Quiz for Lesson 3,4

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Electronic Circuits 1
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Name: _____ Student ID: _____

Prob. 1

Determine the unit for each of following quantities. Give your answers in terms of V (Volt), cm, sec. and C (Coulomb).

(a) Electric field

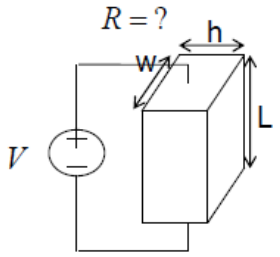
(b) Current density

(c) resistivity

(d) Diffusion constant

Prob. 2

A piece of Si shown below is uniformly doped with 10^{15} cm^{-3} B atoms at room temperature. What is its resistance in Ohms? Assume the electron mobility in Si is 1500 cm^2 / (V x sec) and the hole mobility is 500 cm^2 / (V x sec). Use q = 1.6 x 10^{-19} C. L = 100 μm, h = 5 μm and w = 10 μm.



Prob. 3

What is the expression for the total current density in a semiconductor? Consider both diffusion and drift currents.

Prob. 4

When P-side and N-side in a PN junction are externally connected by a wire with no resistance, there is no current flowing through the wire. Does this mean there is no current flow at all inside the PN junction? Give a brief explanation.

Prob. 5

A PN junction is made up of 10^{16} cm^{-3} P-type Si and 10^{16} cm^{-3} N-type Si. Which side (P or N) has the higher potential? Briefly explain why.

Prob. 6

Determine the built-in potential for the PN junction given in Prob. 2 at room temperature. Use V_T = 25mV and ln(10) = 2.3.