This print-out should have 7 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Please notice that for your homework to be considered towards your grade, it needs to be submitted one hour before the corresponding recitation starts. Work submitted after this time, but before the DUE DATE on top of this page, will be accepted but not graded.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

Current in a Conductor 01

27:01, calculus, numeric, > 1 min, normal.

001

The current

$$I = a\,t^2 - b\,t + c$$

in a section of a conductor depends on time.

What quantity of charge moves across the section of the conductor from $t = 0$ to $t = t_1$?

1. $q = a\,t_1^3 - \dfrac{b}{2}\,t_1^2 + c\,t_1$

2. $q = a\,t_1^2 - b\,t_1 + c$

3. $q = a\,t_1^3 - b\,t_2 + c\,t_1$

4. $q = \dfrac{a}{3}\,t_1^3 - \dfrac{b}{2}\,t_1^2 + c\,t_1$

5. $q = \dfrac{a}{3}\,t_1^3 - \dfrac{b}{2}\,t_1^2 + c$

002

If I is in A, and $a = 2$ C/s^3, $b = 3$ C/s^2, and $c = 7$ C/s, what quantity of charge moves across the section of the conductor from $t_1 = 2$ s to $t_2 = 4$ s? Answer in units of C.

Drift Speed in Copper Wire

27:02, trigonometry, numeric, > 1 min, normal.

003

Calculate the average drift speed of electrons traveling through a copper wire with a cross-sectional area of 5.261 mm^2 when carrying a current of 20 A (values similar to those for the electric wire to your study lamp). Assume one electron per atom of copper contributes to the current. The atomic mass of copper is 63.5 g/mol and its density is 8.93 g/cm^3. Avogadro's number N_A is 6.02×10^{23}. Answer in units of m/s.

Current in Tungsten Wire

27:04, trigonometry, numeric, > 1 min, normal.

004

A 0.9 V potential difference is maintained across a 1.5 m length of tungsten wire that has a cross-sectional area of 0.6 mm^2 and the resistivity of the tungsten is 5.6×10^{-8} $\Omega \cdot$ m.

What is the current in the wire? Answer in units of A.

Lengthening a Wire 02

27:03, trigonometry, numeric, > 1 min, normal.

005

A wire with a resistance R is lengthened to 1.25 times its original length by pulling it through a small hole.

Find the resistance of the wire after it is stretched. Answer in units of R.

Electric Heater

27:10, trigonometry, numeric, > 1 min, normal.

006

An electric heater operating at full power draws a current of 8 A from a 110 V circuit.

What is the resistance of the heater? Answer in units of Ω.

007

Assuming constant R, how much current should the heater draw in order to dissipate 750 W? Answer in units of A.