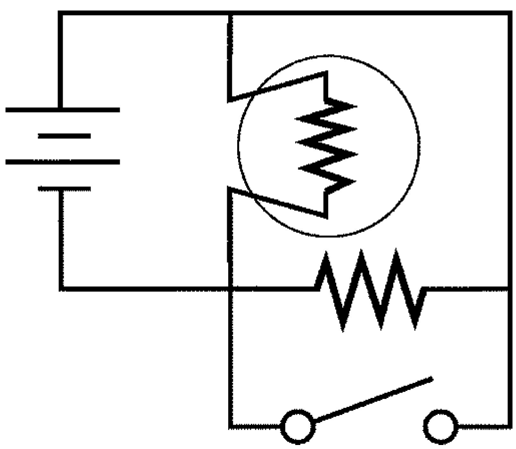
Name: ________________________ Class: ___________________ Date: __________ ID: A

Phys.G12-Q4W1-Wlwctric Circuits-Qs. Bank

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Which of the following is the best description of a schematic diagram?
a. uses pictures to represent the parts of a circuit
b. determines the location of the parts of a circuit
c. shows the parts of a circuit and how the parts connect to each other
d. shows some of the parts that make up a circuit

____ 2.



What happens when the switch is closed in the circuit shown above?
a. The lamp lights because current from the battery flows through the lamp.
b. Current from the battery is carried through the resistor.
c. Current from the battery is carried through both the lamp and the resistor.
d. The lamp goes out, because the battery terminals connect to each other.

____ 3. A circuit has a continuous path through which charge can flow from a voltage source to a device that uses electrical energy. What is the name of this type of circuit?
a. a short circuit
b. a closed circuit
c. an open circuit
d. a circuit schematic

____ 4. If the potential difference across a pair of batteries used to power a flashlight is 6.0 V, what is the potential difference across the flashlight bulb?
a. 3.0 V
b. 6.0 V
c. 9.0 V
d. 12 V

____ 5. If the batteries in a portable CD player provide a terminal voltage of 12 V, what is the potential difference across the entire CD player?
a. 3.0 V
b. 4.0 V
c. 6.0 V
d. 12 V

____ 6. Three resistors with values of 4.0 Ω, 6.0 Ω, and 8.0 Ω, respectively, are connected in series. What is their equivalent resistance?
a. 18 Ω
b. 8.0 Ω
c. 6.0 Ω
d. 1.8 Ω

____ 7. Three resistors connected in series carry currents labeled I_1, I_2, and I_3, respectively. Which of the following expresses the total current, I_t, in the system made up of the three resistors in series?

a. $I_t = I_1 + I_2 + I_3$

b. $I_t = \left(\frac{1}{I_1} + \frac{1}{I_2} + \frac{1}{I_3}\right)$

c. $I_t = I_1 = I_2 = I_3$

d. $I_t = \left(\frac{1}{I_1} + \frac{1}{I_2} + \frac{1}{I_3}\right)^{-1}$

____ 8. Three resistors connected in series have potential differences across them labeled ΔV_1, ΔV_2, and ΔV_3. Which of the following expresses the potential difference taken over the three resistors together?

a. $\Delta V_t = \Delta V_1 + \Delta V_2 + \Delta V_3$

b. $\Delta V_t = \left(\frac{1}{\Delta V_1} + \frac{1}{\Delta V_2} + \frac{1}{\Delta V_3}\right)$

c. $\Delta V_t = \Delta V_1 = \Delta V_2 = \Delta V_3$

d. $\Delta V_t = \left(\frac{1}{\Delta V_1} + \frac{1}{\Delta V_2} + \frac{1}{\Delta V_3}\right)^{-1}$

____ 9. Three resistors with values of R_1, R_2, and R_3 are connected in series. Which of the following expresses the total resistance, R_{eq}, of the three resistors?

a. $R_{eq} = R_1 + R_2 + R_3$

b. $R_{eq} = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$

c. $R_{eq} = R_1 = R_2 = R_3$

d. $R_{eq} = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)^{-1}$

____ 10. A circuit is composed of resistors wired in series. What is the relationship between the equivalent resistance of the circuit and the resistance of the individual resistors?

a. The equivalent resistance is equal to the largest resistance in the circuit.

b. The equivalent resistance is greater than the sum of all the resistances in the circuit.

c. The equivalent resistance is equal to the sum of the individual resistances.

d. The equivalent resistance is less than the smallest resistance in the circuit.

____ 11. Three resistors with values of 3.0 Ω, 6.0 Ω, and 12 Ω are connected in series. What is the equivalent resistance of this combination?

a. 0.58 Ω

b. 1.7 Ω

c. 7.0 Ω

d. 21 Ω

____ 12. Three resistors connected in parallel carry currents labeled I_1, I_2, and I_3. Which of the following expresses the total current I_t in the combined system?

a. $I_t = I_1 + I_2 + I_3$

b. $I_t = \left(\frac{1}{I_1} + \frac{1}{I_2} + \frac{1}{I_3}\right)$

c. $I_t = I_1 = I_2 = I_3$

d. $I_t = \left(\frac{1}{I_1} + \frac{1}{I_2} + \frac{1}{I_3}\right)^{-1}$

____ 13. Three resistors with values of R_1, R_2, and R_3 are connected in parallel. Which of the following expresses the total resistance, R_{eq}, of the three resistors?

a. $R_{eq} = R_1 + R_2 + R_3$

b. $R_{eq} = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$

c. $R_{eq} = R_1 = R_2 = R_3$

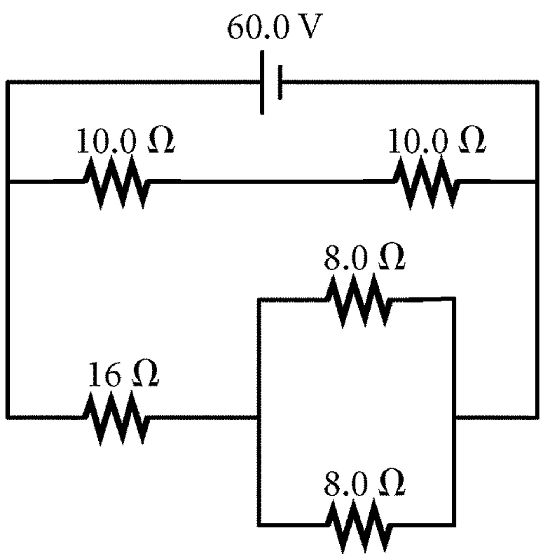
d. $R_{eq} = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)^{-1}$

____ 14. Two resistors having the same resistance value are wired in parallel. How does the equivalent resistance compare to the resistance value of a single resistor?
a. The equivalent resistance is twice the value of a single resistor.
b. The equivalent resistance is the same as a single resistor.
c. The equivalent resistance is half the value of a single resistor.
d. The equivalent resistance is greater than that of a single resistor.

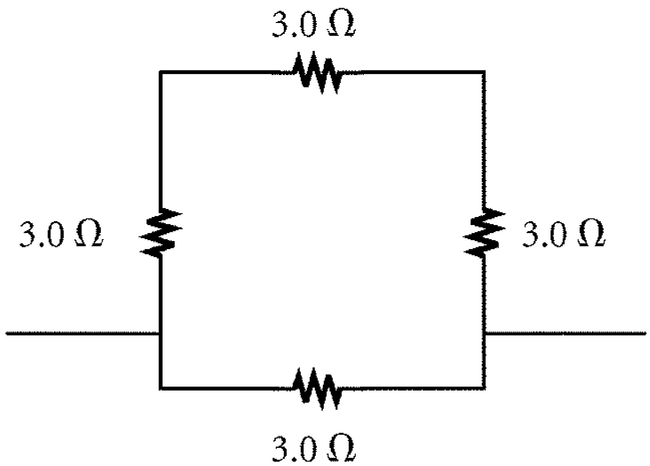
____ 15. Three resistors with values of 3.0 Ω, 6.0 Ω, and 12 Ω are connected in parallel. What is the equivalent resistance of this combination?
a. 0.26 Ω
b. 1.7 Ω
c. 9.0 Ω
d. 21 Ω

____ 16. The equivalent resistance of a complex circuit is usually determined by
a. inspection.
b. simplifying the circuit into groups of series and parallel circuits.
c. adding and subtracting individual resistances.
d. dividing the sum of the individual resistances by the number of resistances.

