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Physics 404 **HOMEWORK ASSIGNMENT #8** **Fall 2013**

Due date: Thursday, Nov. 14 **Deadline:** Tuesday, Nov. 19

1. (10) 6.48 Entropy and chemical potential of a diatomic gas.

2. (5) 6.52 Finding Z_1 for a relativistic gas, so an unconventional energy dispersion relation.

3. (10) 7.2 Model for hemoglobin attachment. Note that 7.1 is essentially the Langmuir problem done in class, so this problem is a generalization of that. You do not need to do the comparison, etc., in the last two lines of the problem. You may use $k_BT = 0.0267$ eV and $\lambda_T = 1.75 \times 10^{-11}$ m; these will be done explicitly in the solutions. Use results from the first problem to show $Z_{rot} \approx 74$

4. (10) 7.5 a-c Ionization of donors in a semiconductor. In b), take $Z_{int} = 2$.

5. (10) 7.22 Relativistic electrons: $\varepsilon \propto |\mathbf{p}|$

6. (10) 7.23 b,c,f White dwarf star. Assume, from part a) that $U_{grav} = -(3/5)GM^2/R$.

The answers to d and e are: $R \approx 7\times10^6$ m, $\rho \approx 1\times10^9$ kg/m^3, $\varepsilon_F \approx 2\times10^5$ eV, $T_F \approx 2\times10^9$ K