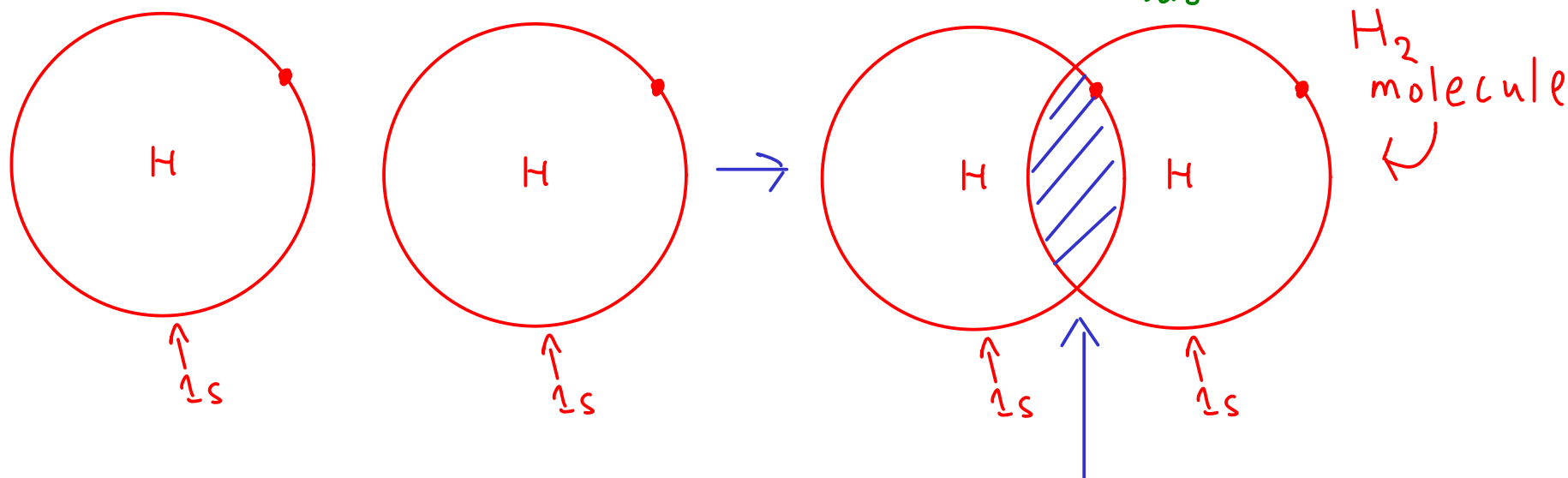


1 VALENCE BOND THEORY

- an attempt to explain why molecules behave in the way that the VSEPR model predicts.
- Describes the formation of bonds in terms of the OVERLAP of ORBITALS from the bonding atoms.

① Bonds are formed when two atoms are close enough together so that their ORBITALS OVERLAP (share the same space).

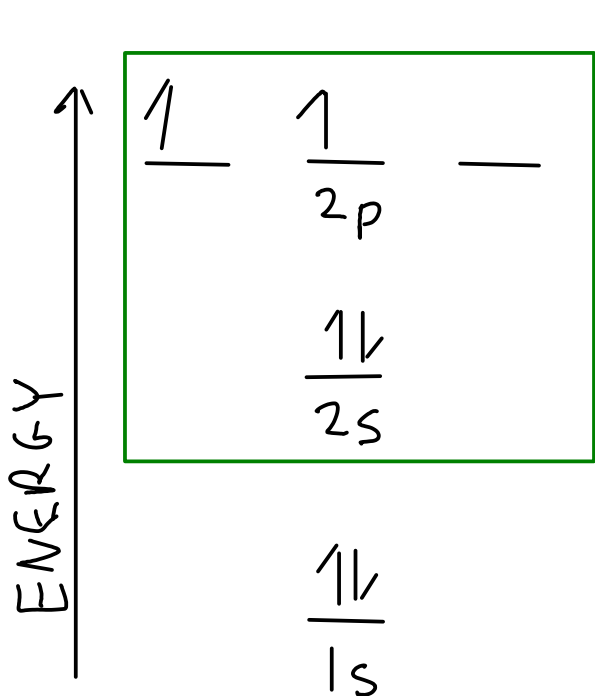
② Each SET of overlapping orbitals can contain at most a total of TWO electrons. So, two orbitals with one electron each may bond. An orbital with two electrons can only bond with an EMPTY orbital (This is called a COORDINATE COVALENT BOND.) **Ag⁺ with :NH₃... the cleanup in the AgCl lab*



These 1s orbitals overlap to form what we call a "sigma bond" with overlap BETWEEN the two atomic nuclei.

