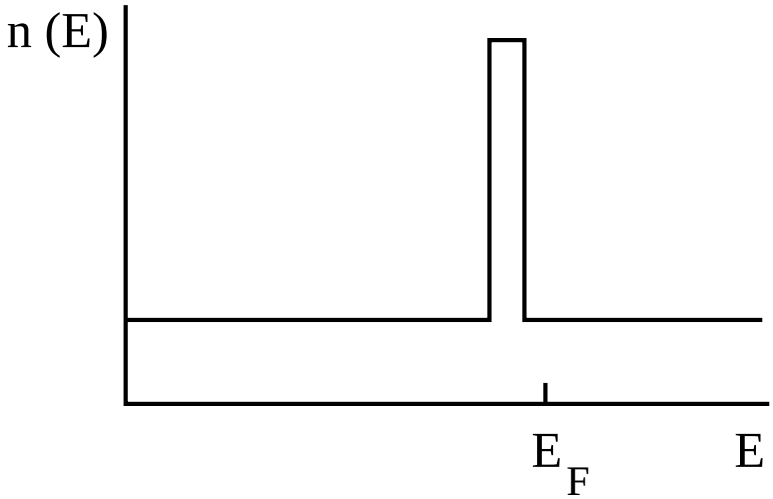
Physics 238C **Spring 2011**

Condensed Matter Physics **due 2:00 pm Thursday April 14**

PROBLEM SET 2

Reading: Ashcroft and Mermin (AM) Chapter 28

1. A fictitious transition metal has the electronic density of states $n(E)$ shown below.



   As the temperature T increases, does the chemical potential μ increase or decrease? Justify your answer.

2. AM 28.4

3. Using the data given in AM Ch. 28, calculate the number of positive and negative carriers per cm^3 present at 300 K in Ge doped with 10^{16} As impurities per cm^3. (Note: It is crucial to count the various pockets and bands correctly. For the purposes of the problem, you may ignore the third hole band shown in AM Fig. 28.8, which since it is $\sim$0.3 eV below the other two will not contribute appreciably. Treat the two hole bands as spherical with the effective masses given in AM.)