Chemical Bonding

Draw the structure of following molecule

16. H_2O_2

17. C_2H_6

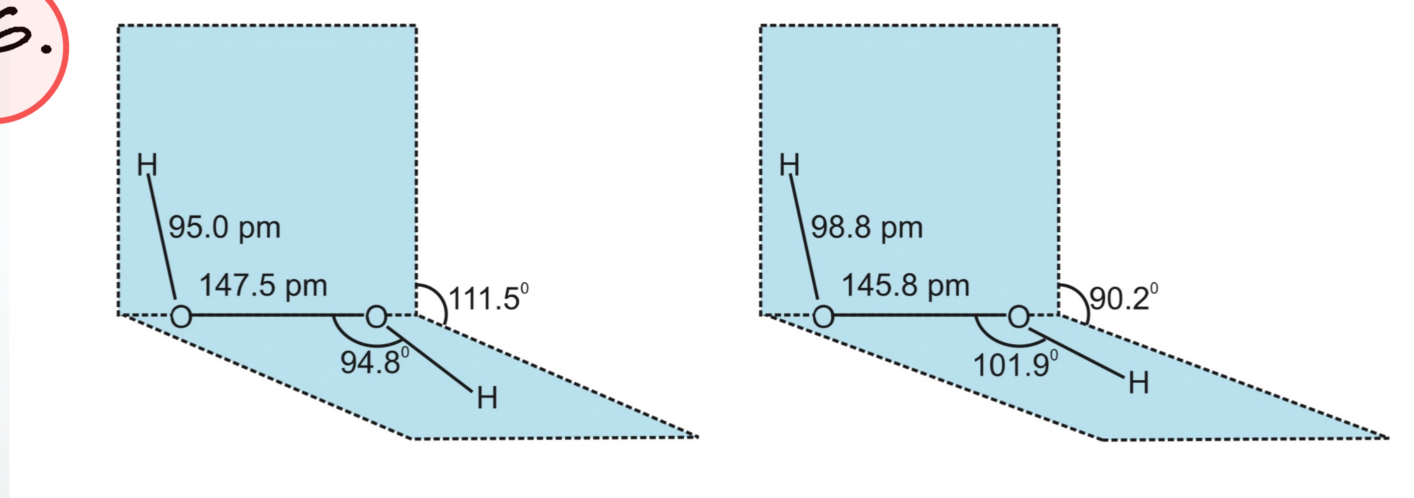
18. C_2H_4

19. C_2H_2

20. CO_3^{2-}

Open book structure

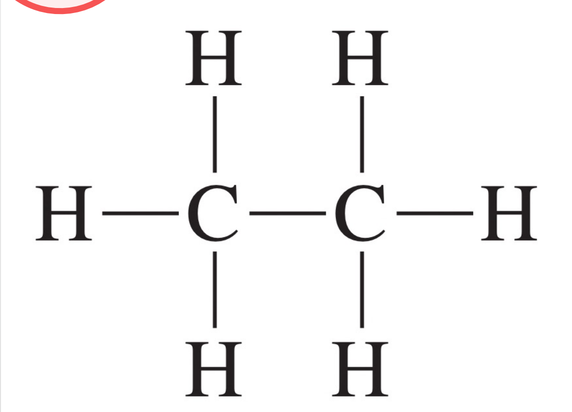
16.



