Strutture molecolari

Numero di legami σ o σ più π formati per condivisione di elettroni dispari da ciascuno degli elementi non metalici nelle loro combinazioni.

Gruppo	**n°**	**Elemento**	**C.E.F. o C.E.E.**	**N° di legami**	**Esempi**
I°	1	H	**$(1s)^1$**	uno	HF, H_2O PH_3
II°	2	Be	**$(2s)^1\ 2(p)^{1,0,0}$**	due	BeO, BeF_2 Be_2C
III°	2	B	**$(2s)^1\ 2(p)^{1,1,0}$**	tre	BF_3, BO_3^{3-}
IV°	2	C	**$(2s)^1\ 2(p)^{1,1,1}$**	quattro	CH_4, CO_2, C_2H_6
	>2	Si, Ge	**$(ns)^1\ n(p)^{1,1,}1\ n(d)^{0,0,0,0,0}$**	quattro	SiO_2, GeO_2

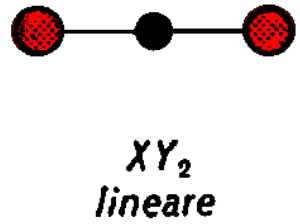
Gruppo	n°	Elemento	C.E.F. o C.E.E.	N° di legami	Esempi
V°	2	N	$\mathbf{(2s)^2\ 2(p)^{1,1,1}}$	tre	NH_3 , N_2H_4 , NO(OH)
		N^+	$\mathbf{(2s)^1\ 2(p)^{1,1,1}}$	quattro	NH_4^+ , NO_3^-
		N^-	$\mathbf{(2s)^2\ 2(p)^{2,1,1}}$	due	NH_2^-
	>2	P , As , Sb	$\mathbf{(ns)^2\ n(p)^{1,1,1}\ n(d)^{0,0,0,0,0}}$	tre	PH_3 , AsH_3 , SbH_3
			$\mathbf{(ns)^1\ n(p)^{1,1,1}\ n(d)^{1,0,0,0,0}}$	cinque	PCl_5 , PO_4^{3-} , AsO_4^{3-}
VI°	2	O	$\mathbf{(2s)^2\ 2(p)^{2,1,1}}$	due	H_2O , CO_2 , SiO_2
		O^+	$\mathbf{(2s)^2\ 2(p)^{1,1,1}}$	tre	O_3 , H_3O^+
		O^-	$\mathbf{(2s)^2\ 2(p)^{2,2,1}}$	uno	O_3 , NO_3^-
	>2	S, Se, Te	$\mathbf{(ns)^2\ n(p)^{2,1,1}\ n(d)^{0,0,0,0,0}}$	due	H_2S, H_2Se, H_2Te
			$\mathbf{(ns)^2\ n(p)^{1,1,1}\ n(d)^{1,0,0,0,0}}$	quattro	SO_2, Cl_2SO, SO_3^{2-}
			$\mathbf{(ns)^1\ n(p)^{1,1,1}\ n(d)^{1,1,0,0,0}}$	sei	SO_3, Cl_2SO_2, SO_4^{2-}

Gruppo	**n°**	**Elemento**	**C.E.F. o C.E.E.**	**N° di legami**	**Esempi**
VII°	2	F	**$(2s)^2\ 2(p)^{2,2,1}$**	uno	HF, BeF_2, BF_3, CF_4
	>2	Cl, Br, I	**$(ns)^2\ n(p)^{2,2,1}\ n(d)^{0,0,0,0,0}$**	uno	HCl, HBr, Cl_2O, ClO^-
			$(ns)^2\ n(p)^{2,1,1}\ n(d)^{1,0,0,0,0}$	tre	Cl_2O_3 , ClO_2^-
			$(ns)^2\ n(p)^{1,1,1}\ n(d)^{1,1,0,0,0}$	cinque	ClO_3^-, BrO_3^-, BrO_3^-
			$(ns)^1\ n(p)^{1,1,1}\ n(d)^{1,1,1,0,0}$	sette	Cl_2O_7, ClO_4^-, IO_4^-

$(:)_cXY_{y-c}$ $(c \geq 0 \ ; \ y-c \geq 2)$

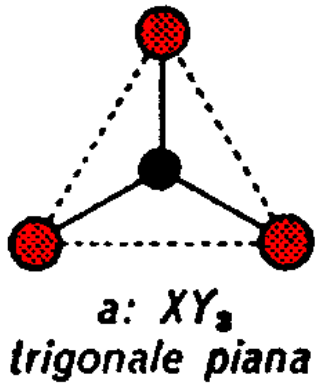
I) *lineare* se $y = 2$ e $c = 0$ XY_2

Esempi: BeH_2 (idururo di berillio) e CO_2 (diossido di carbonio);



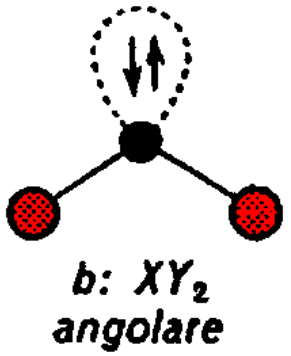
II) *a) triponale piana* se $y = 3$ e $c = 0$ XY_3

Esempi: BF_3 (trifluoruro di boro) ed SO_3 (triossido di zolfo);



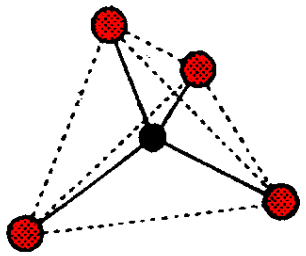
b) angolare se $y = 3$ e $c = 1$ $:XY_2$

Esempi: SO_2 (diossido di zolfo) ed NO_2^- (ione nitrito);



