6.730 PHYSICS FOR SOLID STATE APPLICATIONS

Department of Electrical Engineering and Computer Science
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PROBLEM SET 7

Issued: 4-19-00 Due: 4-26-00, at the beginning of class.

Readings:
PSSA Chapter 9 and 10

Problem 7.1 Ring around the Work Function.

Problem 7.2

An abrupt heterojunction is constructed from two semiconductors having the following data:

	Semiconductor 1	Semiconductor 2
Electron Affinity	2.0 eV	2.5 eV
Band gap	1.8 eV	1.1 eV
Doping	$N_A = 10^{17}\,\mathrm{cm}^{-3}$	$N_D = 10^{15}\,\mathrm{cm}^{-3}$
$N_V = N_C$	$10^{19}\,\mathrm{cm}^{-3}$	$10^{18}\,\mathrm{cm}^{-3}$

Make a sketch of the bands at equilibrium. Show important features of the band structure in the vicinity of the junction, and show the position of the Fermi level relative to the band structure in each semiconductor.

Problem 7.3 *Intrinsic and Extrinsic Semiconductors*

Do Excercises 11.3. 11.8 and 11.9 in SSS.

Problem 7.4 *Electrons and Holes*

Do excercise 12.1 in SSS and also compare the "approx" solution which is known as the depletion approximation.