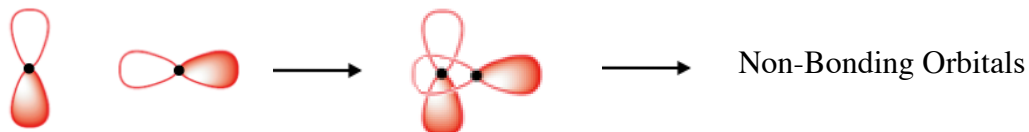


## 24. Non-Bonding Orbitals

When two atoms come together, not all orbitals are able to bond. Specifically, unless the two orbitals are in the same dimensional line ( $x$ ,  $y$ , or  $z$ ), the orbitals do not interfere and they do not form a bond. For example, the diagram below shows one  $2p_y$  atomic orbital and one  $2p_x$  atomic orbital. When they overlap, there is no net interference. As a result, these two orbitals are non-bonding.



From each of the examples below, determine whether or not the two atomic orbitals result in bonding orbitals, anti-bonding orbitals, or non-bonding orbitals. If they are bonding or anti-bonding, draw the resulting molecular orbital.

1) One,  $2p_x$  atomic orbital and one,  $1s$  atomic orbital



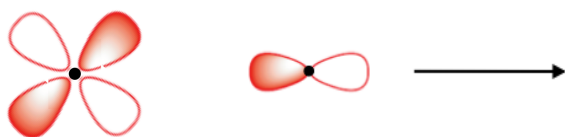
2) One,  $2p_x$  atomic orbital and one,  $1s$  atomic orbital



3) One,  $2p_y$  atomic orbital and one,  $1s$  atomic orbital



4) One,  $3d$  atomic orbital and one,  $2p_x$  atomic orbital



5) In reality, the interactions in (1) and (2) happen concurrently. Of these two, which interaction results in the higher energy MO? Why?