III) *a) tetraedrica* se y = 4 e c = 0 XY_4

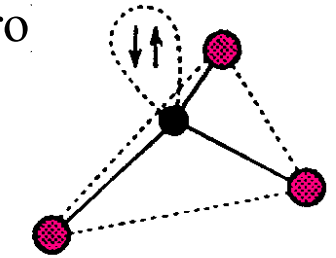
Esempi: CH_4 (metano) ed SiF_4 (tetrafluoruro di silicio);



a: XY_4
tetraedrica

b) piramidale trigonale se y = 4 e c = 1 $:XY_3$

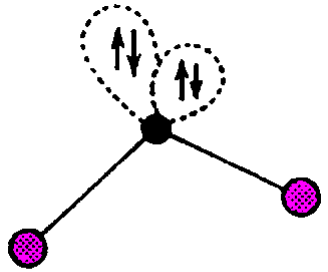
Esempi: NH_3 (ammoniaca) e PCl_3 (tricloruro di fosforo



b: XY_3
piramidale trigonale

c) *a forma di V* se y = 4 e c =2 $(:)_2XY_2$

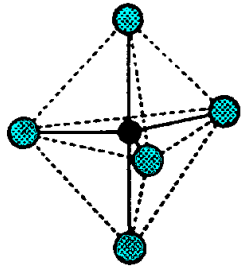
Esempi: OH_2 (acqua) ed SH_2 (acido solfidrico);



c: XY_2
angolare

IV) *a) bipiramidale trigonale* se y = 5 e c = 0 XY_5

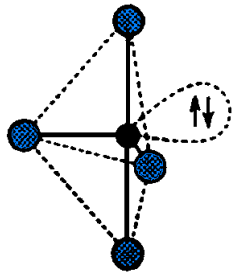
Esempi: PCl_5 (pentacloruro di fosforo)
ed AsF_5 (pentacloruro di arsenico)



a: XY_5
bipiramidale trigonale

b) tetraedrica irregolare se y = 5 e c = 1 $:XY_4$

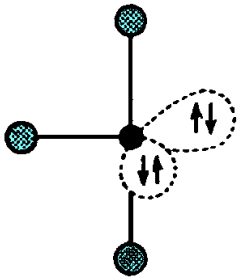
Esempi: SF_4 (Tetrafloruro di zolfo)
ed SeF_4 tetrafloruro di selenio



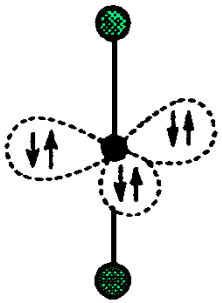
b: XY_4
tetraedrica irregolare

c) piana a forma di T se y = 5 e c = 2 $(:)_2XY_3$

Esempi: ClF_3 (trifloruro di cloro)
e BrF_3 (trifloruro di bromo)



c: XY_3
piana a T



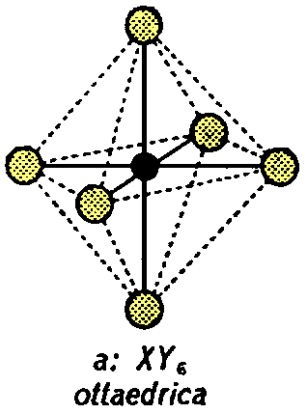
d: XY_2
lineare

d) lineare se Y = 5 e c =3 $(:)_3XY_2$

Esempi: $BrCl_2^-$ (ione diclorobromato) ed ICl_2^- (dicloroiodato)

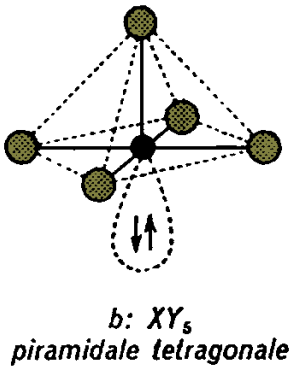
V) *a) ottaedrica* se y = 6 e c = 0 XY_6

Esempi: SF_6 (esafloruro di zolfo) e PF_6^- (ione esafluorofosfato);



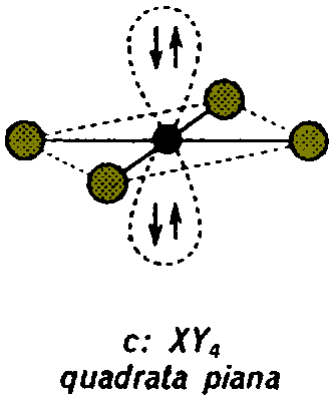
b) piramidale tetragonale se Y = 6 e c = 1 $:XY_5$

Esempi BrF_5 (pentafloruro di bromo)
e SbF_5^- (ione pentafluoroantimoniato)

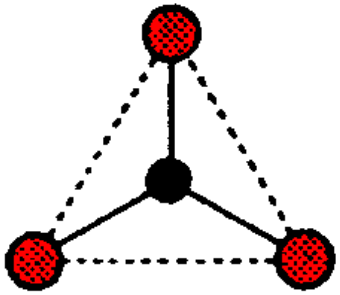


c) quadrata piana se Y = 6 e c = 2 $(:)_2XY$

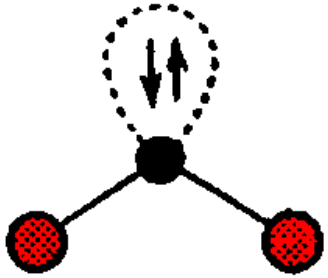
Esempi BrF_4^- (ione tetrafluorobromato)
e ICl_4^- (ione tetracloroiodato)



