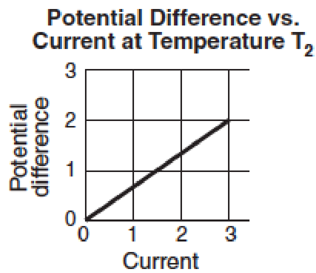
23. The graph at right shows the relationship between the potential difference across a metallic conductor and the electric current through the conductor at constant temperature T_1.



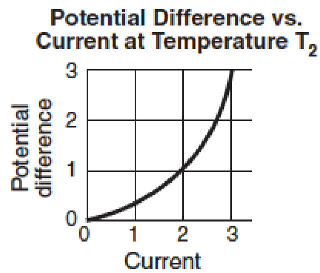
Which graph below best represents the relationship between potential difference and current for the same conductor maintained at a higher constant temperature, T_2?



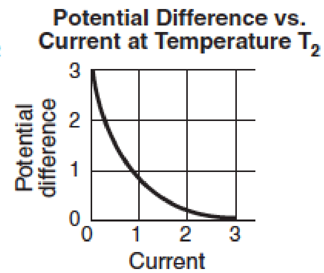
(1)



(2)

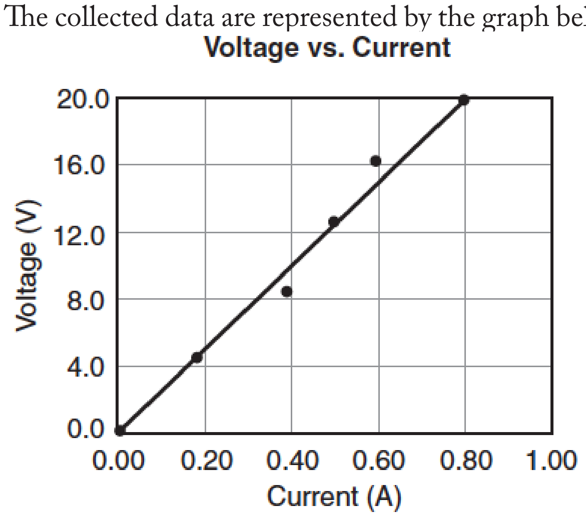


(3)



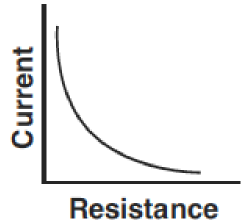
(4)

24. 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.

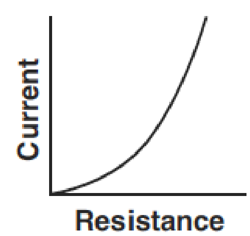


Using the graph, determine the resistance of the copper wire.

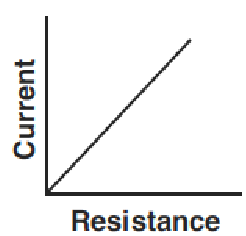
25. A constant potential difference is applied across a variable resistor held at constant temperature. Which graph best represents the relationship between the resistance of the variable resistor and the current through it?



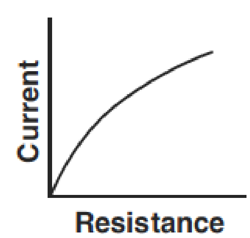
(1)



(3)



(2)



(4)

Name: ______________________________ Period: __________

Circuits-Ohm's Law

26. An electrical appliance draws 9.0 amperes of current when connected to a 120-volt source of potential difference. What is the total amount of power dissipated by this appliance?
    1. 13 W
    2. 110 W
    3. 130 W
    4. 1100 W

27. In a simple electric circuit, a 110-volt electric heater draws 2.0 amperes of current. The resistance of the heater is
    1. 0.018 ohms
    2. 28 ohms
    3. 55 ohms
    4. 220 ohms

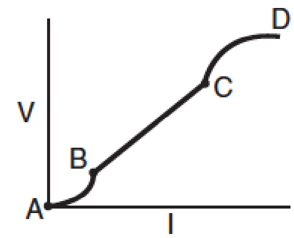
28. If the potential difference applied to a fixed resistance is doubled, the power dissipated by that resistance
    1. remains the same
    2. doubles
    3. halves
    4. quadruples

29. A 4.50-volt personal stereo uses 1950 joules of electrical energy in an hour. What is the electrical resistance of the personal stereo?
    1. 433 ohms
    2. 96.3 ohms
    3. 37.4 ohms
    4. 0.623 ohms

30. If 20 joules of work is used to transfer 20 coulombs of charge through a 20-ohm resistor, the potential difference across the resistor is
    1. 1 V
    2. 20 V
    3. 0.05 V
    4. 400 V

31. A 50-watt lightbulb and a 100-watt lightbulb are each operated at 110 volts. Compared to the resistance of the 50-watt bulb, the resistance of the 100-watt bulb is
    1. half as great
    2. twice as great
    3. one-fourth as great
    4. four times as great

32. The graph below represents the relationship between the potential difference (V) across a resistor and the current (I) through the resistor.



