



Estrutura da Matéria

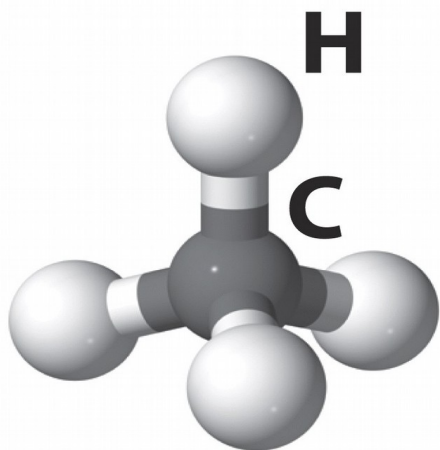
2018-2 – Prof. Célio

BIK0102 – S.A.

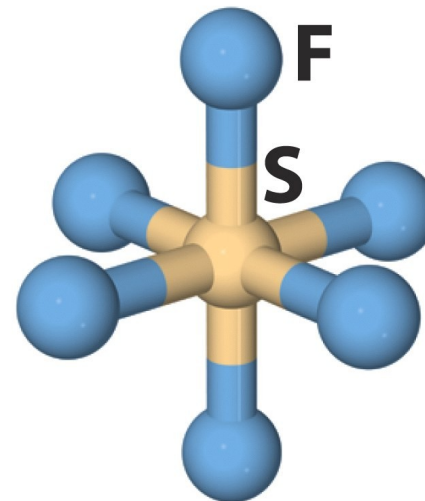
Aula 12 – Forma e estrutura das moléculas I



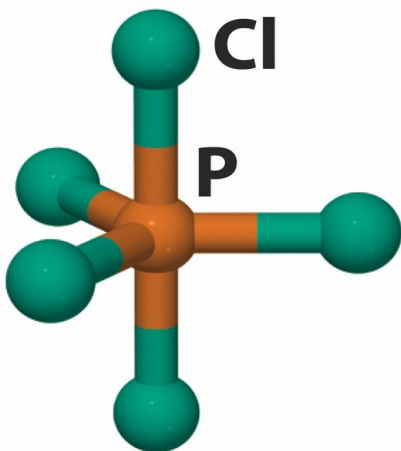
Modelo VSEPR Básico



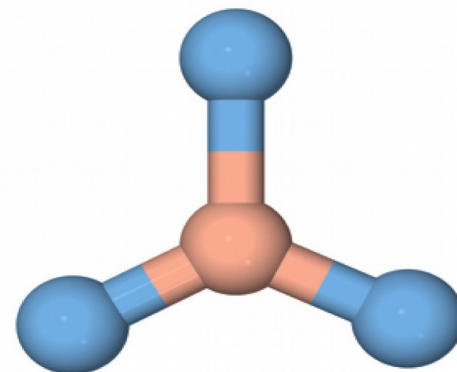
1 Methane, CH_4



2 Sulfur hexafluoride, SF_6



3 Phosphorus pentachloride, PCl_5

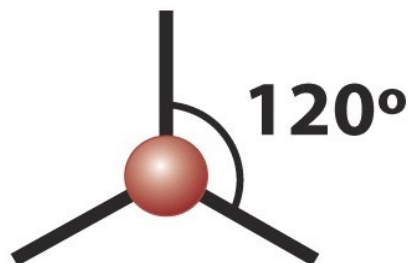


6 Boron trifluoride, BF_3

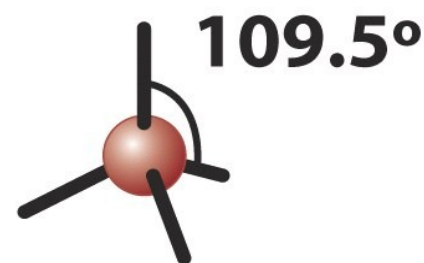
Regiões de alta concentração de elétrons



