

Ch 26 HW Assignment: Answers & HW Hints (Pt. 1)

**Part 1: Electric Current, Current Density,
& Drift Speed**

Pg. 700-701 #1-2, 4-5, 7-9

Answers

1a. 1200C

b. 7.5×10^{21} electrons

2. 0.0056 s

4a. 2.44×10^{-5} A/m²

b. 1.8×10^{-15} m/s

5. 0.038 cm

7a. 6.4 A/m²

b. North

c. Cross-sec area

8a. Yes, because...

b. 397 A/m²

9. 13.5 min

Ch 26 #2

A couple weird things to consider here...

1. There are currents flowing into the sphere and also out of it. Just think in terms of the net charge carried into the sphere every second.
2. The current is somehow responsible for increasing the sphere's potential. This works by realizing the current is depositing charge on the sphere, and more charge on the sphere means more potential. ($V=kQ/r$). So start the problem by calculating the additional charge needed to increase V by $1000V$, then see how much time this requires.

Ch 26 #9

This one asks for time required for electrons to physically travel some distance, so you need to think in terms of how fast the electrons are actually progressing through the wire, which is their drift speed. Then it's just a simple $v=d/t$ problem to finish things off.

Ch 26 HW Assignment: Answers & HW Hints (Pt. 2)

**Part 2: Resistance, Resistivity, and
Ohm's Law**

Pg. 701-702 #16, 18-20, 23, 27, 29, 31

Answers

16a. 1533 A

b. $5.42 \times 10^7 \text{ A/m}^2$

c. $1.06 \times 10^{-7} \Omega\text{m}$

d. Platinum

18. $2R$, because...

19. 2.4Ω

20. 100V

23. 3.0 (Show work!)

27. 335nC

29. $8.21 \times 10^{-4} \Omega\text{m}$

31a. 0.0383 A

b. 109.4 A/m^2

c. 0.013 m/s

d. 226.6 V/m

Ch 26 #19

Because there's a coil, be careful about the two different diameter/radius measurements you're told. One tells you the size of the cross-sectional area, and the other one tells you the size of the loops that are formed. The latter info is helpful to figure out how long the wire is, since its total length is just 250 times the length around one loop.

Ch 26 #23

You're eventually looking for the ratio R_A/R_B , so start by considering an expression for this ratio, in terms of the areas of the two wires, since that's all that differs between the two wires. Then you just need to find the two cross-sectional areas. The first one's a piece of cake. The second one is just found by taking the area it would have if it were solid, and subtracting the 'missing' area that's not there because it's hollow.

Ch 26 HW Assignment: Answers & HW Hints (Pt. 3)

Part 3: Electric Power

Pg. 702-703 #38-43, 45, 49, 51, 52

Answers

38. 14,000 C

39a. 1029 J/s

b. \$0.26

40a. Up, because...

b. $1.92 \times 10^{-18} \text{ J}$

c. $1.92 \times 10^{-18} \text{ J}$

41. 0.135 W

42. 11.1 Ω

43a. 10.87 A

b. 10.58 Ω

c. $4.5 \times 10^6 \text{ J}$

45. 2.5 min

49a. 5.85 m

b. 10.4 m

51a. \$4.47

b. 144 Ω

c. 0.83 A

52a. 0.0169 V/m

b. 243 J

Ch 26 #40

For part B, you need to remember the old relationship between energy and the voltage through which a charge is moved: $W = -qV$. Then for part C, it should make sense that you get the same answer because the charge is losing that amount of potential energy as it moves through the resistor, but the potential energy isn't being converted to kinetic energy, but instead to thermal energy.

Ch 26 #45

This one's maybe just worded a little weird. You can start by finding the rate at which energy is supplied (power) for one hot dog, because the problem tells you that value won't change at all even when you're cooking three hot dogs. Then to solve, it should make sense that the energy required triples when you're cooking three hot dogs, so just use power and energy ideas to find the time to supply three times as much energy.

Ch 26 #49

It's worth noting that the answer to part B isn't just $\frac{4}{3}$ as much as the answer to A, even though the resistor is being supplied with $\frac{4}{3}$ the original voltage. You should make sure you understand *why* this is the case.

Ch 26 #52

On part A, you should see right away that you've got to do some sort of two-step solving to find the E-field. The easiest way is to remember the formula $E=\rho J$, and just find J real quick-like.

For part B, you again need multiple steps, and there are a few different ways to go. You've got to find power so that you can calculate energy dissipated, but how to find power? The easiest way is to remember that $E=-V/d$, find V, and then finish with power ideas.