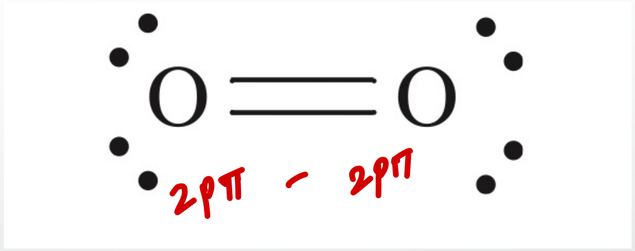
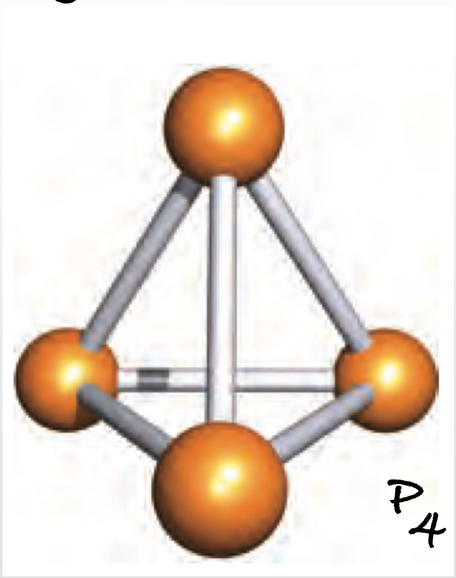
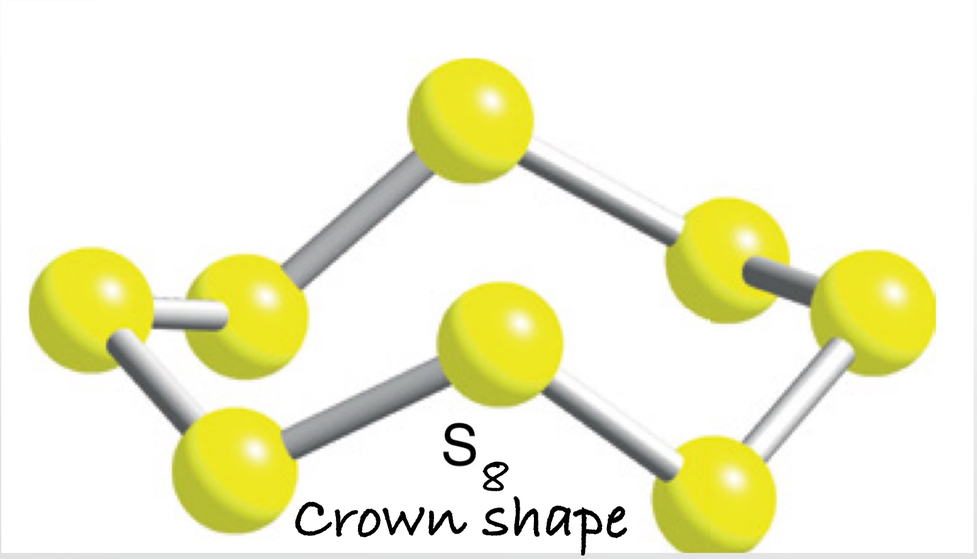
(Q). why Oxygen (O_2) and Nitrogen (N_2) exist in diatomic ~~from~~ form while Phosphorus (P_4) and sulphur (S_8) exist in poly atomic form.



