CENGAGE | WEBASSIGN

tgillette@mail.fresnostate.edu
(sign out)

Home My Assignments Grades
Communication Calendar
My eBooks

← PHYS-2B, section 34945, Spring 2020

INSTRUCTOR
John Walkup
California State University Fresno

Kirchoff's Rules (Homework)

Current Score

QUESTION	1	2	3	4	5	6	7	8	9	10	11	12
POINTS	1/1	2/2	2/2	1/1	3/3	2/2	6/6	0/2	4/4	1/2	2/2	1/1

TOTAL SCORE

25/28 89.3%

Due Date Past Due

WED, FEB 26, 2020

11:59 PM PST

Request Extension

Assignment Submission & Scoring

Assignment Submission

For this assignment, you submit answers by question parts. The number of submissions remaining for each question part only changes if you submit or change the answer.

Assignment Scoring

Your last submission is used for your score.

The due date for this assignment has passed.

Your work can be viewed below, but no changes can be made.

Important! Before you view the answer key, decide whether or not you plan to request an extension. Your Instructor may not grant you an extension if you have viewed the answer key. Automatic extensions are not granted if you have viewed the answer key.

Request Extension

1. 1/1 points Previous Answers **SERCP11 17.4.OP.010.**

My Notes Ask Your Teacher

The potential difference across a resistor in a particular electric circuit is 360 V. The current through the resistor is 20.0 A. What is its resistance (in Ω)?

18 ✔ 18 Ω

Solution or Explanation

From Ohm's law,

$$R = \frac{\Delta V}{I} = \frac{360\text{ V}}{20.0\text{ A}} = 18.0\ \Omega.$$

Need Help? Read It

2. 2/2 points Previous Answers **SERCP11 17.4.OP.014.**

My Notes Ask Your Teacher

An aluminum wire with a circular cross-section has a mass of 1.25 g and a resistance of 0.770 Ω. At 20°C, the resistivity of aluminum is 2.82×10^{-8} Ω · m and its density is 2,700 kg/m^3.

How long (in m) is the wire?

3.56 ✔ 3.56 m

What is the diameter (in mm) of the wire?

.4069 ✔ 0.407 mm

Solution or Explanation

Note: We are displaying rounded intermediate values for practical purposes. However, the calculations are made using the unrounded values.

(a) Let's call the mass m = 1.25 g, the resistance R = 0.770 Ω, the resistivity ρ = 2.82×10^{-8} Ω · m, and the density D = 2,700 kg/m^3. We'll call the unknown length of the wire L and cross-sectional area A.

Let's start with the relationship between resistance, resistivity, area, and length.

$$R = \frac{\rho L}{A} \qquad (1)$$

This equation has two unknowns, L and A. We need to find another equation with these two unknowns to be able to solve for them. From the relationship between mass, density, and volume, we have the following.

$$D = \frac{m}{V} \qquad (2)$$

The volume V of a cylinder is the end-cap area A times the length L.

$$V = AL$$

Substituting this into equation (2) gives the following.

$$D = \frac{m}{AL}$$

Solving this equation for A gives the following.

$$A = \frac{m}{LD} \qquad (3)$$

Substituting equation (3) into equation (1) gives the following.

$$R = \frac{\rho L}{\left(\frac{m}{LD}\right)} = \frac{\rho L^2 D}{m} \qquad (4)$$

Solving this equation for the length L gives the following.

$$L = \sqrt{\frac{mR}{\rho D}}$$

Substituting values into this equation (being careful to convert units) gives the following.

$$L = \sqrt{\frac{(1.25 \times 10^{-3}\ \text{kg})(0.770\ \Omega)}{(2.82 \times 10^{-8}\ \Omega \cdot \text{m})(2,700\ \text{kg/m}^3)}} = 3.56\ \text{m}$$

(b) From equation (3), the cross-sectional area is as follows.

$$A = \frac{m}{LD}$$

The cross-sectional area of a circle, in terms of its diameter *d*, is as follows.

