

Homework #6 — PHYS 603 — Spring 2008  
Deadline: **Thursday, April 3, 2008, in class**

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Web page: <http://www2.physics.umd.edu/~yakovenk/teaching/>

Textbook: Silvio Salinas, *Introduction to Statistical Physics*  
Springer, 2001, ISBN 0-387-95119-9

**Do not forget to write your name and the homework number!**

Each problem is worth 10 points.

## Ch. 6 The Classical Gas in the Canonical Formalism

1. **Problem 6.1. Relativistic gas with  $\varepsilon = cp$ .**
2. **Problem 6.2. Unharmonic oscillators with  $U \propto x^n$ .**
3. **Problem 6.3. Diatomic molecules with the elastic energy  $r_{12}^2$  or  $|r_{12} - r_0|$ .**

The answer to the second part of the problem at <http://fge.if.usp.br/~ssalinas/exchap06/> seems to have incorrect dimensionality. Be sure to check the dimensionality of your answer.

4. **Problem 6.4. 3D rigid rotators, dipoles in an electric field.**

If the rotators have a *magnetic* dipole moment instead of an *electric* dipole moment, and a *magnetic* field is applied instead of an *electric* field, does your answer give the Curie law for the magnetic susceptibility? Compare with Eq. (5.39) for the Curie law.

5. **Problem 6.5. Polarizable molecules in an electric field.**

Does the electric susceptibility in this problem follow the Curie law? Explain the physical origin of the difference in the results of the last two problems.

March 26, 2008