This classical model can be used to describe \( \text{H}_2 \), but fails to describe \( \text{He}_2 \). This is because the electrons are treated as particles, ignoring their wave behavior.
This orbital is an antibond because its energy is higher than the energy of the two atoms if they had not interacted.

This orbital is a bond because the energy is lower than the isolated atoms.

\[ \text{H}_2 \quad \text{LCAO - linear combination of atomic orbitals} \quad \text{atomic orbitals are added + subtracted in such a way as to estimate molecular orbitals (MO) such as bonds + antibonds,} \]

\[ \begin{array}{c}
\text{O} + \text{O} \Rightarrow \text{O} \quad \text{antibond} \\
\text{O} + \text{O} \Rightarrow \text{O} \quad \text{bond}
\end{array} \]

\[ \text{H}_2 \quad \text{Bond Order} = \frac{\# \text{bonding } e^- - \# \text{antibond } e^-}{2} \]

Each antibonding \( e^- \) causes a destabilization (increase in energy) that negates the stabilization (decrease in energy) provided by a bonding electron.
The atomic orbitals of carbon cannot be used directly to describe the molecule methane since the geometry of the orbitals does not match and the energy of the orbitals is not the same. To describe methane, a set of hybrid orbitals are created by adding and subtracting orbitals on the same atom.