Solutions to Pathria's Statistical Mechanics
Chapter 5

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March 24, 2016

Problem 5.1

1 Problem 5.5

The partition function of the noninteracting,indistinguishable particles system is:

$$Q_N(V,T) = \frac{1}{N!\lambda^{3N}} \sum_P \delta_P [f(Pr_1 - r_1) \cdots f(Pr_N - r_N)]$$

where $f(r) = e^{-\frac{\pi r^2}{\lambda^2}}$ The first approximation is:

$$\sum_P = 1 \pm \sum_{i<j} f_{ij} f_{ji}$$

So the partition function in first approximation is:

$$Q_N(V,T) = \frac{1}{N!\lambda^{3N}} \int (1 \pm \sum_{i<j} e^{-\frac{\pi r_{ij}^2}{\lambda^2}}) d^{3N} r$$