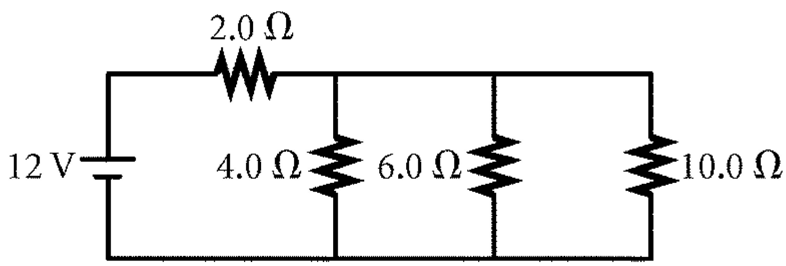
____ 17. To find the current in a complex circuit, it is necessary to know the
a. potential difference in each device in the circuit.
b. current in each device in the circuit.
c. equivalent resistance of the circuit.
d. number of branches in the circuit.



____ 18. What is the equivalent resistance of the resistors in the figure shown above?
a. 7.5 Ω
b. 10 Ω
c. 16 Ω
d. 18 Ω



____ 19. What is the equivalent resistance for the resistors in the figure shown above?
a. 1.3 Ω
b. 2.2 Ω
c. 3.0 Ω
d. 12.0 Ω



____ 20. Three resistors connected in parallel have individual values of 4.0 Ω, 6.0 Ω, and 10.0 Ω, as shown above. If this combination is connected in series with a 12.0 V battery and a 2.0 Ω resistor, what is the current in the 10.0 Ω resistor?
a. 0.58 A
b. 1.0 A
c. 11 A
d. 16 A

____ 21. In any complex resistance circuit, the voltage across any resistor in the circuit is always
a. less than the voltage source.
b. equal to or less than the voltage source.
c. equal to the voltage source.
d. greater than the voltage source.

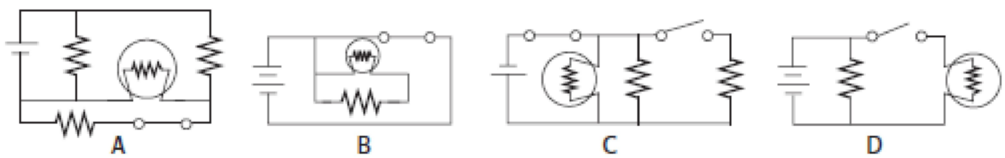
Choose the best answer from the options that follow each question.

____ 22. A load in a circuit
a. is a source of potential difference.
b. dissipates energy.
c. opens and closes the circuit.
d. creates electrical energy.

____ 23. The part of a circuit that converts electrical energy to other forms of energy is
a. a wire.
b. a battery.
c. the load.
d. the switch.

____ 24. A short circuit is
a. potentially hazardous.
b. a circuit in which electrons cannot flow.
c. a circuit without a load that presents little resistance to electron flow.
d. both a and c

____ 25.



Which of the schematics shown above conducts electricity through the lamp?
a. A and B
b. C and D
c. A and C
d. B and D

____ 26. Which is correct regarding the terminal voltage of a battery?
a. Terminal voltage is always the same as the emf of the battery.
b. Terminal voltage is always greater than the emf of the battery.
c. Terminal voltage is always less than the emf of the battery.
d. The emf of the battery is the potential difference across its terminals.

Choose the best answer from the options that follow each question.

____ 27. Several resistors are wired in a circuit so that there is a single path for the flow of electric current. What type of circuit is this?
a. electronic circuit
b. series circuit
c. parallel circuit
d. short circuit

____ 28. Five resistors are wired in a series circuit. How does the equivalent resistance of the circuit compare to the resistances of the individual resistors?
a. The equivalent resistance is greater than any single resistance.
b. The equivalent resistance is less than any single resistance.
c. The equivalent resistance is the same as any single resistance.
d. The equivalent resistance is one-fifth the value of any single resistance.

____ 29. Several resistors are wired in series. What is true about this circuit?
a. The sum of the currents through each of the resistors is equal to the total circuit current.
b. The total circuit current is the same as the current through any one of the resistors.
c. The voltage across any resistor is the same as the voltage of the power supply.
d. The current in any single resistor is determined by its resistance and the voltage of the power supply.

____ 30. Two resistors and a battery are wired in a series circuit. One resistor has twice the resistance of the other resistor. What is true about the voltage across the two resistors?
 a. Each resistor has half the battery voltage across it.
 b. One-third of the battery voltage is across the higher value resistor.
 c. One-third of the battery voltage is across the lower value resistor.
 d. Two-thirds of the battery voltage is across the lower value resistor.

____ 31. What distinguishes a parallel circuit from a series circuit?
 a. The current in a parallel circuit is greater than in a series circuit.
 b. The equivalent resistance of a parallel circuit is less than that of a series circuit.
 c. A parallel circuit always has more than one current path.
 d. The voltage across the resistors in a parallel circuit is greater than it is in a series circuit.

____ 32. Four resistors having equal values are wired as a parallel circuit. How does the equivalent resistance of the circuit compare to the resistance of a single resistor?
 a. The equivalent resistance is greater than the resistance of any single resistor.
 b. The equivalent resistance is the same as the resistance of any single resistor.
 c. The equivalent resistance is one-fourth the resistance value of a single resistor.
 d. The equivalent resistance is one-half the resistance value of a single resistor.

____ 33. Six resistors are wired in a parallel circuit. What is the voltage across each resistor in the circuit if the first resistor is connected to a 24 V battery?
 a. 4 V
 b. 24 V
 c. 0.25 V
 d. Voltage cannot be determined without the resistance values.

Choose the best answer from the options that follow each question.

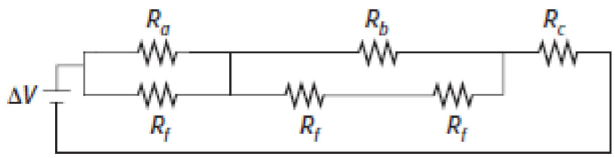
____ 34. You want to determine the current in a complex circuit. Which piece of information will be *least* helpful in making your determination?
 a. the equivalent resistance of the circuit
 b. the number of devices in the circuit
 c. the current in each element in the circuit
 d. the voltage across each element in the circuit

____ 35. You have three 100 Ω resistors available. How would you connect these three resistors to produce a 150 Ω equivalent resistance? You must use all of the resistors.
 a. Connect all three resistors in parallel.
 b. Connect all three resistors in series.
 c. Connect one resistor in series with two resistors in parallel.
 d. Connect two resistors in series with the third resistor in parallel to the first two.

____ 36. Because household devices are connected in parallel in a circuit, ____________ as new devices are connected.
 a. the current does not increase
 b. the potential difference remains the same
 c. the resistance of the circuit increases
 d. the power dissipated in the circuit decreases

____ 37. In any complex resistance circuit, the current through any resistor in the circuit is always
a. less than the total current through the circuit.
b. equal to the total circuit current.
c. less than or equal to the total circuit current.
d. less than or greater than the total circuit current.

____ 38.



In the circuit shown above, which resistors, if any, have equal voltages across them?
a. R_e and R_f
b. R_a and R_d
c. R_a, R_b, and R_c
d. R_b, R_e, and R_f

____ 39. Which of the following devices is always connected in series with a household circuit?
a. air conditioner
b. electric range
c. lamp
d. fuse

Choose the best answer from the options that follow each question.