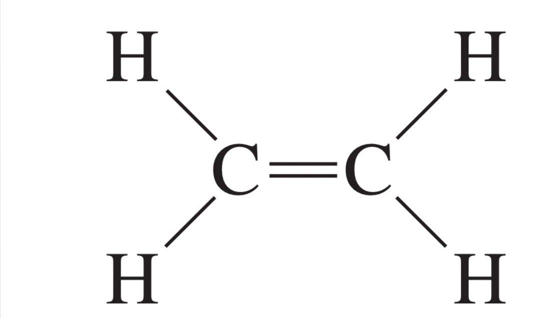
(a) Gas phase

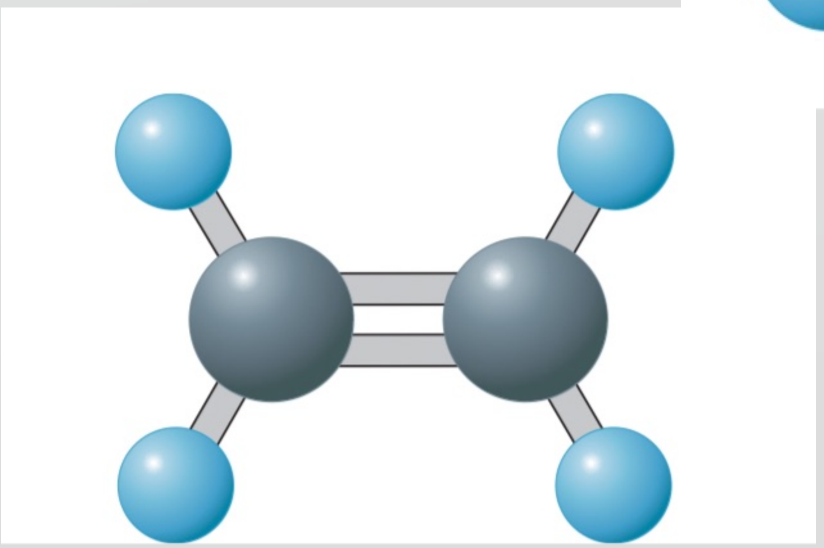
(b) Solid phase

17.



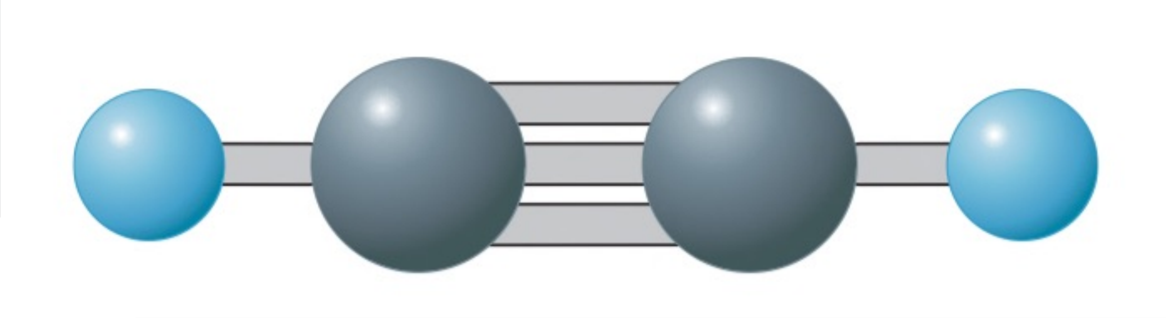
18.



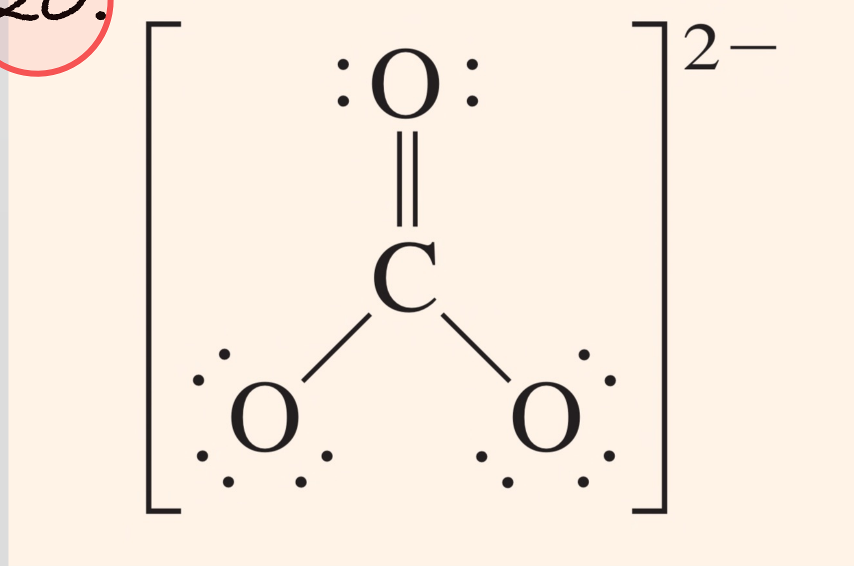


19.

$H-C\equiv C-H$



20.



