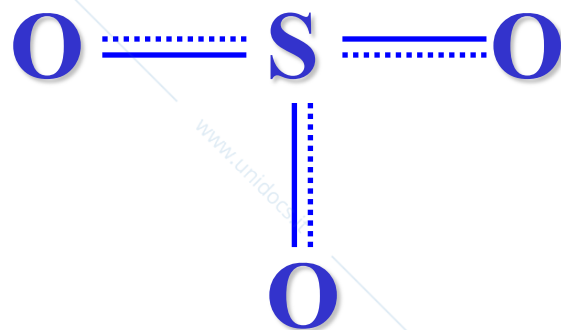
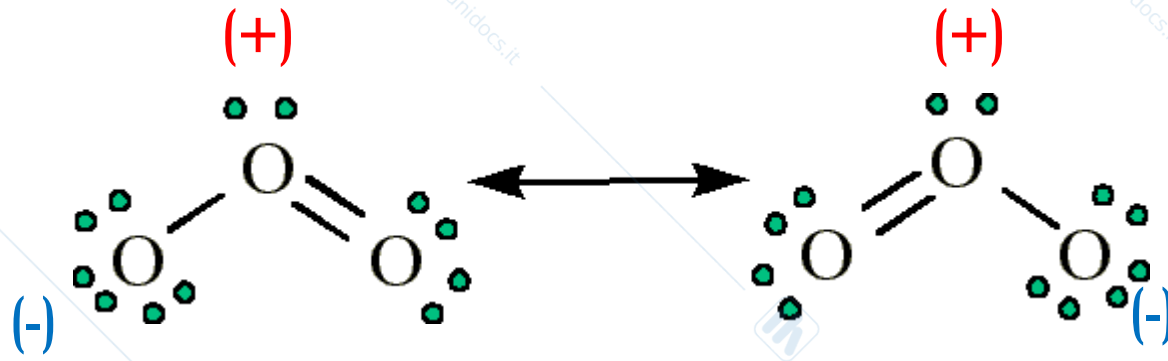


# Risonanza

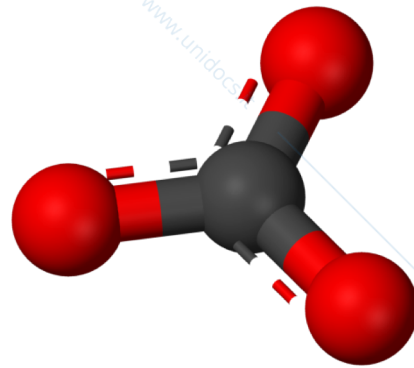
- Deriva dalla limitatezza della nostra capacità di rappresentare le molecole
- Nessuno dei legami in  $SO_3$  è singolo o doppio, ma tutti i legami sono uguali tra loro



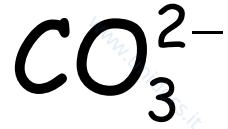
# OZONO $O_3$



# Ione carbonato $CO_3^{2-}$



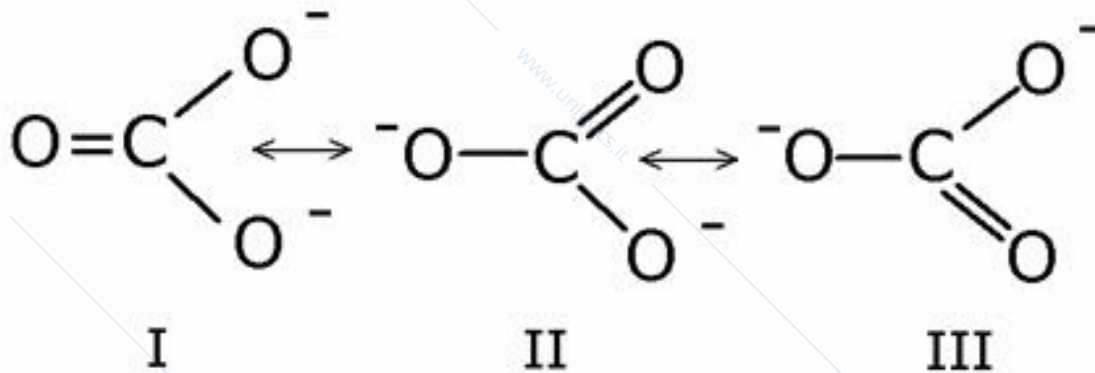
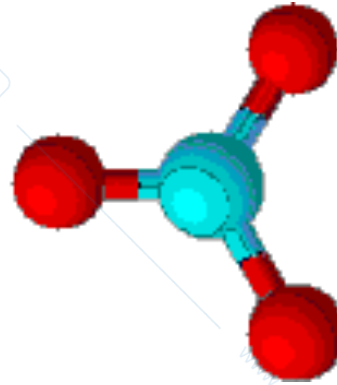
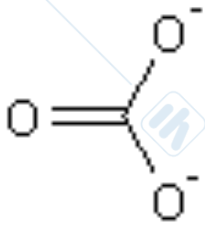
# Lo ione carbonato



$$N = 32$$

$$A = 24$$

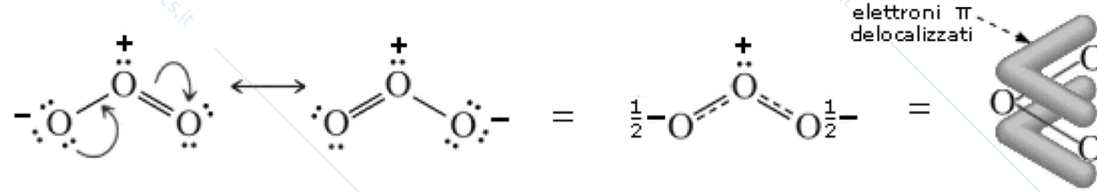
$$S = 8$$



Mettere le coppie solitarie!!!!

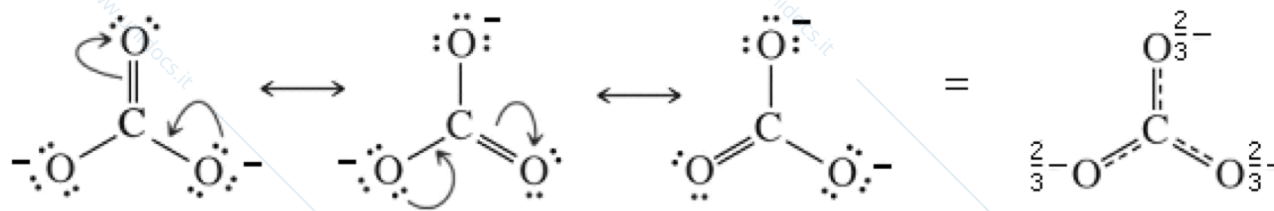
I due legami O-O hanno una lunghezza di 128 nm, intermedia tra quella di un legame semplice O-O (149 nm) e quella di un legame doppio O=O (121 nm).

## Ozono O<sub>3</sub>



Nel caso l'orbitale p coniugato al doppio legame contenga una carica positiva o negativa, anche quest'ultima risulta delocalizzata.

Nell'anione carbonato CO<sub>3</sub><sup>2-</sup> le due cariche negative sono distribuite su tutti e tre gli atomi di ossigeno



# Formule limiti NON equivalenti

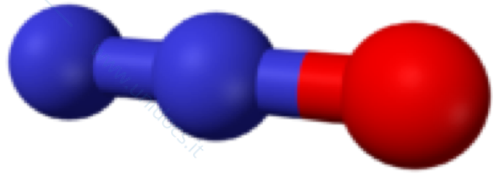
Se le formule limite sono equivalenti (Es:  $\text{NO}_3^-$ ) esse contribuiscono nello stesso modo alla descrizione della struttura molecolare

Se le formule limite NON sono equivalenti, esse contribuiscono **DIVERSAMENTE** alla descrizione della struttura molecolare.

