

Chem. 540

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Models – Problem 4

Calculate the expectation values of the operators \hat{x} , \hat{x}^2 , \hat{p} and \hat{p}^2 for the n^{th} eigenstate of a harmonic oscillator. You can get the answer with very little work if you express \hat{x} and \hat{p} in terms of the lowering and raising operators. How are the expectation values of \hat{x}^2 and \hat{p}^2 (with respect to the same eigenstate) related?