

1 He: $1s \frac{1}{2}$

It does not have an orbital with only 1 e⁻ so the orbitals cannot overlap to form a covalent bond.

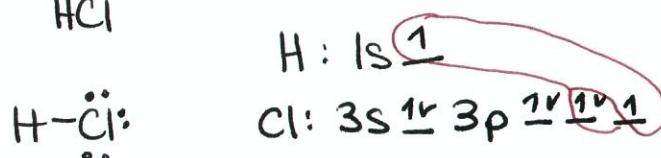
2. bond orbital is formed by an orbital from two separate atoms which each have 1 e⁻ overlapping to form a new orbital (region of space) containing two e⁻.

3.

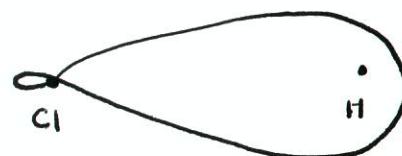


→ suggests the overlap of 3 orbitals but only 2 orbitals overlap to form a covalent bond

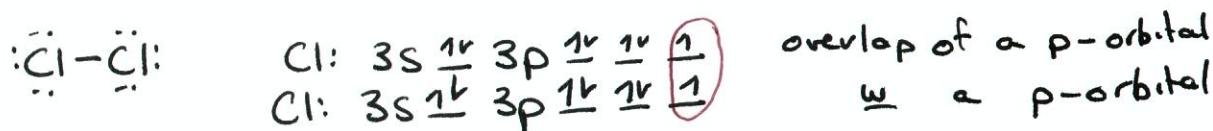
4.a) HCl



overlap of an s-orbital w a p-orbital



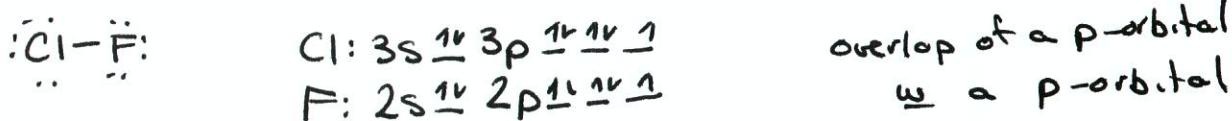
b) Cl₂



overlap of a p-orbital w a p-orbital



c) ClF



overlap of a p-orbital w a p-orbital



8a) H: $1s \underline{1}$ s-orbital

b) F: $2s \underline{1} 2p \underline{1} \underline{1} \underline{1}$ p-orbital

c) S: $3s \underline{1} 3p \underline{1} \underline{1} \underline{1}$ p-orbital

or

$\underbrace{3s \underline{1} 3p \underline{1} \underline{1} \underline{1}}_{3s \underline{p}^3 \underline{d}^2 \underline{1} \underline{1} \underline{1} \underline{1} \underline{1}}$ hybrid orbital

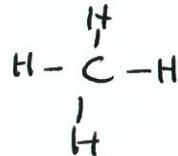
d) Br: $4s \underline{1} 4p \underline{1} \underline{1} \underline{1}$ p-orbital

9. two electrons

-one from each atom involved in the formation of a covalent bond

10. a) C in CH_4

C: $\underbrace{2s \underline{1} 2p \underline{1} \underline{1}}_{2s \underline{p}^3 \underline{1} \underline{1} \underline{1}}$



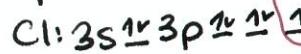
b) B in BH_3

B: $\underbrace{2s \underline{1} 2p \underline{1} \underline{1}}_{2s \underline{p}^2 \underline{1} \underline{1} \underline{1}}$

c) BeH₂

Be $\underbrace{2s \underline{1} 2p \underline{\underline{\underline{\quad}}}}_{2s \underline{p} \underline{1} \underline{1}}$

II. a) BeCl_2

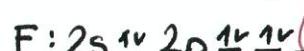
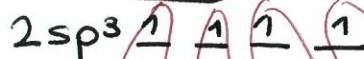
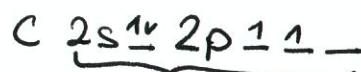
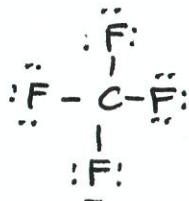


hybrid \approx p-orbital

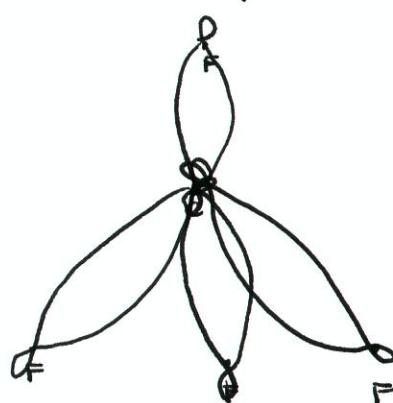
hybrid \approx p-orbital



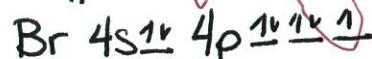
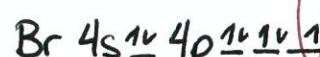
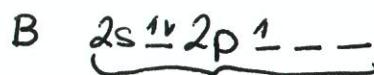
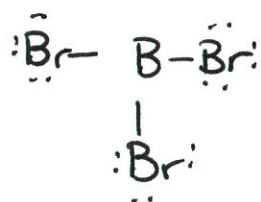
b) CF_4



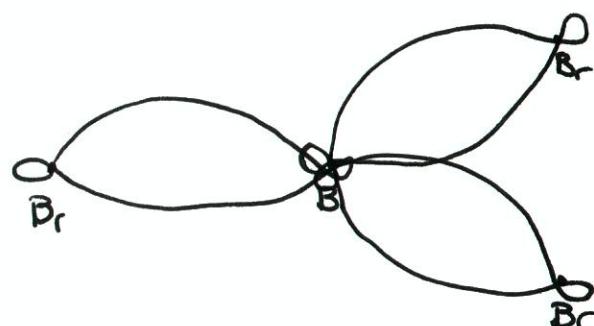
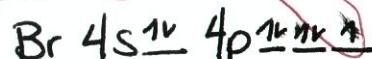
all are overlaps of hybrid orbitals \approx p-orbitals



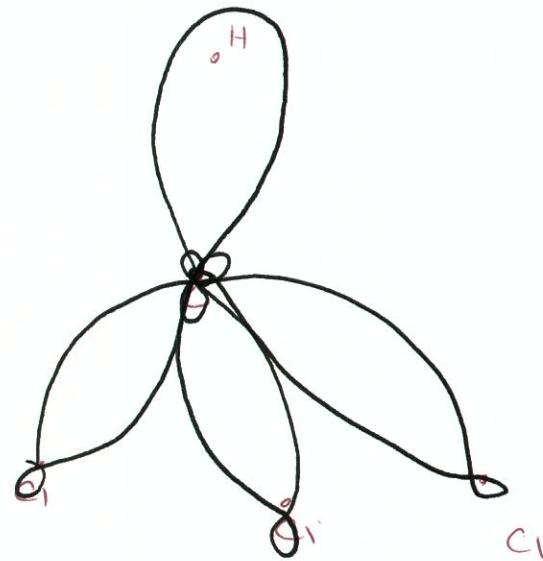
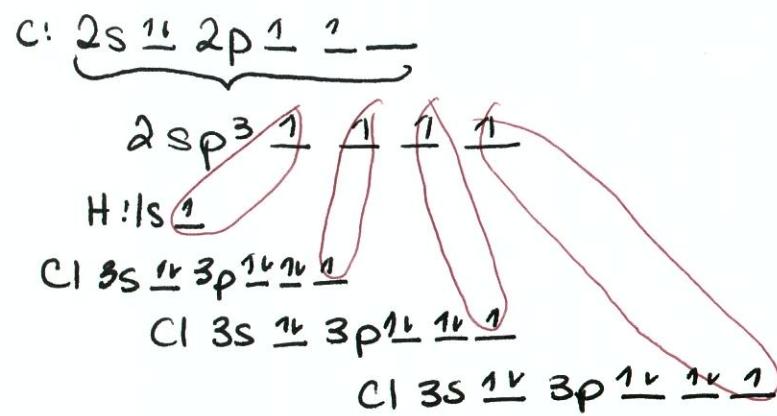
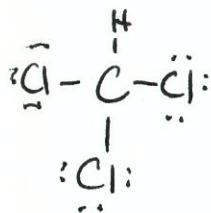
c) BBr_3