____ 40. Which of the following is the best description of a schematic diagram?
a. uses pictures to represent the parts of a circuit
b. determines the location of the parts of a circuit
c. shows the parts of a circuit and how the parts connect to each other
d. shows some of the parts that make up a circuit

____ 41. A circuit has a continuous path through which charge can flow from a voltage source to a device that uses electrical energy. What is the name of this type of circuit?
a. a short circuit
b. a closed circuit
c. an open circuit
d. a circuit schematic

____ 42. How does the potential difference across the bulb in a flashlight compare with the terminal voltage of the batteries used to power the flashlight?
a. The potential difference is greater than the terminal voltage.
b. The potential difference is less than the terminal voltage.
c. The potential difference is equal to the terminal voltage.
d. It cannot be determined unless the internal resistance of the batteries is known.

____ 43. Three resistors connected in series carry currents labeled I_1, I_2, and I_3, respectively. Which of the following expresses the total current, I_t, in the system made up of the three resistors in series?

a. $I_t = I_1 + I_2 + I_3$

b. $I_t = \left(\frac{1}{I_1} + \frac{1}{I_2} + \frac{1}{I_3}\right)$

c. $I_t = I_1 = I_2 = I_3$

d. $I_t = \left(\frac{1}{I_1} + \frac{1}{I_2} + \frac{1}{I_3}\right)^{-1}$

____ 44. Three resistors connected in series have potential differences across them labeled ΔV_1, ΔV_2, and ΔV_3. Which of the following expresses the potential difference taken over the three resistors together?

a. $\Delta V_t = \Delta V_1 + \Delta V_2 + \Delta V_3$

b. $\mathrm{D}V_t = \left(\frac{1}{\Delta V_1} + \frac{1}{\Delta V_2} + \frac{1}{\Delta V_3}\right)$

c. $\Delta V_t = \Delta V_1 = \Delta V_2 = \Delta V_3$

d. $\mathrm{D}V_t = \left(\frac{1}{\Delta V_1} + \frac{1}{\Delta V_2} + \frac{1}{\Delta V_3}\right)^{-1}$

____ 45. Three resistors connected in series have potential differences across them labeled ΔV_1, ΔV_2, and ΔV_3. Which of the following expresses the potential difference taken over the three resistors together?

a. $\Delta V_t = \Delta V_1 + \Delta V_2 + \Delta V_3$

b. $\mathrm{D}V_t = \left(\frac{1}{\Delta V_1} + \frac{1}{\Delta V_2} + \frac{1}{\Delta V_3}\right)$

c. $\Delta V_t = \Delta V_1 = \Delta V_2 = \Delta V_3$

d. $\mathrm{D}V_t = \left(\frac{1}{\Delta V_1} + \frac{1}{\Delta V_2} + \frac{1}{\Delta V_3}\right)^{-1}$

____ 46. Three resistors connected in parallel carry currents labeled I_1, I_2, and I_3. Which of the following expresses the total current I_t in the combined system?

a. $I_t = I_1 + I_2 + I_3$

b. $I_t = \left(\frac{1}{I_1} + \frac{1}{I_2} + \frac{1}{I_3}\right)$

c. $I_t = I_1 = I_2 = I_3$

d. $I_t = \left(\frac{1}{I_1} + \frac{1}{I_2} + \frac{1}{I_3}\right)^{-1}$

____ 47. Three resistors connected in parallel have potential differences across them labeled ΔV_1, ΔV_2, and ΔV_3. Which of the following expresses the potential difference across all three resistors?

a. $\Delta V_t = \Delta V_1 + \Delta V_2 + \Delta V_3$

b. $\Delta V_t = \left(\frac{1}{\Delta V_1} + \frac{1}{\Delta V_2} + \frac{1}{\Delta V_3}\right)$

c. $\Delta V_t = \Delta V_1 = \Delta V_2 = \Delta V_3$

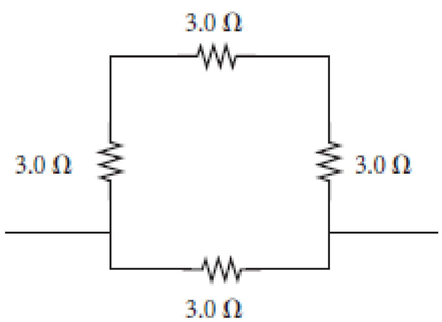
d. $\Delta V_t = \left(\frac{1}{\Delta V_1} + \frac{1}{\Delta V_2} + \frac{1}{\Delta V_3}\right)^{-1}$

____ 48. Three resistors with values of 3.0 Ω, 6.0 Ω, and 12 Ω are connected in parallel. What is the equivalent resistance of this combination?
a. 0.26 Ω
b. 1.7 Ω
c. 9.0 Ω
d. 33 Ω

____ 49. The equivalent resistance of a complex circuit is usually determined by
a. inspection.
b. simplifying the circuit into groups of series and parallel circuits.
c. adding and subtracting individual resistances.
d. dividing the sum of the individual resistances by the number of resistances.

____ 50. To find the current in a complex circuit, it is necessary to know the
a. potential difference in each device in the circuit.
b. current in each device in the circuit.
c. equivalent resistance of the circuit.
d. number of branches in the circuit.

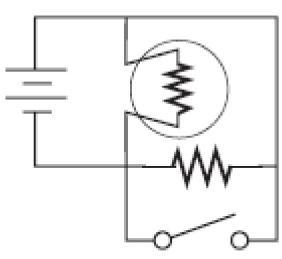
____ 51.



What is the equivalent resistance for the resistors in the figure shown above?
a. 1.3 Ω
b. 2.2 Ω
c. 3.0 Ω
d. 0.75 Ω

Choose the best answer from the options that follow each question.

____ 52. What happens when the switch is closed in the circuit shown below?



a. The lamp lights because current from the battery flows through the lamp.
b. Current from the battery flows through the resistor.
c. Current from the battery flows through both the lamp and the resistor.
d. The lamp goes out, because the battery terminals connect to each other.

____ 53. Which of the following statements about a battery as a source of electric current is *not* true?
a. A battery is a source of emf.
b. A battery provides the energy that moves charge.
c. The terminal voltage of a battery is equal to its emf.
d. The terminal voltage of a battery is the voltage it delivers to the load.

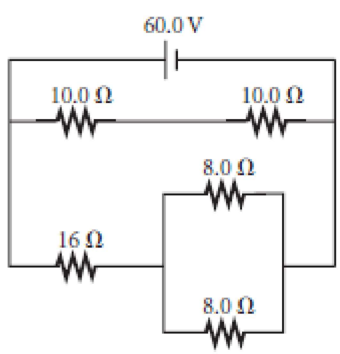
____ 54. Three resistors with values of 4.0 Ω, 6.0 Ω, and 8.0 Ω, respectively, are connected in series. What is their equivalent resistance?
a. 18 Ω
b. 8.0 Ω
c. 6.0 Ω
d. 1.8 Ω

____ 55. A circuit is composed of resistors wired in series. What is the relationship between the equivalent resistance of the circuit and the resistance of the individual resistors?
a. The equivalent resistance is equal to the largest resistance in the circuit.
b. The equivalent resistance is greater than the sum of all the resistances in the circuit.
c. The equivalent resistance is equal to the sum of the individual resistances.
d. The equivalent resistance is less than the smallest resistance in the circuit.

____ 56. Two resistors having the same resistance value are wired in parallel. How does the equivalent resistance compare to the resistance value of a single resistor?
a. The equivalent resistance is twice the value of a single resistor.
b. The equivalent resistance is the same as a single resistor.
c. The equivalent resistance is half the value of a single resistor.
d. The equivalent resistance is greater than that of a single resistor.

