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← **202010-A-10228-PHYS-122-University Physics 2-06(Lecture), Fall 2020**

Chapter 26 - Homework: Current and Resistance (Homework)

🎓 INSTRUCTOR

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Current Score

QUESTION	1	2	3	4	5	6	7	8	9	10
POINTS	1/1 ✓	1/1 ✓	1/1 ✓	1/1 ✓	1/1 ✓	1/1 ✓	1/1 ✓	1/1 ✓	1/1 ✓	1/1 ✓

TOTAL SCORE

10/10	**100.0%**

Due Date   Past Due

SAT, OCT 17, 2020
11:59 PM GMT+4

📅 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]   [🔍 View Key]

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1. **[1/1 Points]**   [DETAILS]   [PREVIOUS ANSWERS]   **SERPSE10 26.1.OP.002.**

[MY NOTES]   [ASK YOUR TEACHER]   [PRACTICE ANOTHER]

Particles with a charge of $+5e$ are incident on a target. If the beam of particles carries a current of 110 µA, how many particles strike the target in a period of 27.0 s?

[3.7e15] ✔   particles

Need Help?   [Read It]

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2. **[1/1 Points]**   [DETAILS]   [PREVIOUS ANSWERS]   **SERPSE10 26.1.P.001.MI.**

[MY NOTES]   [ASK YOUR TEACHER]   [PRACTICE ANOTHER]

A 260-km-long high-voltage transmission line 2.00 cm in diameter carries a steady current of $1,020$ A. If the conductor is copper with a free charge density of 8.50×10^{28} electrons per cubic meter, how many

years does it take one electron to travel the full length of the cable? (Use 3.156×10^7 for the number of seconds in a year.)

34.51 ✓ yr

Need Help? [Read It] [Master It]

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3. **[1/1 Points]** [DETAILS] [PREVIOUS ANSWERS]   **SERPSE10 26.1.P.009.**

[MY NOTES] [ASK YOUR TEACHER] [PRACTICE ANOTHER]

An electric current in a conductor varies with time according to the expression $I(t) = 120 \sin(135\pi t)$, where I is in amperes and t is in seconds. What is the total charge passing a given point in the conductor from $t = 0$ to $t = 1/180$ s?

0.48 ✓ C

Need Help? [Read It] [Watch It]

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4. **[1/1 Points]** [DETAILS] [PREVIOUS ANSWERS]   **SERPSE10 26.2.OP.005.**

[MY NOTES] [ASK YOUR TEACHER] [PRACTICE ANOTHER]

(a) A lightbulb has a resistance of 210 Ω when operating with a potential difference of 150 V across it. What is the current in the lightbulb (in mA)?

714 ✓ mA

(b) **What If?** What would be the current in the lightbulb (in mA) if it were used in Barbados, where the potential difference across it would be 115 V?

547.6 ✓ mA

Need Help? [Read It] [Watch It]

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5. **[1/1 Points]** | DETAILS | | PREVIOUS ANSWERS | **SERPSE10 26.2.OP.008.**

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

The heating coil in a coffee maker is made of nichrome wire with a radius of 0.225 mm. If the coil draws a current of 8.80 A when there is a 120 V potential difference across its ends, find the following. (Take the resistivity of nichrome to be 1.50×10^{-6} $\Omega \cdot$ m.)

(a)   resistance of the coil (in Ω)

    13.64   ✔ Ω

(b)   length of wire used to wind the coil (in m)

    1.45   ✔   m

Need Help? | Read It |

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6. **[1/1 Points]** | DETAILS | | PREVIOUS ANSWERS | **SERPSE10 26.2.P.012.CTX.**

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

You are working at a company that manufactures electrical wire. Gold is the most ductile of all metals: it can be stretched into incredibly long, thin wires. The company has developed a new technique that will stretch 1.80 g of gold into a wire of length L = 2.38 km and uniform diameter. Your supervisor gives you the task of determining the resistance of such a wire (in MΩ) at 20.0°C. (The density of gold is 19.3×10^3 kg/m^3.)

1.48   ✔   MΩ

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7. **[1/1 Points]**   DETAILS   PREVIOUS ANSWERS   **SERPSE10 26.4.OP.011.**

MY NOTES   ASK YOUR TEACHER   PRACTICE ANOTHER

An advanced lab student is studying the effect of temperature on the resistance of a current carrying wire. She applies a voltage to a tungsten wire at a temperature of 61.0°C and notes that it produces a current of 1.20 A. If she then applies the same voltage to the same wire at −88.0°C, what current should she expect (in A)? The temperature coefficient of resistivity for tungsten is 4.50×10^{-3} (°C)$^{-1}$. (Assume that the reference temperature is 20°C.)

2.77 ✔ A

Need Help? [Read It]

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8. [1/1 Points]   DETAILS   PREVIOUS ANSWERS   **SERPSE10 26.4.P.019.MI.**

MY NOTES   ASK YOUR TEACHER   PRACTICE ANOTHER

An aluminum wire with a diameter of 0.105 mm has a uniform electric field of 0.195 V/m imposed along its entire length. The temperature of the wire is 35.0°C. Assume one free electron per atom.

(a) Use the information in this Table of Resistivities and Temperature Coefficients to determine the resistivity (in $\Omega \cdot$ m) of aluminum at this temperature.

$\rho = $ 2.985e-8 ✔️ $\Omega \cdot$ m

(b) What is the current density (in MA/m²) in the wire?

$J = $ 6.53 ✔️ MA/m²

(c) What is the total current (in mA) in the wire?

$I = $ 56.6 ✔️ mA

(d) What is the drift speed of the conduction electrons?

$v_d = $ 677 ✔️ μm/s

(e) What potential difference must exist between the ends of a 1.70 m length of the wire to produce the stated electric field?

$\Delta V = $ 0.332 ✔️ V

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9. [1/1 Points]   DETAILS   PREVIOUS ANSWERS   **SERPSE10 26.6.OP.017.**

MY NOTES   ASK YOUR TEACHER   PRACTICE ANOTHER

A turbine of a coal burning installation delivers 1,500 hp of mechanical energy to a generator. The generator then converts 80.0% of the mechanical energy into electrical energy. If the terminal potential difference of the generator is 1650 V, what current does it deliver (in A)?

542 ✓   A

Need Help? [Read It]

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10. **[1/1 Points]**   [DETAILS]   [PREVIOUS ANSWERS]   **SERPSE10 26.6.OP.020.MI.**

[MY NOTES]   [ASK YOUR TEACHER]   [PRACTICE ANOTHER]

(a) A well-insulated electric water heater warms 107 kg of water from 20.0°C to 43.0°C in 29.0 min. Find the resistance (in Ω) of its heating element, which is connected across a 240 V potential difference.

9.73 ✓   Ω

(b) **What If?** How much additional time (in min) would it take the heater to raise the temperature of the water from 43.0°C to 100°C?

71.9 ✓   min

(c) What would be the total amount of time (in min) required to evaporate all of the water in the heater starting from 20.0°C?

779.4 ✓   min

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