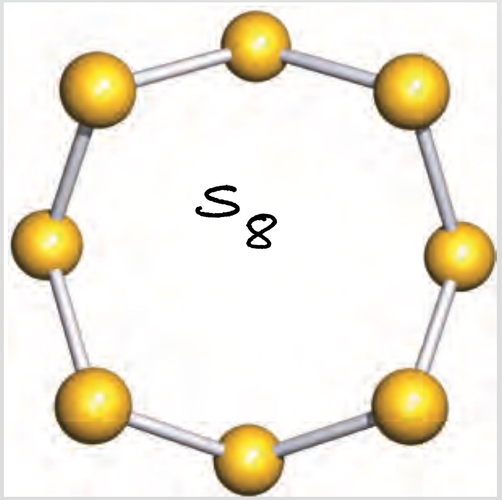


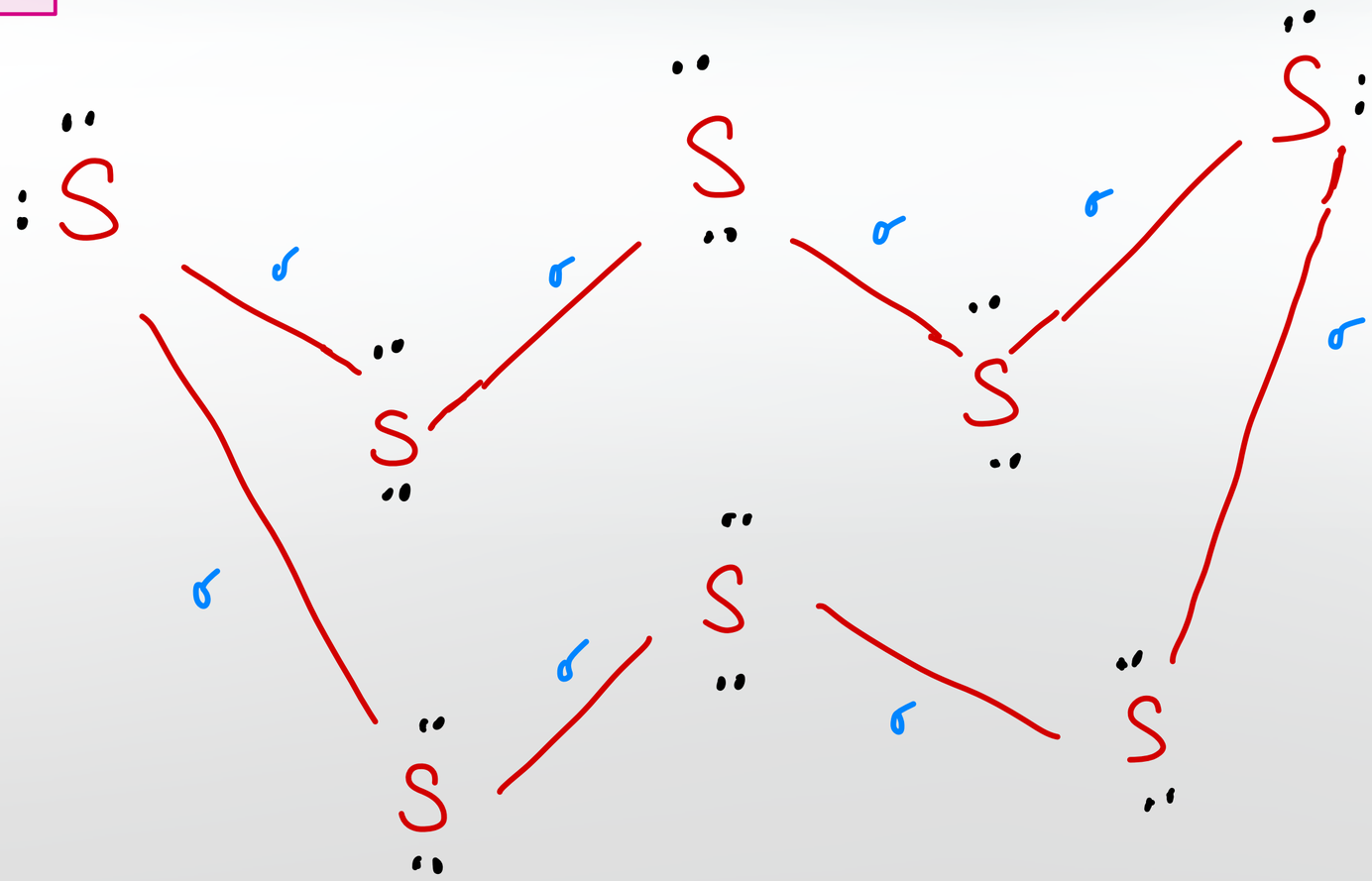


Ans: increases strength of P-P sigma bond in compare to strength of P-P Pi bond

3pπ - 3pπ
P ≡ P

(two unequal exist 3pπ - 3pπ form
S = S





total σ Bond = 8

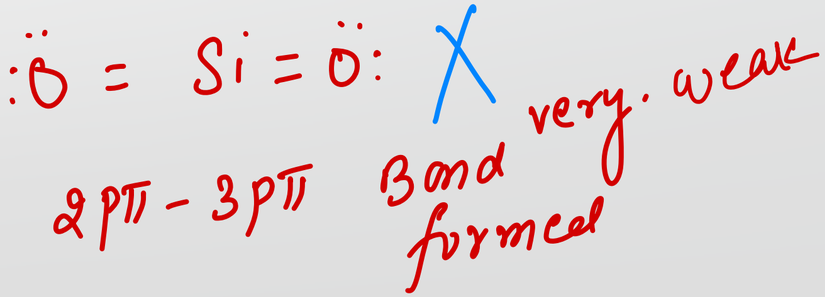
total lp = 16

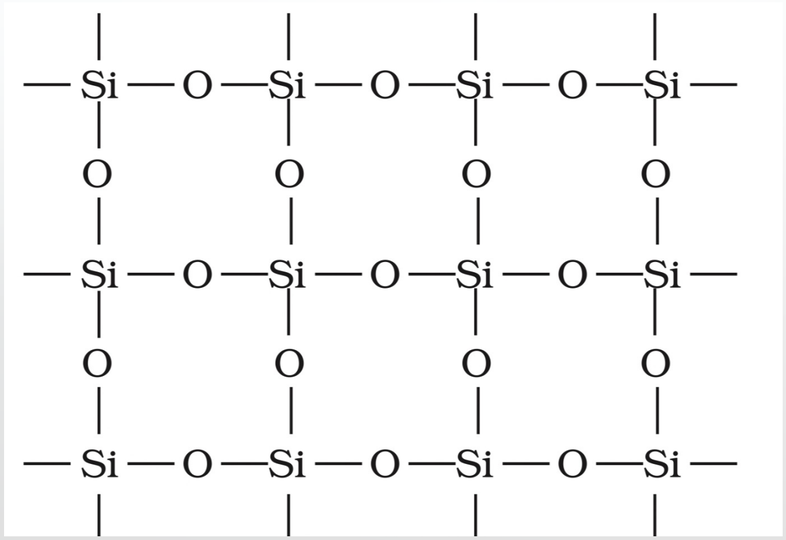
ratio of lp/σ = 2

(Q) Why Co2 donot form giant structure while from Sio2 form giant structure although carbon ans silicon belongs to same family.?