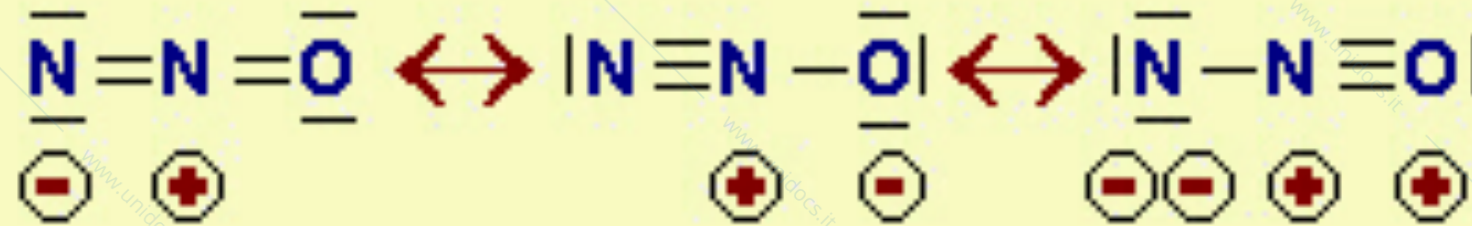
Le formule ad **ENERGIA PIU' BASSA** sono quelle che contribuiscono di più (Es: Se tra 2 formule limite una contribuisce all' 80% e l'altra al 20%, *è' come se la molecola avesse per 80% del tempo la struttura A e per il 20% la struttura B.*

La formula limite con minore separazione di **carica formale** è quella a minore energia, è cioè la più stabile e contribuisce di più alla descrizione della formula vera del composto

# Formule limiti NON equivalenti



Ossido di diazoto

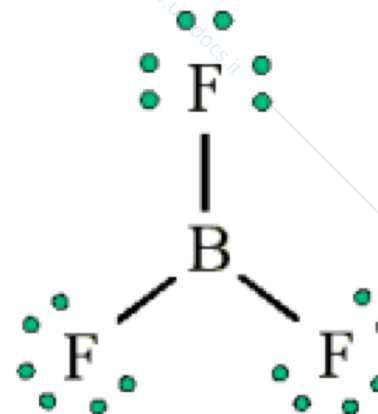
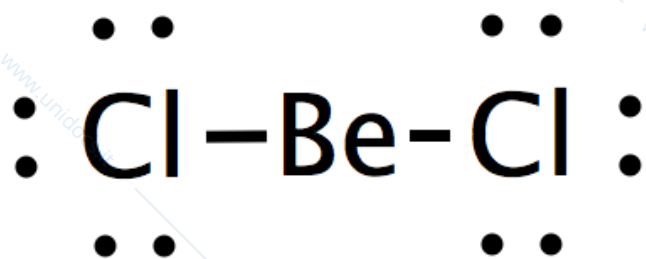


# Limitazioni alla Regola dell'ottetto

- **$N - A = S$  non vale per**
  - **Composti covalenti di Be**
  - **Composti covalenti del Gruppo 13**
  - **Specie contenenti un numero dispari di elettroni**
  - **Specie in cui l'elemento centrale DEVE condividere più di 8 elettroni di valenza per accomodare tutti i sostituenti**
  - **Composti dei metalli di transizione d- e f-**

- Nei casi in cui la regola dell'ottetto **NON** vale, i sostituenti attaccati all'atomo centrale arrivano in genere alle configurazioni dei gas nobili, mentre l'atomo centrale no

