

Material for Week 7

Physics 4488/6562: Statistical Mechanics

<https://sethna.lassp.cornell.edu/Teaching/562/>

Exercises due Fri. Mar 10

Last correction at December 22, 2022, 2:09 pm

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The exercise with number N1.xxx are to be found in <https://sethna.lassp.cornell.edu/StatMech/NewStatMechExercises.pdf>

NOTE: The prelim will be distributed this Friday, and will be due Monday March 13. The exercises this week are due this Friday, not Monday.

Monday

In-class question: [7.3](#) *Phase-space units and the zero of entropy*

Wednesday

Read: Chapter 7, Sec. 7.6 (Black body radiation and Bose condensation).

Pre-class question: [N1.4](#) *Bosons in two states*

In-class question: [7.22](#) *Light baryon superfluids*

In-class question: [7.23](#) *Why are atoms classical?*

Friday

Read: Chapter 7, Sec. (7.7) (Metals and the Fermi gas).

Pre-class question: [7.6](#) *Spin density matrix*

In-class question: [7.2](#) *Phonons and photons are bosons*

Monday

Read: PRELIM DUE.

Exercises for everyone

- [7.1](#) *Ensembles and quantum statistics.* Don't be misled by the multiple choice format. You will likely need to do a complete solution to answer the questions

Select one (4488) or two (6562)

- [7.15](#) *The photon-dominated Universe.* (Astrophysics) The echo of the Big Bang is a Planck distribution.
- [7.21](#) *The greenhouse effect.* (Astrophysics, Ecology) A brief calculation showing why the Earth is hotter than one would guess.
- [7.14](#) *Bose condensation: the experiment.* (Quantum, Atomic physics) Analyzing the 1995 experiment first showing Bose condensation.
- [7.12](#) *Semiconductors.* (Quantum, Condensed matter) A caricature model for electrons and holes in a semiconductor.