0. **(0 points)** /opt/webwork/webwork2/conf/snippets/ASimpleCombinedHeaderFile.pg

Alice Quillen **fall22phy141**

Assignment PHY141_WW11 due 12/02/2022 at 11:59pm EST

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1. **(1 point)** setPHY141_WW11/multiplicity1.pg

On multiplicity function of a binary spin system

A system has $N = 5$ particles. Each particle can be in 1 of two possible spin states, up or down.

What is the multiplicity $g(N_\uparrow, N_\downarrow)$ of a state with $N_\uparrow = 2$ particles with spin up and $N_\downarrow = 3$ particles with spin down?

Enter a value for $g(N_\uparrow, N_\downarrow)$: ___

If all spin states are equally probable what is the probability that the system will be found with $N_\uparrow = 2$ and $N_\downarrow = 3$?

Enter probability: ___

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2. **(1 point)** setPHY141_WW11/multiplicity2.pg

On multiplicity function of a system of harmonic oscillators

We denote the multiplicity of a system of N harmonic oscillators with n quanta of energy as $g(N,n)$.

A system of $N = 5$ harmonic oscillators has $n = 2$ quanta of energy.

What is the multiplicity of this state?

Enter a value for $g(5,2)$: _____

How many of these states correspond to all 2 quanta given to the same oscillator?

___ Ways

The ground state of a single oscillator has energy E_0 and its energy levels are $E_m = m\hbar\omega + E_0$ for integer m. The quanta of energy that we add to the system each have size $\hbar\omega$.

What is the total energy in the state with $N = 5$ harmonic oscillators and $n = 2$ quanta of energy?

Energy $E = 5E_0 +$ ___ $\hbar\omega$

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3. **(1 point)** setPHY141_WW11/heat.pg

On heat, temperature and entropy

A large isolated system has a temperature of 300° K.

It absorbs 1 J of heat.

What is the change in the entropy?

Enter a value for ΔS: _____ J K^{-1}.