

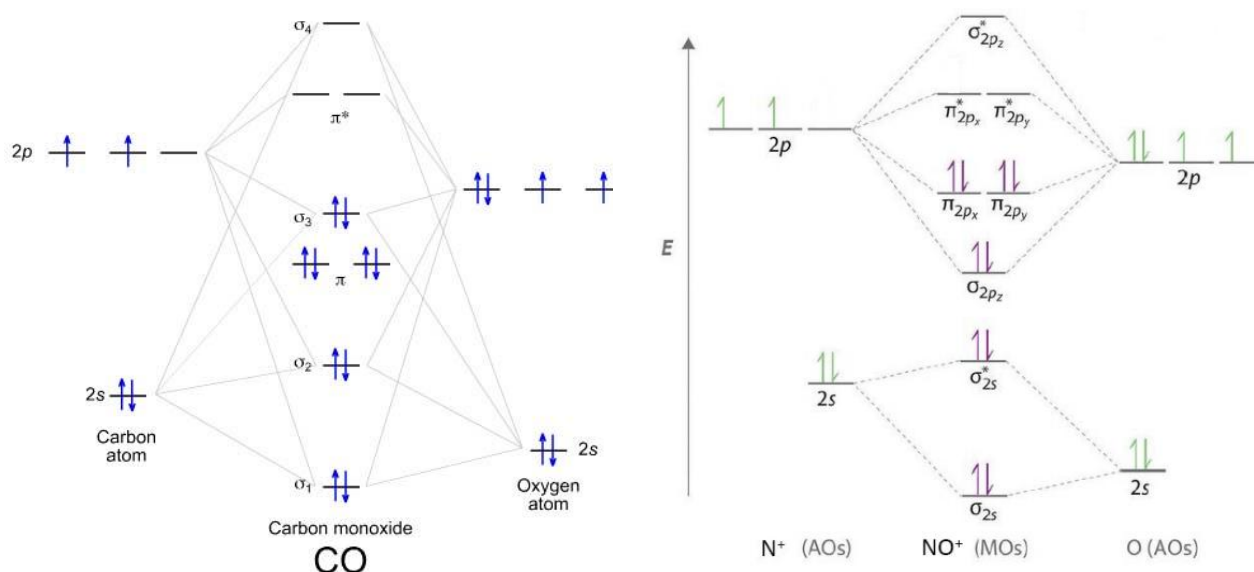
Answer on the question #54656 – Chemistry – General chemistry

Question:

Based on molecular orbital theory, draw the energy patterns for NO^+ ion and CO molecule. Between these two, point out the similarities with respect to bond order and magnetic character and, the dissimilarity with respect to energy pattern of orbitals.

Answer:

The molecular orbital diagram for CO and NO^+ molecule and ion are:



The bond order is the difference between the number of the bonding electrons and the number of antibonding electrons, divided by two. In CO and NO^+ it is equal: $(8-2)/2 = 3$.

The magnetic character can be derived from the presence/absence of unpaired electrons. These structures don't have unpaired electrons. This means the theory predicts that these substances are diamagnetic.

The dissimilarity in the diagrams is the respective energy of different molecular orbitals. Thus, bonding π -orbitals are lower in energy than bonding σ_p -orbital for carbon monoxide molecule. Contrarily, for the NO^+ ion, bonding π -orbitals are higher in energy than bonding σ_p -orbital.

In conclusion, one can say that CO and NO^+ are isoelectronic structures that are different only in relative energies of the orbitals.