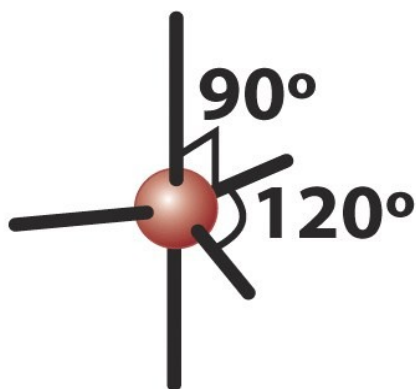
Linear



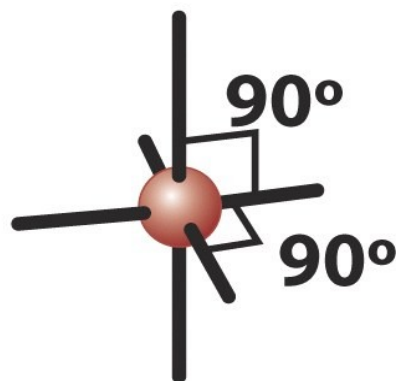
Trigonal planar



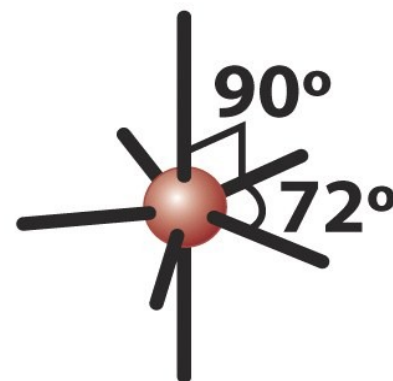
Tetrahedral



**Trigonal
bipyramidal**

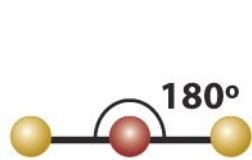


Octahedral

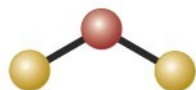


**Pentagonal
bipyramidal**

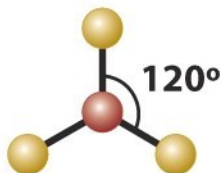
Nomes das formas de moléculas simples e seus ângulos de ligação