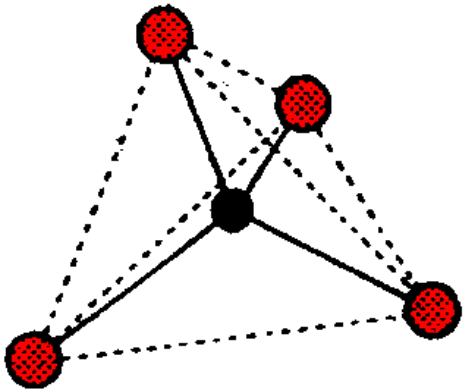
XY_2
lineare



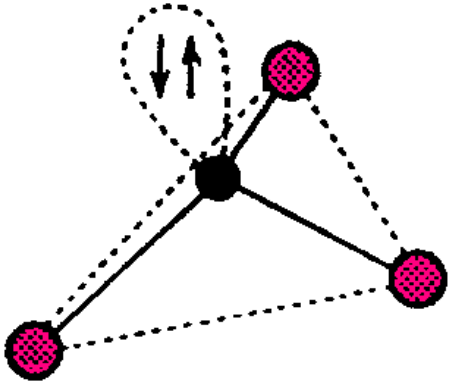
a: XY_3
trigonale piana



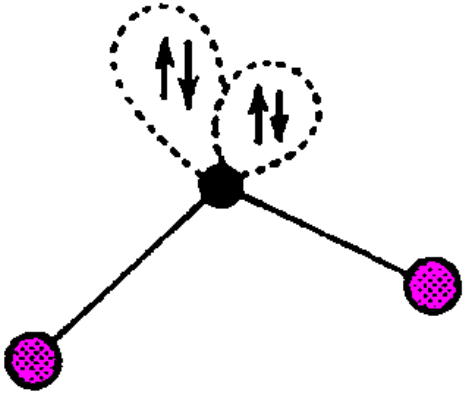
b: XY_2
angolare



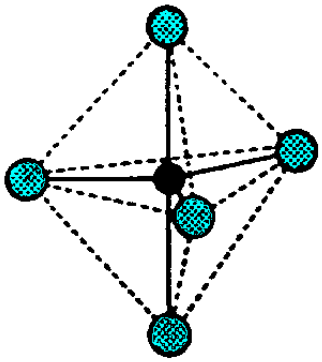
a: XY_4
tetraedrica



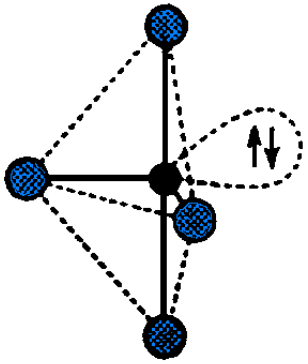
b: XY_3
piramidale trigonale



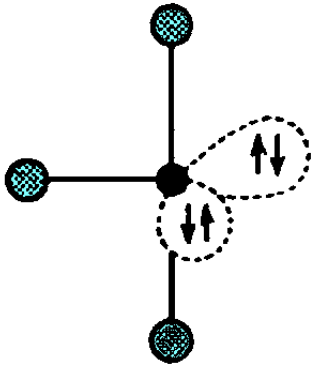
c: XY_2
angolare



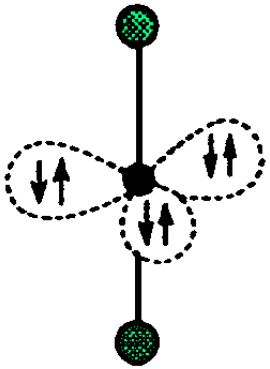
a: XY_5
bipiramidale trigonale



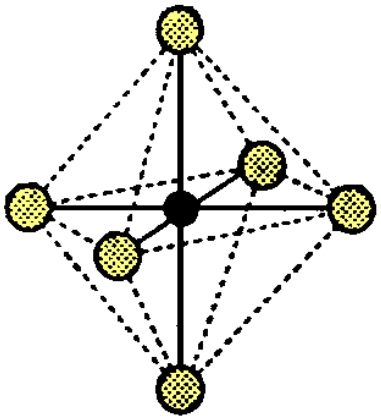
b: XY_4
tetraedrica irregolare



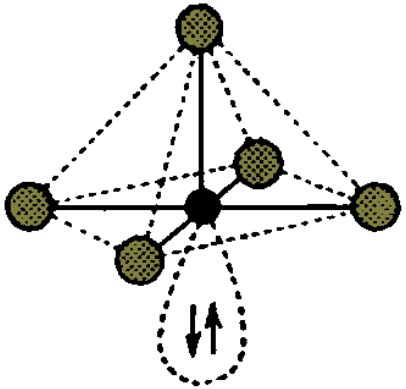
c: XY_3
piana a T



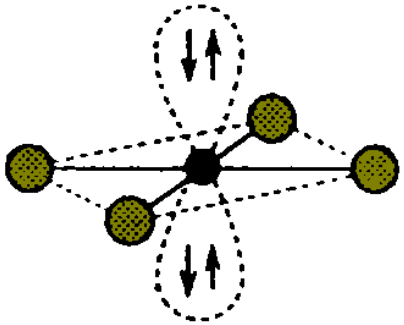
d: XY_2
lineare



a: XY_6
ottaedrica



b: XY_5
piramidale tetragonale



c: XY_4
quadrata piana

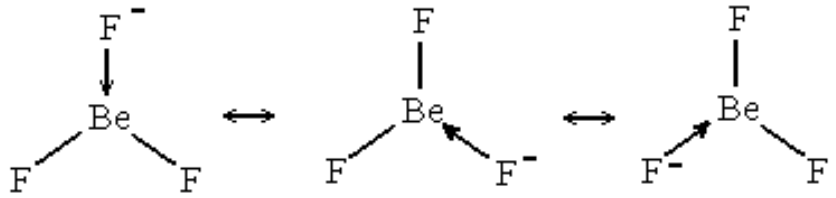
molecole con l'atomo centrale ibridato *sp*, a geometria *lineare*:

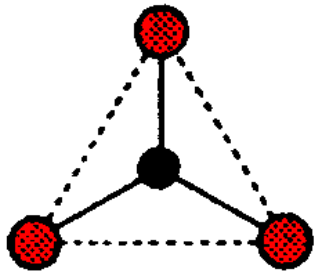
BeF_2	(difluoruro di berillio)	F—Be—F
BeO_2^{2-}	(ione berillato)	$^{-}$O—Be—O^{-}
CO_2	(diossido di carbonio)	O=C=O
C_2H_2	(etino o acetilene)	H—C≡C—H
HCN	(acido cianidrico)	H—C≡N
N_2O	(ossido di diazoto)	$\bar{N}=\overset{+}{N}=O$

XY_2
lineare

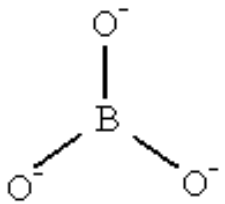
II *a*) molecole con l'atomo centrale ibridizzato ***sp²*** , a geometria ***trigonale piana***