Chemical Bonding

21.monothiocarbonate ion =S

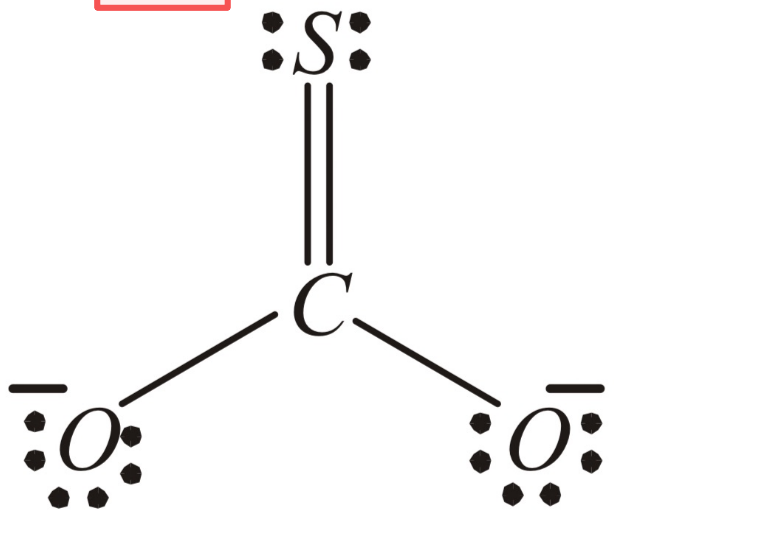
22.N2O3

23.N2O4

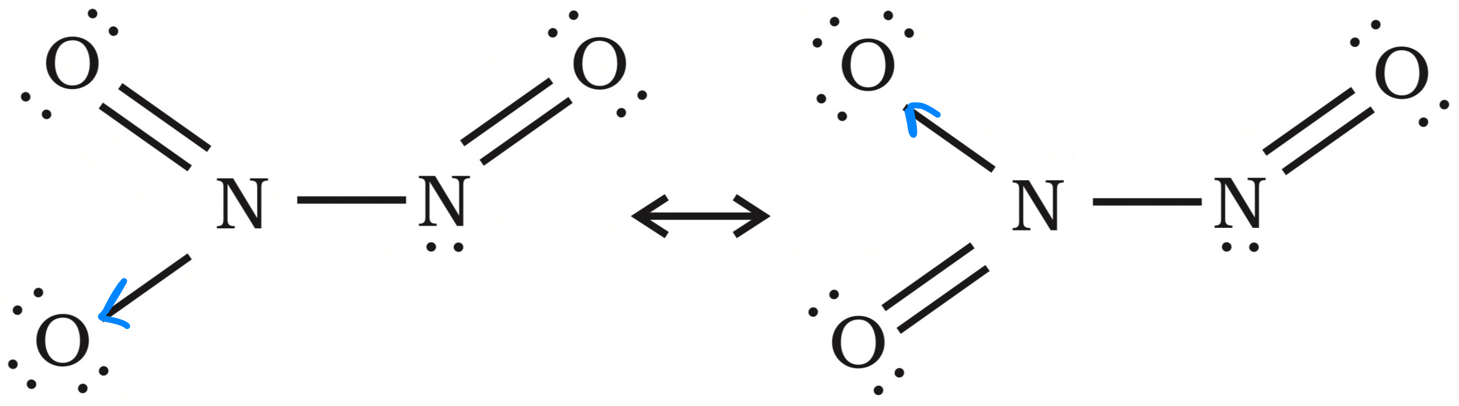
24.N2O5