Linear



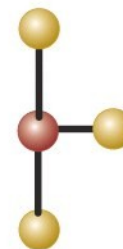
Angular



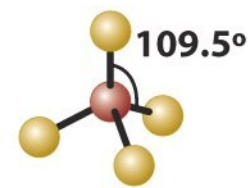
Trigonal planar



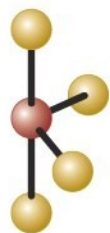
Trigonal pyramidal



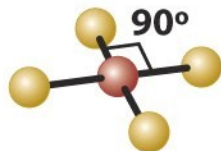
T-shaped



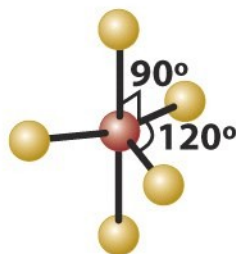
Tetrahedral



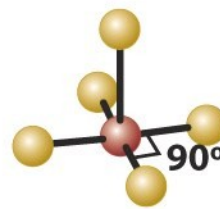
Seesaw



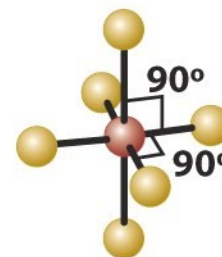
Square planar



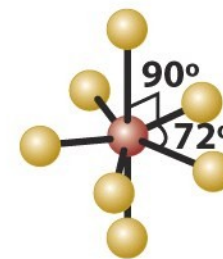
Trigonal bipyramidal



Square pyramidal

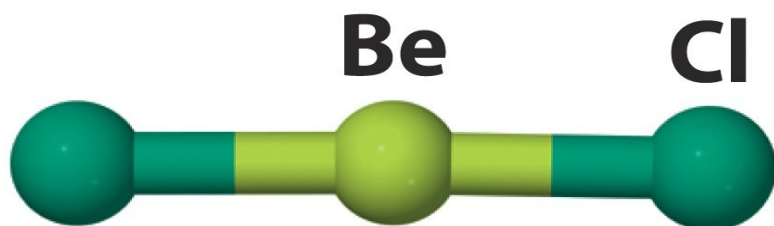


Octahedral

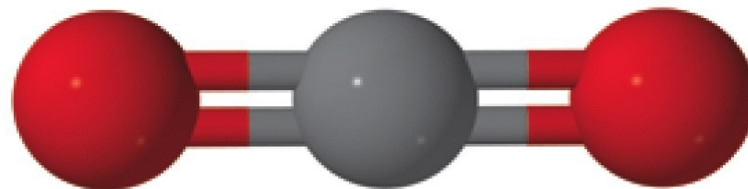


Pentagonal bipyramidal

Ligações simples ou múltiplas

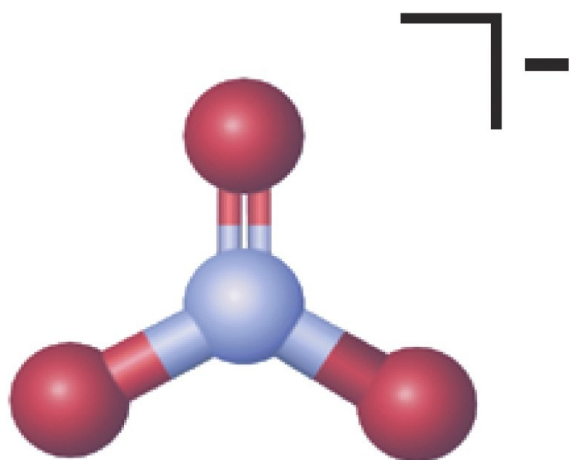


4 Beryllium chloride, BeCl₂

