Name _____ Period _____ Date _____

Series and Parallel Circuits

A. Completing Concepts

In the space to the left, write the answer that best completes each statement.

_____ **1.** In a series circuit, the voltage drop across the entire circuit is equal to the _____ of the voltage drops across the individual resistors.

_____ **2.** Total current in a parallel circuit is the sum of the currents in the separate _____ .

_____ **3.** The total resistance of a(n) _____ circuit is equal to the sum of the individual resistances.

_____ **4.** The voltage across the branches of a(n) _____ circuit is the same everywhere.

_____ **5.** In a(n) _____ circuit, the total resistance is less than any single resistance.

_____ **6.** The current in a(n) _____ circuit is the same everywhere.

_____ **7.** _____ law may be applied to an entire circuit or to any part of the circuit.

_____ **8.** In a(n) _____ circuit, each resistor can be operated independently.

_____ **9.** It is not practical for house circuits to be wired in _____ .

_____ **10.** A parallel circuit _____ when too many appliances are placed across the circuit.

_____ **11.** A(n) _____ occurs when a piece of low resistance wire is placed across a circuit.

_____ **12.** A(n) _____ is a short piece of metal that melts if a predetermined current in the line is exceeded.

_____ **13.** A(n) _____ is an automatic switch that cuts off the current if the circuit is overloaded.

_____ **14.** A(n) _____ must be built with a very high resistance or it changes the circuit that it is designed to measure.

_____ **15.** The resistance of a(n) _____ should be very low so that it does not affect the circuit in which it operates.

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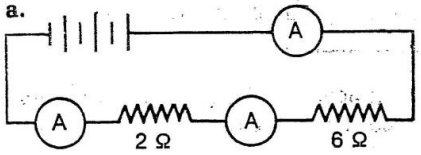
B. Understanding Concepts

In the space to the left, write the letter of the answer to each question.

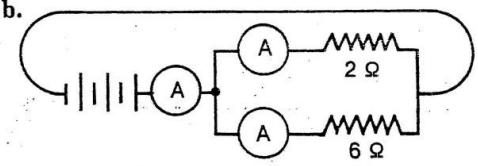
_____ **1.** Three 6-Ω resistors are connected in series. Their total resistance is
a. 2 Ω **b.** 6 Ω **c.** 12 Ω **d.** 18 Ω

_____ **2.** In which circuit would all the ammeters, labeled A, read the same?

a.

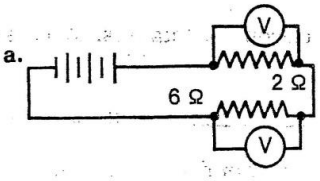


b.

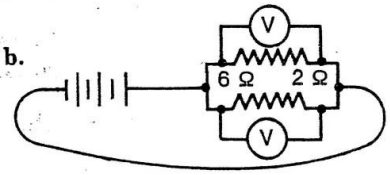


_____ **3.** In which circuit would all the voltmeters, labeled V, read the same?

a.



b.

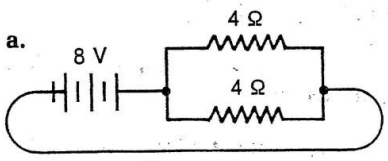


_____ **4.** A 5-A current flows through a 10-Ω resistor. The voltage drop across this resistor is
a. 1/2 V **b.** 2 V **c.** 15 V **d.** 50 V

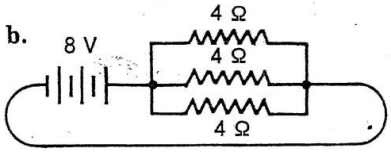
_____ **5.** A 1-Ω resistor, a 1000-Ω resistor, and a 2000-Ω resistor are connected in parallel. The total resistance is _____ Ω.
a. <1 **b.** >1000 **c.** >2000 **d.** >3000

_____ **6.** Which circuit would draw more current?

a.

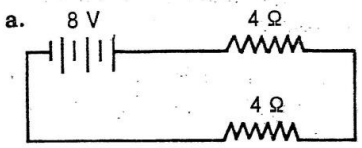


b.

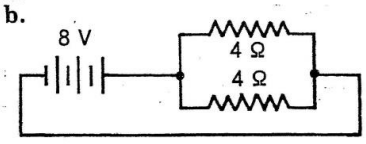


_____ **7.** Which circuit would draw more current?

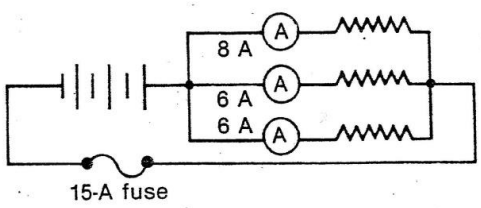
a.



b.



_____ **8.** Will the 15-A fuse blow in the circuit drawn below?
a. yes **b.** no



Name _____ Period _____ Date_____

C. Using Concepts

1. A 6-Ω resistor, a 54-Ω resistor, and a 32-Ω resistor are connected in series. Calculate their total resistance.

2. Calculate the total resistance of four 8-Ω resistors connected in parallel.

3. Two 12-Ω resistors and a 6-Ω resistor are each connected in parallel. A 15-Ω resistor is added to the parallel group in series. Calculate the voltage needed to drive a 2.0-A current through the total resistance.

