Homework 4

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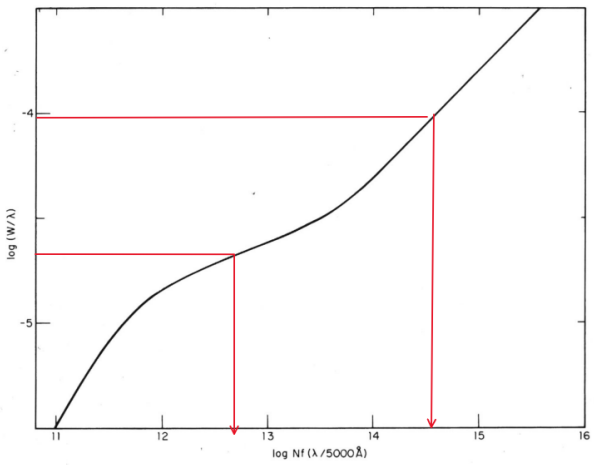
1. $log_{10}(\frac{0.067}{3302.98}) = -4.693$
   $log_{10}(\frac{0.560}{5895.94}) = -4.022$
   $log_{10}(\frac{fN_a\lambda}{5000A^{\circ}}) = 12.80$ for $\lambda = 3302.98$Å
   $log_{10}(\frac{fN_a\lambda}{5000A^{\circ}}) = 14.60$ for $\lambda = 5895.94$Å
   $log_{10}(\frac{(0.0049)(3302.98)}{5000}) = -2.48$
   $log_{10}(\frac{(0.3250)(5895.94)}{5000}) = -0.42$
   $12.80 - (-2.48) = 15.28$
   $14.6 - (-0.42) = 15.02$
   Then the average value of $log_{10}N_a$ is 15.15. Therefore there are $10^{15.15}N_a$ per unit area of the sun's photosphere.

Draw your lines on the graph below and read the axes carefully.
Do your calculations neatly on a separate page.



2. $\Delta\lambda = \frac{\lambda}{c}\sqrt{\frac{2kT}{m}}$
   Atomic Mass of Calcium: $40.078 * 1.66 * 10^{-27} = 66.53 * 10^{-27}$kg
   $T = 3000$k :

$$\begin{aligned}\Delta\lambda &= \frac{393.3 * 10^{-9}}{3 * 10^{8}} \sqrt{\frac{2(1.38 * 10^{-23})(3000)}{66.53 * 10^{-27}}} \\ &= 1.46 * 10^{-3}\text{nm}\end{aligned}$$

$T = 6000\text{k}$:

$$\begin{aligned}\Delta\lambda &= \frac{393.3 * 10^{-9}}{3 * 10^{8}} \sqrt{\frac{2(1.38 * 10^{-23})(6000)}{66.53 * 10^{-27}}} \\ &= 2.06 * 10^{-3}\text{nm}\end{aligned}$$

$T = 12000\text{k}$:

$$\begin{aligned}\Delta\lambda &= \frac{393.3 * 10^{-9}}{3 * 10^{8}} \sqrt{\frac{2(1.38 * 10^{-23})(12000)}{66.53 * 10^{-27}}} \\ &= 2.92 * 10^{-3}\text{nm}\end{aligned}$$