Announcements – 11/10/00

- **Exam #3** - Wed., 11/15/00, 7pm

  Review/Problem Session:

  Sunday, 11/12
  4 - 6 pm
  B112 Angell

- **Quiz today!**

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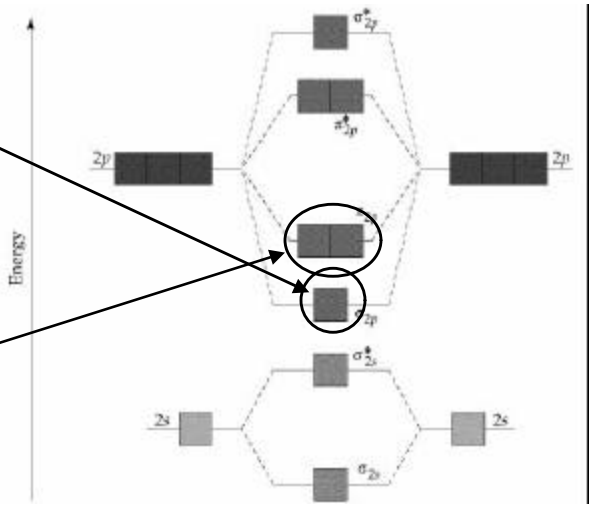
2nd Period MO Energies

σ_{2p} has lowest energy due to better overlap (end-on) of $2p_z$ orbitals

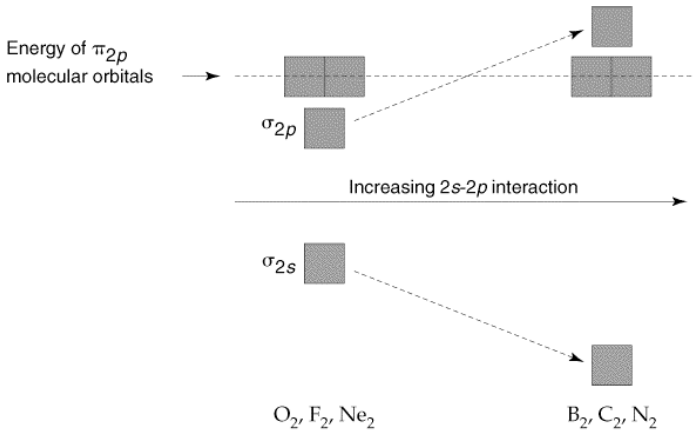
π_{2p} orbitals are *degenerate* and at higher energy than the σ_{2p}



2nd Period MO Energies: Shift!

For Z <8:

2s and 2p orbitals can interact enough to change energies of the resulting σ_{2s} and σ_{2p} MOs.



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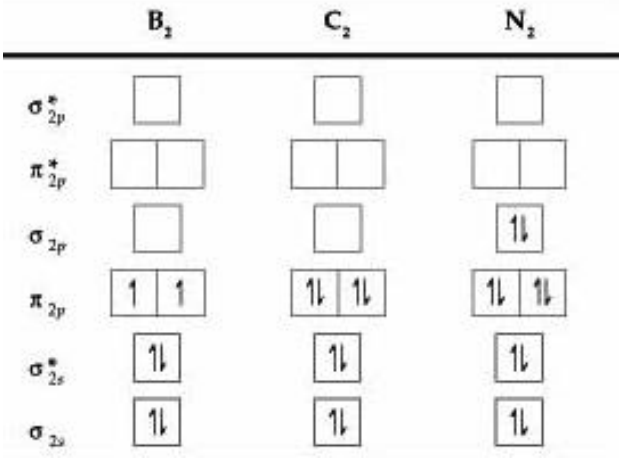
2nd Period Diatomics: π first

Note that B_2 has *unpaired electrons* so it must be **paramagnetic**



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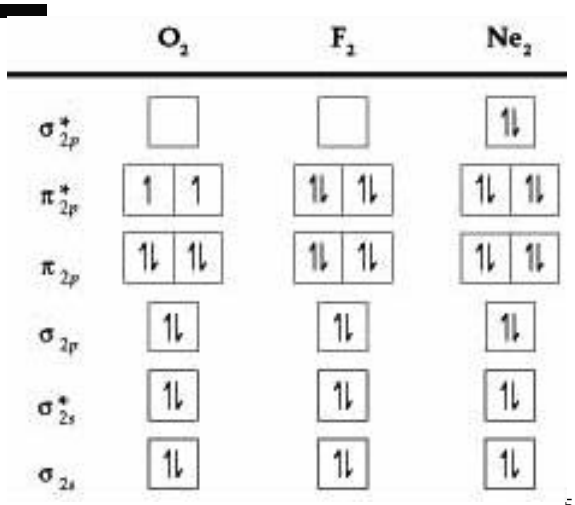
2nd Period Diatomics: σ first

O_2 *also* has <u>unpaired electrons</u> so it must be ***paramagnetic***



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Configurations and Bond Orders: 2nd Period Diatomics

Species	Config.	B.O.	Energy	Length
Li_2	$(\sigma_{2s})^2$	1	105 kJ/mol	2.67 Å
Be_2	$(\sigma_{2s})^2(\sigma^*_{2s})^2$	0	9 kJ/mol	2.45 Å
B_2	$(\sigma_{2s})^2(\sigma^*_{2s})^2(\pi_{2p})^2$	1	289 kJ/mol	1.59 Å
C_2	$(\sigma_{2s})^2(\sigma^*_{2s})^2(\pi_{2p})^4$	2	599 kJ/mol	1.24 Å
N_2	$(\sigma_{2s})^2(\sigma^*_{2s})^2(\pi_{2p})^4(\sigma_{2p})^2$	3	942 kJ/mol	1.10 Å
O_2	$(\sigma_{2s})^2(\sigma^*_{2s})^2(\sigma_{2p})^2(\pi_{2p})^4(\pi^*_{2p})^2$	2	494 kJ/mol	1.21 Å
F_2	$(\sigma_{2s})^2(\sigma^*_{2s})^2(\sigma_{2p})^2(\pi_{2p})^4(\pi^*_{2p})^4$	1	154 kJ/mol	1.41 Å

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Heteronuclear Diatomics

- Different atoms = different *atomic orbital* energies
  - So, when combining *atomic* orbitals, we don't always combine *like* orbitals
  - And, if we do combine *like* orbitals (e.g., 1s and 1s), they are not necessarily at the same energy, so they combine *unequally*
  - RESULT: ***asymmetry***
    - *Unequal* distribution of electron density between the two atoms
    - Resulting *molecular orbitals* are not symmetrical
    - Bond is *polar* and has a *dipole moment* (μ)

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