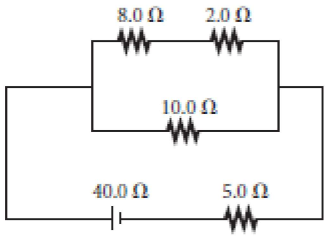
____ 57. Three resistors with values of 4.0 Ω, 6.0 Ω, and 10.0 Ω are connected in parallel. What is their equivalent resistance?
a. 20.0 Ω
b. 7.3 Ω
c. 6.0 Ω
d. 1.9 Ω

____ 58. What is the equivalent resistance of the resistors in the figure shown below?



a. 7.5 Ω
b. 10 Ω
c. 16 Ω
d. 18 Ω

____ 59. What is the equivalent resistance for the resistors in the figure shown below?



a. 25 Ω
b. 10.0 Ω
c. 7.5 Ω
d. 5.0 Ω

____ 60. Three resistors connected in parallel have individual values of 4.0 Ω, 6.0 Ω, and 10.0 Ω, as shown below. If this combination is connected in series with a 12.0 V battery and a 2.0 Ω resistor, what is the current in the 10.0 Ω resistor?
a. 0.58 A
b. 1.0 A
c. 11 A
d. 16 A

Problem

1. Three resistors with values of 17 Ω, 23 Ω, 9 Ω, respectively, are connected in series. What is their equivalent resistance?

2. Three resistors with values of 17 Ω, 31 Ω, 191 Ω, respectively, are connected in series. What is their equivalent resistance?

3. Three resistors with values of 29 Ω, 56 Ω, 24 Ω, respectively, are connected in series. What is their equivalent resistance?

4. Three resistors with values of 69 Ω, 176 Ω, 98 Ω, respectively, are connected in series. What is their equivalent resistance?

5. A current of 0.12 A passes through a 5.1 Ω resistor. The resistor is connected in series with a 9.1 V battery and an unknown resistor. What is the resistance value of the unknown resistor?

6. Three resistors are wired in series with a 28.5 V battery. The resistances are 21.2 Ω, 37.6 Ω, and 6.1 Ω. What is the voltage across the 6.1 Ω resistor?

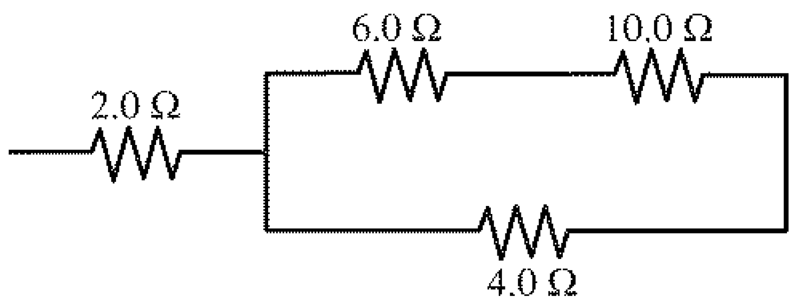
7. Three resistors with values of 11 Ω, 15 Ω, 22 Ω, respectively, are connected in parallel. What is their equivalent resistance?

8. Three resistors with values of 23 Ω, 89 Ω, 19 Ω, respectively, are connected in parallel. What is their equivalent resistance?

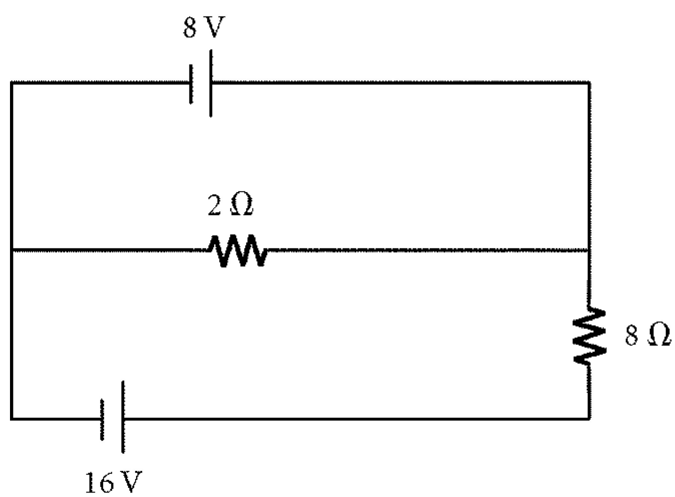
9. Three resistors with values of 18.9 Ω, 2.15 Ω, 2.17 Ω, respectively, are connected in parallel. What is their equivalent resistance?

10. Three resistors with values of 4.8 Ω, 5.3 Ω, 12.7 Ω, respectively, are connected in parallel. What is their equivalent resistance?

11. Three resistors with values of 12 Ω, 49 Ω, 51 Ω, respectively, are connected in parallel. What is their equivalent resistance?

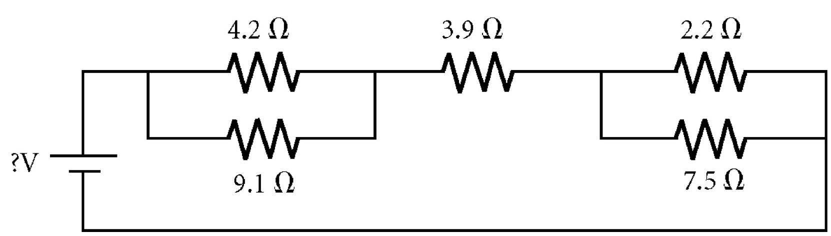


12. What is the equivalent resistance for the resistors in the figure shown above?

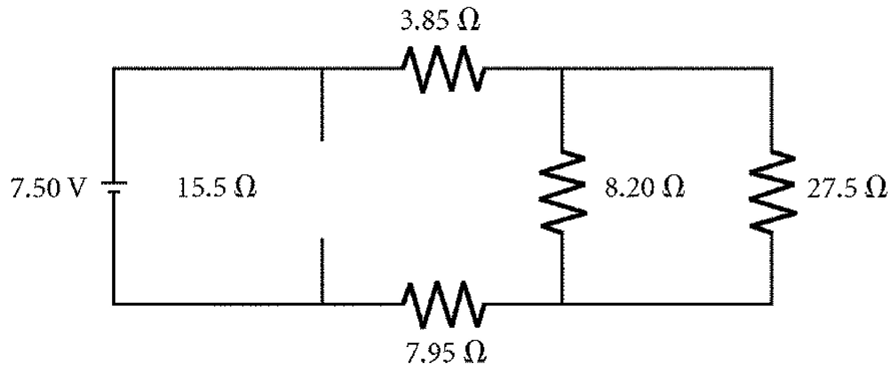


13. What is the current in the 8 Ω resistor in the circuit shown in the figure above?

14. What is the current in the 2 Ω resistor in the circuit shown in the figure above?



15. In the circuit shown above, the current in the 3.9 Ω resistor is 0.27 A. What is the voltage of the battery?



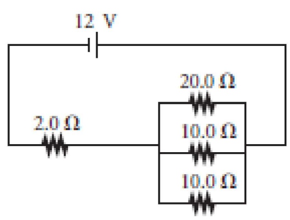
16. What is the current through the 8.20 Ω resistor in the circuit shown above?

17. Two resistors having values of 4.1 Ω and 5.8 Ω are wired in parallel. This pair of resistors is wired in series with a second pair of parallel resistors having values of 4.7 Ω and 5.9 Ω. If the current in the 5.8 Ω resistor is 0.35 A, what is the voltage across the entire circuit?

18. A current of 0.20 A passes through a 3.0 Ω resistor. The resistor is connected in series with a 6.0 V battery and an unknown resistor. What is the resistance value of the unknown resistor?

19. Three resistors with values of 27 Ω, 81 Ω, 16 Ω, respectively, are connected in parallel. What is their equivalent resistance?

