2) $CH_4(g) + 2O_2(g) \rightleftharpoons CO_2(g) + 2H_2O(\ell)$

$$K = \frac{[CO_2]}{[CH_4][O_2]^2}$$

3) $2SO_2(g) + 1O_2(g) \rightleftharpoons 2SO_3(g)$

$K_c = 279$ @ 25°C $\Delta n = -1$

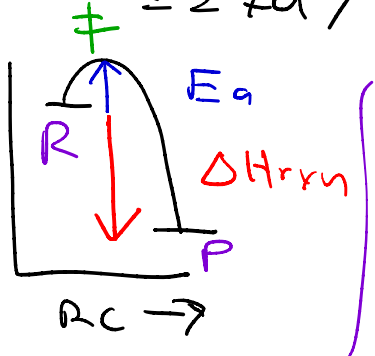
$$K_p = K_c \cdot (RT)^{\Delta n}$$

$$K_p = 279 \cdot (.0821 \times 298)^{-1}$$

$$= 279 \cdot (24.47)^{-1}$$

$$= 279 / 24.47 = 11.4$$

4)



5) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

$K_c = 0.10$

0.40 mol N_2

0.40 mol O_2

0.80 mol NO

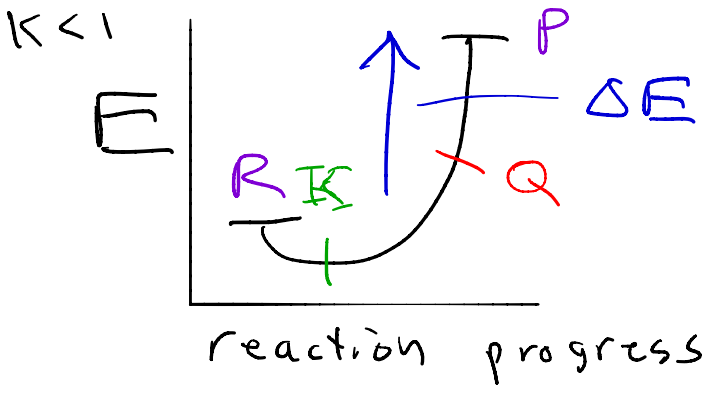
$$[N_2] = [O_2] = \frac{0.40 \text{ mol}}{5 \text{ L}} = 0.08 \text{ M}$$

$$[NO] = 0.16 \text{ M} = 0.80/5$$

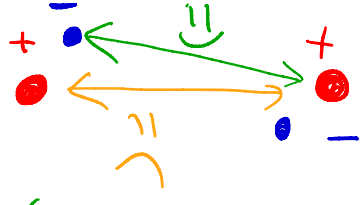
$$Q = \frac{[NO]^2}{[N_2][O_2]} = \frac{(.16)^2}{(.08)(.08)} = \frac{(.16)^2}{(.08)^2} = 4$$

$Q > K$

reverse



Bonding H – H



When two hydrogen atoms first approach each other, the favorable electrostatic interaction between electrons and protons outweighs the unfavorable electrostatic interactions.

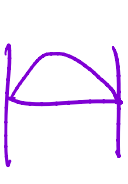
LCAO - linear combination of atomic orbitals [3]

→ add + subtract AOs to create new ones

In hybridization, atomic orbitals from the same atom, with different energies and/or geometries, are combined to create a new set of degenerate orbitals.

equal energy

In bonding, AOs from different atoms are combined to create new molecular orbitals.