## Esempi

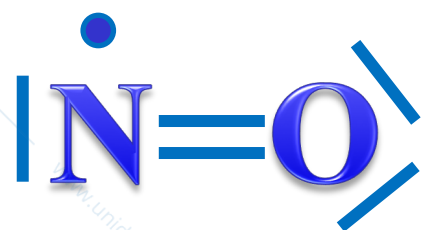


**NO**

$$N = 8 + 8 = 16$$

$$A = 5 + 6 = 11$$

$$S = 5$$

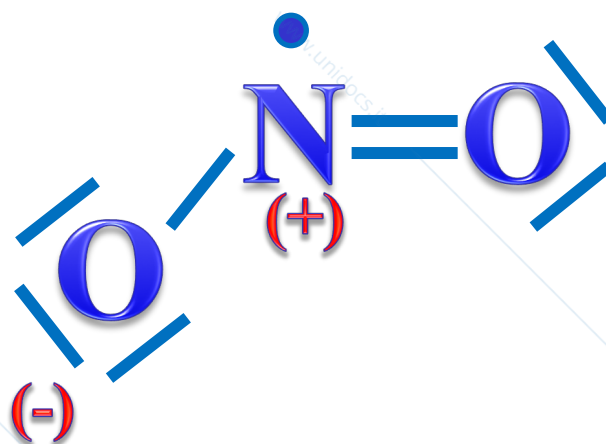


**NO<sub>2</sub>**

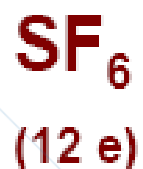
$$N = 8 + 8 + 8 = 24$$

$$A = 5 + 6 + 6 = 17$$

$$S = 7$$



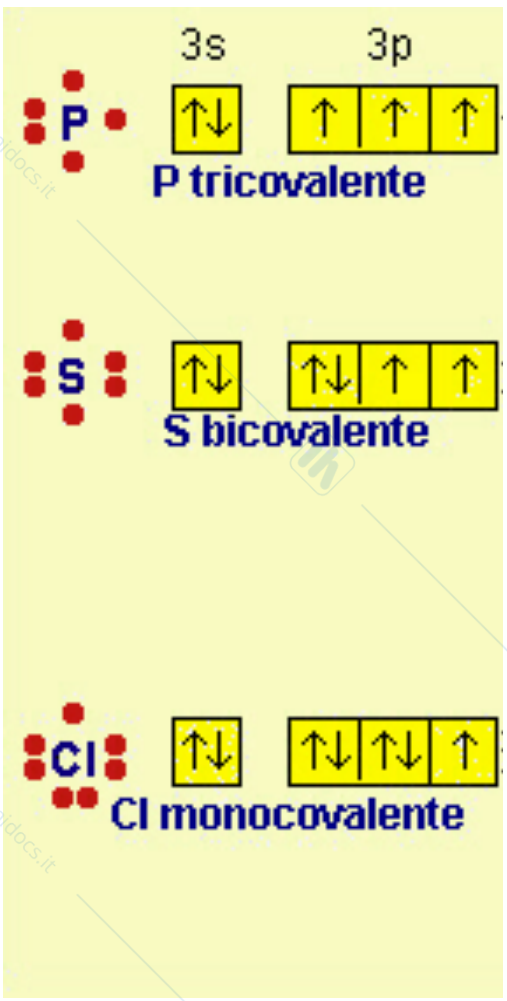
# Espansione dell'ottetto

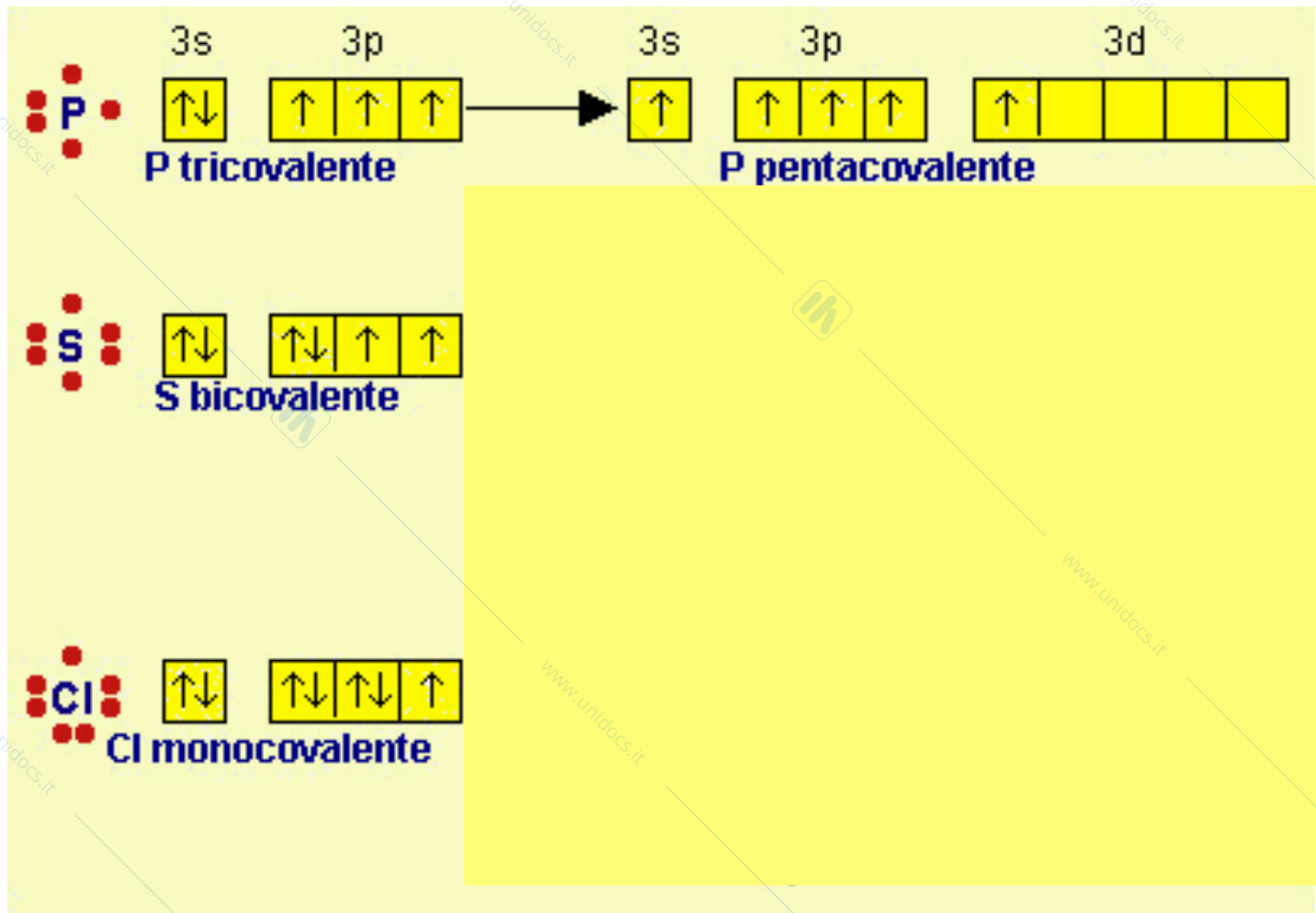


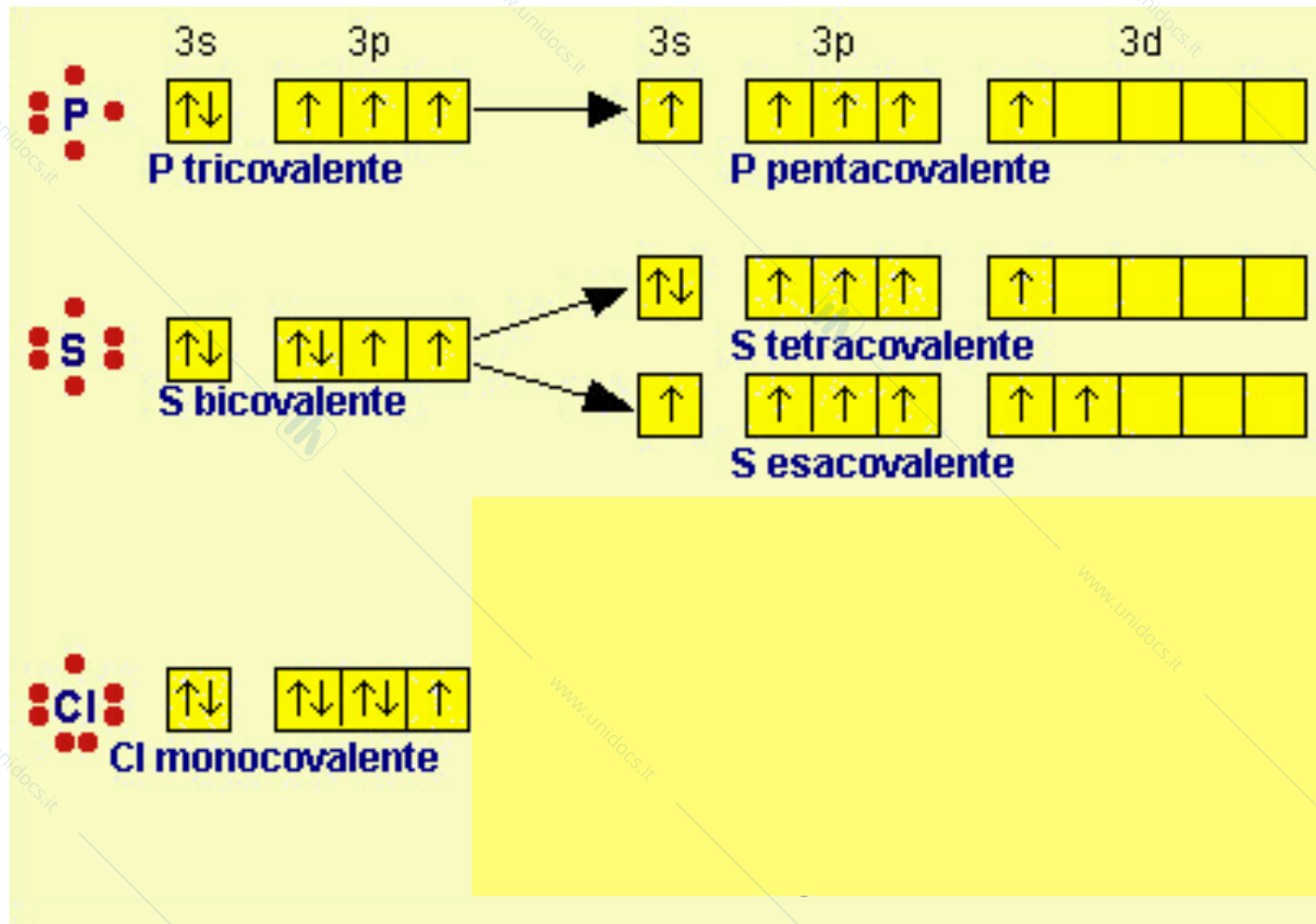
**espansione  
dell'ottetto**  
(in queste  
molecole l'atomo  
centrale è  
circondato da 10  
e anche 12  
elettroni)