20. How much current is in one of the 10 V resistors in the diagram shown below?



Phys.G12-Q4W1-Wlwctric Circuits-Qs. Bank
Answer Section

MULTIPLE CHOICE

1. ANS: C PTS: 1 DIF: I OBJ: 18-1.1
2. ANS: D PTS: 1 DIF: II OBJ: 18-1.1
3. ANS: B PTS: 1 DIF: II OBJ: 18-1.2
4. ANS: B PTS: 1 DIF: II OBJ: 18-1.3
5. ANS: D PTS: 1 DIF: II OBJ: 18-1.3
6. ANS: A

   Given
   $R_1 = 4.0\ \Omega$
   $R_2 = 6.0\ \Omega$
   $R_3 = 8.0\ \Omega$

   Solution
   $R_{eq} = R_1 + R_2 + R_3 = 4.0\ \Omega + 6.0\ \Omega + 8.0\ \Omega = 18\ \Omega$

   PTS: 1 DIF: I OBJ: 18-2.1
7. ANS: C PTS: 1 DIF: II OBJ: 18-2.1
8. ANS: A PTS: 1 DIF: II OBJ: 18-2.1
9. ANS: A PTS: 1 DIF: II OBJ: 18-2.1
10. ANS: C PTS: 1 DIF: II OBJ: 18-2.1
11. ANS: D

    Given
    $R_1 = 3.0\ \Omega$
    $R_2 = 6.0\ \Omega$
    $R_3 = 12\ \Omega$

    Solution
    $R_{eq} = R_1 + R_2 + R_3 = 3.0\ \Omega + 6.0\ \Omega + 12\ \Omega = 21\ \Omega$

    PTS: 1 DIF: I OBJ: 18-2.1
12. ANS: A PTS: 1 DIF: II OBJ: 18-2.2
13. ANS: D PTS: 1 DIF: II OBJ: 18-2.2
14. ANS: C PTS: 1 DIF: II OBJ: 18-2.2

15. ANS: B

Given

$R_1 = 3.0\ \Omega$

$R_2 = 6.0\ \Omega$

$R_3 = 12\ \Omega$

Solution

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{3.0\,\Omega} + \frac{1}{6.0\,\Omega} + \frac{1}{12\,\Omega}$$

$$\frac{1}{R_{eq}} = \frac{4.0}{12\,\Omega} + \frac{2.0}{12\,\Omega} + \frac{1.0}{12\,\Omega} = \frac{7.0}{12\,\Omega}$$

$$R_{eq} = \frac{12\,\Omega}{7.0} = 1.7\,\Omega$$

PTS: 1 DIF: IIIA OBJ: 18-2.2

16. ANS: B PTS: 1 DIF: I OBJ: 18-3.1

17. ANS: C PTS: 1 DIF: I OBJ: 18-3.1

18. ANS: B

Given

$R_1 = 10.0\ \Omega$

$R_2 = 10.0\ \Omega$

$R_3 = 16\ \Omega$

$R_4 = 8.0\ \Omega$

$R_5 = 8.0\ \Omega$

$\Delta V = 60$ V

Solution

$R_{1,2} = R_1 + R_2 = 10.0\ \Omega + 10.0\ \Omega = 20.0\ \Omega$

$$\frac{1}{R_{4,5}} = \frac{1}{R_4} + \frac{1}{R_5} = \frac{1}{8.0\,\Omega} + \frac{1}{8.0\,\Omega}$$

$$\frac{1}{R_{4,5}} = \frac{2.0}{8.0\,\Omega}$$

$$R_{4,5} = \frac{8.0\,\Omega}{2.0} = 4.0\,\Omega$$

$$R_{3,4,5} = R_3 + R_{4,5} = 16\ \Omega + 4.0\ \Omega = 20\ \Omega$$

$$\frac{1}{R_{eq}} = \frac{1}{R_{1,2}} + \frac{1}{R_{3,4,5}} = \frac{1}{20.0\,\Omega} + \frac{1}{20\,\Omega}$$

$$\frac{1}{R_{eq}} = \frac{2}{20.0\,\Omega}$$

$$R_{eq} = \frac{20.0\,\Omega}{2} = 10\,\Omega$$

PTS: 1 DIF: IIIB OBJ: 18-3.1

19. ANS: B
Given
$R_1 = 3.0\ \Omega$
$R_2 = 3.0\ \Omega$
$R_3 = 3.0\ \Omega$
$R_4 = 3.0\ \Omega$

Solution
$R_{1,2,3} = R_1 + R_2 + R_3 = 3.0\ \Omega + 3.0\ \Omega + 3.0\ \Omega = 9.0\ \Omega$

$$\frac{1}{R_{eq}} = \frac{1}{R_{1,2,3}} + \frac{1}{R_4} = \frac{1}{9.0\,\Omega} + \frac{1}{3.0\,\Omega}$$

$$\frac{1}{R_{eq}} = \frac{1.0}{9.0\,\Omega} + \frac{3.0}{9.0\,\Omega} = \frac{4.0}{9.0\,\Omega}$$

$$R_{eq} = \frac{9.0\,\Omega}{4.0} = 2.2\,\Omega$$

PTS: 1 DIF: IIIA OBJ: 18-3.1

20. ANS: A

Given

$R_1 = 2.0\ \Omega$
$R_2 = 4.0\ \Omega$
$R_3 = 6.0\ \Omega$
$R_4 = 10.0\ \Omega$
$\Delta V_{batt} = 12\ \text{V}$

Solution

$$\frac{1}{R_{2,3,4}} = \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} = \frac{1}{4.0\ \Omega} + \frac{1}{6.0\ \Omega} + \frac{1}{10.0\ \Omega}$$

$$\frac{1}{R_{2,3,4}} = \frac{0.25}{1\ \Omega} + \frac{0.17}{1\ \Omega} + \frac{0.100}{1\ \Omega} = \frac{0.52}{1\ \Omega}$$

$$R_{2,3,4} = \frac{1\ \Omega}{0.52} = 1.9\ \Omega$$

$$R_{1,2,3,4} = R_1 + R_{2,3,4} = 2.0\ \Omega + 1.9\ \Omega = 3.9\ \Omega$$

$$I_{total} = \frac{\Delta V_{batt}}{R_{1,2,3,4}} = \frac{12\ \text{V}}{3.9\ \Omega} = 3.1\ \text{A}$$

$\Delta V_{R1} = R_1 \times I_{total} = 2.0\ \Omega \times 3.1\ \text{A} = 6.2\ \text{V}$
$\Delta V_{R4} = \Delta V_{batt} - \Delta V_{R1} = 12\ \text{V} - 6.2\ \text{V} = 5.8\ \text{V}$

$$I_{R4} = \frac{\Delta V_{R4}}{R_4} = \frac{5.8\ \text{V}}{10.0\ \Omega} = 0.58\ \text{A}$$

	PTS: 1	DIF: IIIA	OBJ: 18-3.2	
21. ANS: B	PTS: 1	DIF: II		OBJ: 18-3.2
22. ANS: B	PTS: 1	TOP: Chapter 18 Section Quiz 1		
23. ANS: C	PTS: 1	TOP: Chapter 18 Section Quiz 1		
24. ANS: D	PTS: 1	TOP: Chapter 18 Section Quiz 1		
25. ANS: C	PTS: 1	TOP: Chapter 18 Section Quiz 1		
26. ANS: C	PTS: 1	TOP: Chapter 18 Section Quiz 1		
27. ANS: B	PTS: 1	TOP: Chapter 18 Section Quiz 2		
28. ANS: A	PTS: 1	TOP: Chapter 18 Section Quiz 2		
29. ANS: B	PTS: 1	TOP: Chapter 18 Section Quiz 2		
30. ANS: C	PTS: 1	TOP: Chapter 18 Section Quiz 2		
31. ANS: C	PTS: 1	TOP: Chapter 18 Section Quiz 2		
32. ANS: C	PTS: 1	TOP: Chapter 18 Section Quiz 2		
33. ANS: B	PTS: 1	TOP: Chapter 18 Section Quiz 2		
34. ANS: B	PTS: 1	TOP: Chapter 18 Section Quiz 3		
35. ANS: C	PTS: 1	TOP: Chapter 18 Section Quiz 3		
36. ANS: B	PTS: 1	TOP: Chapter 18 Section Quiz 3		
37. ANS: C	PTS: 1	TOP: Chapter 18 Section Quiz 3		

38. ANS: B PTS: 1 TOP: Chapter 18 Section Quiz 3
39. ANS: D PTS: 1 TOP: Chapter 18 Section Quiz 3
40. ANS: C PTS: 1 TOP: Chapter 18 Test A
41. ANS: B PTS: 1 TOP: Chapter 18 Test A
42. ANS: C PTS: 1 TOP: Chapter 18 Test A
43. ANS: C PTS: 1 TOP: Chapter 18 Test A
44. ANS: A PTS: 1 TOP: Chapter 18 Test A
45. ANS: A PTS: 1 TOP: Chapter 18 Test A
46. ANS: A PTS: 1 TOP: Chapter 18 Test A
47. ANS: C PTS: 1 TOP: Chapter 18 Test A
48. ANS: B