$$A = \frac{\pi d^2}{4}$$

Substituting this into equation (3) gives the following.

$$\frac{\pi d^2}{4} = \frac{m}{LD}$$

Solving this for *d* gives the following.

$$d = \sqrt{\frac{4m}{\pi LD}} = 2\sqrt{\frac{m}{\pi LD}}$$

Substituting values, including the value of *L* found in part (a), gives the following.

$$d = 2\sqrt{\frac{1.25 \times 10^{-3}\ \text{kg}}{\pi(3.56\ \text{m})(2{,}700\ \text{kg/m}^3)}} = 4.07 \times 10^{-4}\ \text{m}$$

In units of mm, this is as follows.

$$d = 0.407\ \text{mm}$$

Need Help? Read It

3. 2/2 points Previous Answers **SERCP11 17.4.P.011.**

My Notes Ask Your Teacher

A voltmeter connected across the terminals of a tungsten-filament light bulb measures 118 V when an ammeter in line with the bulb registers a current of 0.508 A.

HINT

(a) Find the resistance of the light bulb. (Enter your answer in ohms.)

232.3 ✓ 232 Ω

(b) Find the resistivity of tungsten (in Ω · m) at the bulb's operating temperature if the filament has an uncoiled length of 0.613 m and a radius of 2.48×10^{-5} m.

7.322e-7 ✓ 7.32e-07 *Resistivity* is a material property not depending on the device's size and shape. *Resistance* is a property of a particular device, depending on the material (through its resistivity), its length, and cross-sectional area. Both resistivity and resistance vary with temperature. Ω · m

Solution or Explanation

(a) Solve for the resistance R using Ohm's law to find the following.

$$\Delta V = IR \rightarrow R = \frac{\Delta V}{I} = \frac{118 \text{ V}}{0.508 \text{ A}} = 232\ \Omega$$

(b) The wire's cross-sectional area is $A = \pi r^2 = \pi(2.48 \times 10^{-5} \text{ m})^2 = 1.93 \times 10^{-9} \text{ m}^2$. Solve for the resistivity using the following.

$$R = \rho\frac{\ell}{A}$$

$$\rho = \frac{RA}{\ell} = \frac{\Delta V(\pi r^2)}{I\ell}$$

$$= \frac{(118 \text{ V})\left[\pi(2.48 \times 10^{-5} \text{ m})^2\right]}{(0.508 \text{ A})(0.613 \text{ m})} = 7.32 \times 10^{-7}\ \Omega \cdot \text{m}$$

Need Help? Read It Watch It

4. 1/1 points Previous Answers **SERCP11 17.5.P.024.**

My Notes Ask Your Teacher

If a certain silver wire has a resistance of 9.00 Ω at 30.0°C, what resistance will it have at 49.0°C?

9.65 ✔ 9.65 Ω

Solution or Explanation

Using $R = R_0[1 + \alpha(T - T_0)]$, with R_0 = 9.00 Ω at T_0 = 30.0°C and $\alpha_{silver} = 3.8 \times 10^{-3}\ (°C)^{-1}$ (from this table), the resistance at T = 49.0°C is

$$R = (9.00\ \Omega)\left[1 + \left(3.8 \times 10^{-3}\ (°C)^{-1}\right)\left(49.0°C - 30.0°C\right)\right] = 9.65\ \Omega$$

Need Help? Read It

5. 3/3 points Previous Answers **SERCP11 17.6.OP.036.**

My Notes Ask Your Teacher

In a particular area of the country, electrical energy costs $0.12 per kilowatt-hour. (Round your answers, in dollars, to at least two decimal places.)

(a) How much does it cost to operate an old-style incandescent 60.0-W light bulb continuously for 24 hours?

$ .173 ✔ 0.173

(b) A modern LED light bulb that emits as much visible light as a 60.0-W incandescent only draws 8.50 W of power. How much does it cost to operate this bulb for 24 hours?