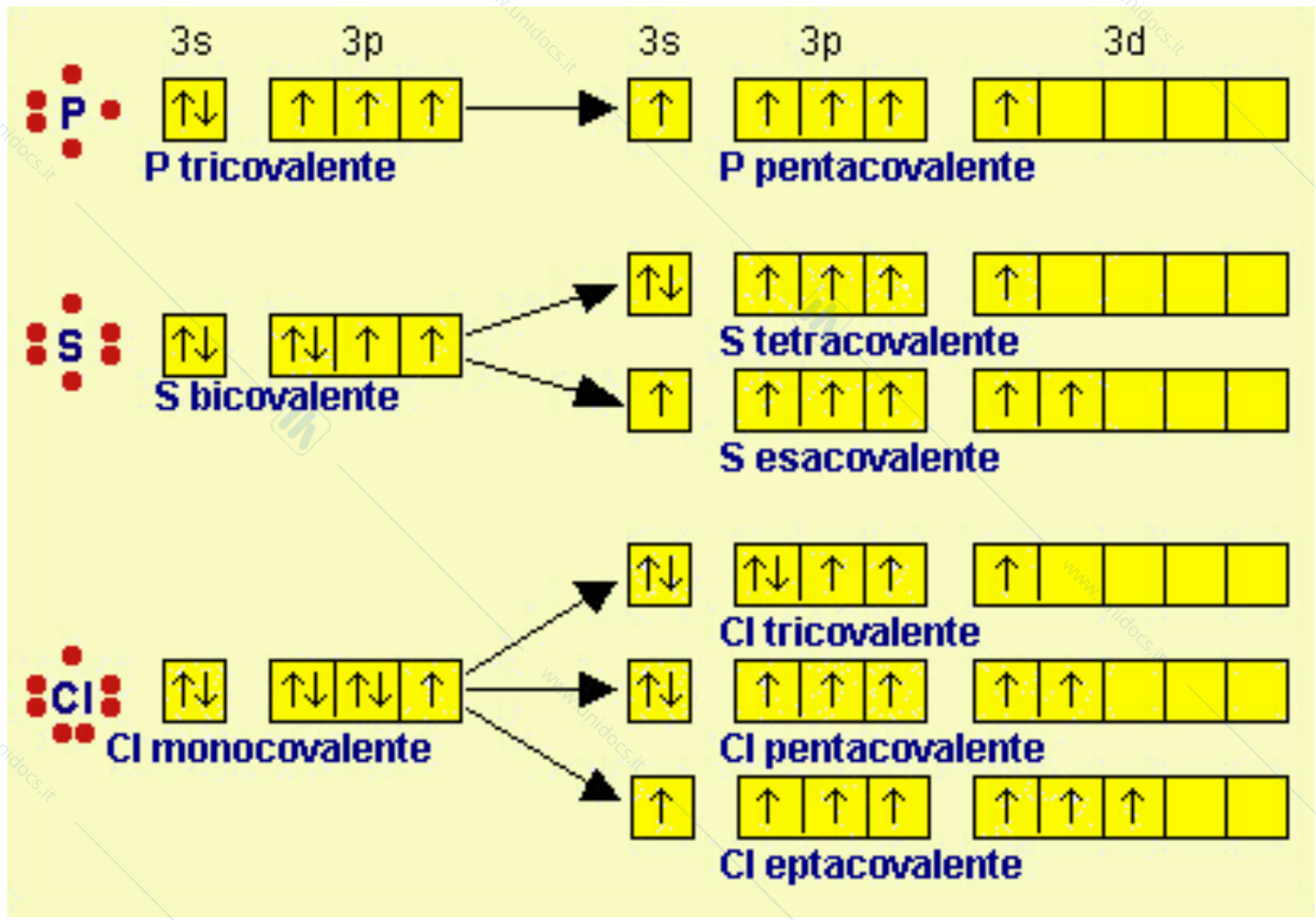
La regola dell'ottetto è osservata bene solo dagli elementi del 2° periodo.

Dal 3° periodo in poi si può avere **espansione**.







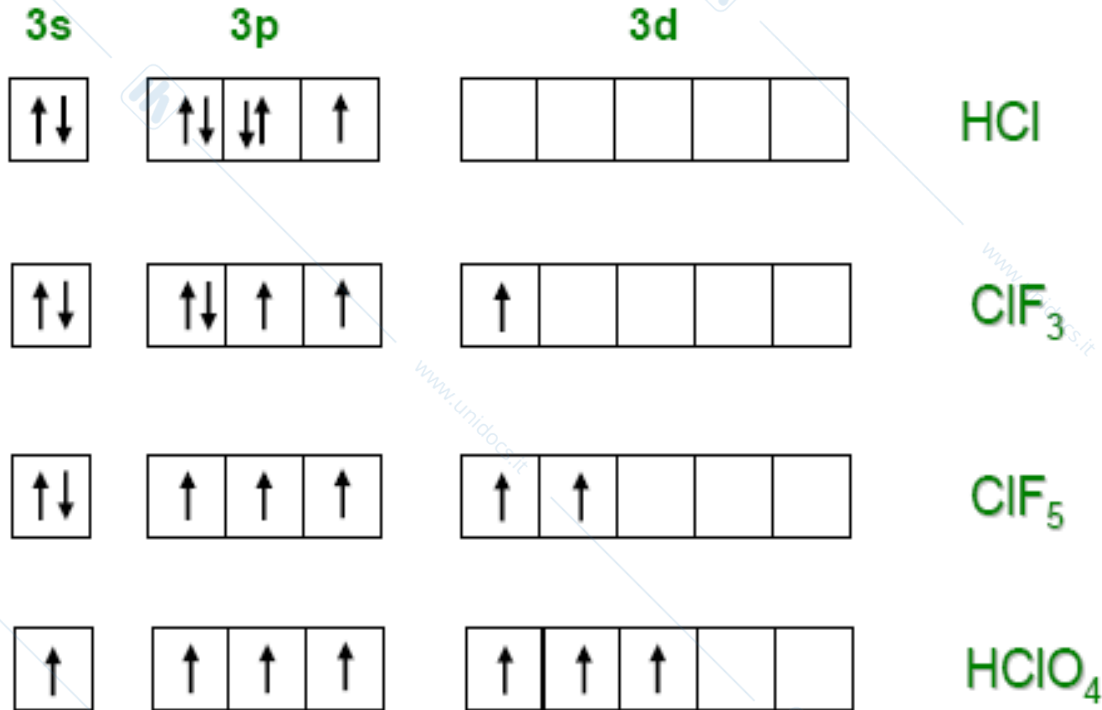


# Espansione dell'ottetto

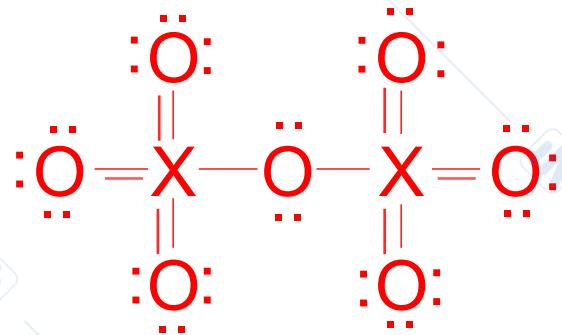
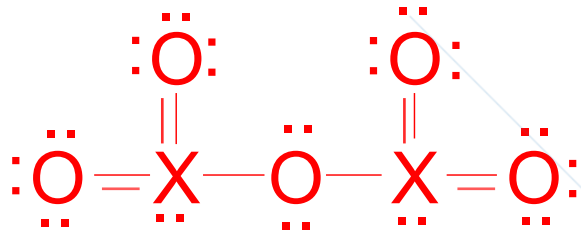
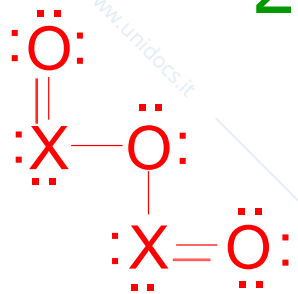
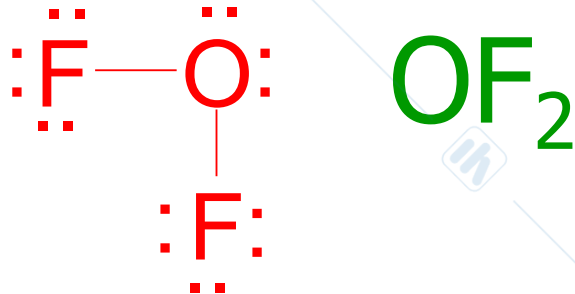
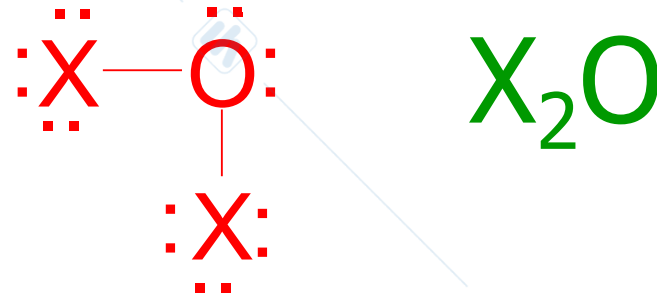
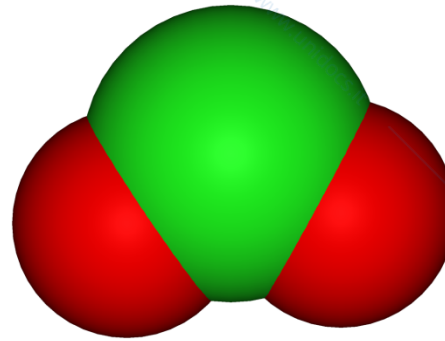
Cl