BeF_3^- (ione trifluoro berillato)

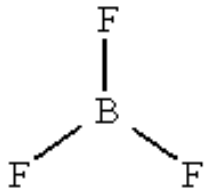




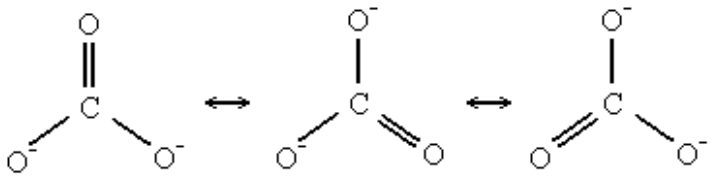
BO_3^- (ione ortoborato o borato)



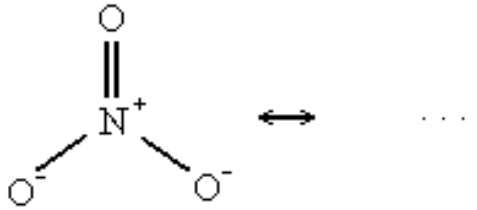
BF_3 (trifloruro di boro)



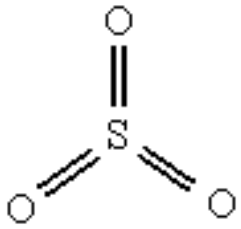
CO_3^{2-} (ione carbonato)



NO_3^- (ione nitrato)

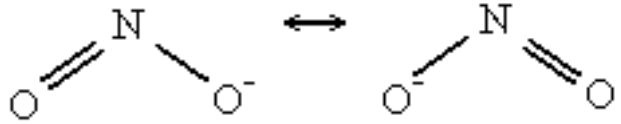


SO_3 (triossido di zolfo)

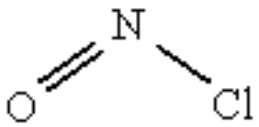


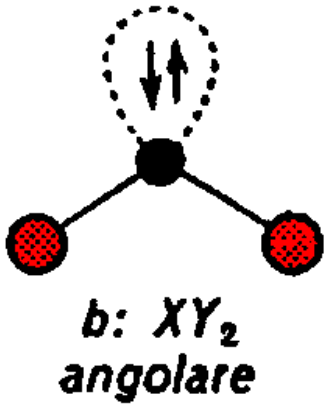
b) molecole con l'atomo centrale ibridizzato ***sp²*** , a geometria ***angolare***

NO_2^- (ione nitrito)

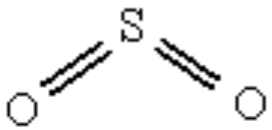


NOCl (cloruro di nitrosile)

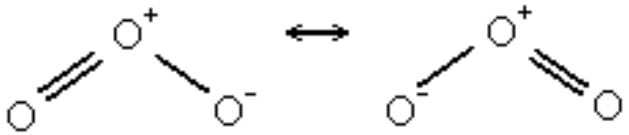




SO_2 (diossido di zolfo)

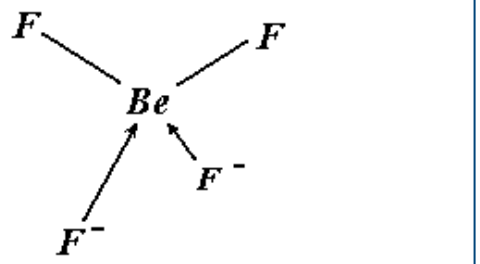


O_3 (ozono)

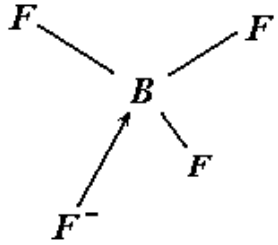


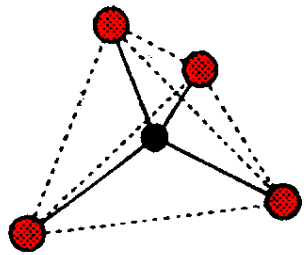
III *a*) molecole con l'atomo centrale ibridizzato ***sp³*** , a geometria ***tetraedrica***

BeF_4^{2-} *(ione tetrafluoroberillato)*

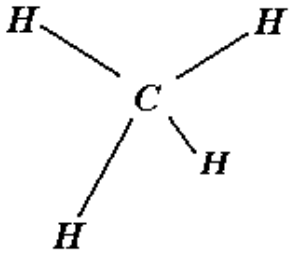


BF_4^- *(ione tetrafluoroborato)*

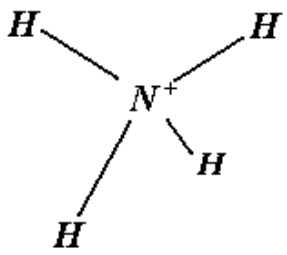




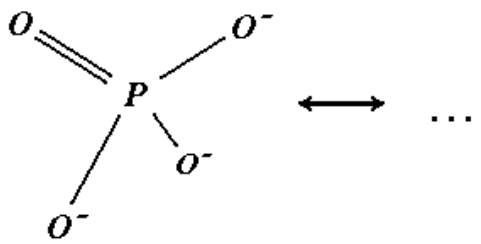
CH_4 *(metano)*



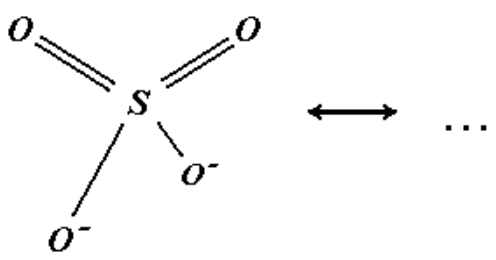
NH_4^+ *(ione ammonio)*



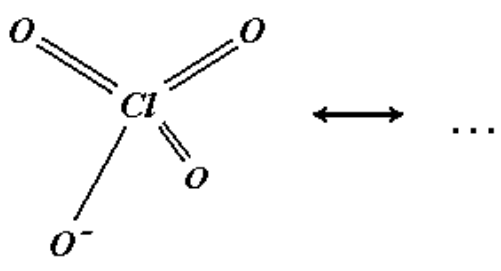
PO_4^{3-} *(ione ortofosfato o fosfato)*



