Name:_____

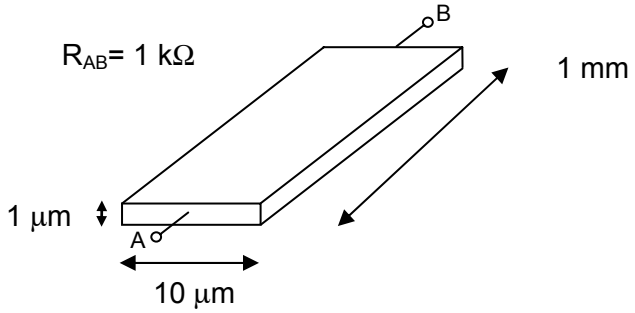
Student ID #:_____

ECE 113A
Homework #2
Due 10 A.M. Wednesday, October 15, 2003

Please *staple* this sheet to the front of your homework.

1a	1b	2a	2b	2c	2d	3a	3b	Total
/10	/10	/15	/15	/15	/15	/10	/10	/100

1) A thin metal film resistor as shown in the figure below has a resistance of 1 kΩ. It is 1 mm long, 10 μm wide, and 1 μm thick.
   a. Calculate the resistivity (ρ), in units of Ω-m.
   b. Now express the resistivity in units of μΩ-cm, a more common unit.



2) For Si at 300 K, do the following: (Use cm^{-3} as your units.)

   a. $N_D = 10^{17}$ cm^{-3}; $N_A << N_D$. Calculate the equilibrium electron concentration (n) and hole concentration (p).
   b. $N_D = 10^{15}$ cm^{-3}; $N_A << N_D$. Calculate the equilibrium electron concentration (n) and hole concentration (p).
   c. $N_A = 5x10^{17}$ cm^{-3}; $N_D << N_A$. Calculate the equilibrium electron concentration (n) and hole concentration (p).
   d. $N_A = 10^{14}$ cm^{-3}; $N_D << N_A$. Calculate the equilibrium electron concentration (n) and hole concentration (p).

3) For the silicon sample at T= 300 K shown below, given $N_D = 10^{17}$ cm^{-3}, $N_A << N_D$,
   a. Find the resistivity ρ of the Si to within 10%. For units, use Ω-cm.
      (You may use figure 3.8 from the text.)
   b. Calculate the resistance R_{AB} in units of Ω, for the following geometry: