Series and Parallel Circuits

Vocabulary Review

For each description on the left, write the letter of the matching item.

1. a circuit in which all current travels through each device
   a. ammeter
   b. circuit breaker
   c. combination series-parallel circuit
   d. equivalent resistance
   e. fuse
   f. ground-fault interrupter
   g. parallel circuit
   h. series circuit
   i. short circuit
   j. voltage divider
   k. voltmeter

2. a short piece of metal that melts if a current that is too large passes through it
   a. ammeter
   b. circuit breaker
   c. combination series-parallel circuit
   d. equivalent resistance
   e. fuse
   f. ground-fault interrupter
   g. parallel circuit
   h. series circuit
   i. short circuit
   j. voltage divider
   k. voltmeter

3. the occurrence when a circuit forms that has a very low resistance
   a. ammeter
   b. circuit breaker
   c. combination series-parallel circuit
   d. equivalent resistance
   e. fuse
   f. ground-fault interrupter
   g. parallel circuit
   h. series circuit
   i. short circuit
   j. voltage divider
   k. voltmeter

4. a circuit in which there are several different paths for a current
   a. ammeter
   b. circuit breaker
   c. combination series-parallel circuit
   d. equivalent resistance
   e. fuse
   f. ground-fault interrupter
   g. parallel circuit
   h. series circuit
   i. short circuit
   j. voltage divider
   k. voltmeter

5. an automatic switch that opens a circuit when the current reaches some set value
   a. ammeter
   b. circuit breaker
   c. combination series-parallel circuit
   d. equivalent resistance
   e. fuse
   f. ground-fault interrupter
   g. parallel circuit
   h. series circuit
   i. short circuit
   j. voltage divider
   k. voltmeter

6. a circuit that has some branches in parallel and some in series
   a. ammeter
   b. circuit breaker
   c. combination series-parallel circuit
   d. equivalent resistance
   e. fuse
   f. ground-fault interrupter
   g. parallel circuit
   h. series circuit
   i. short circuit
   j. voltage divider
   k. voltmeter

7. the value of a single resistor that could replace all resistors in a circuit without changing the current
   a. ammeter
   b. circuit breaker
   c. combination series-parallel circuit
   d. equivalent resistance
   e. fuse
   f. ground-fault interrupter
   g. parallel circuit
   h. series circuit
   i. short circuit
   j. voltage divider
   k. voltmeter

8. a device used to measure the current in part of a circuit
   a. ammeter
   b. circuit breaker
   c. combination series-parallel circuit
   d. equivalent resistance
   e. fuse
   f. ground-fault interrupter
   g. parallel circuit
   h. series circuit
   i. short circuit
   j. voltage divider
   k. voltmeter

9. a device used to measure the potential drop across some part of a circuit
   a. ammeter
   b. circuit breaker
   c. combination series-parallel circuit
   d. equivalent resistance
   e. fuse
   f. ground-fault interrupter
   g. parallel circuit
   h. series circuit
   i. short circuit
   j. voltage divider
   k. voltmeter

10. a device that detects small differences in current caused by an extra current path and opens the circuit
    a. ammeter
    b. circuit breaker
    c. combination series-parallel circuit
    d. equivalent resistance
    e. fuse
    f. ground-fault interrupter
    g. parallel circuit
    h. series circuit
    i. short circuit
    j. voltage divider
    k. voltmeter

11. a series circuit used to produce a voltage source from a higher-voltage battery
    a. ammeter
    b. circuit breaker
    c. combination series-parallel circuit
    d. equivalent resistance
    e. fuse
    f. ground-fault interrupter
    g. parallel circuit
    h. series circuit
    i. short circuit
    j. voltage divider
    k. voltmeter

Section 23.1 Simple Circuits

In your textbook, read about currents in series circuits on pages 618–619.
Circle the letter of the choice that best completes the statement or answers the question.

1. The current is ______ a series circuit.
   a. higher at the beginning of
   b. the same everywhere in
   c. lower at the beginning of
   d. variable in

2. In an electric circuit, the increase in voltage provided by the generator or other energy source, \(\Delta V_{\text{source}}\) is equal to the ______ of voltage drops across the resistors.
   a. difference
   b. product
   c. sum
   d. average
3. Which of the following equations is not correct?

   a. \( I = \Delta V_{\text{source}}/(R_1 + R_2) \)
   b. \( I = \Delta V_{\text{source}}/(R) \)
   c. \( I = \Delta V_{\text{source}}/(R_1 + R_2 + R_3) \)
   d. \( I = R_3 + (\Delta V_{\text{source}})/(R_1 + R_2) \)

4. Which of the following equations computes the equivalent resistance for a series circuit with four resistors?

   a. \( R = R_1 + R_2 + R_3 + R_4 \)
   b. \( R = R_1 \times R_2 \times R_3 \times R_4 \)
   c. \( 1/R = 1/R_1 + 1/R_2 + 1/R_3 + 1/R_4 \)
   d. \( R = (R_1 \times R_2)/(R_3 \times R_4) \)