25. POCl 3

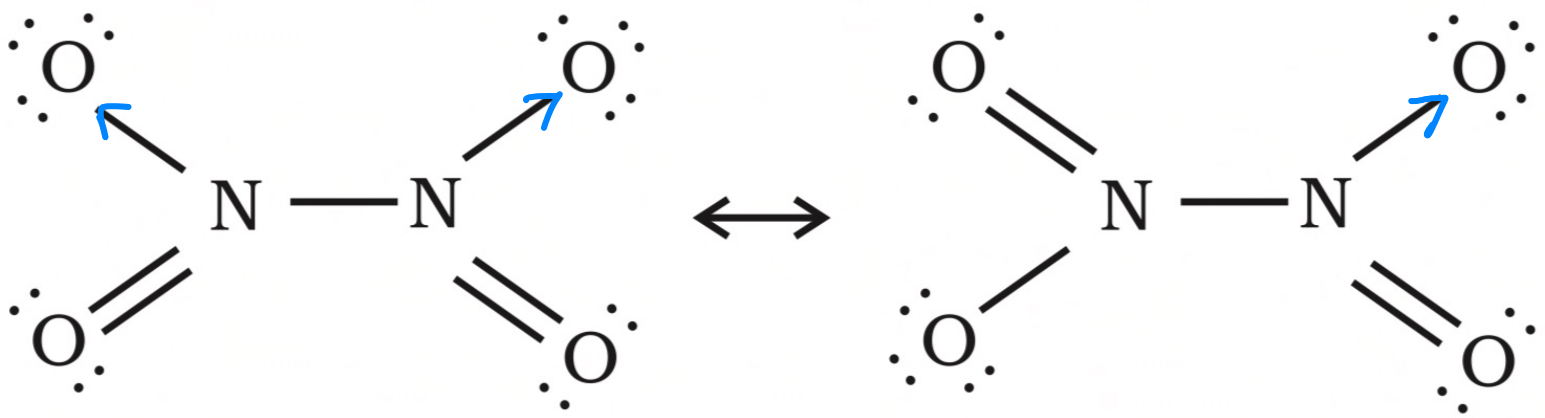
21.



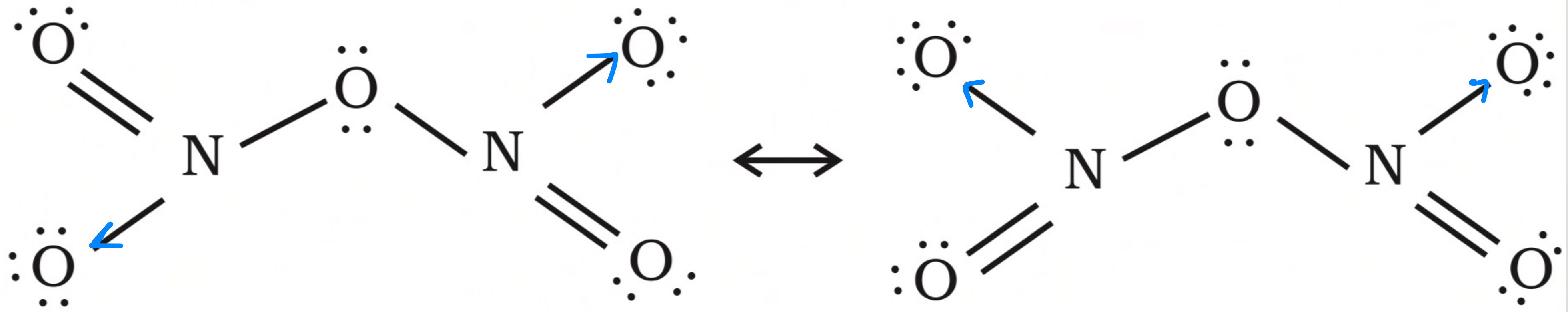
22.



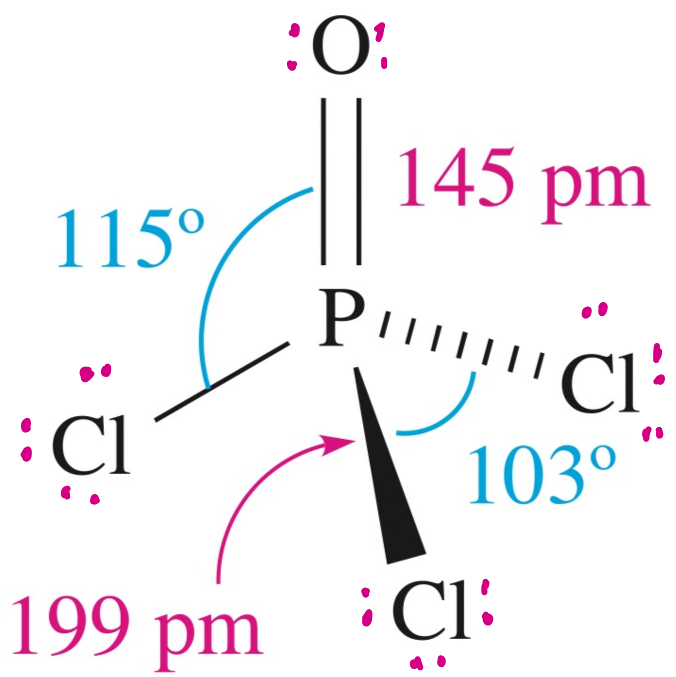
23



24



25.



