CENGAGE | WEBASSIGN

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← **PHYS 2401, section 201, Summer 2 2022**

Currents and Circuits (Homework)

🎓 **INSTRUCTOR**

Keith West
Texas Tech University

Current Score

QUESTION	1	2	3	4	5	6	7	8	9	10	11	12
POINTS	–/3	–/1	–/1	–/1	–/1	–/1	–/2	–/2	–/1	–/6	–/17	–/3

TOTAL SCORE

–/39	**0.0%**

Due Date

THU, AUG 4, 2022
11:58 PM CDT

📅 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.

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1. **[–/3 Points]**   DETAILS   SERPSE10 26.1.OP.003.MI.

MY NOTES   ASK YOUR TEACHER   PRACTICE ANOTHER

The electron beam emerging from a certain high-energy electron accelerator has a circular cross section of radius **1.65** mm.

(a) The beam current is **8.05** µA. Find the current density in the beam assuming it is uniform throughout.

[   ] A/m^2

(b) The speed of the electrons is so close to the speed of light that their speed can be taken as 300 Mm/s with negligible error. Find the electron density in the beam.

[   ] m^{-3}

(c) Over what time interval does Avogadro's number of electrons emerge from the accelerator?

[   ] s

Need Help?   [Read It]   [Master It]

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2. [–/1 Points]   DETAILS   SERPSE10 26.2.P.010.MI.

MY NOTES   ASK YOUR TEACHER   PRACTICE ANOTHER

A wire 50.0 m long and 2.00 mm in diameter is connected to a source with a potential difference of 9.11 V, and the current is found to be 5.20 A. Assume a temperature of 20.0°C and, using this table, identify the metal out of which the wire is made.

- ○ copper
- ○ gold
- ○ iron
- ○ aluminum
- ○ tungsten
- ○ platinum
- ○ lead
- ○ silver

Need Help?   Read It   Master It

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3. [–/1 Points]   DETAILS   SERPSE10 26.2.P.011.

MY NOTES   ASK YOUR TEACHER   PRACTICE ANOTHER

An electric heater carries a current of 18.5 A when operating at a voltage of 120 V. What is the resistance of the heater?

[   ] Ω

Need Help?   Read It

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4. **[–/1 Points]**   **DETAILS**   **SERPSE10 26.3.P.015.**

MY NOTES   **ASK YOUR TEACHER**   **PRACTICE ANOTHER**

A current density of 4.50×10^{-13} A/m^2 exists in the atmosphere at a location where the electric field is 176 V/m. Calculate the electrical conductivity of the Earth's atmosphere in this region.

[   ] $(\Omega \cdot m)^{-1}$

Need Help?   **Read It**

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5. **[–/1 Points]**   **DETAILS**   **SERPSE10 26.4.P.017.**

MY NOTES   **ASK YOUR TEACHER**   **PRACTICE ANOTHER**

What is the fractional change in the resistance of an iron filament when its temperature changes from 24.6°C to 52.6°C?

$$\frac{R - R_0}{R_0} = [\qquad\qquad]$$

Need Help?   **Read It**

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6. **[–/1 Points]**   **DETAILS**   **SERPSE10 26.4.OP.012.**

MY NOTES   **ASK YOUR TEACHER**   **PRACTICE ANOTHER**

A silver wire has a resistance of 5.50 Ω at 11.0°C. Determine its resistance (in Ω) at 411°C. The temperature coefficient of resistivity for silver wire is 3.80×10^{-3} (°C)$^{-1}$. (Assume that the temperature coefficient of resistivity was measured using the reference temperature 20°C.)

[   ] Ω

Need Help?   **Read It**

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7. [–/2 Points] | DETAILS | **SERPSE10 26.6.OP.018.**

| MY NOTES | | ASK YOUR TEACHER | | PRACTICE ANOTHER |

A coffee maker is rated at 0.75 kW when connected to a 120 V source.

(a)   What current (in A) does the coffee maker carry?

[   ] A

(b)   What is its resistance (in Ω)?

[   ] Ω

Need Help? | Read It |

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8. [–/2 Points] | DETAILS | **SERPSE10 27.1.OP.001.MI.**

| MY NOTES | | ASK YOUR TEACHER | | PRACTICE ANOTHER |

A battery has an emf of 15.0 V. The terminal voltage of the battery is 9.8 V when it is delivering 22.0 W of power to an external load resistor R.

(a) What is the value of R?

[   ] Ω

(b) What is the internal resistance of the battery?