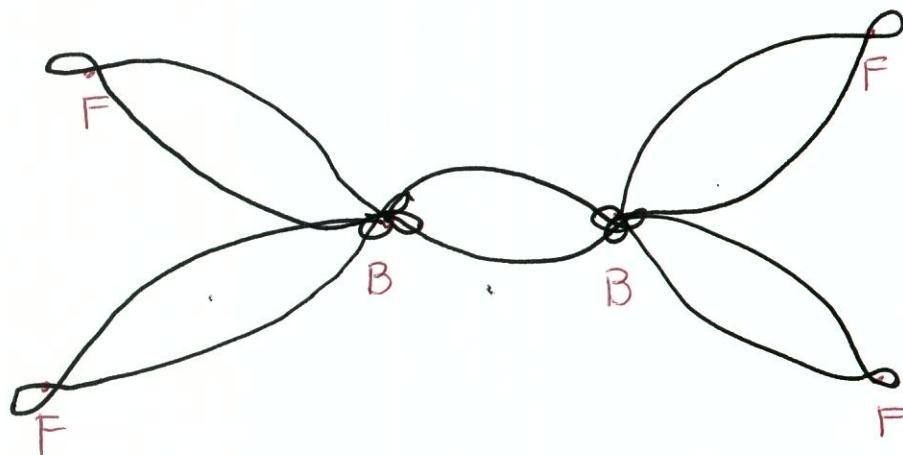
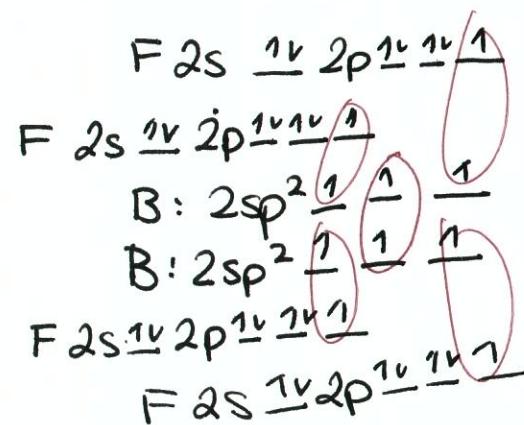
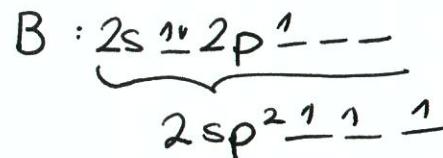
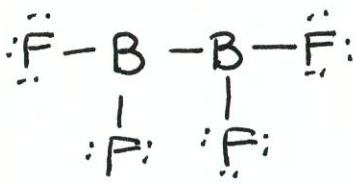
all are overlaps of hybrid orbitals \approx p-orbitals



d) CHCl_3



e) B_2F_4

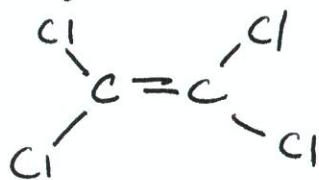


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π -bonds are formed through the side-by-side overlap of 2 p-orbitals

19 \rightarrow ignore

20.a)



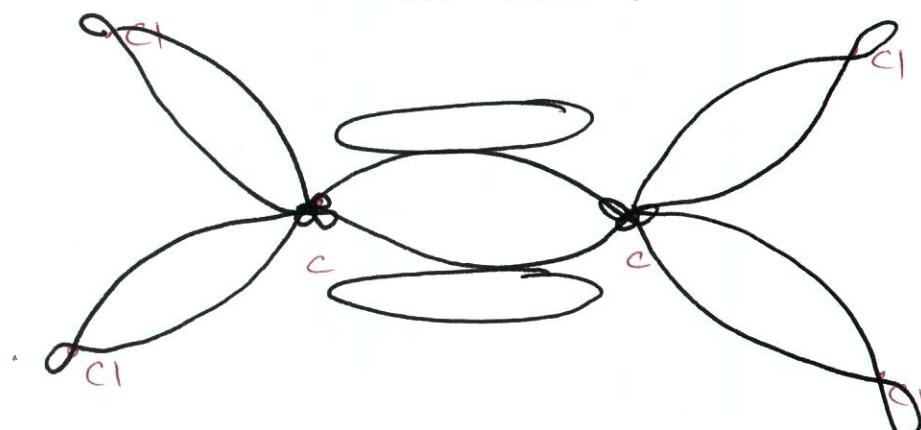
C: $2s \frac{1}{\cancel{1}} \underline{2p} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}}$
 $2s \cancel{p^2} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} 2p \frac{1}{\cancel{1}}$

Cl: $3s \frac{1}{\cancel{1}} \underline{3p} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}}$
 $3s \cancel{1} \frac{1}{\cancel{1}} \underline{3p} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}}$

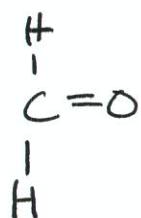
C: $2s \cancel{p^2} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} 2p \frac{1}{\cancel{1}}$

C: $2s \cancel{p^2} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} 2p \frac{1}{\cancel{1}}$

Cl: $3s \frac{1}{\cancel{1}} \underline{3p} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}}$
 $3s \cancel{1} \frac{1}{\cancel{1}} \underline{3p} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}}$



b)



CO₂ $2s \frac{1}{\cancel{1}} \underline{2p} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}}$
 $2s \cancel{p^2} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} 2p \frac{1}{\cancel{1}}$

H: $1s \frac{1}{\cancel{1}}$
 $1s \frac{1}{\cancel{1}}$

O: $2s \frac{1}{\cancel{1}} \underline{2p} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}} \frac{1}{\cancel{1}}$