Chemical Bonding

(Q) find the order of thermal stability.

(A) $HClO$. (B) $HClO_2$. (C) $HClO_3$. (d) $HClO_4$

Number of bond increases energy required increases thermal stability increases

Covalency /variable valency in covalent bonds

* number of bonds formed by element in ground state or excited state

(i) Variable valencies are shown by those elements which have empty orbitals in outermost shell.

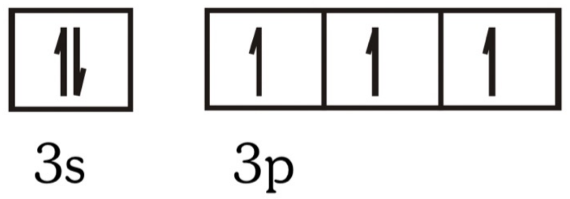
(ii) Lone pair electrons get excited in the subshell of the same shell to form the maximum number of unpaired electrons. Maximum covalency is shown in excited state.

(iii) The energy required for excitation of electrons is called promotion energy.

(iv) Promotion rule – Excitation of electrons in the same orbit.

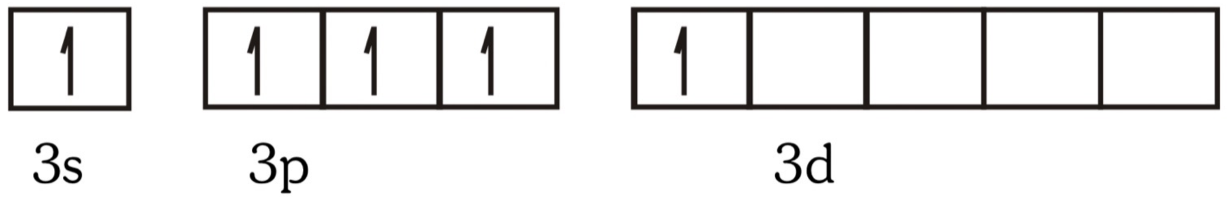
Ex.