Given

$R_1 = 3.0\ \Omega$

$R_2 = 6.0\ \Omega$

$R_3 = 12\ \Omega$

Solution

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{3.0\Omega} + \frac{1}{6.0\Omega} + \frac{1}{12\Omega}$$

$$\frac{1}{R_{eq}} = \frac{4.0}{12\Omega} + \frac{2.0}{12\Omega} + \frac{1.0}{12\Omega} = \frac{7.0}{12\Omega}$$

$$R_{eq} = \frac{12\Omega}{7.0} = 1.7\ \Omega$$

PTS: 1 TOP: Chapter 18 Test A

49. ANS: B PTS: 1 TOP: Chapter 18 Test A
50. ANS: C PTS: 1 TOP: Chapter 18 Test A
51. ANS: B

Given

$R_1 = 3.0\ \Omega$

$R_2 = 3.0\ \Omega$

$R_3 = 3.0\ \Omega$

$R_4 = 3.0\ \Omega$

Solution

$R_{1,2,3} = R_1 + R_2 + R_3 =$

$3.0\ \Omega + 3.0\ \Omega + 3.0\ \Omega = 9.0\ \Omega$

$$\frac{1}{R_{eq}} = \frac{1}{R_{1,2,3}} + \frac{1}{R_4} = \frac{1}{9.0\Omega} + \frac{1}{3.0\Omega} = \frac{1}{R_{eq}} = \frac{1}{9.0\Omega} + \frac{3}{9.0\Omega} = \frac{4}{9.0\Omega}$$

$$R_{eq} = \frac{9.0\Omega}{4} = 2.2\ \Omega$$

PTS: 1 TOP: Chapter 18 Test A

52. ANS: D PTS: 1 TOP: Chapter 18 Test B
53. ANS: C PTS: 1 TOP: Chapter 18 Test B

54. ANS: A

Given

$R_1 = 4.0\ \Omega$

$R_2 = 6.0\ \Omega$

$R_3 = 8.0\ \Omega$

Solution

$R_{eq} = R_1 + R_2 + R_3 = 4.0\ \Omega + 6.0\ \Omega + 8.0\ \Omega = 18\ \Omega$

PTS: 1 TOP: Chapter 18 Test B

55. ANS: C PTS: 1 TOP: Chapter 18 Test B

56. ANS: C PTS: 1 TOP: Chapter 18 Test B

57. ANS: D

Given

$R_1 = 4\ \Omega$

$R_2 = 6\ \Omega$

$R_3 = 10\ \Omega$

Solution

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{40\Omega} + \frac{1}{6.0\Omega} + \frac{1}{10\Omega}$$

$$\frac{1}{R_{eq}} = \frac{0.25}{1\Omega} + \frac{0.17}{1\Omega} + \frac{0.100}{1\Omega} = \frac{0.520}{1\Omega}$$

$$\frac{1}{R_{eq}} = \frac{1\Omega}{0.520} = 19\ \Omega$$

PTS: 1 TOP: Chapter 18 Test B

58. ANS: B
Given
$R_1 = 10.0\Omega$
$R_2 = 10.0\Omega$
$R_3 = 16\Omega$
$R_4 = 8.0\Omega$
$R_5 = 8.0\Omega$
$\Delta V = 60\text{V}$
Solution
$R_{1,2} = R_1 + R_2 = 10.0\Omega + 10.0\Omega = 20.0\Omega$

$$\frac{1}{R_{4,5}} = \frac{1}{R_4} + \frac{1}{R_5} = \frac{1}{8.0\Omega} + \frac{1}{8.0\Omega}$$

$$\frac{1}{R_{4,5}} = \frac{2.0}{8.0\Omega}$$

$$R_{4,5} = \frac{8.0\Omega}{2.0} = 4.0\Omega$$

$R_{3,4,5} = R_3 + R_{4,5} = 16\Omega + 4.0\Omega = 20.0\Omega$

$$\frac{1}{R_{eq}} = \frac{1}{R_{1,2}} + \frac{1}{R_{3,4,5}} = \frac{1}{20.0\Omega} + \frac{1}{20\Omega}$$

$$\frac{1}{R_{eq}} = \frac{2.0}{20.0\Omega}$$

$$\frac{1}{R_{eq}} = \frac{20.0\Omega}{2.0} = 10.0\ \Omega$$

PTS: 1 TOP: Chapter 18 Test B

59. ANS: B
Given
$R_1 = 8.0\Omega$
$R_2 = 2.0\Omega$
$R_3 = 10.0\Omega$
$R_4 = 5.0\Omega$

Solution
$R_{1,2} = R_1 + R_2 = 8.0\Omega + 2.0\Omega = 10.0\Omega$

$$\frac{1}{R_{1,2,3}} = \frac{1}{R_{1,2}} + \frac{1}{R_3}$$

$$= \frac{1}{10.0\Omega} + \frac{1}{10.0\Omega} = \frac{2}{10.0\Omega}$$

$$R_{1,2,3} = \frac{10.0\Omega}{2.0} = 5.0\Omega$$

$R_{eq} = R_{1,2,3} + R_4 = 5.00\Omega + 5.0\Omega = 10.0\Omega$

PTS: 1 TOP: Chapter 18 Test B

60. ANS: A

Given

$R_1 = 2.0\Omega$

$R_2 = 4.0\Omega$

$R_3 = 6.0\Omega$

$R_4 = 10.0\Omega$

$\Delta V_{batt} = 12$ V

Solution

$R_{1,2} = R_1 + R_2 = 8.0\Omega + 2.0\Omega = 10.0\Omega$

$$\frac{1}{R_{2,3,4}} = \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} = \frac{1}{4.0\Omega} + \frac{1}{6.0\Omega} = \frac{1}{10.0\Omega}$$

$$\frac{1}{R_{2,3,4}} = \frac{0.25}{1\Omega} + \frac{0.17}{1\Omega} + \frac{0.100}{1\Omega} = \frac{0.520}{1\Omega}$$

$$R_{2,3,4} = \frac{1\Omega}{0.520} = 192\Omega$$

$R,_{1,2,3,4} = R_1 + R2,3,4 = 2.0\ \Omega + 1.92\ \Omega + 3.9\ \Omega$

$$I_{total} = \frac{\Delta V_{batt}}{R_{1,2,3,4}} = \frac{12V}{3.9\Omega} = 3.1A$$

$\Delta V_{R1} = R_1 \times I_{total} = 2.0\ \Omega \times 3.1$ A $= 6.2$ V

$$\Delta V_{R4} = \Delta V_{batt} - \ \Delta V_{R1} = I_{R4} = \frac{\Delta V_{R4}}{R_4} = \frac{5.8V}{10.0\Omega} = 0.58 \text{ A}$$

