Quiz 9.1 – Valence Bond Theory

Name: _____

Valence Bond Theory

Consider an F_2 molecule from the perspective of valence bond theory. Draw the orbital overlap which leads to the covalent bond in F_2

Hybridization

For each class of hybridization, give the linear combination that forms one of the hybrid orbitals

- sp
- sp^2
- sp^3

Variational Theory

For a particle in a box with length $L = 1$, the ground state wavefunction is $\Psi = \sqrt{2}\sin(\pi x)$ and the ground state energy is $\dfrac{h^2}{8m}$

The normalized trial function $\phi = \sqrt{30}\left(-x^2 + x\right)$ has a similar shape and obeys the same boundary conditions. Demonstrate the variational theory by finding the energy expectation value $\left\langle \phi \middle| \hat{H} \middle| \phi \right\rangle$ and comparing it to the true ground state energy.