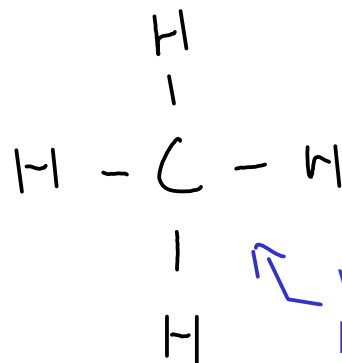
Hybridization

- Look at carbon's electron configuration:



valence

You would expect that carbon would form several different kinds of bonds in a molecule like methane. But, methane's bonds are experimentally all identical. How does carbon form the four equivalent C-H bonds we see in methane?

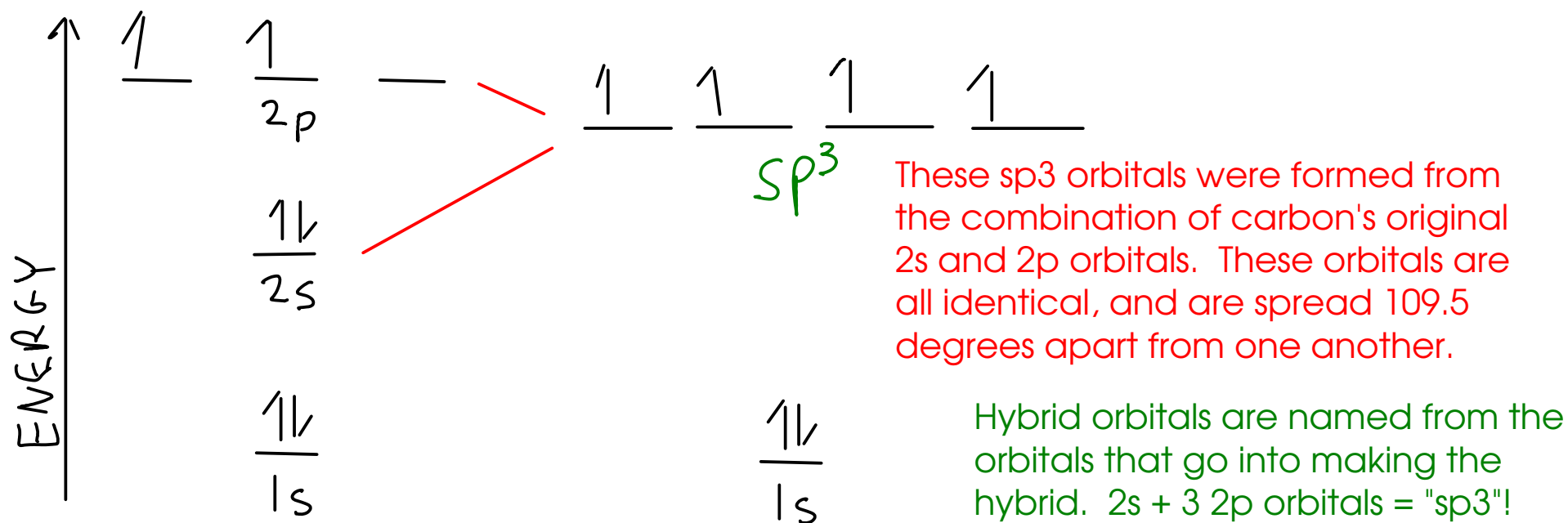


↙ We observe that these bonds are IDENTICAL! Same bond energy, distance, and angle.

- In valence bond theory, atomic orbitals can COMBINE to make new orbitals that can then go on to bond with other molecules.

- When orbitals combine to make HYBRID ORBITALS, ...

- ① The overall NUMBER OF ORBITALS does not change.
- ② The overall NUMBER OF ELECTRONS around the atom does not change
- ③ The energy of the orbitals is between the energies of the orbitals that combine.



OpenStax: See page 422 for a picture of hybrid orbitals.