configurazione [Ne] 3s<sup>2</sup>3p<sup>5</sup>

Z=17 ⇒ 17-10 = 7 e- di valenza



# Composti binari con l'ossigeno

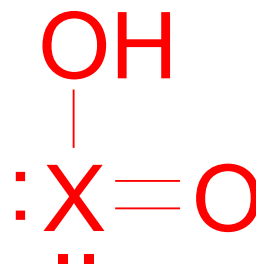


X=Cl, Br, I

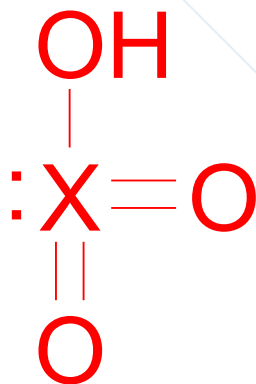
## Composti ternari, acidi ossigenati



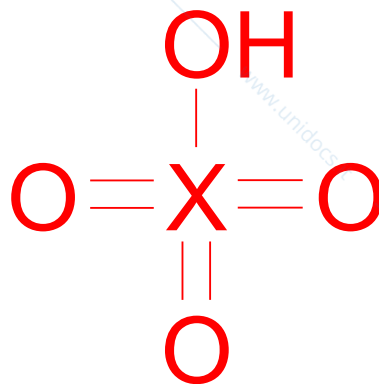
HXO



HXO<sub>2</sub>



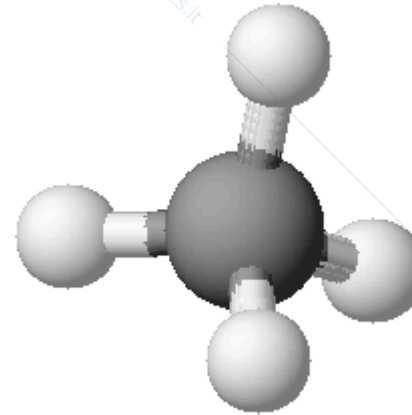
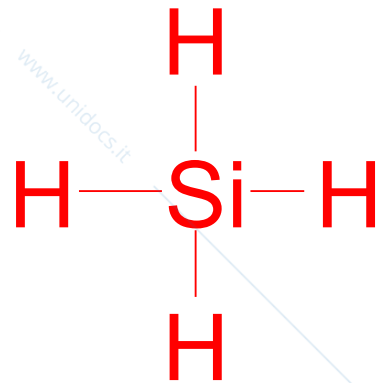
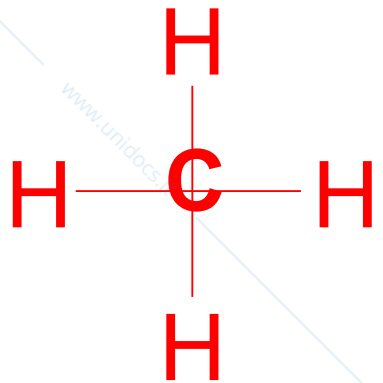
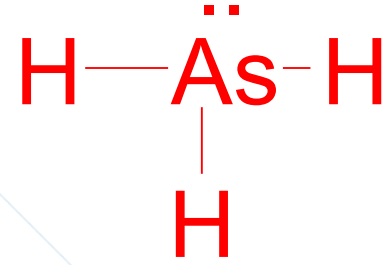
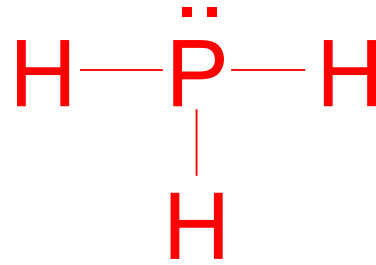
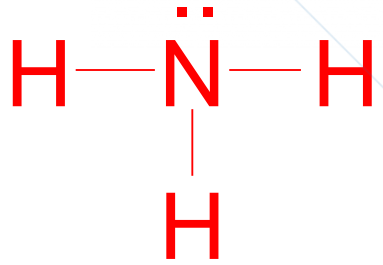
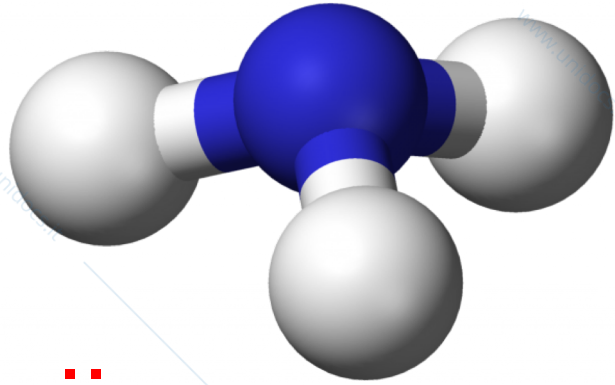
HXO<sub>3</sub>



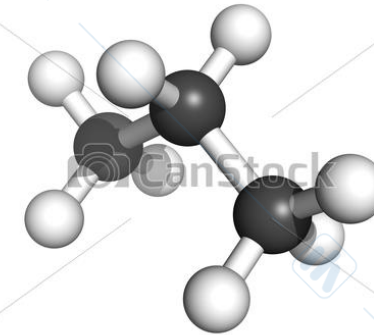
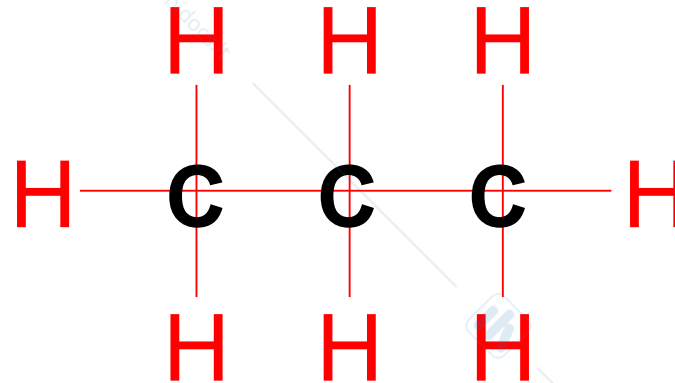
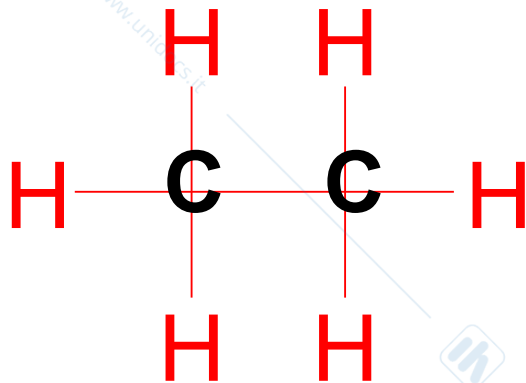
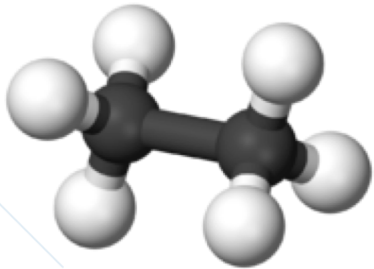
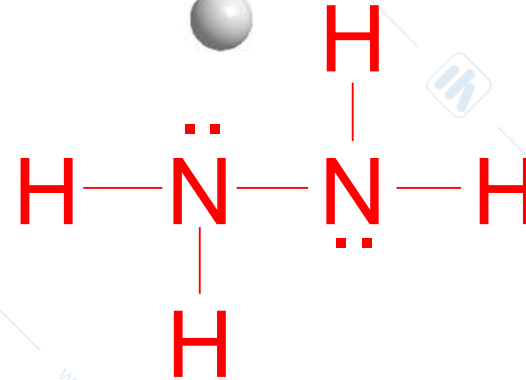
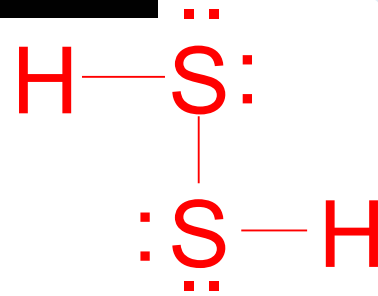
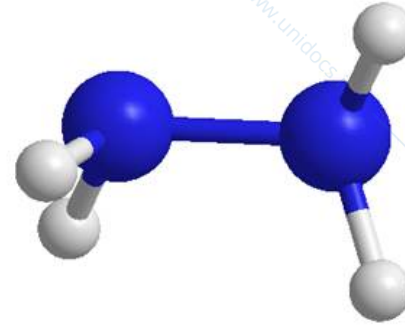
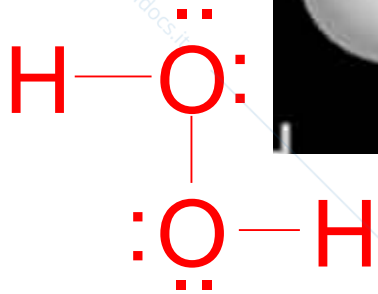
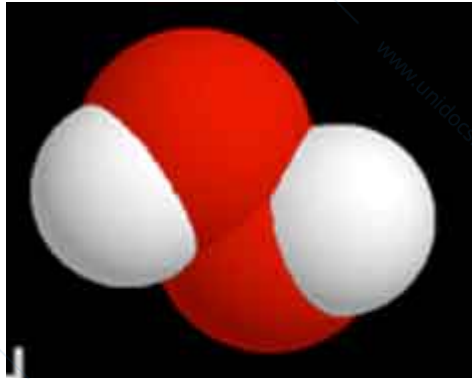
HXO<sub>4</sub>

Mettere le coppie solitarie!!!!