PTS: 1 TOP: Chapter 18 Test B

PROBLEM

1. ANS:

49 Ω

Given

$R_1 = 17\ \Omega$

$R_2 = 23\ \Omega$

$R_3 = 9\ \Omega$

Solution

For resistors in series,

$R_{eq} = R_1 + R_2 + R_3 = 17\ \Omega + 23\ \Omega + 9\ \Omega = 49\ \Omega$

PTS: 1 DIF: I OBJ: 18-2.1

2. ANS:
   239 Ω

   Given
   $R_1 = 17\ \Omega$
   $R_2 = 31\ \Omega$
   $R_3 = 191\ \Omega$

   Solution
   For resistors in series,

   $R_{eq} = R_1 + R_2 + R_3 = 17\ \Omega + 31\ \Omega + 191\ \Omega = 239\ \Omega$

   PTS: 1 DIF: I OBJ: 18-2.1
3. ANS:
   109 Ω

   Given
   $R_1 = 29\ \Omega$
   $R_2 = 56\ \Omega$
   $R_3 = 24\ \Omega$

   Solution
   For resistors in series,

   $R_{eq} = R_1 + R_2 + R_3 = 29\ \Omega + 56\ \Omega + 24\ \Omega = 109\ \Omega$

   PTS: 1 DIF: I OBJ: 18-2.1
4. ANS:
   343 Ω

   Given
   $R_1 = 69\ \Omega$
   $R_2 = 176\ \Omega$
   $R_3 = 98\ \Omega$

   Solution
   For resistors in series,

   $R_{eq} = R_1 + R_2 + R_3 = 69\ \Omega + 176\ \Omega + 98\ \Omega = 343\ \Omega$

   PTS: 1 DIF: I OBJ: 18-2.1

5. ANS:
   71 Ω

   Given
   $I_1 = 0.12$ A
   $R_1 = 5.1\ \Omega$
   $\Delta V_{batt} = 9.1$ V

   Solution
   For a series circuit,

   $I_1 = I_2 = I = 0.12$ A
   $\Delta V_1 = R_1 I = (5.1\ \Omega)(0.12\ \text{A}) = 0.61$ V
   $\Delta V_2 = \Delta V_{batt} - \Delta V_1 = 9.1\ \text{V} - 0.61\ \text{V} = 8.5$ V
   $$R_2 = \frac{\Delta V_2}{I} = \frac{8.5\ \text{V}}{0.12\ \text{A}} = 71\ \Omega$$

   PTS: 1 DIF: IIIB OBJ: 18-2.1
6. ANS:
   2.7 V

   Given
   $\Delta V_{batt} = 28.5$ V
   $R_1 = 21.2\ \Omega$
   $R_2 = 37.6\ \Omega$
   $R_3 = 6.1\ \Omega$

   Solution
   For a series circuit,

   $$R_{eq} = R_1 + R_2 + R_3 = 21.2\ \Omega + 37.6\ \Omega + 6.1\ \Omega = 64.9\ \Omega$$
   $$I = \frac{\Delta V_{batt}}{R_{eq}} = \frac{28.5\ \text{V}}{64.9\ \Omega} = 0.439\ \text{A}$$
   $$\Delta V_3 = IR_3 = (0.439\ \text{A})(6.1\ \Omega) = 2.7\ \text{V}$$

   PTS: 1 DIF: IIIA OBJ: 18-2.1

7. ANS:
4.93 Ω

Given
$R_1 = 11\ \Omega$
$R_2 = 15\ \Omega$
$R_3 = 22\ \Omega$

Solution
For resistors in parallel,

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{11\ \Omega} + \frac{1}{15\ \Omega} + \frac{1}{22\ \Omega}$$

$$\frac{1}{R_{eq}} = \frac{0.091}{1\ \Omega} + \frac{0.067}{1\ \Omega} + \frac{0.045}{1\ \Omega} = \frac{0.203}{1\ \Omega}$$

$$R_{eq} = \frac{1\ \Omega}{0.203} = 4.93\ \Omega$$

PTS: 1 DIF: IIIA OBJ: 18-2.2

8. ANS:
9.35 Ω

Given
$R_1 = 23\ \Omega$
$R_2 = 89\ \Omega$
$R_3 = 19\ \Omega$

Solution
For resistors in parallel,

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{23\ \Omega} + \frac{1}{89\ \Omega} + \frac{1}{19\ \Omega}$$

$$\frac{1}{R_{eq}} = \frac{0.043}{1\ \Omega} + \frac{0.011}{1\ \Omega} + \frac{0.053}{1\ \Omega} = \frac{0.107}{1\ \Omega}$$

$$R_{eq} = \frac{1\ \Omega}{0.107} = 9.35\ \Omega$$

PTS: 1 DIF: IIIA OBJ: 18-2.2

9. ANS:
$1.02\ \Omega$

Given
$R_1 = 18.9\ \Omega$
$R_2 = 2.15\ \Omega$
$R_3 = 2.17\ \Omega$

Solution
For resistors in parallel,

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{18.9\ \Omega} + \frac{1}{2.15\ \Omega} + \frac{1}{2.17\ \Omega}$$

$$\frac{1}{R_{eq}} = \frac{0.0529}{1\ \Omega} + \frac{0.465}{1\ \Omega} + \frac{0.461}{1\ \Omega} = \frac{0.979}{1\ \Omega}$$

$$R_{eq} = \frac{1\ \Omega}{0.979} = 1.02\ \Omega$$

PTS: 1 DIF: IIIA OBJ: 18-2.2

10. ANS:
$2.1\ \Omega$

Given
$R_1 = 4.8\ \Omega$
$R_2 = 5.3\ \Omega$
$R_3 = 12.7\ \Omega$

Solution
For resistors in parallel,

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{4.8\ \Omega} + \frac{1}{5.3\ \Omega} + \frac{1}{12.7\ \Omega}$$

$$\frac{1}{R_{eq}} = \frac{0.21}{1\ \Omega} + \frac{0.19}{1\ \Omega} + \frac{0.0787}{1\ \Omega} = \frac{0.48}{1\ \Omega}$$

$$R_{eq} = \frac{1\ \Omega}{0.48} = 2.1\ \Omega$$

PTS: 1 DIF: IIIA OBJ: 18-2.2

11. ANS:
8.13 Ω

Given
$R_1 = 12\ \Omega$
$R_2 = 49\ \Omega$
$R_3 = 51\ \Omega$

Solution
For resistors in parallel,

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{12\ \Omega} + \frac{1}{49\ \Omega} + \frac{1}{51\ \Omega}$$

$$\frac{1}{R_{eq}} = \frac{0.083}{1\ \Omega} + \frac{0.020}{1\ \Omega} + \frac{0.020}{1\ \Omega} = \frac{0.123}{1\ \Omega}$$

$$R_{eq} = \frac{1\ \Omega}{0.123} = 8.13\ \Omega$$

PTS: 1 DIF: IIIA OBJ: 18-2.2

12. ANS:
5.2 Ω

Given
$R_1 = 2.0\ \Omega$
$R_2 = 6.0\ \Omega$
$R_3 = 10.0\ \Omega$
$R_4 = 4.0\ \Omega$

Solution
$R_{2,3} = R_2 + R_3 = 6.0\ \Omega + 10.0\ \Omega = 16.0\ \Omega$

$$\frac{1}{R_{2,3,4}} = \frac{1}{R_{2,3}} + \frac{1}{R_4} = \frac{1}{16.0\ \Omega} + \frac{1}{4.0\ \Omega} = \frac{0.0625}{1\ \Omega} + \frac{0.25}{1\ \Omega} = \frac{0.31}{1\ \Omega}$$

$$R_{2,3,4} = \frac{1\ \Omega}{0.31} = 3.2\ \Omega$$

$$R_{eq} = R_{1,2,3,4} = R_4 + R_{2,3,4} = 2.0\ \Omega + 3.2\ \Omega = 5.2\ \Omega$$

PTS: 1 DIF: IIIB OBJ: 18-3.1

13. ANS:
1 A

Given
$R_1 = 2\ \Omega$
$R_2 = 8\ \Omega$
$\Delta V_1 = 8$ V
$\Delta V_2 = 16$ V

Solution
Because one side of R_2 is connected to the 16 V battery and the other side is connected to the 8 V battery, the voltage across R_2 must be the difference between the battery voltages.

