
Problem Set 5Due **before 1:00pm** Wednesday 11 Nov, 2020

Readings: Readings for this week are to finish the readings on Sections 5.1-5.5, if you have not done so, plus Sections 5.6-5.7 of Chapter 5 (section 5.8 on the Ising model and renormalization group is interesting, but not required) and Sections 6.1-6.4 of Chapter 6 of Thorne & Blandford *Modern Classical Physics*, hereafter called TBMCP.

Non-Collaboration Problem Notice that problem 2 is a non-collaboration problem: you must solve this problem on your own (as if it were an untimed quiz), without discussing it with other students, or with the TA (see the collaboration and grading policy for how these will be graded and used: <http://www.its.caltech.edu/~esp/ph136a/Policies.pdf>)

Submitting your homework Please upload your completed homework solutions as a pdf file to Canvas. If that fails to work, you may instead email the file to the TA, twang3@caltech.edu, with the subject line **ph136 homework 5**. Note that Caltech email will reject attachment sizes larger than 10Mbyte, so be conscious of scanning parameters!

Homework Problems: (50 points total)

1. **TBMCP Problem 5.3 (25 points: 3+3+6+5+3+5)** *Grand Canonical Ensemble for a Classical, Relativistic Perfect Gas*
2. **TBMCP Problem 5.4 NONCOLLABORATION (9 points: 3+3+3)** *Adiabatic Index for Ideal Gas*
3. Do ONE of the following two problems (whichever is more interesting to you):
 - a) **TBMCP Problem 5.9 (16 points: 1+3+4+5+3)** *Electron-Positron Equilibrium at "Low" Temperatures*
 - b) **TBMCP Problem 5.14 (16 points: 2+4+2+3+5)** *Out-of-Equilibrium Gibbs Potential for Water: Surface Tension and Nucleation* (this problem is a bit more work, but relevant to the behavior of mouth spray containing SARS-COV-2 virus)