$ .025 ✔ 0.024

(c) A particular electric oven requires a potential difference of 220 V and draws 20.0 A of current when operating. How much does it cost to operate the oven for 5.30 hours?

$ 2.796 ✔ 2.798

Solution or Explanation

Note: We are displaying rounded intermediate values for practical purposes. However, the calculations are *made using the unrounded values.*

(a) The definition of power is

$$P = \frac{E}{\Delta t}$$

where E is the energy and Δt is the amount of time.

The energy used by a 60.0-W bulb in 24 hours is then

$$E = P\Delta t = (60.0\text{ W})(24\text{ h}) = (1{,}440\text{ W}\cdot\text{h})\left(\frac{1\text{ kW}}{1{,}000\text{ W}}\right) = 1.44\text{ kWh}.$$

The cost of this energy, at a rate of \$0.12 per kilowatt-hour, is

$$\text{cost} = (E)(\text{rate}) = (1.44\text{ kWh})(\$0.12/\text{kWh}) = \$0.173.$$

(b) We could use the same method as part (a) to find the cost. But note that

$$(\text{cost})_1 = (P_1\Delta t)(\text{rate})$$

where the subscript 1 refers to the incandescent bulb. Similarly, using a subscript 2 for the LED bulb, we have

$$(\text{cost})_2 = (P_2\Delta t)(\text{rate}).$$

Taking the ratio of the two equations, and noting the rate and time are the same for both,

$$\frac{(\text{cost})_2}{(\text{cost})_1} = \frac{(P_2\Delta t)(\text{rate})}{(P_1\Delta t)(\text{rate})} = \frac{P_2}{P_1}.$$

Solving for the LED cost,

$$(\text{cost})_2 = \frac{P_2}{P_1}(\text{cost})_1 = \left(\frac{8.50\text{ W}}{60.0\text{ W}}\right)(\$0.173) = \$0.024.$$

(c) Again, energy is related to power by

$$E = P\Delta t.$$

Electric power is related to current I and potential difference ΔV by

$$P = I\Delta V.$$

Substituting this into the equation above,

$$E = I(\Delta V)(\Delta t) = (20.0\text{ A})(220\text{ V})(5.30\text{ h}) = 2.33 \times 10^4\text{ W}\cdot\text{h} = 23.3\text{ kWh}.$$

The cost of this energy at a rate of \$0.12 per kilowatt-hour is

$$\text{cost} = (E)(\text{rate}) = (23.3\text{ kWh})(\$0.12/\text{kWh}) = \$2.798.$$

Need Help? Read It

6. 2/2 points Previous Answers **SERCP11 17.6.P.038.**

My Notes Ask Your Teacher

A portable coffee heater supplies a potential difference of 12.0 V across a Nichrome heating element with a resistance of 2.17 Ω.

HINT

(a) Calculate the power (in W) consumed by the heater.

66.359 ✔ 66.4 The three equivalent expressions for electrical power are linked by Ohm's law: $P = I\Delta V = I^2R = \frac{(\Delta V)^2}{R}$. W

(b) How many minutes would it take to heat 1.13 kg of coffee from 20.6°C to 51.2°C with this heater? Coffee has a specific heat of 4184 $\frac{\text{J}}{(\text{kg}\cdot{}^\circ\text{C})}$. Neglect any energy losses to the environment.

36.3 ✔ 36.3 min

Solution or Explanation

Note: We are displaying rounded intermediate values for practical purposes. However, the calculations are made using the unrounded values.

(a) The consumed power is $P = \frac{(\Delta V)^2}{R} = \frac{(12.0\text{ V})^2}{2.17\ \Omega} = 66.4$ W.

