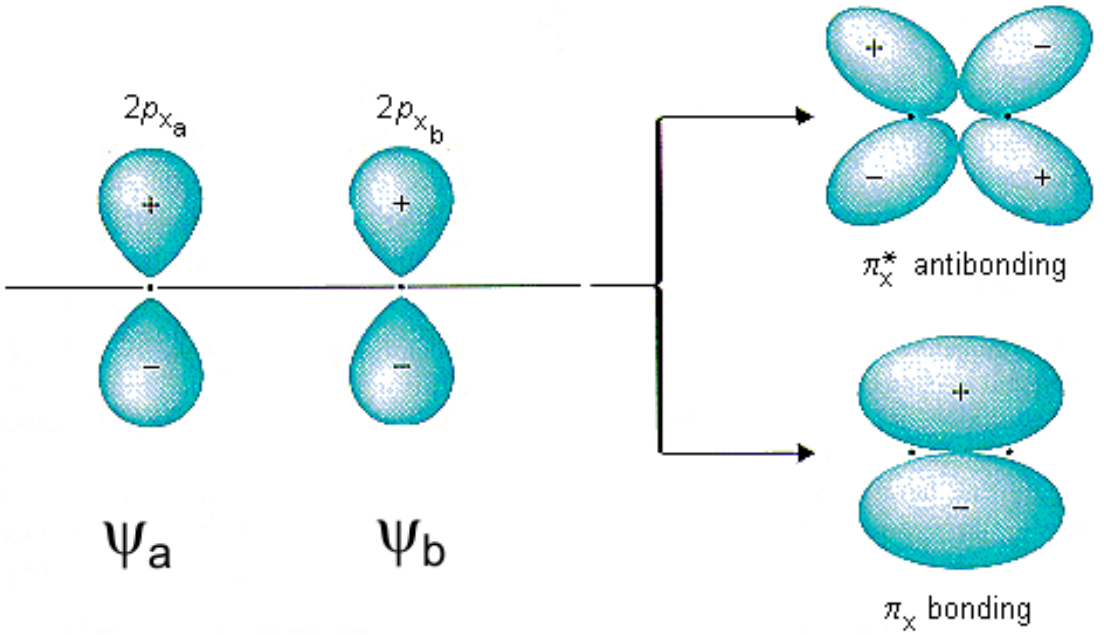
The bonding orbital corresponds to

A. $\psi_S \propto \psi_a + \psi_b$

B. $\psi_A \propto \psi_a - \psi_b$

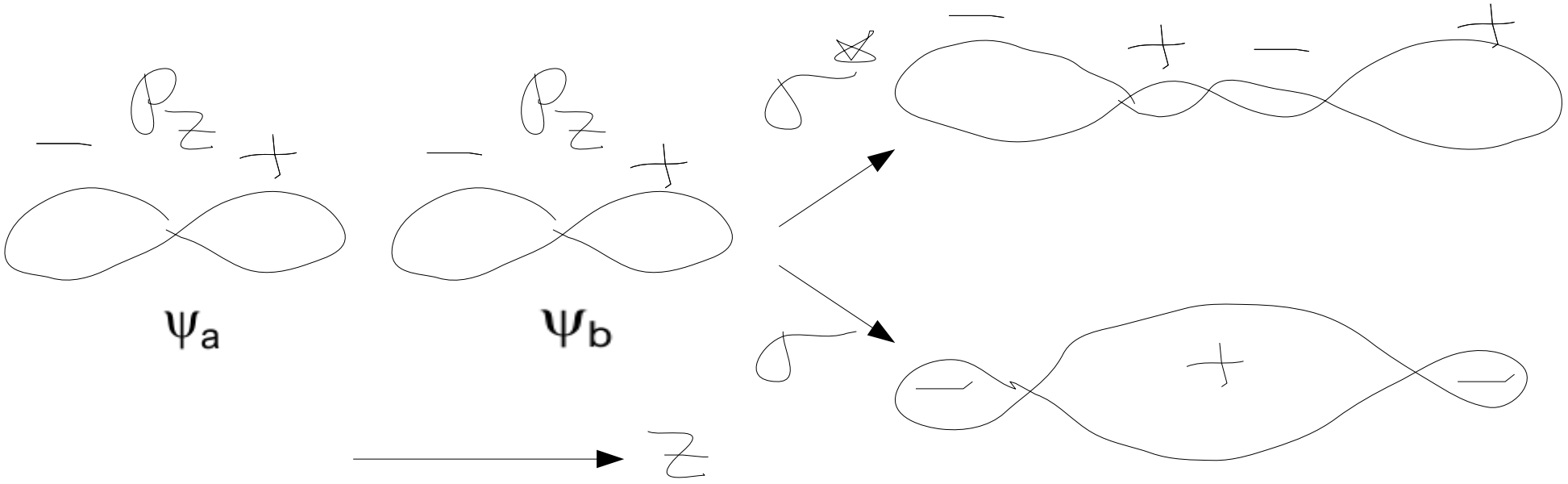


Ans: A – just like the 1s orbital.

The bonding orbital corresponds to

A. $\psi_S \propto \psi_a + \psi_b$

B. $\psi_A \propto \psi_a - \psi_b$



Ans: B (I think most of you understood this question, but the image shown in class was not a good one!) Now the orbitals ψ_a and ψ_b are correctly defined.

What is the essence here?

- Bonding means energy lowering.
- Bonding orbital is the lowest energy orbital.
- Energy lowering occurs by sharing electrons between ions. The origin of this is the potential energy (t) or the kinetic energy (in a simple quantum well view). In either case, the electron must spend most time in the center ("bonding") region.
- This energy lowering occurs with $\psi_s \sim \psi_a + \psi_b$ if the atomic orbitals have the same sign when they meet in the center ("bonding") region. Like the $2p_x$ example in this slide or the 1s example in class.
- The energy lowering occurs with $\psi_s \sim \psi_a - \psi_b$ if the atomic orbitals have the opposite signs when they meet in the center ("bonding") region. Like the $2p_z$ example in this slide.