2Pπ - 2Pπ Bond formed.

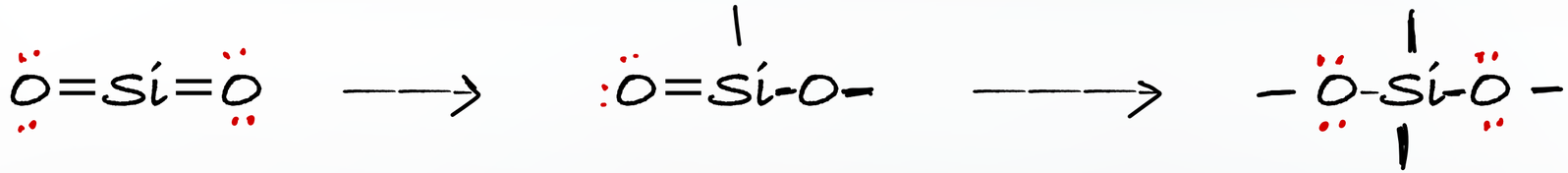
Ans :)





1.tendency of polymerisation decreases with increase in strength of pie bond.

2.weak pie bond tends to break them and convert into more stable Structure (polymer)



SiO2 form giant covalent network.

All giant molecule are covalent solids. E.g SiO2

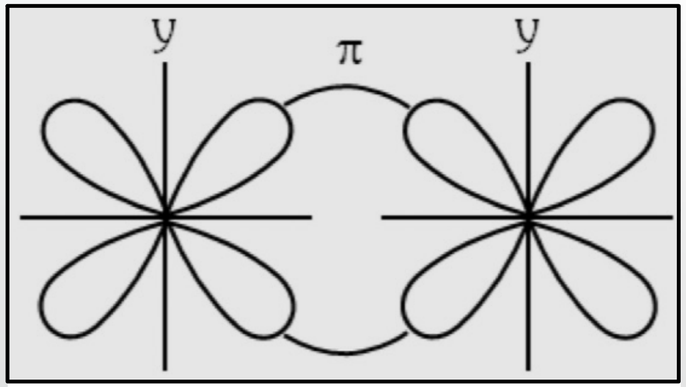
Dry ice (CO_2) molecular solid : held by vanderwaals attraction.

