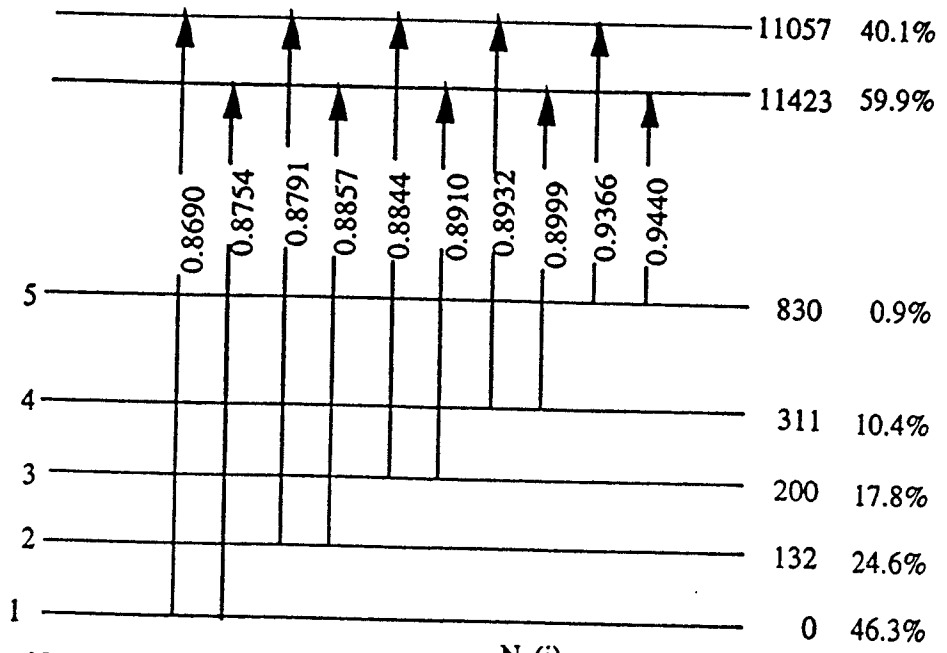
ECE 476/576

HW #8

10.3



$N_1(5) + N_1(4) + N_1(3) + N_1(2) + N_1(1) = N_1$; $\frac{N_1(j)}{N_1(1)} = e^{-\Delta E_j/kT}$; $\therefore N_1(1) = 0.463\ N_1$.

Note that all wavelengths are in the region for semiconductor laser pumping.

10.18

The energy stored in the gas before lasing: E = [N] (2300 + 2200 + 2100 + 2000 = 8600 [N] (E in cm^{-1}). After lasing, all populations are equal. E = [N]/5) ( ) = 1720 [N] (E in cm^{-1}); $\Delta E \rightarrow$ stimulation emission – 6480 (cm^{-1}).

For [N] = $2.69\times10^{+19}$ cm^{-3} (Standard Temperature and Pressure),

$\Delta E = (1.743\times10^{+23})\times($ E in $cm^{-1})/cm^3 \rightarrow 3.46$ J/cm^3