

Oct. 5, 2007

Phys. 541, Homework Problems 2

Please pass in your solutions at the beginning of class on Fri., Oct. 12.

1. (30 pts)

For an ideal gas in d spatial dimensions, calculate the average of the ℓ 'th power of the magnitude of the velocity $v = |\mathbf{v}|$, i.e., $\langle v^\ell \rangle$. Evaluate your answer for $d = 3$ and $\ell = 1$ and $\ell = 2$.

2. (40 pts)

(i) Calculate the partition function for a monatomic ideal gas with atoms of mass m in thermal equilibrium at temperature T in a volume V . (ii) Using the result, calculate the total entropy S and verify that it is an extensive quantity.

3. (20 pts)

Determine the planar lattice dual to the $4 \cdot 8 \cdot 8$ lattice. Are all vertices on this lattice equivalent or not? Are all faces equivalent or not? Is this dual lattice bipartite? Is it tripartite? What is the girth of this lattice?

4. (20 pts)

Sketch a portion of the $3 \cdot 6 \cdot 3 \cdot 6$ lattice. This is called the kagomé lattice. Is this bipartite? Is it tripartite? What is the coordination number of this lattice? What is its girth?

(total pts. = 110)