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

001 (part 1 of 2) 10.0 points
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. \( q = \frac{a}{3} t_1^3 - \frac{b}{2} t_1^2 + c \)
2. \( q = a t_1^2 - b t_1 + c \)
3. \( q = a t_1^3 - b t_2 + c t_1 \)
4. \( q = \frac{a}{3} t_1^3 - \frac{b}{2} t_1^2 + c t_1 \)
5. \( q = a t_1^3 - \frac{b}{2} t_1^2 + c t_1 \)

002 (part 2 of 2) 10.0 points
If \( I \) is in A, and \( a = 2 \text{ C/s}^2 \), \( b = 3 \text{ C/s}^2 \), and \( c = 15 \text{ C/s} \), what quantity of charge moves across the section of the conductor from \( t_1 = 2 \text{ s} \) to \( t_2 = 4 \text{ s} \)? Answer in units of C.

003 10.0 points
Calculate the average drift speed of electrons traveling through a copper wire with a cross-sectional area of 90 mm\(^2\) when carrying a current of 60 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 \( 6.02 \times 10^{23} \). Answer in units of m/s.

004 10.0 points
A wire with a resistance \( R \) is lengthened to 6.53 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 \( R \).

005 10.0 points
A 0.59 V potential difference is maintained across a 2.2 m length of tungsten wire that has a cross-sectional area of 0.47 mm\(^2\) and the resistivity of the tungsten is \( 5.6 \times 10^{-8} \text{ Ω} \cdot \text{m} \).

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

006 (part 1 of 2) 10.0 points
An electric heater operating at full power draws a current of 15.3 A from a 188 V circuit.

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

007 (part 2 of 2) 10.0 points
Assuming constant \( R \), how much current should the heater draw in order to dissipate 1120 W? Answer in units of A.