(a) Phosphorus → Ground state

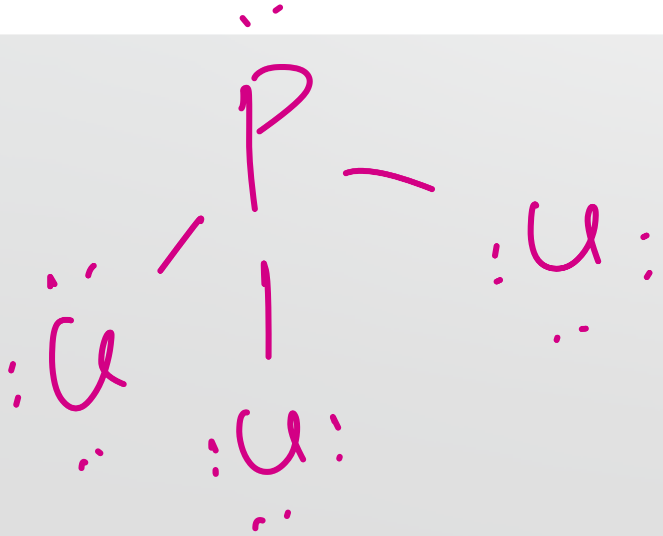


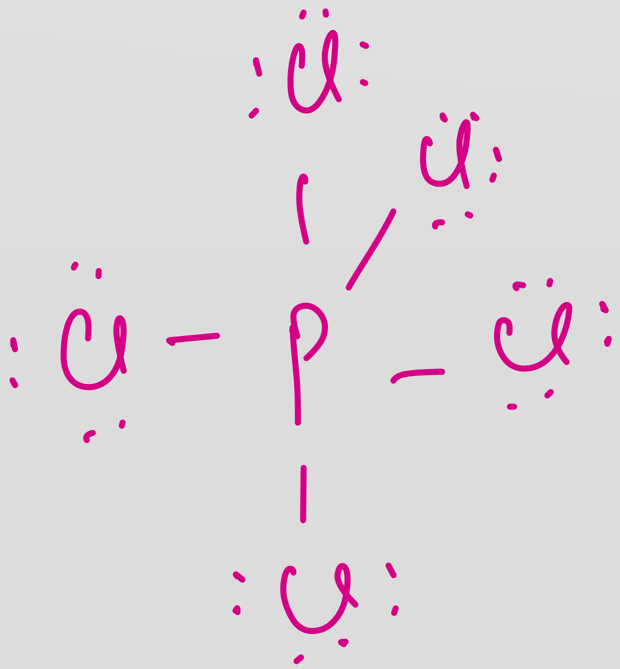
Covalency 3 (PCl_3)

Phosphorus → Excited state



Covalency – 5 (PCl_5)



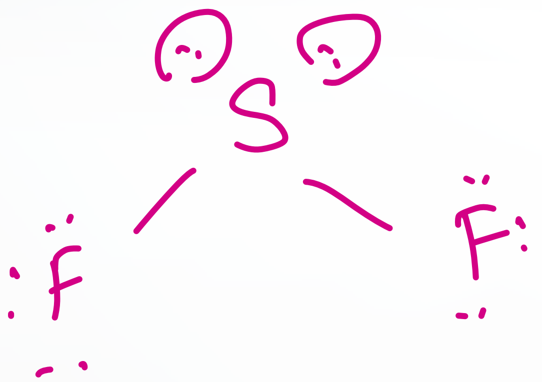


Covalency.	Ground state.	FES
Phosphorus.	3.	5

Sulphur $\rightarrow$ Ground state.

3s	3p			3d				
↑↓	↑↓	↑	↑					

Covalency - 2 (SF_2)



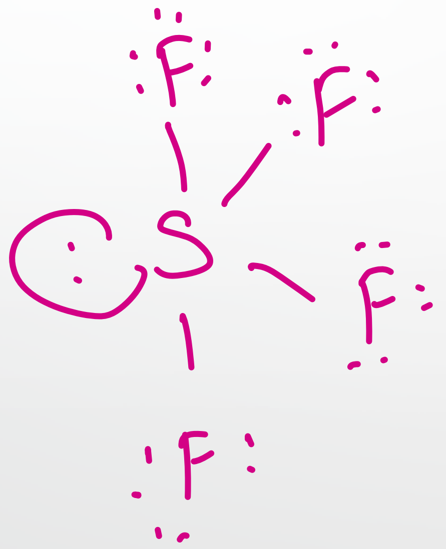
Sulphur $\rightarrow$ Excited state

I[st] excited state

3s	3p			3d				
↑↓	↑	↑	↑	↑				

Covalency - 4 (SF_4)

(SO_2)

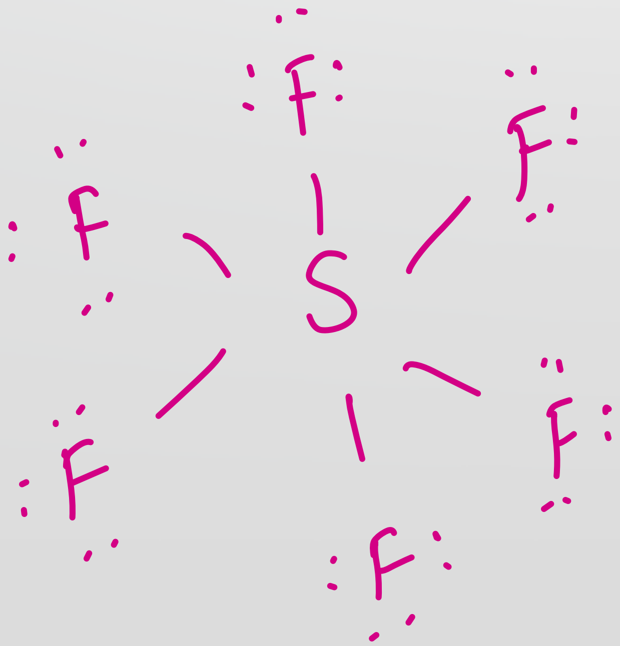


2[nd] excited state

3s	3p			3d				
↑	↑	↑	↑	↑	↑			

Covalency - 6 (SF_6)

So variable covalency of S is 2, 4, & 6.