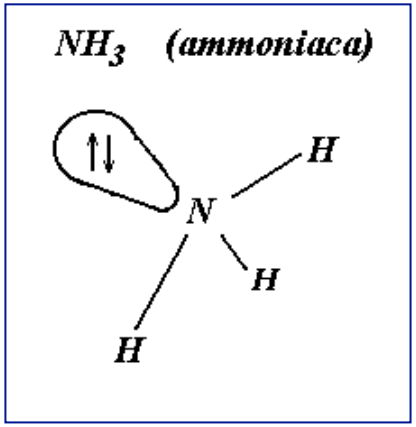
SO_4^{2-} *(ione solfato)*

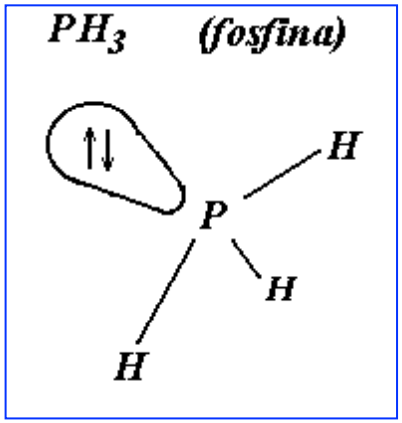


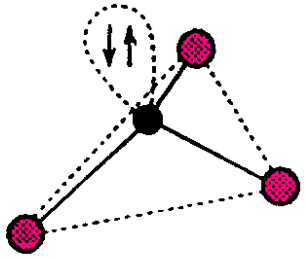
ClO_4^- *(ione perclorato)*

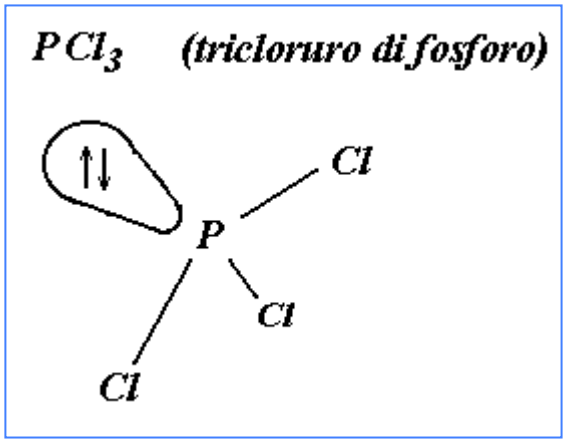


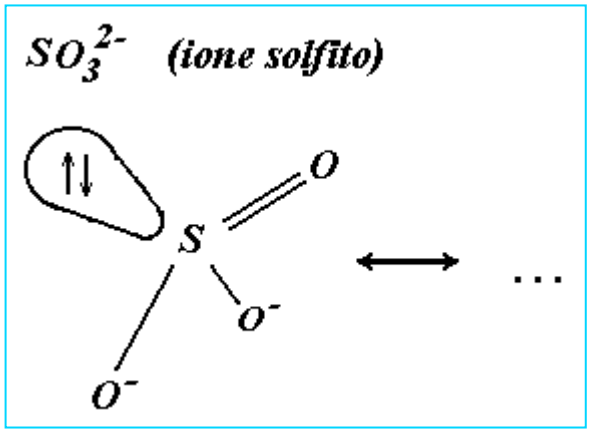
b) molecole con l'atomo centrale ibridizzato ***sp*^{3}** , a geometria ***piramidale trigonale***