(b) The energy required to heat the coffee is $Q = mc\Delta T$. Use the definition of average power to solve for the time Δt, converting to minutes using 1 min = 60 s.

$$P_{\text{av}} = \frac{Q}{\Delta t}$$

$$\Delta t = \frac{Q}{P_{\text{av}}} = \frac{mc\Delta T}{P}$$

$$= \frac{(1.13\text{ kg})\left(4184\ \frac{\text{J}}{\text{kg}\cdot{}^\circ\text{C}}\right)\left[(51.2^\circ\text{C}) - (20.6^\circ\text{C})\right]}{66.4\text{ W}}$$

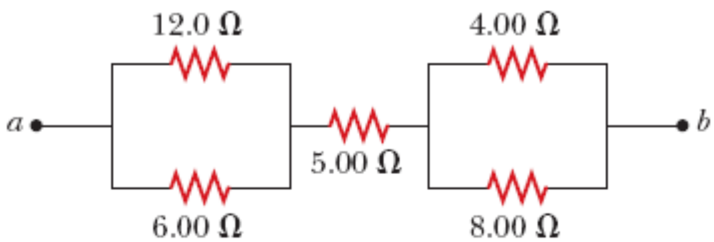
$$= 2.18\times 10^3\text{ s} = 36.3\text{ min}$$

Need Help? Read It Watch It

7. 6/6 points Previous Answers **SERCP11 18.3.OP.008.**

My Notes Ask Your Teacher

The figure below shows a network of connected resistors between points *a* and *b*. The resistance of each is given in the figure.



(a) What is the equivalent resistance (in Ω) of the entire network between points *a* and *b*?

1.167e1 ✓ 11.7 Ω

(b) A battery with a potential difference of 60.4 V is connected to the network, with one terminal connected to point *a* and the other connected to point *b*. What is the current (in A) in each resistor?

12.0 Ω	1.725 ✓	1.73	A
6.00 Ω	3.45 ✓	3.45	A
5.00 Ω	5.177 ✓	5.18	A
4.00 Ω	3.45 ✓	3.45	A
8.00 Ω	1.725 ✓	1.73	A

Solution or Explanation

Note: We are displaying rounded intermediate values for practical purposes. However, the calculations are made using the unrounded values.

(a) The parallel combination of the 6.00 Ω and 12.0 Ω resistors has an equivalent resistance of

$$\frac{1}{R_{p1}} = \frac{1}{6.00\ \Omega} + \frac{1}{12.0\ \Omega} = \frac{2+1}{12.0\ \Omega} \text{ or } R_{p1} = \frac{12.0\ \Omega}{3} = 4.00\ \Omega.$$

Similarly, the equivalent resistance of the 4.00 Ω and 8.00 Ω parallel combination is

$$\frac{1}{R_{p2}} = \frac{1}{4.00\ \Omega} + \frac{1}{8.00\ \Omega} = \frac{2+1}{8.00\ \Omega} \text{ or } R_{p2} = \frac{8.00\ \Omega}{3}.$$

The total resistance of the series combination between points a and b is then

$$R_{ab} = R_{p1} + 5.00\ \Omega + R_{p2} = 4.00\ \Omega + 5.00\ \Omega + \frac{8.00\ \Omega}{3} = \frac{35.0\ \Omega}{3}.$$

(b) If ΔV_{ab} = 60.4 V, the total current from a to b is

$$I_{ab} = \frac{\Delta V_{ab}}{R_{ab}} = \frac{60.4\ \text{V}}{(35.0\ \Omega)/3} = 5.18\ \text{A}$$

and the potential differences across the two parallel combinations are

$$\Delta V_{p1} = I_{ab}R_{p1} = (5.18\ \text{A})(4.00\ \Omega) = 20.7\ \text{V, and}$$

$$\Delta V_{p2} = I_{ab}R_{p2} = (5.18\ \text{A})\left(\frac{8.00\ \Omega}{3}\right) = 13.8\ \text{V}.$$