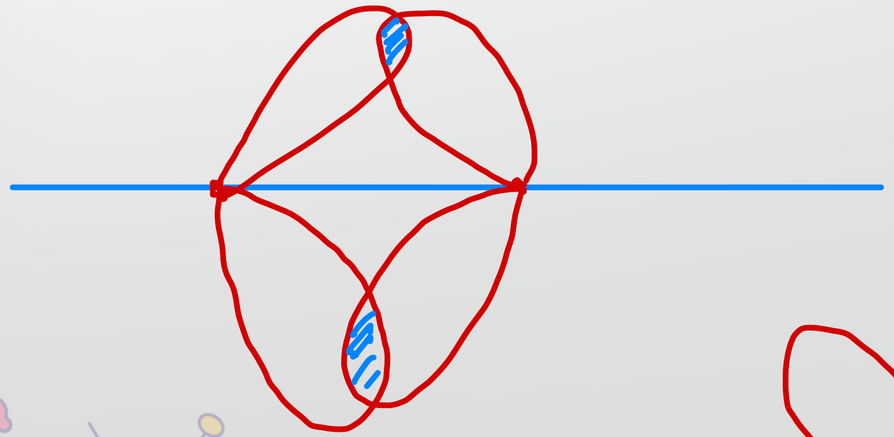
Chemical Bonding

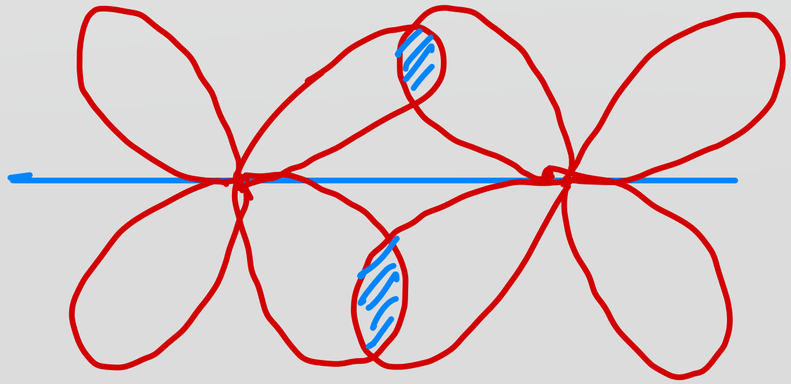
Compare bond strength

$3P_{\pi} - 3P_{\pi} < 3P_{\pi} - 3d_{\pi} < 3d_{\pi} - 3d_{\pi}$

**since d has inclined lobe it can form pie bond easily

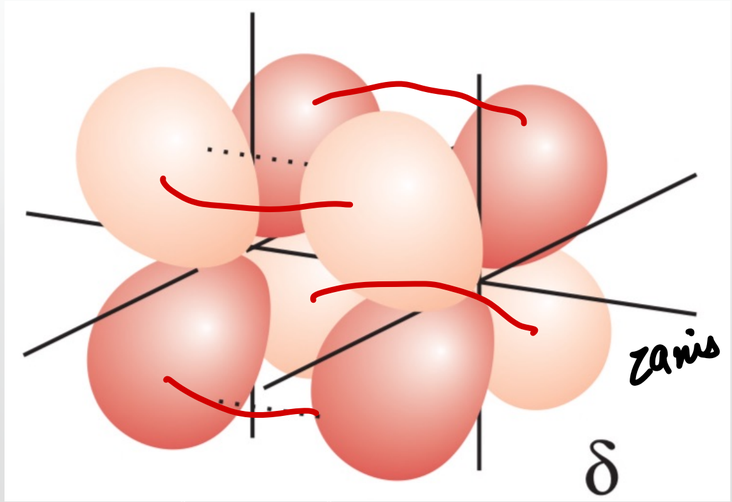




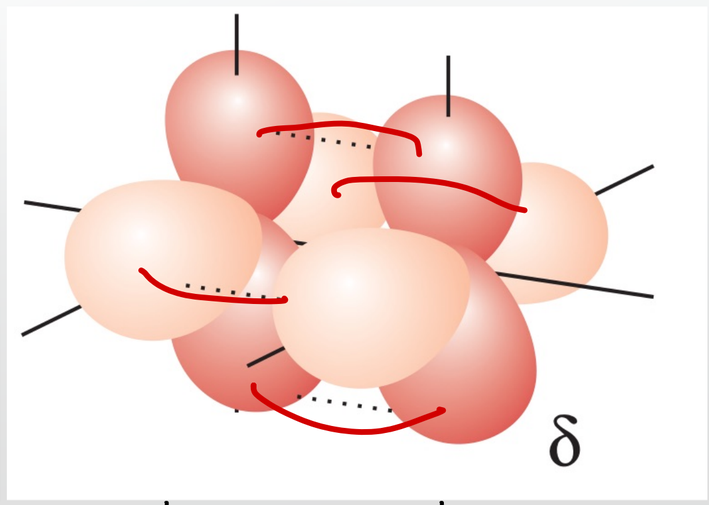


Delta. (δ) Bond

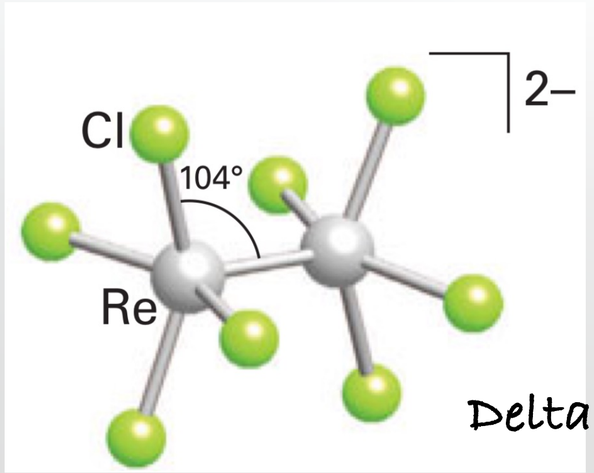
delta (δ) ***bond :*** are the covalent bonds where four lobes of d-orbital of one atom overlap with four lobes of the similar d-orbital of other atom. Except d_{z^2} all d orbitals form δ bond.



dxy - dxy



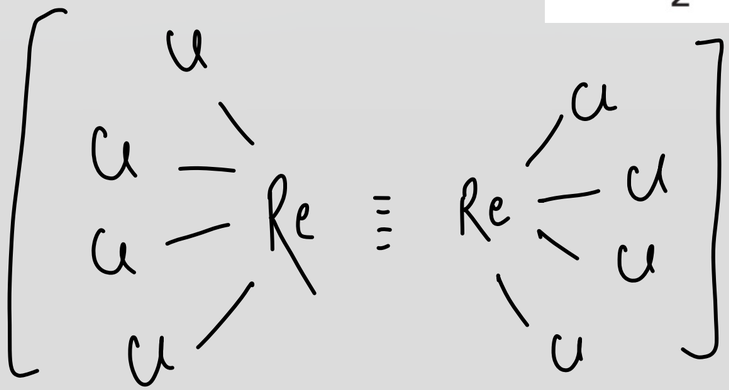
dx2-y2. dx2-y2



Delta bond

$[Re_2Cl_8]^{2-}$

Four lobe interactions



quadruple bond

1σ + 2π + 1δ = 4 bonds.

Diffenence in σ and π bonds :

Sigma (σ) bond	Pi (π) bond
1. It results from the end to end overlapping of two s orbitals or two p–orbitals or one s and one p–orbital.	It result from the sidewise (lateral) overlapping of two p orbitals.
2. Its bonded orbital consists of a single electron cloud symmetrical about internuclear Axis	Its bonded orbital consists of two electron clouds one above and the other below the plane of symimetry
3. Strong	Weak
4. Bond energy 80 Kcals	65 Kcals Approximately
5. More stable	Less Stable
6. Less reactive	More reactive
7. Can independently exist	Always exists along with a σ bond hybridsation