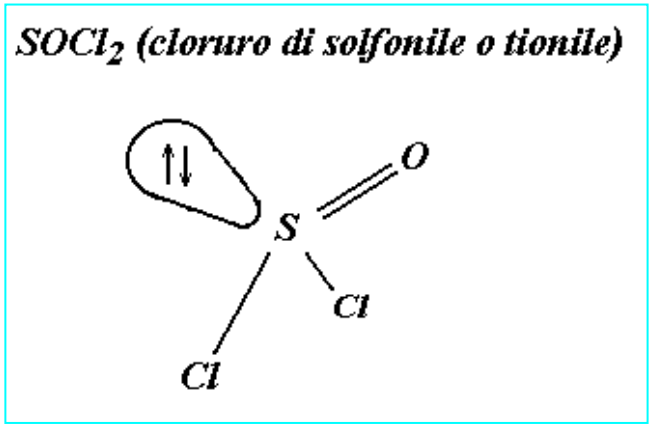


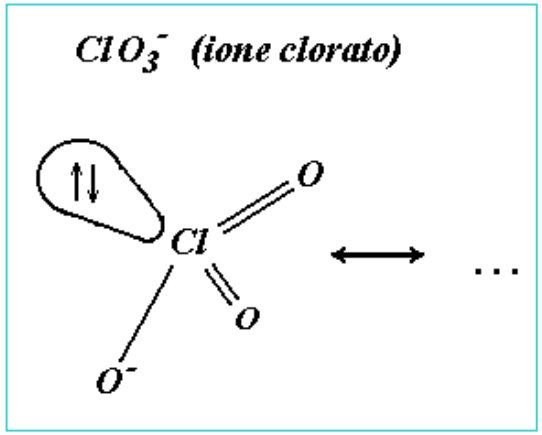






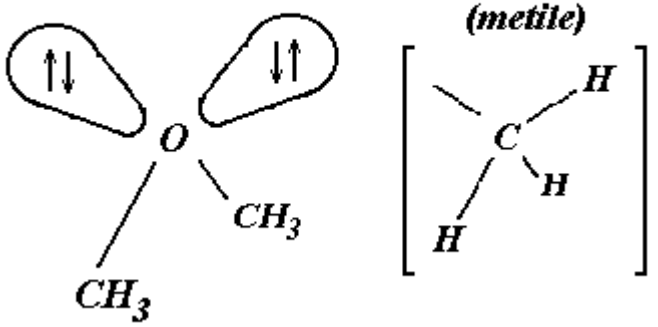




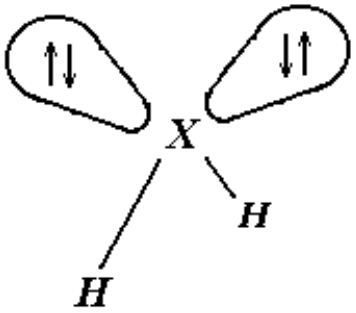


c) molecole con l'atomo centrale ibridizzato ***sp³*** , a geometria a ***V***

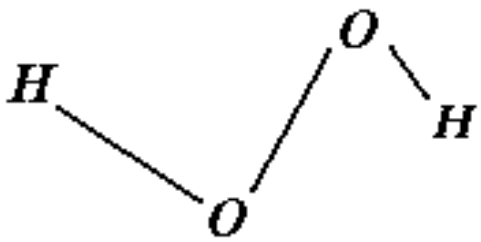
$(CH_3)_2O$ (etere metilico)



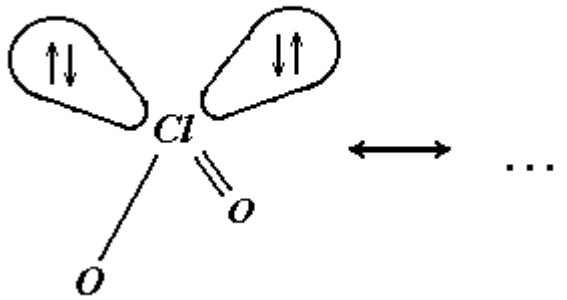
H_2X (X = O o S o Se o Te)



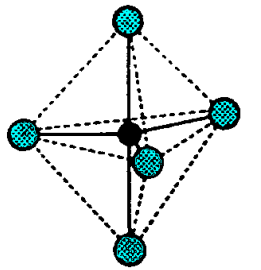
H_2O_2 (acqua ossigenata)



ClO_2^- (ione clorito)

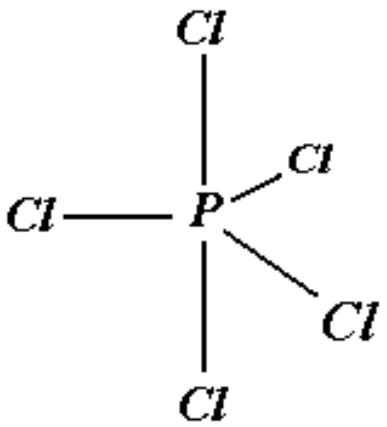


IV *a*) molecole con l'atomo centrale ibridizzato ***sp^3d*** , a geometria a ***bipiramidale trigonale***

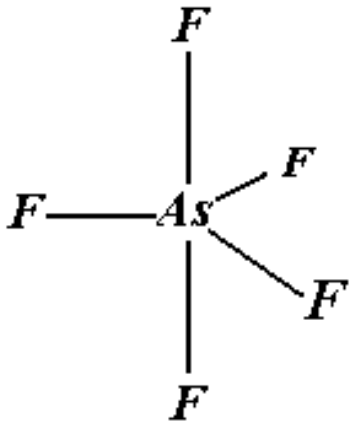


a: XY_5
bipiramidale trigonale

PCl_5 (pentacloruro di fosforo)

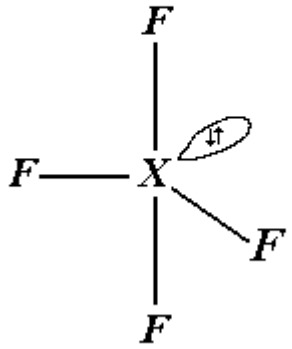


AsF_5 (pentafloruro di arsenico)

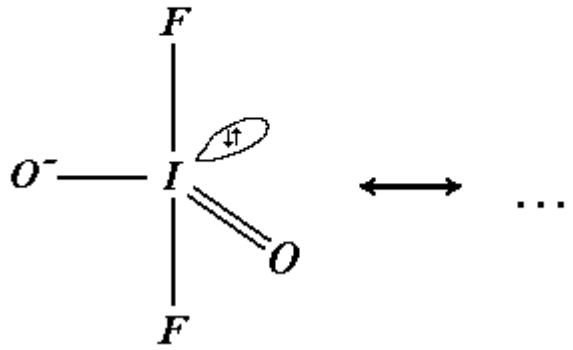


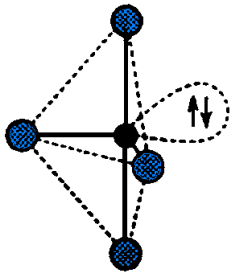
b) molecole con l'atomo centrale ibridizzato ***sp^3d*** , a geometria ***tetraedrica irregolare***

XF_4 (X = S o Se o Te)
(tetrafloruro di ...)



$(IO_2F_2)^-$ (ione difluoruro di iodile)

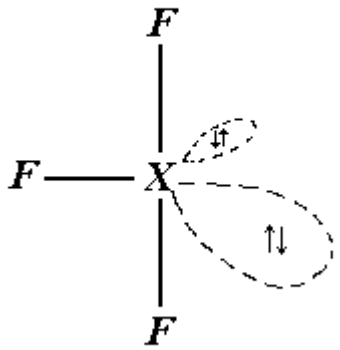


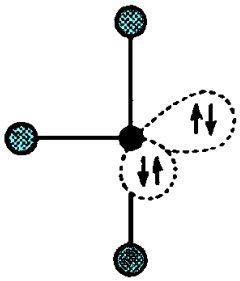


b: XY_4
tetraedrica irregolare

c) molecole con l'atomo centrale ibridizzato ***sp^3d*** , con geometria a ***T***

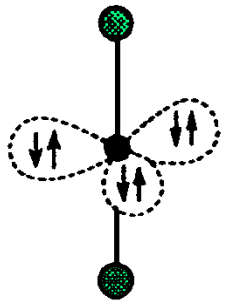
XF_3 (X = Cl o Br)