The individual currents through the various resistors are

$$I_{12} = \frac{\Delta V_{p1}}{12.0\ \Omega} = 1.73\ \text{A}$$

$$I_{6} = \frac{\Delta V_{p1}}{6.00\ \Omega} = 3.45\ \text{A}$$

$$I_{5} = I_{ab} = 5.18\ \text{A}$$

$$I_{4} = \frac{\Delta V_{p2}}{4.00\ \Omega} = 3.45\ \text{A}$$

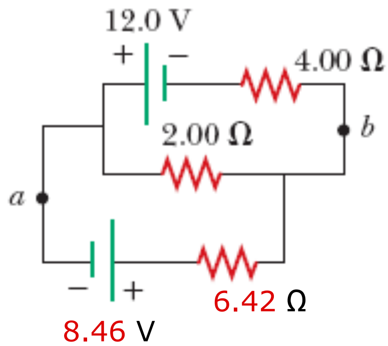
$$I_{8} = \frac{\Delta V_{p2}}{8.00\ \Omega} = 1.73\ \text{A}.$$

Need Help? Read It

8. 0/2 points Previous Answers **SERCP11 18.4.OP.020.**

My Notes Ask Your Teacher

The figure below shows with two batteries and three resistors. The potential difference across the batteries and the resistance of each resistor is given in the figure.



(a) What is the current (in A) in the 2.00 Ω resistor? (Enter the magnitude.)

.9 ✖ 0.929

Use Kirchhoff's junction and loop rules to find equations to solve for the unknown currents in the branches of the circuit. You will need one junction equation and two loop equations to get three equations and three unknowns. Be careful of sign rules in your equations. A

(b) What is the potential difference (in V) between points *a* and *b*, that is, $\Delta V = V_b - V_a$?

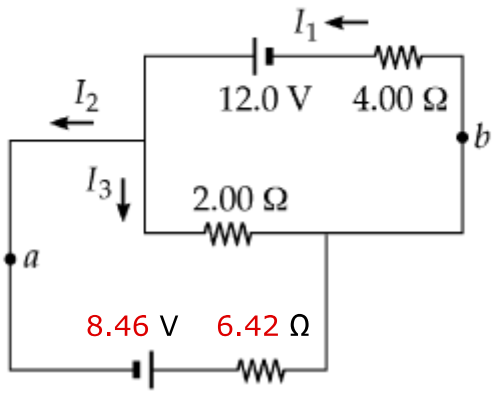
-1.9 ✖ -1.86

Remember that $V_a - V_b$ refers to the potential at the final point (point *b*) minus the potential at the initial point (point *a*). Can you choose a path in the circuit from *a* to *b* that uses the current found in part (a)? Be careful of sign rules when finding potential differences along this path. V

Solution or Explanation

Note: We are displaying rounded intermediate values for practical purposes. However, the calculations are made using the unrounded values.

(a) We will use Kirchhoff's rules to find equations to solve for the unknown current. Let's first redraw the circuit, defining currents, along with their directions, along each branch of the circuit.



Applying the junction rule to the upper-left junction, we have

(1) $I_1 = I_2 + I_3$.

Next we'll apply the loop rule to the upper loop, formed by the 12.0 V battery, the 4.00 Ω resistor, and the 2.00 Ω resistor. Our loop will be counterclockwise. Since this traverses from the negative to the positive terminal of the battery, the potential difference across the battery will be positive. The loop direction is also the same direction as the two currents in the loop, so the potential differences across the resistors will be negative. This gives

(2) $12.0\text{ V} - (2.00\ \Omega)I_3 - (4.00\ \Omega)I_1 = 0.$

We'll apply the loop rule again to the bottom loop, consisting of the 8.46 V battery, the 6.42 Ω resistor, and the 2.00 Ω resistor. Again we choose a counterclockwise direction. This means the potential difference across the battery will be positive and, because we travel in the same direction as I_2, the potential difference across the 6.42 Ω resistor is negative. However, because our loop is in the opposite direction of I_3, the potential difference across the 2.00 Ω resistor is positive. Therefore,