Covalency.	GS.	FES.	SES
Sulphur.	2.	4.	6

Iodine has three lone pair of electrons

(Ground state) 

5s 5p 5d

So it shows three excited states – Maximum number of unpaired electrons = 7

Variable Valencies are 1, 3, 5, 7

Covalency.	GS.	FES.	SES.	TES
(CL/Br/I).	1.	3.	5.	7

H.W

Draw orbital diagram of all excited state

Chemical Bonding

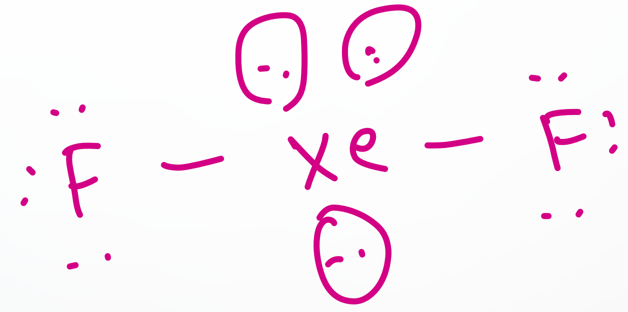
Xe :- (G.S.)

5s	5p			5d				
↑↓	↑↓	↑↓	↑↓					

(Ist E.S.) :-

5s	5p			5d				
↑↓	↑↓	↑↓	↑	↑				

(Covalency is 2) E.g. : XeF_2 etc.



(2nd E.S.) :-

5s	5p			5d				
↑↓	↑↓	↑	↑	↑	↑			

(Covalency is 4) E.g. : XeF_4 etc.

(3rd E.S.) :-

5s	5p			5d				
↑↓	↑	↑	↑	↑	↑	↑		

(Covalency is 6) E.g. : XeF_6 etc.

(~~3rd~~ 4th E.S.) :-

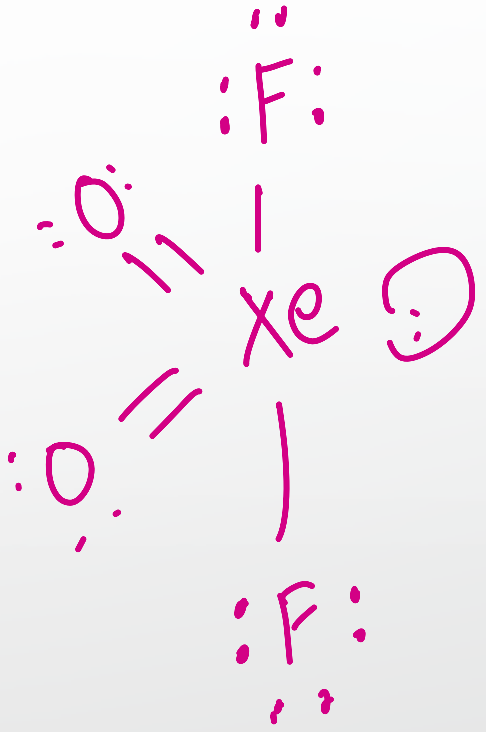
5s	5p			5d				
↑	↑	↑	↑	↑	↑	↑	↑	

(Covalency is 8) E.g. : XeO_4 et

So variable covalency of Xe is 2,4,6,8.

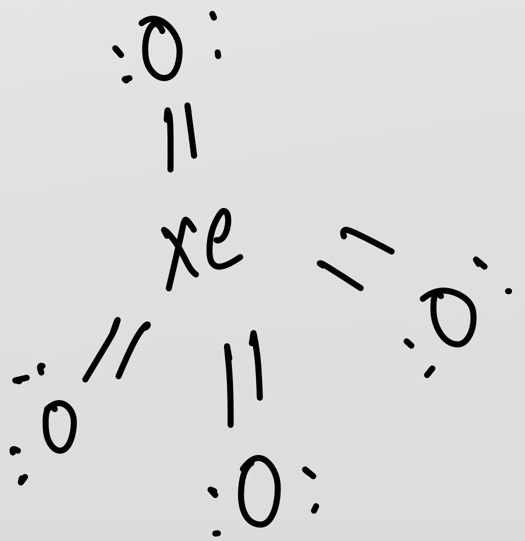
Chemical Bonding

(Q) what is the excited state of Xe in XeO_2F_2 ?