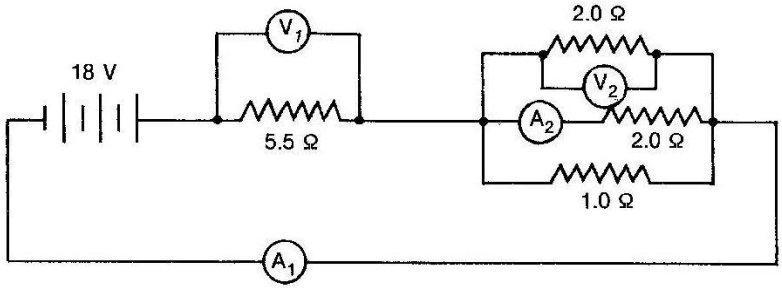
4. A 15-Ω resistor, a 6-Ω resistor, and a 39-Ω resistor are connected in series across a potential difference of 120 V.
   a. Calculate the current flowing through the circuit.

   b. Calculate the voltage drop across the 15-Ω resistor.

5. Three resistors are connected in parallel across 20.0 V. The resistors draw a total of 5.0 A. Two of the resistors have values of 24 Ω and 12 Ω. What is the value of the third resistor?

6. A coffee pot rated at 360 W, an iron rated at 960 W, and an oven rated at 1200 W are connected in parallel across 120 V. The 15-A fuse in the circuit immediately blows. Calculate the total current drawn.

7. Calculate the total resistance of the circuit shown below.



8. What are the meter readings for the diagram in Problem 7?

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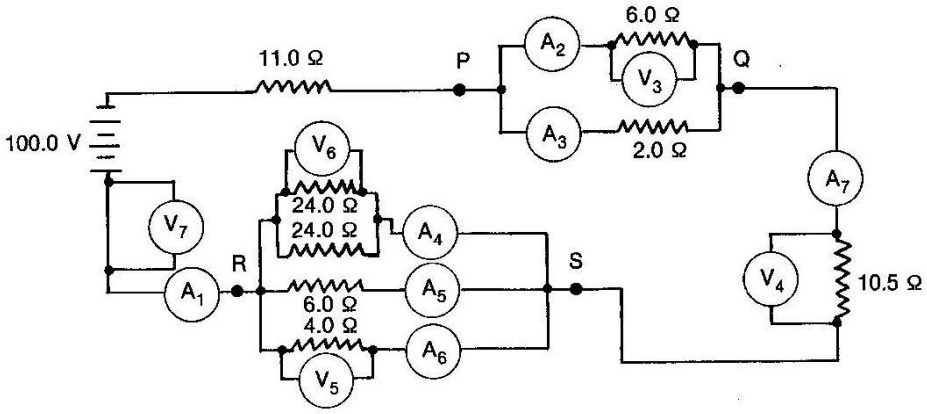
D. Extending Concepts

1. Calculate the reading for each of the 7 voltmeters and 7 ammeters in the circuit diagram below.



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REVIEW — Chapter 24

For Questions 1–10, write the letter of the correct answer to the left of the question.

_____ **1.** As resistors are added to a circuit in series, the current in the circuit
(a) increases **(b)** decreases **(c)** remains the same.

_____ **2.** As you plug in more appliances in your house, the total current in the circuit
(a) increases **(b)** decreases **(c)** remains the same.

_____ **3.** As you plug in more appliances in your house, the total resistance
(a) increases **(b)** decreases **(c)** remains the same.

_____ **4.** An ammeter connected in parallel with a battery and resistor will
(a) give the current in the circuit **(b)** read zero **(c)** measure the resistance of the battery **(d)** burn out.

_____ **5.** A voltmeter has an internal resistance that is
(a) high **(b)** low.

_____ **6.** An ammeter has an internal resistance that is
(a) high **(b)** low.

_____ **7.** Current is the same throughout in a
(a) series circuit **(b)** parallel circuit.

_____ **8.** The sum of the resistors is less than the smallest resistor in a
(a) series circuit **(b)** parallel circuit.

_____ **9.** If you have three identical resistors in parallel and one is removed, the current through the remaining resistors
(a) increases **(b)** decreases **(c)** remains the same.

_____ **10.** If one resistor in a parallel circuit is removed, the total current
(a) increases **(b)** decreases **(c)** remains the same.

11. A 10-ohm resistor, a 20-ohm resistor, and a 30-ohm resistor are connected in series with a 120-volt source.

a. What is the effective resistance of the circuit?

b. What is the current in the circuit?

c. What is the voltage drop across the 20-ohm resistor?

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12. A 10.0-Ω resistor, a 20.0-Ω resistor, and a 30.0-Ω resistor are connected in parallel across a potential difference of 120 V.

a. What is the effective resistance of the circuit?

b. What is the current through the 20.0-Ω resistor?

13. A 15.0-Ω resistor is connected in series with two 10.0-Ω resistors in parallel and a 120-V generator.

a. What is the total current in the circuit?

b. What is the current through the 10.0-Ω resistors?

c. What is the voltage drop across the 15.0-Ω resistor?

14. The following appliances are all connected in parallel in one of the lines in the electrical system of a house: a 15-Ω electric fry pan, a 25-Ω refrigerator, a 20.0-Ω heater, and a 12-Ω toaster. The fuse in this line melts at 28 A. Will this arrangement of appliances cause the fuse to melt? Explain.

15. Find the effective resistance of the circuit in the diagram.