(3) $8.46\text{ V} - (6.42\ \Omega)I_2 + (2.00\ \Omega)I_3 = 0.$

We now have 3 equations and 3 unknowns, and we wish to solve for I_3. Substituting equation (1) into equation (2) and solving for I_2 gives

$$\begin{aligned} 12.0\text{ V} - (2.00\ \Omega)I_3 - (4.00\ \Omega)(I_2 + I_3) &= 0 \\ 12.0\text{ V} - (6.00\ \Omega)I_3 - (4.00\ \Omega)I_2 &= 0 \\ \text{(4)} \qquad I_2 &= 3.00\text{ A} - 1.50 I_3. \end{aligned}$$

Substituting equation (4) into equation (3) and solving for I_3 gives

$$\begin{aligned} 8.46\text{ V} - (6.42\ \Omega)(3.00\text{ A} - 1.50 I_3) + (2.00\ \Omega)I_3 &= 0 \\ -10.8\text{ V} + (11.6\ \Omega)I_3 &= 0 \\ I_3 &= \frac{10.8\text{ V}}{11.6\ \Omega} = 0.929\text{ A}. \end{aligned}$$

Note that our answer is positive, which means the current I_3 does in fact flow in the direction we supposed in our diagram.

(b) To find the potential difference $V_b - V_a$, we traverse a path from point *a* to point *b* on the circuit, finding the potential difference across each element. We can choose multiple paths, but since we found I_3 above, let's choose the path along the middle branch, through the 2.00 Ω resistor—the only element along this path. Since the path is in the same direction as I_3, the potential difference across the resistor is negative, so

$$V_b - V_a = -I_3(2.00\ \Omega) = -(0.929\ \text{A})(2.00\ \Omega) = -1.86\ \text{V}.$$

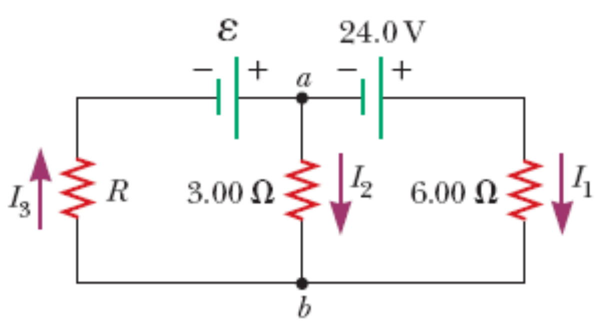
Need Help? Read It

---

9. 4/4 points Previous Answers **SERCP11 18.4.OP.022.**

My Notes Ask Your Teacher

A lab assistant is attempting to determine the currents through each branch of the circuit in the figure below. The assistant has assumed the currents are in the directions shown in the figure. The assistant has found that the current I_1 is 3.32 A and the values of $\mathcal{E}$ and *R* are unknown.



What is the magnitude of the current I_2 (in A)?

1.36 ✓ 1.36 A

Does the direction of the current I_2 match the direction shown in the figure?

- Yes, I_2 points in the direction shown.
- No, I_2 points opposite to the direction shown. (selected)
- The magnitude of I_2 is zero, so there is no direction.

What is the magnitude of the current I_3 (in A)?

1.96 ✔ 1.96 A

Does the direction of the current I_3 match the direction shown in the figure?

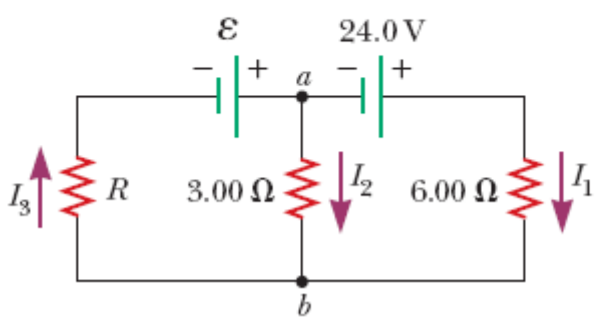
- (●) Yes, I_3 points in the direction shown.
- ( ) No, I_3 points opposite to the direction shown.
- ( ) The magnitude of I_3 is zero, so there is no direction.

✔

Solution or Explanation

Note: We are displaying rounded intermediate values for practical purposes. However, the calculations are made using the unrounded values.