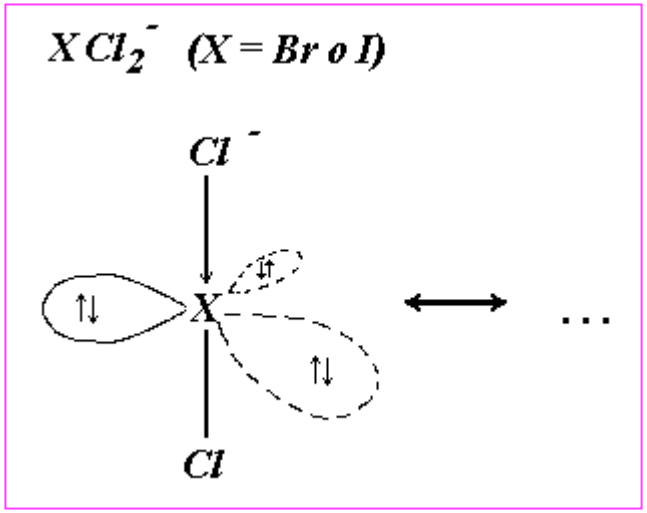


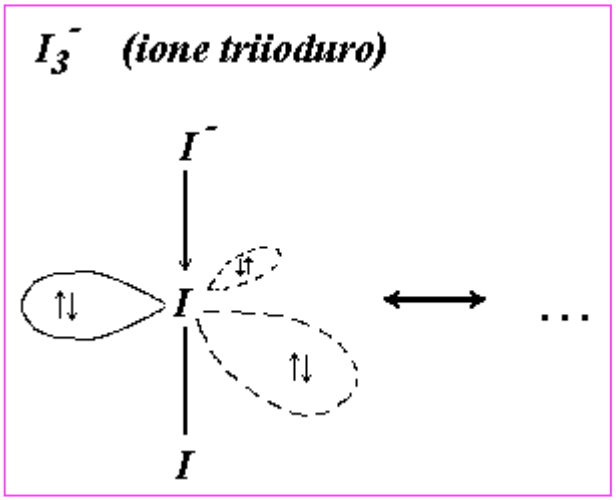


c: XY_3
piana a T

d) molecole con l'atomo centrale ibridizzato ***sp^3d*** , con geometria a ***lineare***

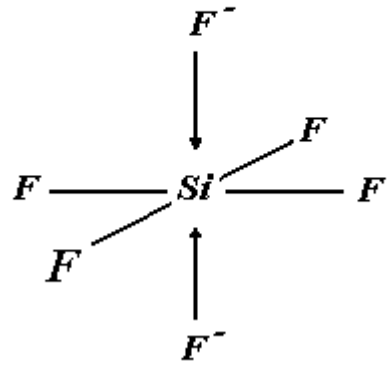




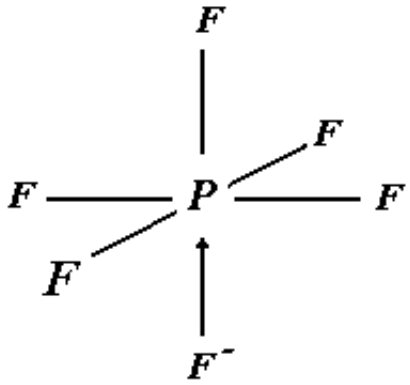


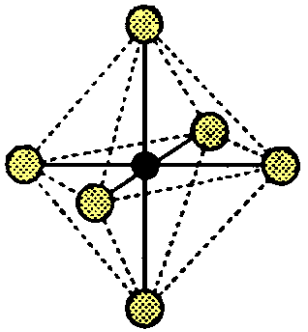
V *a*) molecole con l'atomo centrale ibridizzato ***sp^3d^2*** , a geometria a ***ottaedrica***

SiF_6^{2-} (ione esafluoro silicato)

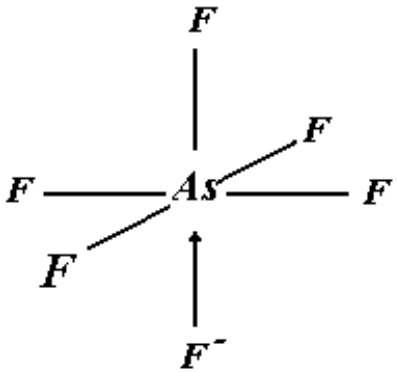


PF_6^- (ione esafluorofosfato)

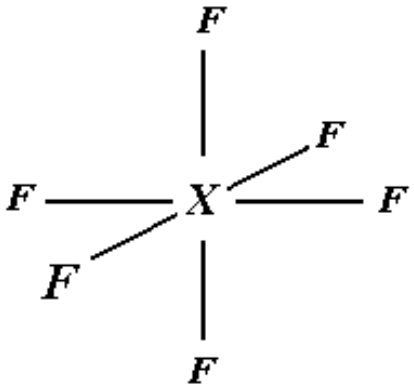




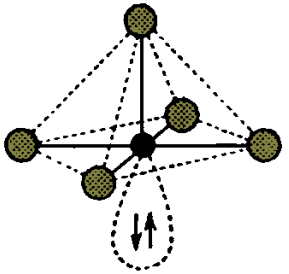
AsF_6^- (ione esafluoroarseniato)



XF_6 (X = S o Se) (esafluoruro di ...)

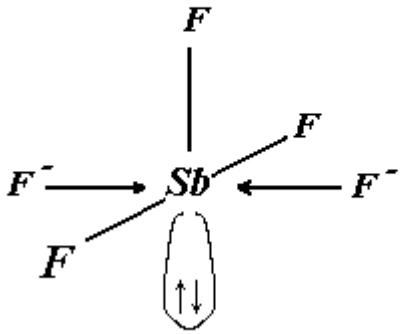


b) molecole con l'atomo centrale ibridizzato ***sp^3d^2*** , a geometria a ***piramidale tetragonale***

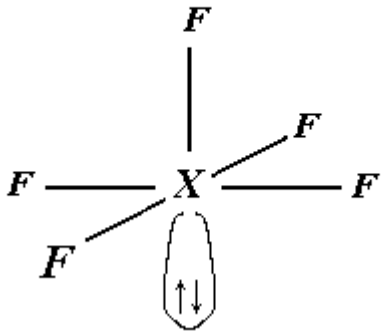


b: XY_5
piramidale tetragonale

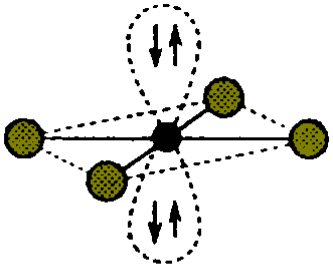
SbF_5^{2-} (ione pentafluoroantimoniato)



XF_5 (X = Br o I) (pentafluoruro di ...)

