

CHEM352 Exam I (March 17 2010).

$33\frac{1}{3}$ points / problem with maximum of 100 points.

1. Is the function $x^2e^{-ax^2}$ an eigenfunction of operator $\frac{d^2}{dx^2} - 4a^2x^2$. If it is then what is the corresponding eigenvalue?
2. Power operation for operator \hat{B} is defined as follows: $\hat{B}^n\psi = \hat{B}^{n-1}(\hat{B}\psi)$.
Prove the following statement: If b is an eigenvalue of operator \hat{B} then b^n is an eigenvalue of operator \hat{B}^n (n is a positive integer).
3. What are the possible term symbols for an atom that has two valence electrons, one on $2p$ and the other on $3p$ (i.e., $2p$ and $3p$ shells are open but the rest are closed)? Does the Pauli exclusion principle play any role here?