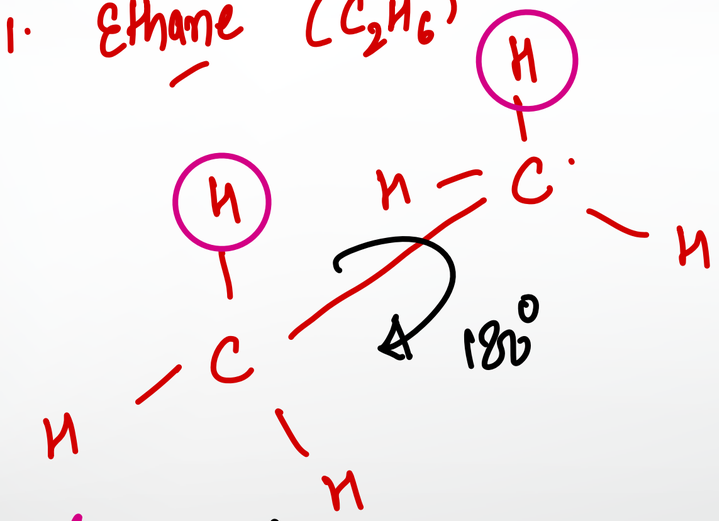
Alkane C_2H_6

Alkene C_2H_4

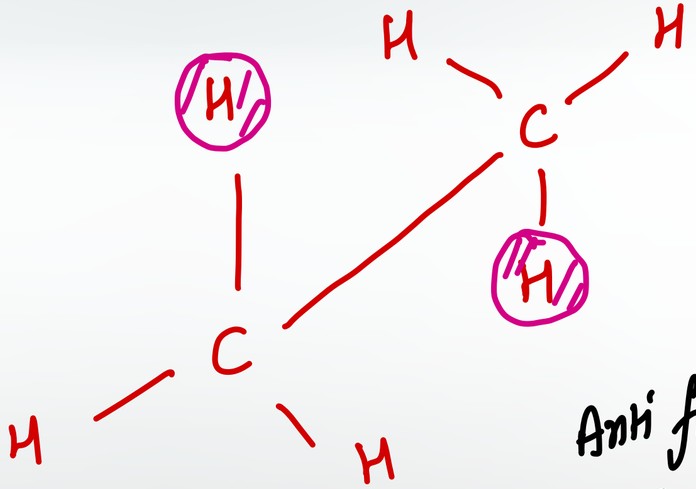
8. Hybridization depends upon σ bond	doesn't depend on σ bond
9. The groups or atoms can undergo bond rotation about single sigma (σ) bonds	Due to resistance to rotation around the π bond the groups attached to it are not free to rotate.
10. The σ electrons are referred as localised	in π bond the electrons are held less firmly bond thus can be easily dissociated or polarised by an external charge and hence the π e^- are referred as mobile electrons.
11. Shape of the molecule is determined by the σ bonds present in the molecule	π bonding does not affect the shape of the molecule

Chemical Bonding

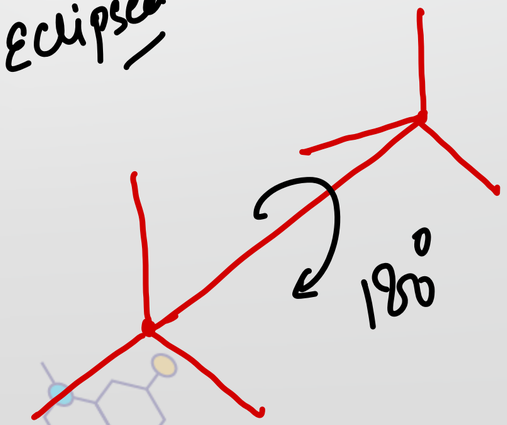
1. Ethane (C_2H_6)



Eclipsed.

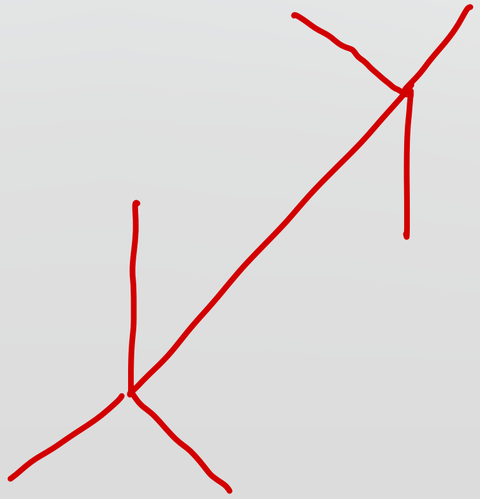


Anti form.



(Saw-horse projection)