5. In a series circuit, the equivalent resistance is ______ any single resistance.

   a. larger than
   b. determined by
   c. equal to
   d. smaller than

6. If the battery voltage does not change, adding more devices in the series ______ the current.

   a. sometimes decreases
   b. always decreases
   c. sometimes increases
   d. always increases

7. To find the current through a series circuit, first calculate the ______.

   a. voltage
   b. equivalent resistance
   c. power
   d. equivalent voltage

8. Why must the net change in potential be zero as current moves through a circuit?

   ____________________________
   ____________________________
   ____________________________

9. How do you find the potential drop across an individual resistor?

   ____________________________
   ____________________________

10. What type of circuit is used as a voltage divider?

    ____________________________

11. What is the purpose of a voltage divider?

    ____________________________

In your textbook, read about voltage drops in series circuits on pages 618–619. Answer the following questions. Use complete sentences.
12. What determines the resistance of a photoresistor?

13. Name a device that employs the special qualities of a photoresistor. How does this device work?

In your textbook, read about parallel circuits on pages 623–626. Refer to the circuit diagram below to answer questions 14–18. Circle the letter of the choice that best answers each question.

14. What type of circuit does the diagram represent?
   a. a series circuit  
   b. a parallel circuit  
   c. a combination series-parallel circuit  
   d. a tandem circuit

15. How many current paths are in this circuit?
   a. one  
   b. three  
   c. four  
   d. five

16. How would you calculate the total current of this circuit?
   a. Find the average of the currents through each path.  
   b. Subtract the currents through each path.  
   c. Add the currents through each path.  
   d. It is not possible to calculate total current for this circuit.

17. If the 10-Ω resistor were removed from the circuit, which of the following would not be true?
   a. The current through the 20-Ω resistor would be unchanged.  
   b. The sum of the current in the branches of the circuit would change.  
   c. The total current through the generator would change.  
   d. The current through the 50-Ω resistor would change.
18. Which of the following is true for this circuit?
   a. The equivalent resistance of this circuit is smaller than 10 Ω.
   b. \( R = R_1 + R_2 + R_3 \)
   c. \( R = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \)
   d. \( R = R_1 \times R_2 \times R_3 \)

Section 23.2 Applications of Circuits

In your textbook, read about safety devices on pages 627–628.

For each statement below, write true or rewrite the italicized part to make the statement true.

1. ____________________________ When appliances are connected in parallel, each additional appliance placed in operation reduces the equivalent resistance in the circuit and causes more current to flow through the wires.

2. ____________________________ The length of the metal in a fuse determines the amount of current that will melt the fuse and break the circuit.

3. ____________________________ When a circuit breaker opens, it allows current to flow.

4. ____________________________ Ground-fault interrupters can be used to detect differences in current caused by an extra path from the power source into the electric outlet and back to the source.

5. ____________________________ Electric wiring at home uses only series circuits.

6. ____________________________ Low resistance causes the current to be very small and may result in a short circuit.

In your textbook, read about combined series-parallel circuits on page 629.

Answer the following question. Use complete sentences.

7. Describe the strategy you would use to calculate resistance in a combined series-parallel circuit.
Circle the letter of the choice that best answers the following question.

8. Which diagram represents a combined series-parallel circuit in which a 30-Ω resistor and a 75-Ω resistor are connected in parallel to a 125-V source through a 2-Ω resistor in series?

- a. 
- b. 
- c. 
- d. 

In your textbook, read about ammeters and voltmeters on page 631. Refer to the circuit diagram below to answer questions 9a–c.

9. Redraw the circuit diagram according to the following directions.
   - a. Insert an ammeter in the circuit that would measure the current of the entire circuit.
b. Insert an ammeter in the circuit that would measure the current that flows through the 60-Ω resistor.

c. Insert a voltmeter that would measure the voltage drop across the 10-Ω resistor.

Write the term that correctly completes the statement.

10. _________________ A(n) ____ measures the voltage drop across a resistor.

11. _________________ A(n) ____ measures current.

12. _________________ The resistance of a voltmeter should be as ____ as possible so that it will change the current as little as possible.

13. _________________ The resistance of an ammeter should be as ____ as possible so that it will change the current as little as possible.

14. _________________ An ammeter is placed in ____ with the resistor if you want to measure the current through the resistor.

15. _________________ A voltmeter should be connected in ____ with a resistor to measure the potential drop across that resistor.

16. _________________ A(n) ____ always has low resistance and is connected in series.

17. _________________ A voltmeter always has ____ resistance and is connected in ____ with the part of the circuit being measured.

18. _________________ The result of connecting a(n) ____ across a resistor is to lower the potential drop across it.

19. _________________ The higher the ____ of a voltmeter, the smaller the voltage change.

20. _________________ If you want to measure the current in a branch or part of a circuit, use a(n) ____.