Consider the following image.



We will apply Kirchhoff's loop and junction rules to get equations that allow us to solve for the currents I_2 and I_3. We'll apply the loop rule to the right half of the circuit—that is, the loop that starts at point *a*, goes clockwise, and returns to point *a* through the center branch with the 3.00 Ω resistor.

Note our chosen loop direction gives us a positive 24.0 V across the battery, a negative potential difference across the 6.00 Ω resistor (in the direction of I_1), and a positive potential difference across the 3.00 Ω resistor (in the opposite direction of I_2).

$$24.0\text{ V} - (6.00\ \Omega)I_1 + (3.00\ \Omega)I_2 = 0$$

Substituting I_1 = 3.32 A and solving for I_2 gives

$$\begin{aligned} 24.0\text{ V} - (6.00\ \Omega)(3.32\text{ A}) + (3.00\ \Omega)I_2 &= 0 \\ 4.08\text{ V} + (3.00\ \Omega)I_2 &= 0 \\ I_2 &= -\frac{4.08\text{ V}}{3.00\ \Omega} = -1.36\text{ A} \end{aligned}$$

The magnitude of I_2 is then 1.36 A. The negative sign of the current tells us that the direction of I_2 is opposite of what is drawn in the figure. That is, the (conventional) current I_2 actually flows from *b* to a through the 3.00 Ω resistor.

Using the drawn direction of I_2, we next apply the junction rule to point *a* (or to point *b*). This gives the equation

$$I_3 = I_1 + I_2.$$

Substituting values gives

$$I_3 = 3.32 \text{ A} - 1.36 \text{ A} = 1.96 \text{ A}.$$

The positive sign indicates that the current I_3 does flow in the direction indicated in the figure.

Alternatively, since we now know that current I_2 flows opposite of the indicated direction, we note that both I_3 and I_2 flow into junction a while I_1 flows out. Using the magnitude of I_2, we could write

$$I_3 + \left|I_2\right| = I_1.$$

The result is the same.

Need Help? Read It

---

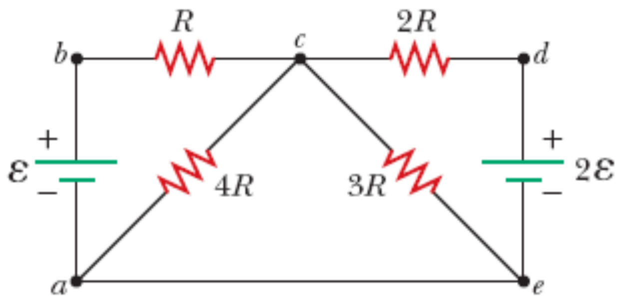
10. 1/2 points Previous Answers **SERCP11 18.4.P.021.**

My Notes Ask Your Teacher

Taking R = 1.60 kΩ and $\mathscr{E}$ = 190 V in the figure shown below, determine the magnitude and direction of the current in the horizontal wire between *a* and *e*.

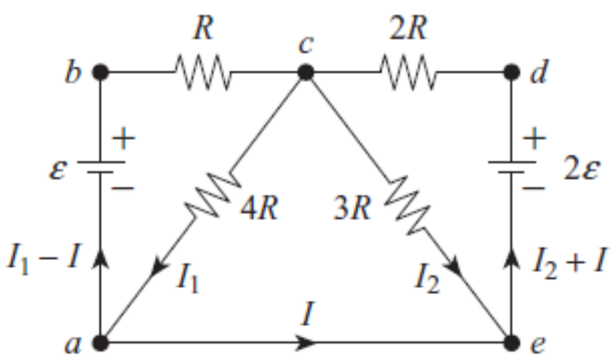
magnitude 2.38 ✗ 23.7
Your response is off by a multiple of ten. mA

direction from *a* to *e* ✓ from *a* to *e*



Solution or Explanation

Consider the circuit diagram below, in which Kirchhoff's junction rule has already been applied at points *a* and *e*.