# Composti binari con H



# Composti binari con H



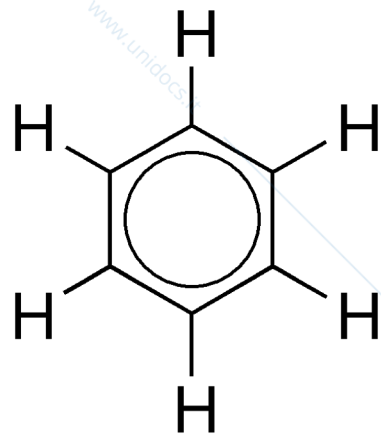
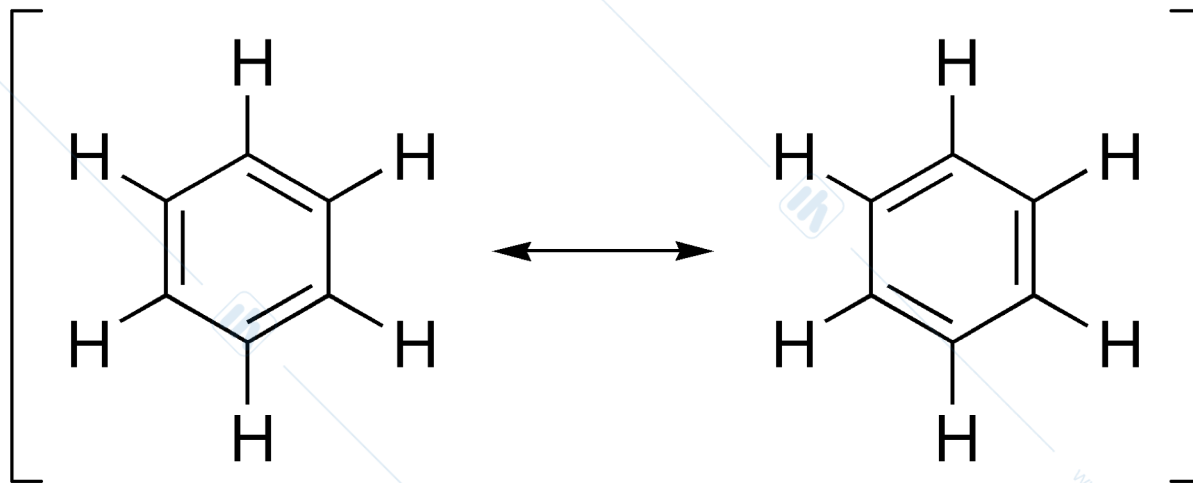
# Composti binari con H

**Benzene  $C_6H_6$**

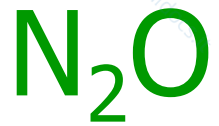
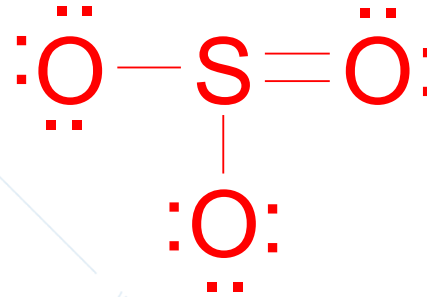
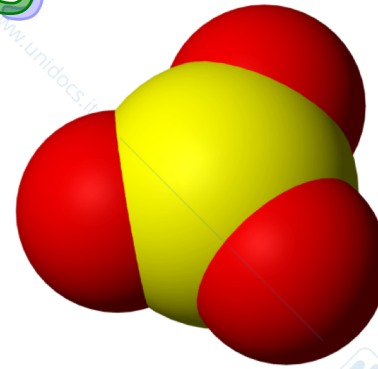
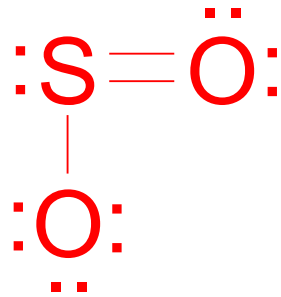
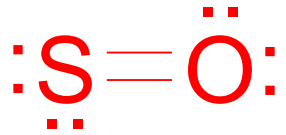
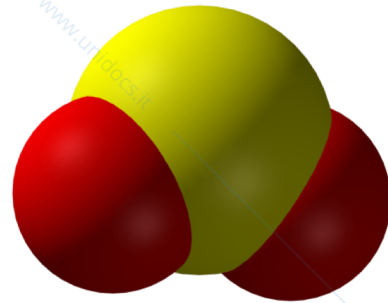
**$N = 60$**

**$A = 30$**

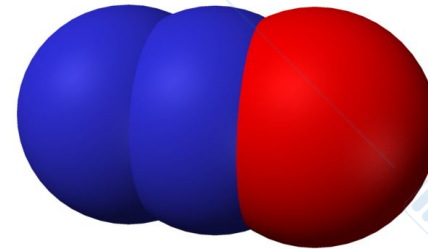
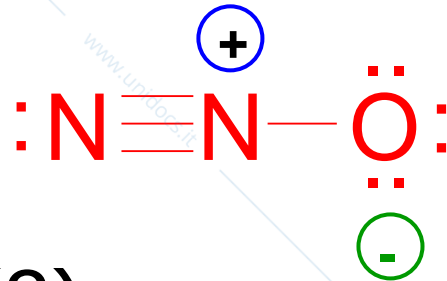
**$S = 30$**



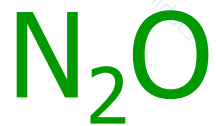
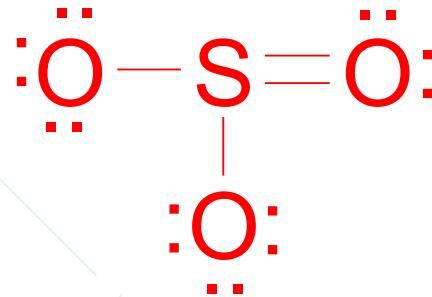
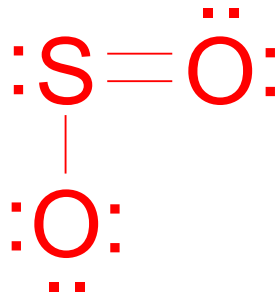
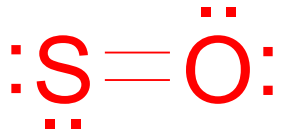
# Composti binari con l'ossigeno



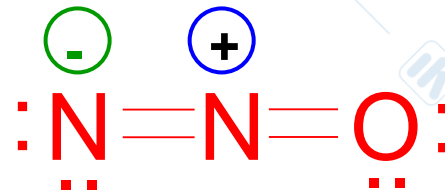
$$\text{N}(24) - \text{A}(16) = \text{S}(8)$$