[   ] Ω

Need Help? | Read It | | Master It |
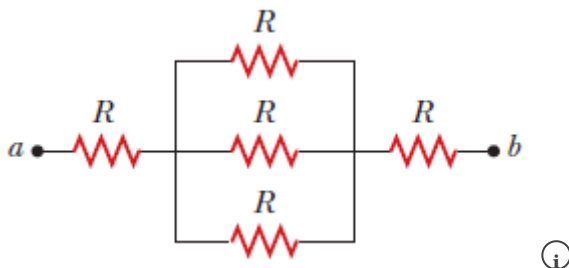
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9. **[–/1 Points]**   DETAILS   **SERPSE10 27.2.OP.005.**

MY NOTES   ASK YOUR TEACHER

Consider the combination of resistors shown in the figure. What is the equivalent resistance between points a and b? (Enter your answer as a multiple of R.)

[_____] R

Need Help?   Read It

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10. **[–/6 Points]**   DETAILS   SERPSE10 27.2.OP.010.

MY NOTES   ASK YOUR TEACHER   PRACTICE ANOTHER

Consider the combination of resistors shown in the figure below.
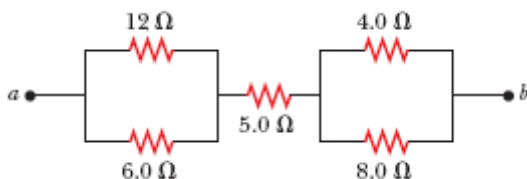
(a) Calculate the equivalent resistance (in Ω) between points *a* and *b*.

Ω

(b) If a voltage of 44.0 V is applied between points *a* and *b*, find the current (in A) in each resistor.

12 Ω   A
6.0 Ω   A
5.0 Ω   A
4.0 Ω   A
8.0 Ω   A

Need Help?   Read It

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11. **[–/17 Points]** | DETAILS | SERPSE10 27.3.OP.017.MI.SA.
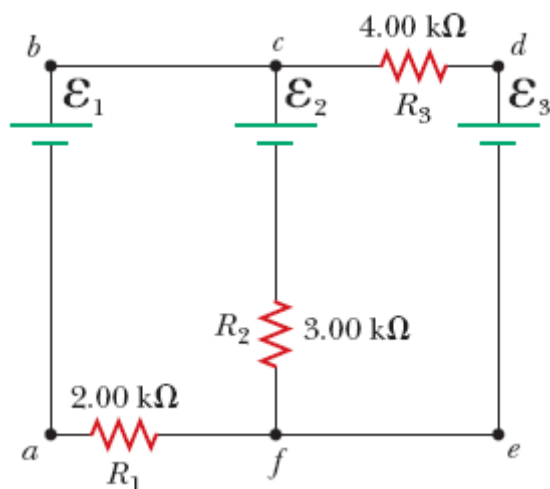
| MY NOTES | | ASK YOUR TEACHER | | PRACTICE ANOTHER |

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Tutorial Exercise

Using Kirchhoff's rules, find the following. ($\mathcal{E}_1$ = 70.7 V, $\mathcal{E}_2$ = 60.5 V, and $\mathcal{E}_3$ = 79.5 V.)

(a) the current in each resistor shown in the figure above

(b) the potential difference between points *c* and *f*

Need Help? | Read It |
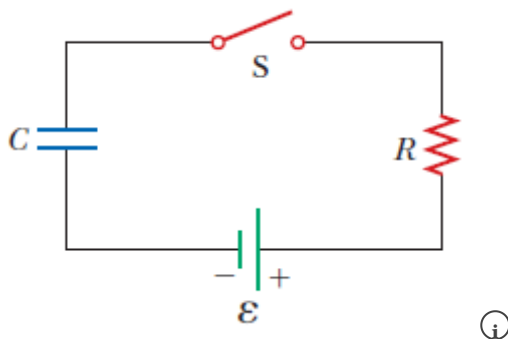
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12. **[–/3 Points]**   DETAILS   **SERPSE10 27.4.OP.021.**

MY NOTES   ASK YOUR TEACHER   PRACTICE ANOTHER

Consider a series RC circuit as in the figure below for which R = 8.00 MΩ, C = 1.00 µF, and $\mathcal{E}$ = 27.0 V.

(a) Find the time constant of the circuit.

[_____] s

(b) What is the maximum charge on the capacitor after the switch is thrown closed?

[_____] µC

(c) Find the current in the resistor 10.0 s after the switch is closed.

[_____] µA

Need Help?   [Read It]   [Watch It]

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