Applying the loop rule around loop *abca* gives

$$\mathcal{E} - R(I_1 - I) - 4RI_1 = 0 \text{ or } I_1 = \frac{1}{5}\left(\frac{\mathcal{E}}{R} + I\right). \quad \textbf{[1]}$$

Next, applying the loop rule around loop *cedc* gives

$$-3RI_2 + 2\mathcal{E} - 2R(I_2 + I) = 0 \text{ or } I_2 = \frac{2}{5}\left(\frac{\mathcal{E}}{R} - I\right). \quad \textbf{[2]}$$

Finally, applying the loop rule around loop *caec* gives

$$-4RI_1 + 3RI_2 = 0 \text{ or } 4I_1 = 3I_2. \quad \textbf{[3]}$$

Substituting Equations [1] and [2] into Equation [3] yields $I = \frac{\mathcal{E}}{5R}$.

Thus, if $\mathcal{E}$ = 190 V and R = 1.60 kΩ = 1.60×10^3 Ω, the current in the wire between a and e is

$$I = \frac{190\text{ V}}{5(1.60 \times 10^3\ \Omega)} = 2.37 \times 10^{-2}\text{ A} = 23.7\text{mA}$$ flowing from a toward e.

Need Help? Read It

11. 2/2 points Previous Answers **SERCP11 18.CQ.001.**

My Notes Ask Your Teacher

Choose the words that make each statement correct.

HINT

(a) When two or more resistors are connected in series, the equivalent resistance is always greater than ✓ greater than any individual resistance.

(b) When two or more resistors are connected in parallel, the equivalent resistance is always less than ✓ less than The most common mistake in calculating the equivalent resistance for resistors in parallel is to forget to invert the answer after summing the reciprocals. Don't forget to flip it! any individual resistance.

Solution or Explanation

(a) When two or more resistors are connected in series, the equivalent resistance is always **greater than** any individual resistance. For a series combination of resistors,

$$R_{eq} = R_1 + R_2 + R_3 + \ldots$$

Each individual resistance is positive so that R_{eq} must be larger than any individual resistance.

(b) When two or more resistors are connected in parallel, the equivalent resistance is always **less than** any individual resistance. For a parallel combination of resistors,

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$$

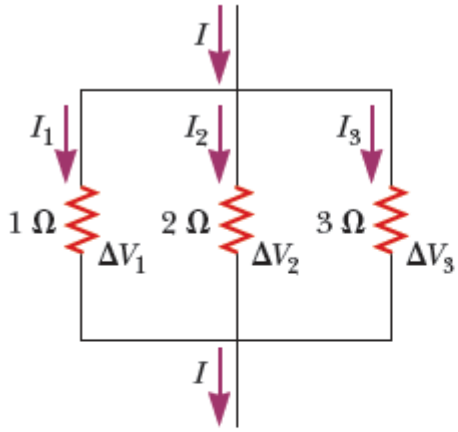
Each individual resistance is positive so that R_{eq} must be smaller than any individual resistance.

Need Help? Read It

12. 1/1 points Previous Answers **SERCP11 18.CQ.005.**

My Notes Ask Your Teacher

Electric current I enters a node with three resistors connected in parallel (see the figure below).



HINT

Which one of the following is correct?

- $I_2 > I_1$ and $I_2 > I_3$
- $I_1 = I$ and $I_2 = I_3 = 0$
- $\Delta V_1 < \Delta V_2 < \Delta V_3$
- $I_1 > I_2 > I_3 > 0$

You may have heard the statement, "Current takes the path of least resistance." For a parallel combination of resistors, an accurate version of that statement would be, "Electric current takes all available paths, and the most current follows the path of least resistance."

Solution or Explanation

The correct choice is $I_1 > I_2 > I_3 > 0$. For a parallel combination of resistors, current follows all paths. The most current travels in the path of least resistance and, in general, the current in each path is inversely proportional to the path's resistance.

Need Help? Read It

Home My Assignments Request Extension