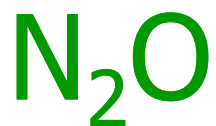
# Composti binari con l'ossigeno



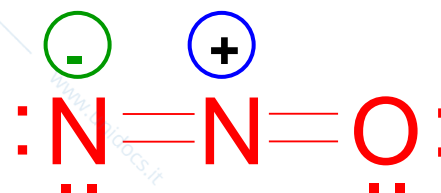
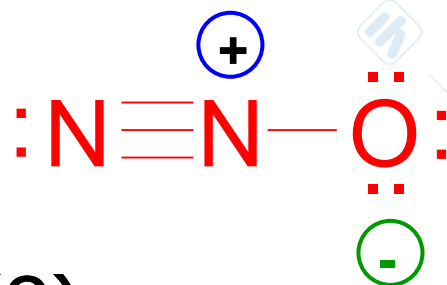
$$\text{N}(24) - \text{A}(16) = \text{S}(8)$$



# Composti binari con l'ossigeno



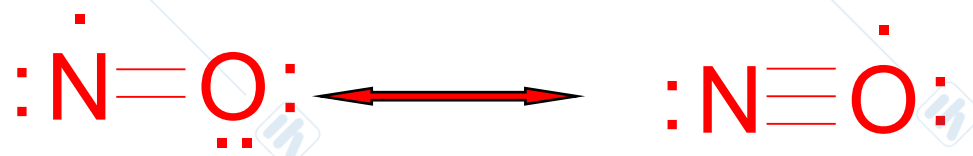
$$\text{N}(24) - \text{A}(16) = \text{S}(8)$$



# Composti binari con l'ossigeno

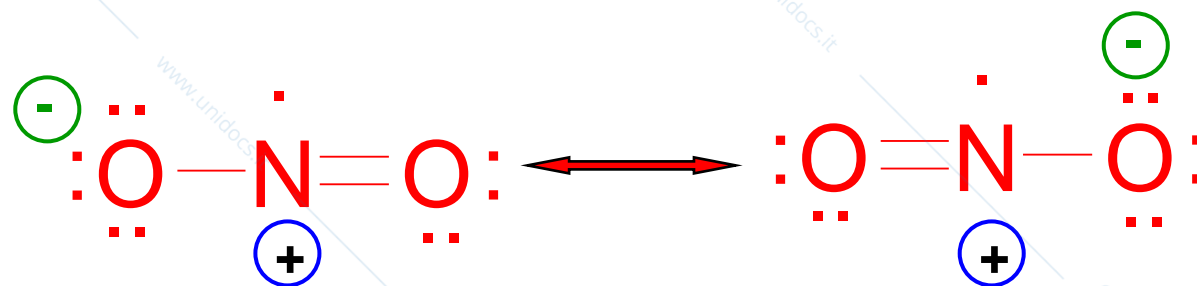
NO

$$N(16) - A(11) = S(5)$$

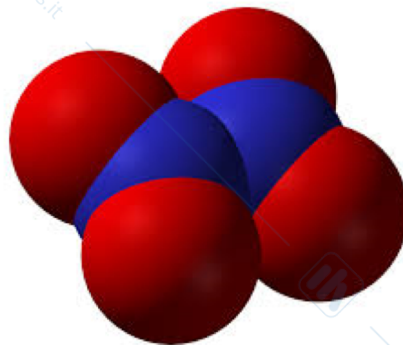
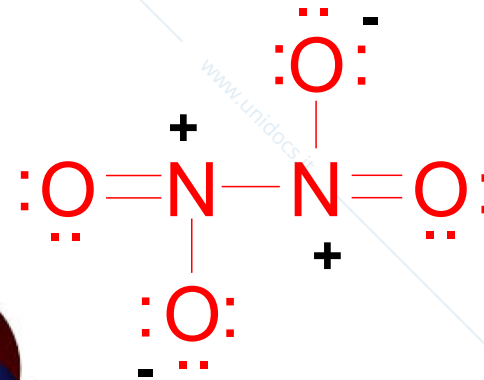
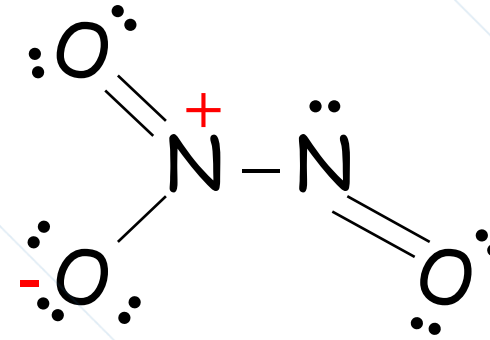
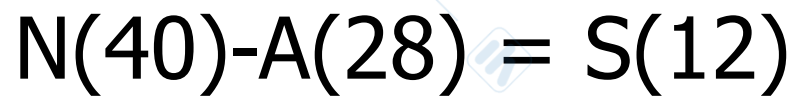
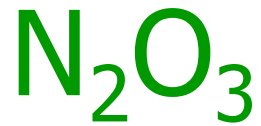
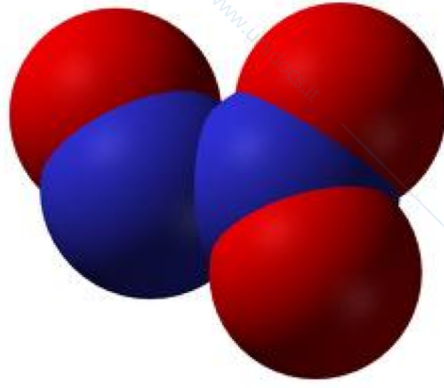


NO<sub>2</sub>

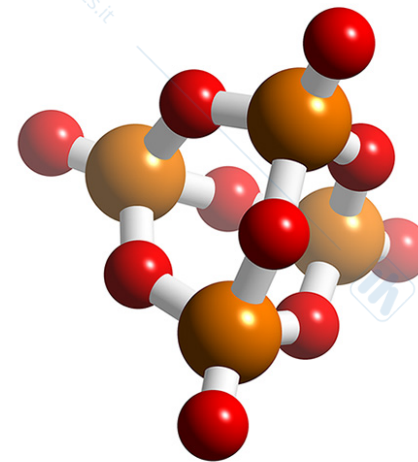
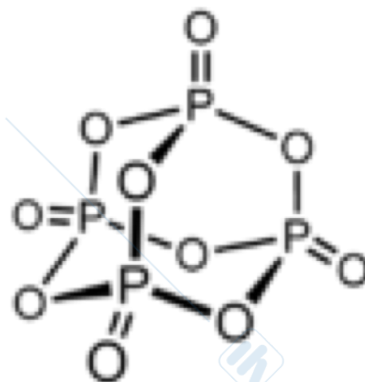
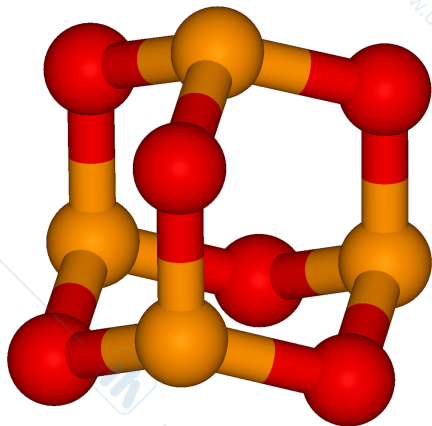
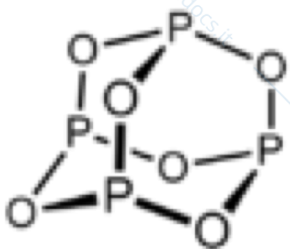
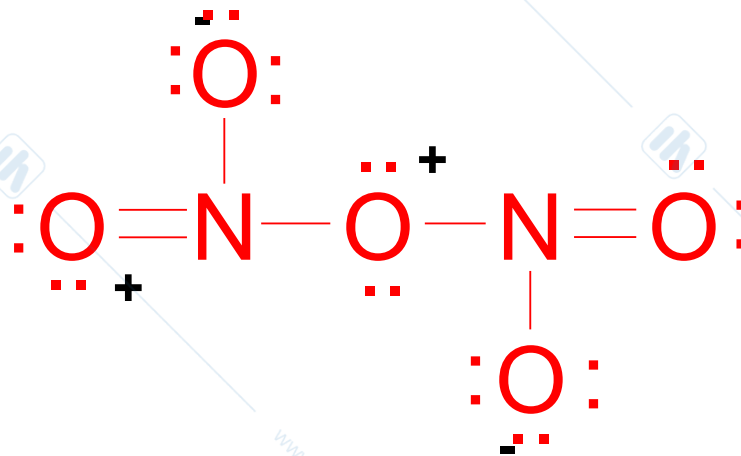
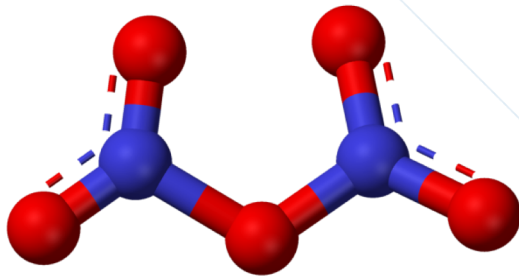
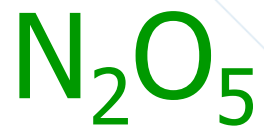
$$N(24) - A(17) = S(7)$$