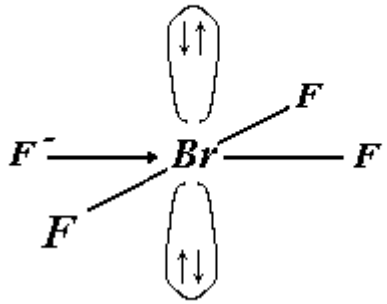


c) molecole con l'atomo centrale ibridizzato ***sp^3d^2*** , a geometria a ***quadrata***

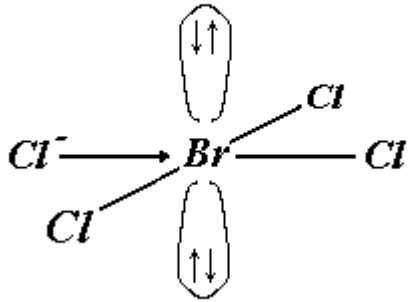


c: XY_4
quadrata piana

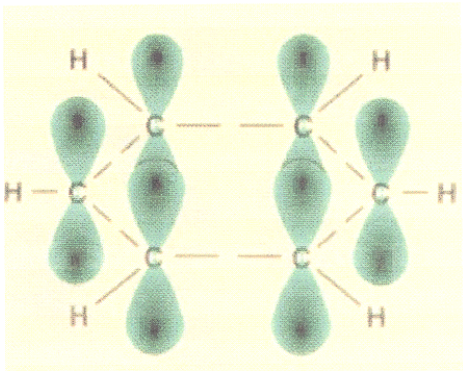
BrF_4^- (ione tetrafluorobromato)

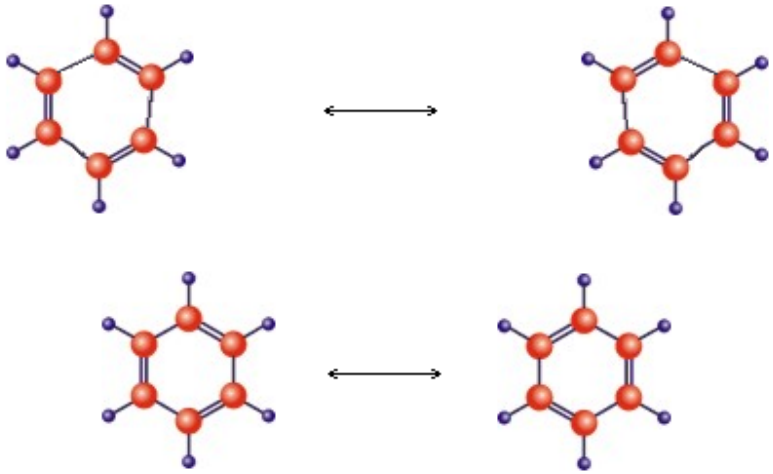


ICl_4^- (ione tetracloroiodato)



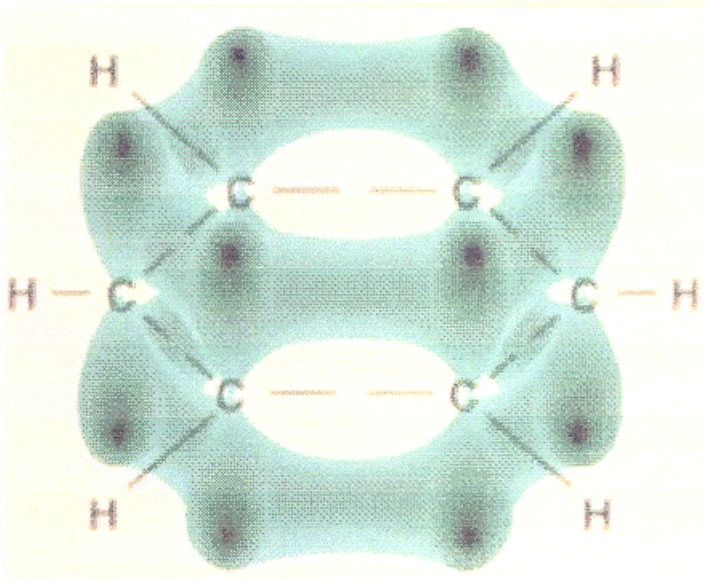
Il benzene C_6H_6



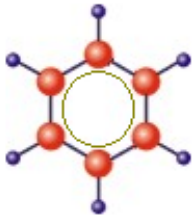


Formule limite di kekulé

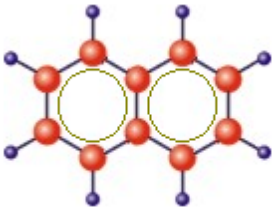
Composti aromatici: il numero di elettroni p di atomi di C adiacenti deve soddisfare la formula $4n+2$



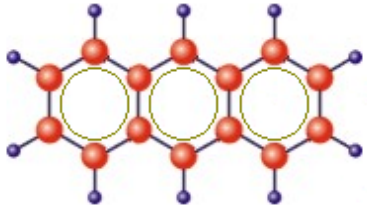
Composti aromatici: il numero di elettroni p di atomi di C adiacenti deve soddisfare la formula $4n+2$



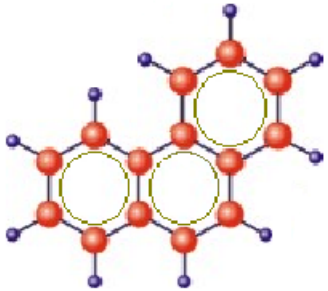
Benzene



Naftalina



Antracene



Fenantrane