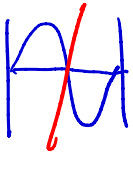
1s + 1s →

bond

e⁻ between nuclei

lower E

→ favorable charge interaction



1s + 1s →

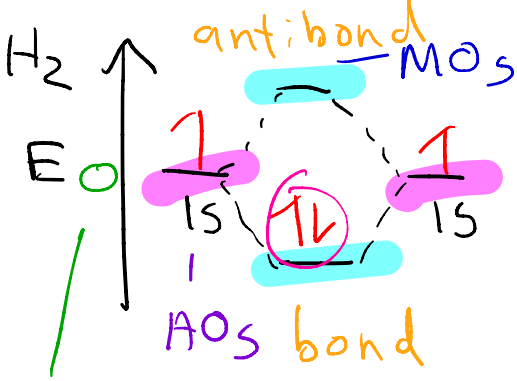
antibond

node

lack of e⁻ between nuclei

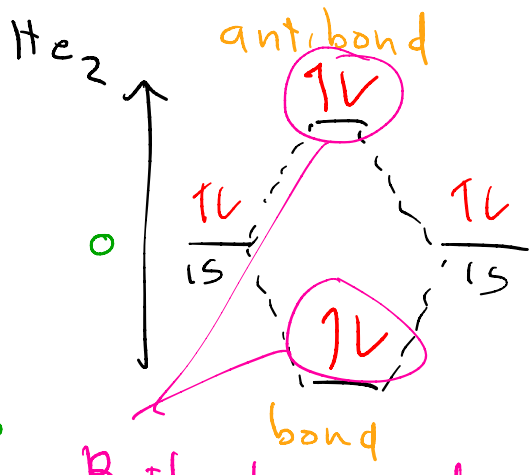
→ higher E

→ unfavorable charge interaction



Energy of the atoms when not interacting

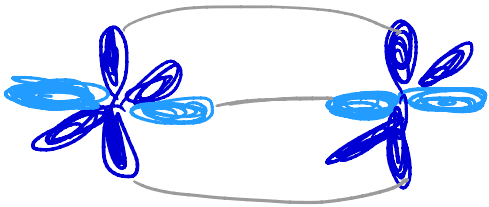
only bond filled



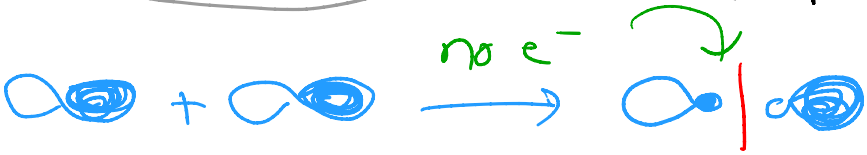
Both bond and antibond filled

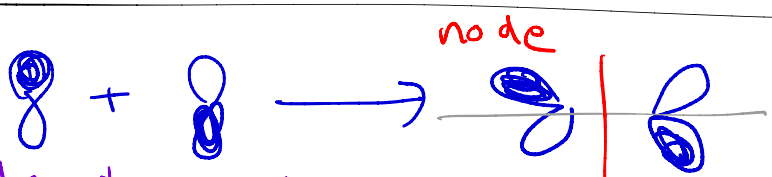
In He_2, the stabilization (lowering of E) caused by the bonding interaction is canceled by the destabilization (raising of E) caused by the antibonding interaction, ⟶ He_2 does not form

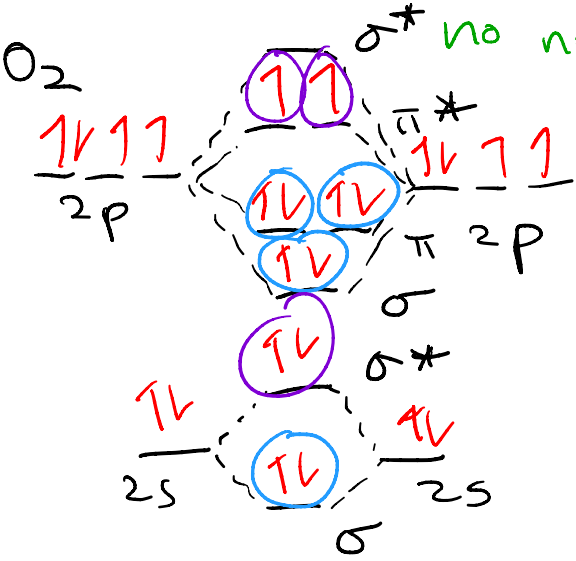
The fact that He_2 does not exist cannot be predicted by the interaction of charge alone; it can only be predicted if the wave behavior of electrons is considered.



In this diagram, color does not indicate phase.

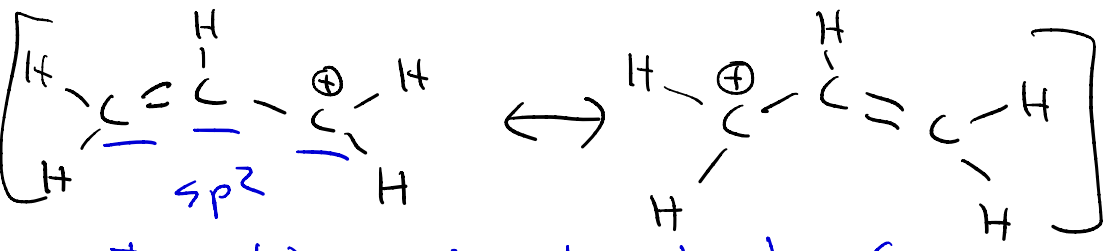




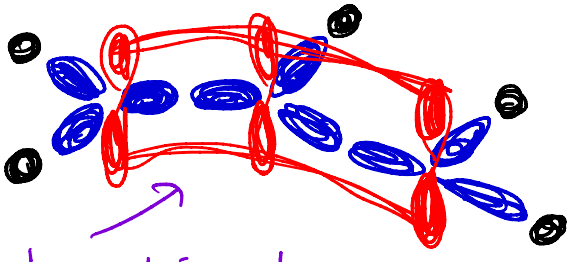


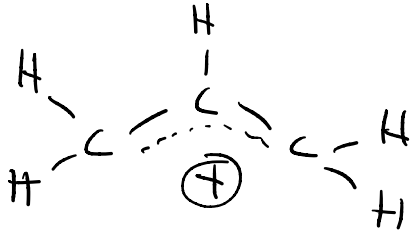
Bond order = (# bonding e⁻ − # antibonding e⁻) / 2

$\frac{8-4}{2} = \frac{4}{2} = 2$



- In this molecule, both C-C bonds are identical..... (?)





Delocalized → spread out across more than two atoms

Resonance structures come from the fact that in many systems, bonding does not occur between only two atoms, Since Lewis dot structures are based on bonding between only <u>two</u> atoms, no single LDS can represent a delocalized molecule,

In this example, both C-C bonds are equal, but they are written as singlet double bonds