$\Delta V_{net} = \Delta V_2 - \Delta V_1 = 16\text{ V} - 8\text{ V} = 8\text{ V}$

$$I_2 = \frac{\Delta V_{net}}{R_2} = \frac{8\text{ V}}{8\ \Omega} = 1\text{ A}$$

PTS: 1 DIF: IIIB OBJ: 18-3.2

14. ANS:
4 A

Given
$R_1 = 2\ \Omega$
$R_2 = 8\ \Omega$
$\Delta V_1 = 8$ V
$\Delta V_2 = 16$ V

Solution
The voltage across R_1 must be equal to 8 V, because R_1 is connected directly across the 8 V battery.

$$I_1 = \frac{\Delta V_1}{R_1} = \frac{8\text{ V}}{2\ \Omega} = 4\text{ A}$$

PTS: 1 DIF: IIIB OBJ: 18-3.2

15. ANS:
2.3 V

Given
$R_1 = 4.2\ \Omega$
$R_2 = 9.1\ \Omega$
$R_3 = 3.9\ \Omega$
$R_4 = 2.2\ \Omega$
$R_5 = 7.5\ \Omega$
$I_3 = 0.27$ A

Solution

$$\frac{1}{R_{1,2}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{4.2\ \Omega} + \frac{1}{9.1\ \Omega} = \frac{0.24}{1\ \Omega} + \frac{0.11}{1\ \Omega} = \frac{0.35}{1\ \Omega}$$

$$R_{1,2} = \frac{1\ \Omega}{0.35} = 2.9\ \Omega$$

$$\frac{1}{R_{4,5}} = \frac{1}{R_4} + \frac{1}{R_5} = \frac{1}{2.2\ \Omega} + \frac{1}{7.5\ \Omega} = \frac{0.45}{1\ \Omega} + \frac{0.13}{1\ \Omega} = \frac{0.58}{1\ \Omega}$$

$$R_{4,5} = \frac{1\ \Omega}{0.58} = 1.7\ \Omega$$

$R_{eq} = R_{1,2} + R_3 + R_{4,5} = 2.9\ \Omega + 3.9\ \Omega + 1.7\ \Omega = 8.5\ \Omega$
$I = I_3 = I_{1,2} = I_{4,5}$
$\Delta V_{batt} = R_{eq} I = (8.5\ \Omega)(0.27\ \text{A}) = 2.3\ \text{V}$

PTS: 1 DIF: IIIC OBJ: 18-3.2

16. ANS:
0.320 A

Given
$\Delta V = 7.50$ V
$R_1 = 15.5\ \Omega$
$R_2 = 3.85\ \Omega$
$R_3 = 7.95\ \Omega$
$R_4 = 8.20\ \Omega$
$R_5 = 27.5\ \Omega$

Solution

$$\frac{1}{R_{4,5}} = \frac{1}{R_4} + \frac{1}{R_5} = \frac{1}{8.20\ \Omega} + \frac{1}{27.5\ \Omega} = \frac{0.122}{1\ \Omega} + \frac{0.0364}{1\ \Omega} = \frac{0.158}{1\ \Omega}$$

$$R_{4,5} = \frac{1\ \Omega}{0.158} = 6.33\ \Omega$$

R_1 is not needed for the calculations as the potential difference across it is the same as the potential difference across the equivalent resistance in part of the circuit that includes R_4:

$R_{eq} = R_2 + R_3 + R_{4,5} = 3.85\ \Omega + 7.95\ \Omega + 6.33\ \Omega = 18.13\ \Omega$

$$I = \frac{\Delta V}{R_{eq}} = \frac{7.50\ \text{V}}{18.13\ \Omega} = 0.414\ \text{A}$$

$I = I_2 = I_3 = I_{4,5}$

$$\Delta V_4 = \Delta V_5 = \Delta V_{4,5} = (I_{4,5})(R_{4,5}) = IR_{4,5} = (0.414\ \text{A})(6.33\ \Omega) = 2.62\ \text{V}$$

$$I_4 = \frac{\Delta V_4}{R_4} = \frac{2.62\ \text{V}}{8.20\ \Omega} = 0.320\ \text{A}$$

PTS: 1 DIF: IIIC OBJ: 18-3.2

17. ANS:
4.2 V

Given
$R_1 = 4.1\ \Omega$
$R_2 = 5.8\ \Omega$
$R_3 = 4.7\ \Omega$
$R_4 = 5.9\ \Omega$
$I_2 = 0.35$ A

Solution
$$\Delta V_2 = (I_2)(R_2) = (0.35\text{ A})(5.8\,\Omega) = 2.0\text{ V}$$
$$\Delta V_2 = \Delta V_1$$
$$I_1 = \frac{\Delta V_1}{R_1} = \frac{\Delta V_2}{R_1} = \frac{2.0\text{ V}}{4.1\,\Omega} = 0.49\text{ A}$$
$$I = I_2 + I_1 = 0.35\text{ A} + 0.49\text{ A} = 0.84\text{ A}$$
$$\frac{1}{R_{3,4}} = \frac{1}{R_3} + \frac{1}{R_4} = \frac{1}{4.7\,\Omega} + \frac{1}{5.9\,\Omega} = \frac{0.21}{1\,\Omega} + \frac{0.17}{1\,\Omega} = \frac{0.38}{1\,\Omega}$$
$$R_{3,4} = \frac{1\,\Omega}{0.38} = 2.6\,\Omega$$
$$\Delta V_3 = \Delta V_4 = (I)(R_{3,4}) = (0.84\text{ A})(2.6\,\Omega) = 2.2\text{ V}$$
$$\Delta V = \Delta V_1 + \Delta V_3 = 2.0\text{ V} + 2.2\text{ V} = 4.2\text{ V}$$

PTS: 1 DIF: IIIC OBJ: 18-3.2

18. ANS:
27 Ω
Given
$I_{R1} = 0.20$ A
$R_1 = 3.0\ \Omega$
$\Delta V_{batt} = 6.0$ V
Solution
$\Delta V_{R1} = R_1 \times I_1 = 3.0\ \Omega \times 0.20\text{ A} = 0.60\text{ V}$
$\Delta V_{R2} = \Delta V_{batt} - \Delta V_{R1} = 6.0\text{ V} - 0.60\text{ V} = 5.4\text{ V}$
$I_{R2} = I_{R1} = 0.20$ A
$$R_2 = \frac{V_{R2}}{I_{R2}} = \frac{5.4V}{0.20A} = 27\ \Omega$$

PTS: 1 TOP: Chapter 18 Test A

19. ANS:
9.0 Ω
Given
$R_1 = 27\ \Omega$
$R_2 = 81\ \Omega$
$R_3 = 16\ \Omega$

Solution
$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{27\Omega} + \frac{1}{81\Omega} + \frac{1}{16\Omega}$$
$$\frac{1}{R_{eq}} = \frac{0.037}{1\Omega} + \frac{0.012}{1\Omega} + \frac{0.062}{1\Omega} = \frac{0.111}{1\Omega}$$
$$\frac{1}{R_{eq}} = \frac{1\Omega}{0.111} = 9.0\ \Omega$$

PTS: 1 TOP: Chapter 18 Test A

20. ANS:
0.80 A
Given
$R_1 = 2.0\ \Omega$
$R_2 = 20.0\ \Omega$
$R_3 = 10.0\ \Omega$
$R_4 = 10.0\ \Omega$
$\Delta V_{batt} = 12\ \text{V}$
$I_{R3} = I_{R4}$
Solution
$$\frac{1}{R_{2,3,4}} = \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} = \frac{1}{20.0\Omega} + \frac{1}{10.0\Omega} + \frac{1}{10.0\Omega}$$
$$\frac{1}{R_{2,3,4}} = \frac{1}{20.0\Omega} + \frac{2}{20.0\Omega} + \frac{2}{20.0\Omega} = \frac{5}{20.0\Omega}$$
$$R_{2,3,4} = \frac{20.0\Omega}{5} = 4.00\ \Omega$$
$$R_{eq} = R_1 + R_{2,3,4} = 2.0\ \Omega + 4.00\ \Omega = 6.0\ \Omega$$
$$I_{tot} = \frac{\Delta V_{batt}}{R_{eq}} = \frac{12}{6.0\Omega} = 2.0\text{A}$$
$$\Delta_{V3} = \Delta_{V4} = R_{2,3,4} \times I_{tot} = 4.00\ \Omega \times 2.0\ \text{A} = 8.0\ \text{V}$$
$$I_{R3} = I_{R4} = \frac{\Delta V_2}{R_3} = \frac{\Delta V_4}{R_4} = \frac{8.0V}{10.0\Omega} = 0.80\ \text{A}$$

PTS: 1 TOP: Chapter 18 Test B