# Composti binari con l'ossigeno



# Composti binari con l'ossigeno



# Composti binari con l'ossigeno

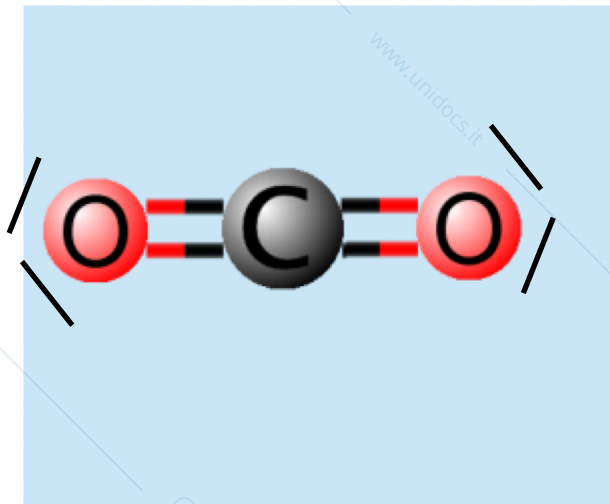
CO

$$N(16) - A(10) = S(6)$$

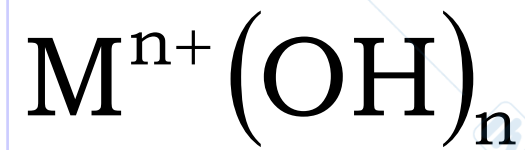


CO<sub>2</sub>

$$N(24) - A(16) = S(8)$$



# Composti ternari



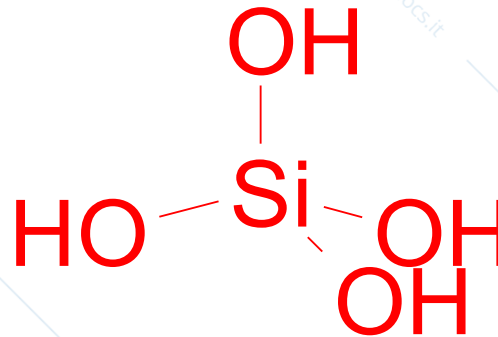
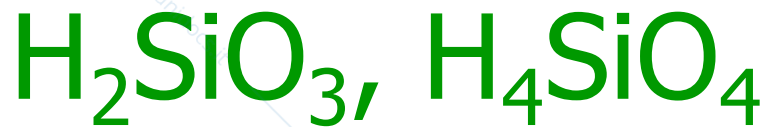
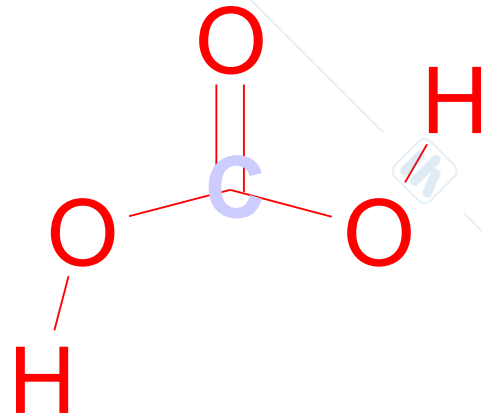
## Idrossidi metallici



## Acidi

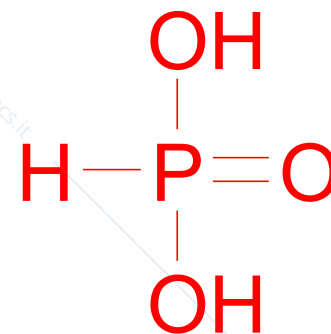
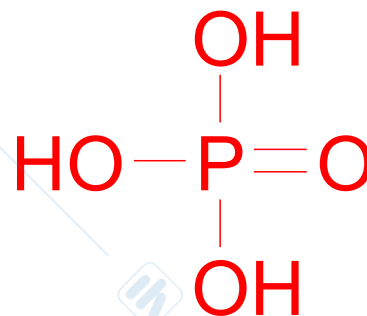
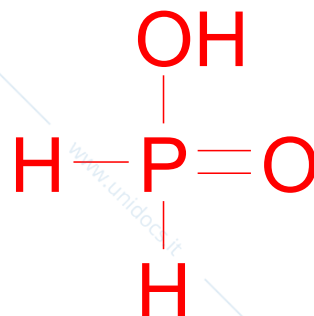
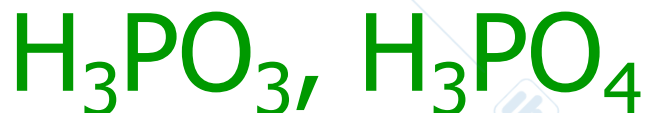
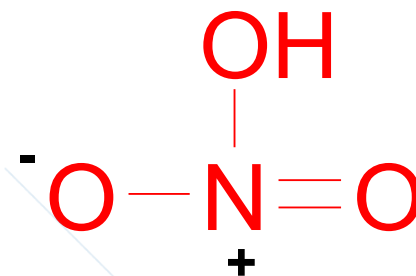
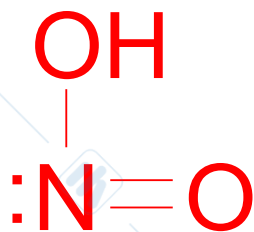
Normalmente H è legato a O

# Composti ternari



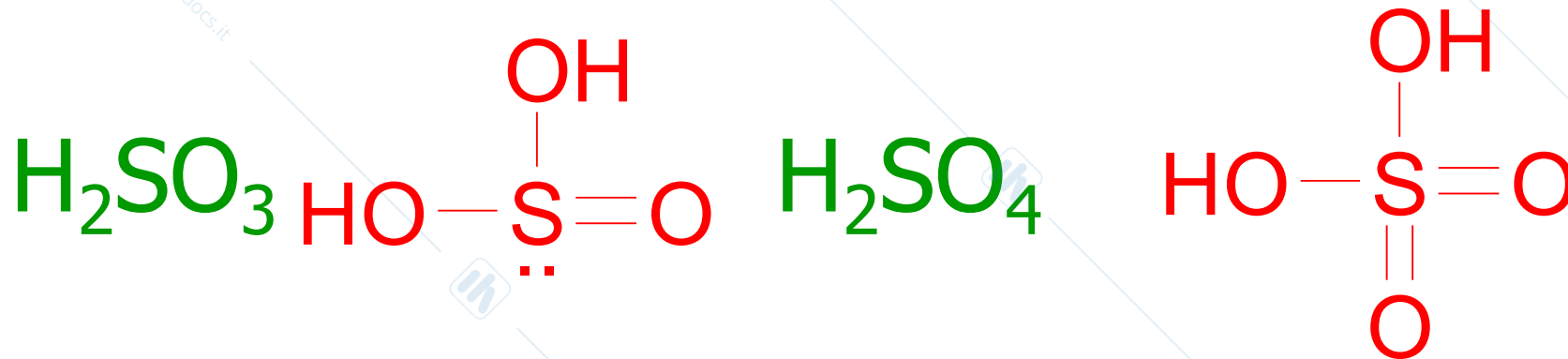
Mettere le coppie solitarie!!!!

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