

Material for Week 6

Physics 4488/6562: Statistical Mechanics

<http://www.physics.cornell.edu/sethna/teaching/562/>

Exercises due Mon. Mar 02

Last correction at March 12, 2020, 4:49 pm

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All exercises are from Version 2.0 of the text: <http://pages.physics.cornell.edu/~sethna/StatMech/v2EntropyOrderParametersComplexity.pdf>

Wednesday

In-class question: [6.13](#) *Pollen and hard squares*

Friday

Read: Chapter 6, Sec. (6.6) (Chemical equilibrium) and (6.7) (Free energy density)

Pre-class question: [6.15](#) *Gas vs. rubber band*

In-class question: [6.6](#) *Lagrange*

In-class question: [6.5](#) *Laplace*

In-class question: [6.7](#) *Legendre*

Monday

Read: Chapter 7, Sec. 7.1 (Mixed states and density matrices), Sec. 7.2 (Quantum harmonic oscillator), and 7.3 (Bose and Fermi statistics).

Pre-class question: [7.18](#) *Drawing wavefunctions*

Exercises

Everyone (4488 and 6562)

[6.11](#) *Barrier crossing.*

[6.25](#) *Epidemics and zombies.* Epidemiology studies the spread of disease through a population. The foundation of the field is the SIR model, tracking the susceptible, infected, and recovered people in the population. Our group had fun analyzing the SZR model, which illustrates stochastic effects in chemical reactions and gene mutation propagation.

Graduate (6562 only)

[6.3](#) *Negative temperature.*

[6.24](#) *Word frequencies: Zipf's law.*