

Physics 4243/5243  
Problem Set #4  
Due Monday February 16<sup>th</sup>.

Problem 1: Calculate quantitatively the impact on the lattice constant and binding energy of NaCl if the ions are doubly ionized instead of singly ionized. You can keep the same repulsive potential.

Problem 2: Suppose you were able to permeate the space between ions in an ionic crystal with a dielectric ( $\epsilon=81$ , like water). This reduces the Coulomb interaction by  $1/\epsilon$ . Calculate the lattice constant and binding energy of NaCl in this situation. Compare the binding energy per atom with the approximate thermal energy ( $kT$ ) at room temperature.

Problem 3:  
Simon Chapter 8 problem 2

Problem 4:  
Simon Chapter 9 problem 2