

## Homework Set #1

**Due 5 pm Thursday, Jan. 26, 2018**

### **Problem 1:**

*Compute the pressure, in atmospheres, exerted by a thermonuclear plasma on its container. Assume  $k_B T_e = k_B T_i = 20 \text{ keV}$ ,  $n = 10^{14} \text{ cm}^{-3}$ , and  $p = n k_B (T_i + T_e)$ .*

### **Problem 2:**

*Consider two infinite, parallel plates at  $x = \pm d$ , set at potential  $\phi = 0$ . The space between them is uniformly filled by a 1-species gas of density  $n$  of particles with charge  $q$ . Find the potential distribution  $\phi(x)$  between the plates.*

### **Problem 3:**

*In laser fusion, the core of a small pellet of DT plasma is compressed to a density of  $n = 10^{27} \text{ cm}^{-3}$  at a temperature of 50,000,000 K. Estimate the number of particles in a Debye sphere in this plasma.*

### **Problem 4:**

*Assuming an isothermal atmosphere at  $k_B T = 20 \text{ C}$ , estimate by what factor the atmospheric pressure in Boulder is lower than in New York.*

### **Problem 5:**

*Show that, in a non-relativistic plasma ( $kT_e \ll m_e c^2$ ), the mutual Coulomb (electrostatic) force between two typical nearby electrons is much stronger than their mutual Lorentz (magnetic) force.*