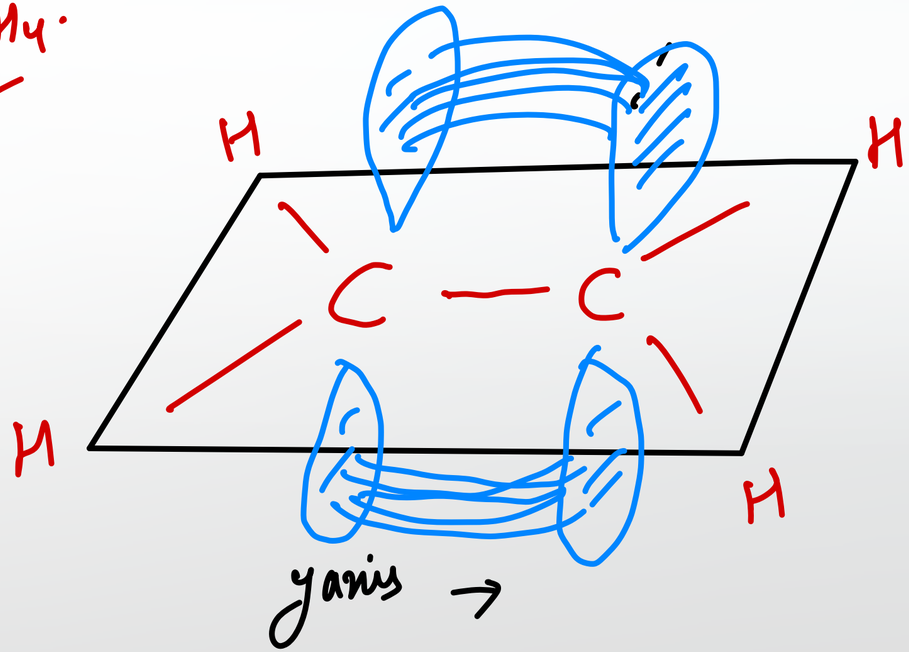
free rotation about sigma bond.



Conformational

Room temperature

2. Ethene. C_2H_4.



Restricted rotation about π Bond.

Factor affecting bond strength.

1. On the basis of size of overlapping orbital . (n)

$$\text{Bond strength} \propto \frac{1}{\text{Size of overlapping orbital}}$$

1.

$$C — C > Si — Si > Ge — Ge > Sn — Sn$$

2P -2P. 3P-3P. 4P-4P. 5P-5P

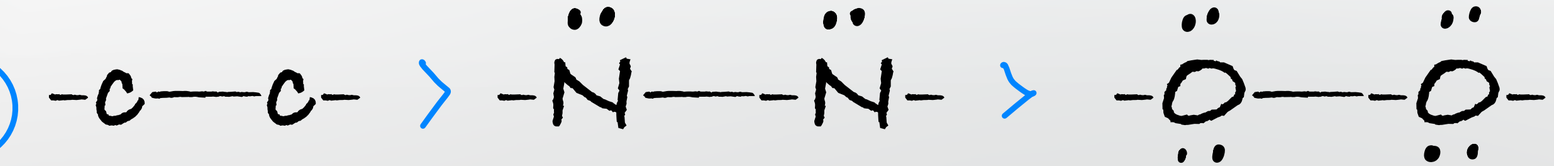
2.

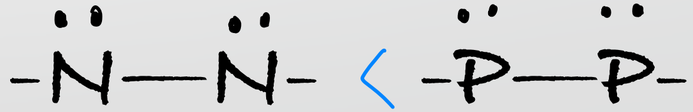
$$H — F > H — Cl > H — Br > H — I$$

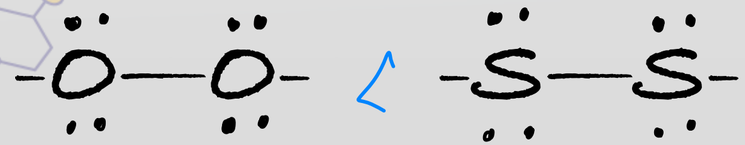
1S-2P. 1S- 3P. 1S-4P. 1S-5P

2. On the basis of lp-lp repulsion

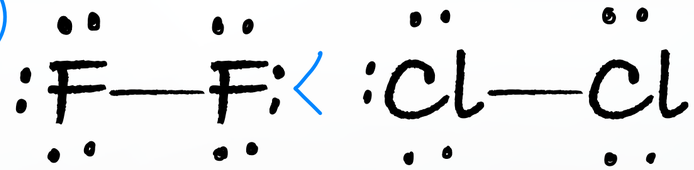
$$\text{Bond strength} \propto \frac{1}{\text{lp} - \text{lp repulsion}}$$

1.  On the basis of number of lone pair

2.  On the basis of orbital in which lone pair is present

3. 

4.