Through which entire interval does the resistor obey Ohm's law?
    1. AB
    2. BC
    3. CD
    4. AD

33. The resistance of a 60-watt lightbulb operated at 120 volts is approximately
    1. 720 ohms
    2. 240 ohms
    3. 120 ohms
    4. 60 ohms

34. An electric drill operating at 120 volts draws a current of 3 amperes. What is the total amount of electrical energy used by the drill during one minute of operation?
    1. 2.16×10^4 J
    2. 2.40×10^3 J
    3. 3.60×10^2 J
    4. 4.00×10^1 J

35. An electric iron operating at 120 volts draws 10 amperes of current. How much heat energy is delivered by the iron in 30 seconds?
    1. 3.0×10^2 J
    2. 1.2×10^3 J
    3. 3.6×10^3 J
    4. 3.6×10^4 J

36. In a series circuit containing two lamps, the battery supplies a potential difference of 1.5 volts. If the current in the circuit is 0.10 ampere, at what rate does the circuit use energy?
    1. 0.015 W
    2. 0.15 W
    3. 1.5 W
    4. 15 W

Name: ____________________ Period: ________

Circuits-Ohm's Law

37. An electric circuit consists of a variable resistor connected to a source of constant potential difference. If the resistance of the resistor is doubled, the current through the resistor is
    1. halved
    2. doubled
    3. quartered
    4. quadruples

38. Which physical quantity is correctly paired with its unit?
    1. power and watt·seconds
    2. energy and newton·seconds
    3. electric current and amperes/coulomb
    4. electrical potential difference and joules/coulomb

39. A 6-ohm resistor that obeys Ohm's Law is connected to a source of variable potential difference. When the applied voltage is decreased from 12 V to 6 V, the current passing through the resistor
    1. remains the same
    2. is doubled
    3. is halved
    4. is quadruples

40. An electric heater operating at 120 volts draws 8 amperes of current through its 15 ohms of resistance. The total amount of heat energy produced by the heater in 60 seconds is
    1. 7.20×10^3 J
    2. 5.76×10^4 J
    3. 8.64×10^4 J
    4. 6.91×10^6 J

41. A device operating at a potential difference of 1.5 volts draws a current of 0.20 ampere. How much energy is used by the device in 60 seconds?
    1. 4.5 J
    2. 8.0 J
    3. 12 J
    4. 18 J

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

43. What is the current in a 100-ohm resistor connected to a 0.40-volt source of potential difference?
    1. 250 mA
    2. 40 mA
    3. 2.5 mA
    4. 4.0 mA

44. How much total energy is dissipated in 10 seconds in a 4-ohm resistor with a current of 0.50 ampere?
    1. 2.5 J
    2. 5.0 J
    3. 10 J
    4. 20 J

45. If a 1.5-volt cell is to be completely recharged, each electron must be supplied with a minimum energy of
    1. 1.5 eV
    2. 1.5 J
    3. 9.5×10^{18} eV
    4. 9.5×10^{18} J

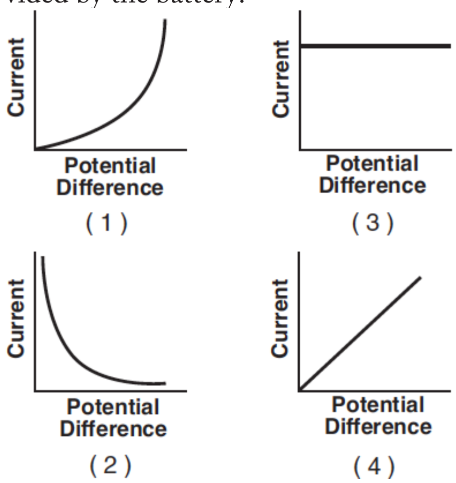
46. As the potential difference across a given resistor is increased, the power expended in moving charge through the resistor
    1. decreases
    2. increases
    3. remains the same

47. The heating element in an automobile window has a resistance of 1.2 ohms when operated at 12 volts. Calculate the power dissipated in the heating element. [Show all work, including the equation and substitution with units.]

Name: ____________________ Period: __________

Circuits-Ohm's Law

48. 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?



49. Moving 4.0 coulombs of charge through a circuit requires 48 joules of electric energy. What is the potential difference across this circuit?
    1. 190 V
    2. 48 V
    3. 12 V
    4. 4.0 V

50. 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
    1. 10 A
    2. 15 A
    3. 9.0×10^2 A
    4. 3.3×10^3 A

51. The total amount of electrical energy used by a 315-watt television during 30.0 minutes of operation is
    1. 5.67×10^5 J
    2. 9.45×10^3 J
    3. 1.05×10^1 J
    4. 1.75×10^{-1} J

52. A radio operating at 3.0 volts and a constant temperature draws a current of 1.8×10^{-4} ampere. What is the resistance of the radio circuit?
    1. $1.7 \times 10^4\ \Omega$
    2. $3.0 \times 10^1\ \Omega$
    3. $5.4 \times 10^{-4}\ \Omega$
    4. $6.0 \times 10^{-5}\ \Omega$