There are three possible bonding interactions:

\[ p_z \quad d_{z^2} \quad p_y \quad d_{yz} \quad p_x \quad d_{xz} \]

All other combinations have both positive and negative overlaps, resulting in no bonding.

5-9. \( \text{O}_2{}^2^- \) has a single bond, with four electrons in the \( \pi^* \) orbitals canceling those in the \( \pi \) orbitals.

\( \text{O}_2{}^- \) has three electrons in the \( \pi^* \) orbitals, and a bond order of 1.5. The Lewis structure has an unpaired electron and a bond order of 1.5. The Pauling structure has one 3-electron bond.

\[ \text{O}_2{}^2^- \quad \text{O}_2^- \]

Lewis and Pauling