Experimentally bond dissociation energy order in Halogen is found to be

$Cl_2 > Br_2 > F_2 > I_2$

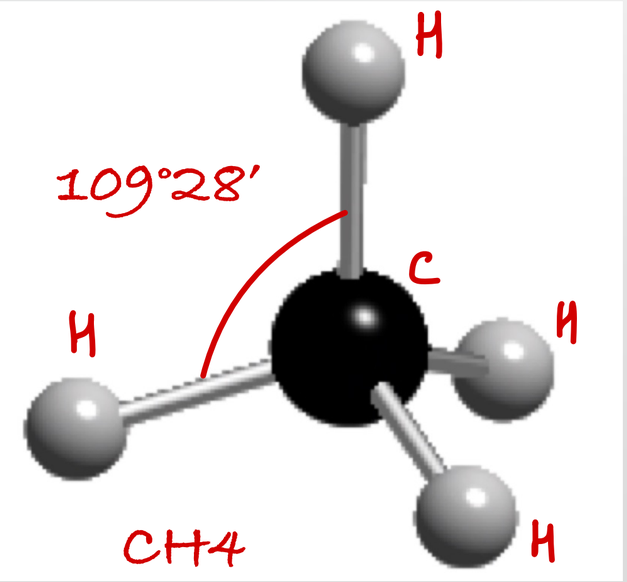
Draw backs of valence bond theory (VBT)

* valence bond theory fails to explain the structure and bonding of molecules which are poly atomic . (molecule having more than two atom.)

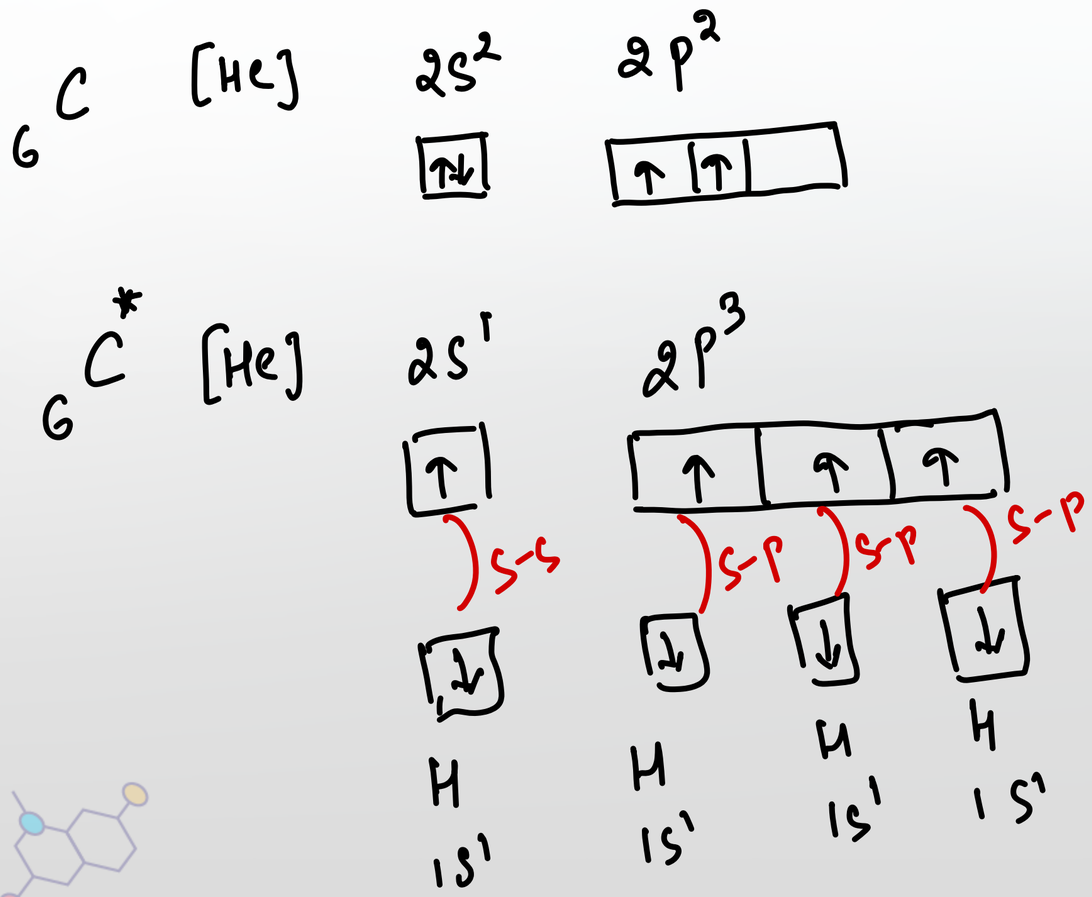
Let us consider the CH_4 molecule.

For the CH_4 molecule following observations are made.

1. All four 'C-H' bonds are identical
2. All bond are of equal strength .
3. All bond angle 'H-C-H' are equal and equal to 109°28' ($\hat{HCH}$)



According to VBT the CH_4 molecule can be explained as follows:



Bond strength.

$(1s - 2p) > (1s - 2s)$