

S11 PHY114 Problem Set 5

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1. Recall that the resistance R of a wire is proportional to its length L and inversely proportional to its cross-sectional area A ; i.e., $R = \rho \frac{L}{A}$. The constant ρ is the resistivity of the material making up the wire. Copper has a resistivity of $17n\Omega m$. Household Copper wire has a diameter of $1.6mm$. Find the voltage drop across a $26m$ length of this wire carrying a $12A$ current.
2. What is the total resistance of the electrical network shown in the Figure 1?
3. Two Capacitors C_1 and C_2 and two resistors R_1 and R_2 are connected in series. Starting from an uncharged state, how long does it take for the current to drop to half its initial value?
4. Find the equivalent resistance of an infinite ladder of resistors, each equal to 1Ω , as in the Figure 2. That is, find a single resistor connecting points A and B which is equivalent to the whole infinite ladder.