3rd excited state.

(Q) XeO_4



4th excited state.

Chemical Bonding

For second period element

$_7N$: $1s^2$ $2s^2$ $2p^3$

$1s^2$	$2s^2$	$2p^3$		
↑↓	↑↓	↑	↑	↑

*absence of 2d orbital

Covalency (3/4)

Note : Exicatiton is not possible from one shell to another shell because very high amount of energy will be required which could be even higher than bond energy

So jump to 3S not favourable

(Q) which of the following exist?

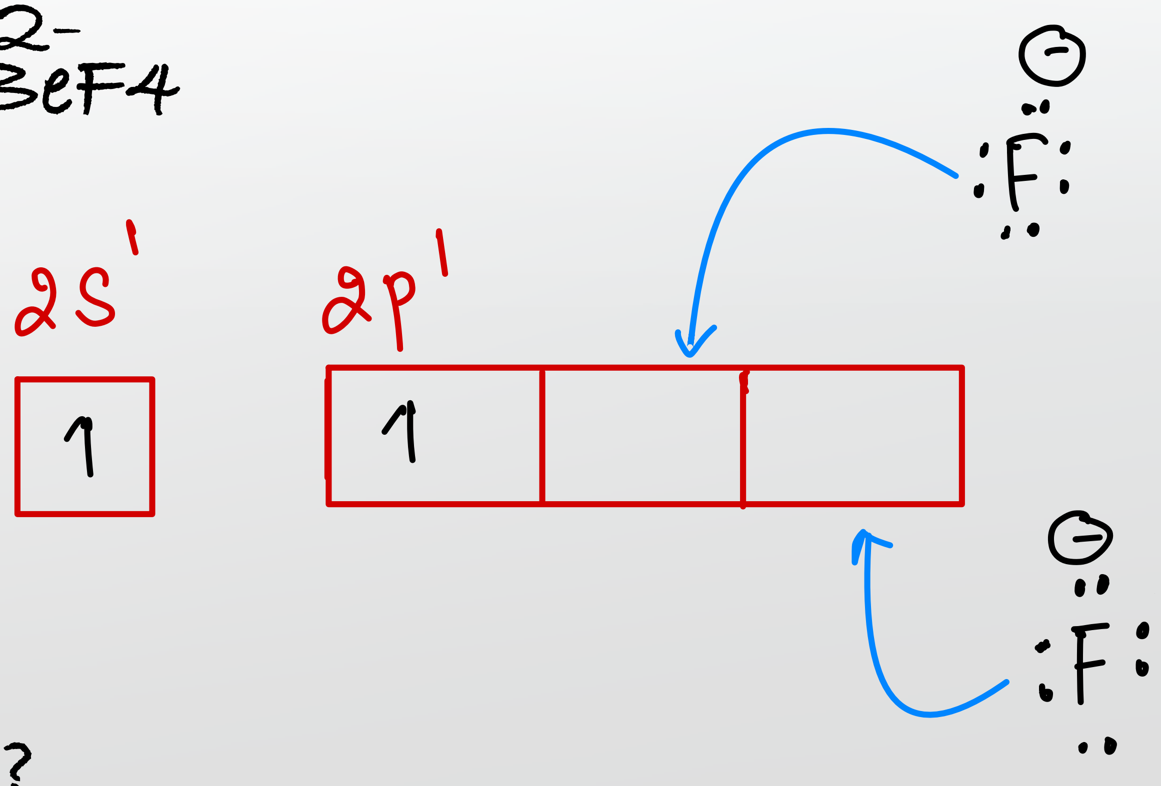
✓ NCl_3.	NCl_5 ✗	
✓ PCl_3.	PCl_4. ✗	PCl_5 ✓
✓ OF_2.	OF_4. ✗	OF_6 ✗
SF_2. ✓	SF_4. ✓	SF_6 ✓

Sidgwick Rule

*Atom which has vacant orbital in outermost shell can extend their valency.

1. $BeF_2 + 2F^{\ominus} \rightarrow BeF_4^{2-}$

Be^*. [He] $2s^1$ $2p^1$



Is BeF_5^{3-} possible ?

* doesnot exist.