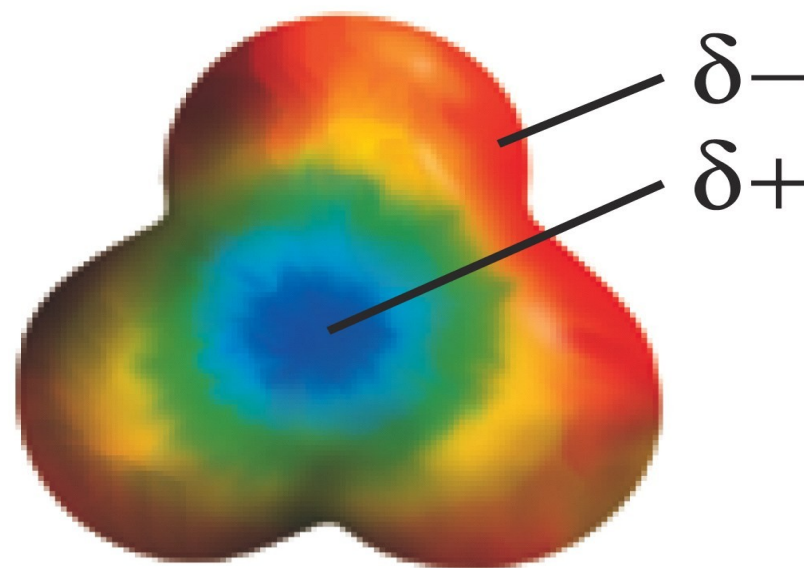


9 Carbon dioxide, CO₂

Híbridos de Ressonância



15 Nitrate ion, NO_3^-

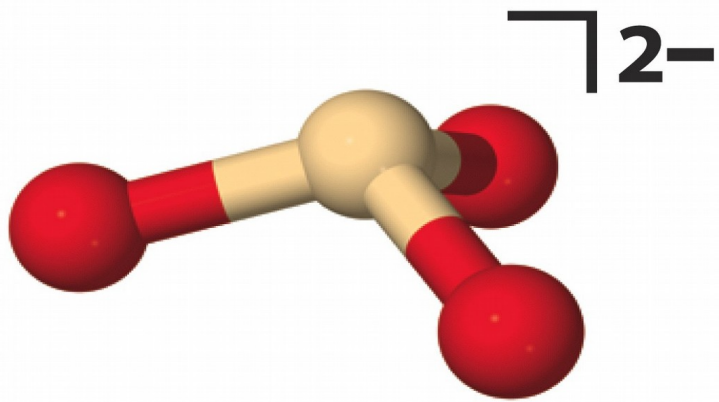


16 Nitrate ion

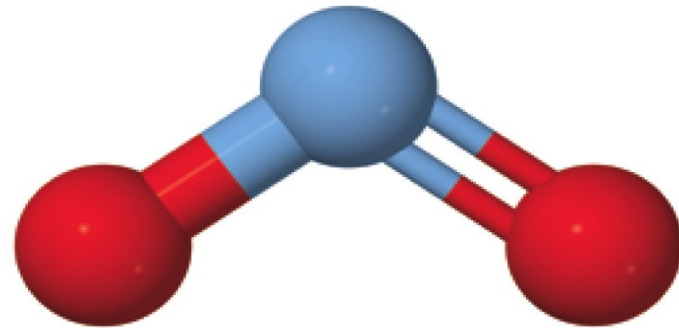
Moléculas com pares de elétrons isolados no átomo central

- Fórmula VSEPR geral: AX_nE_m ;
 - A – representa um átomo central;
 - X – um átomo ligado;
 - E – um par isolado.
- $BF_3 \rightarrow AX_3$;
- $SO_3^{2-} \rightarrow AX_3E$.
- Ao reconhecer a fórmula, podemos prever a forma, mas não o valor numérico preciso dos ângulos de ligação.

Moléculas com pares de elétrons isolados no átomo central



18 Sulfite ion, SO_3^{2-}



20 Nitrogen dioxide, NO_2

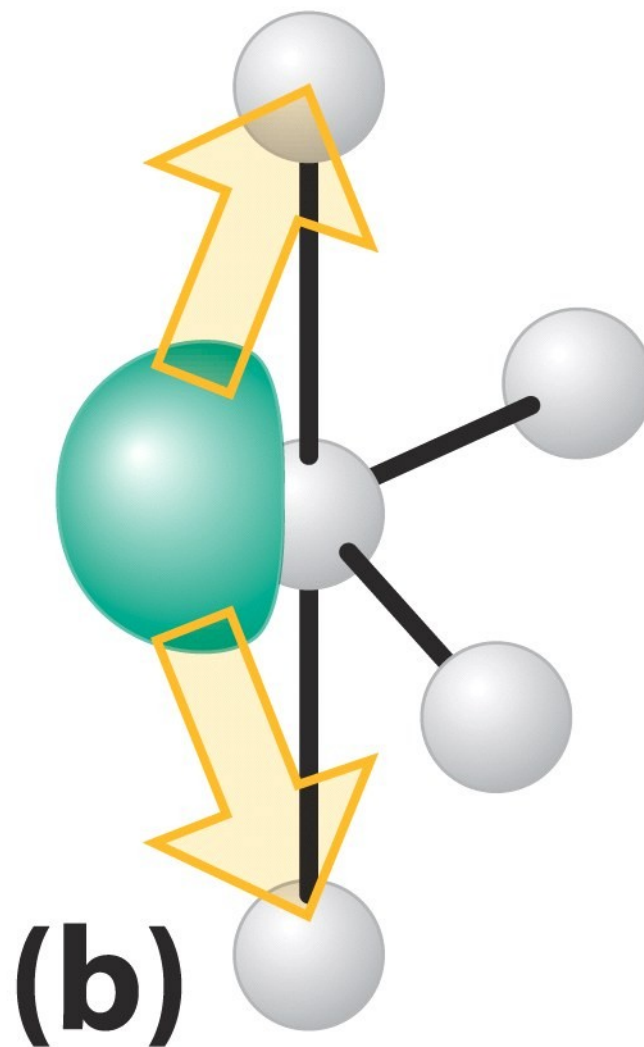
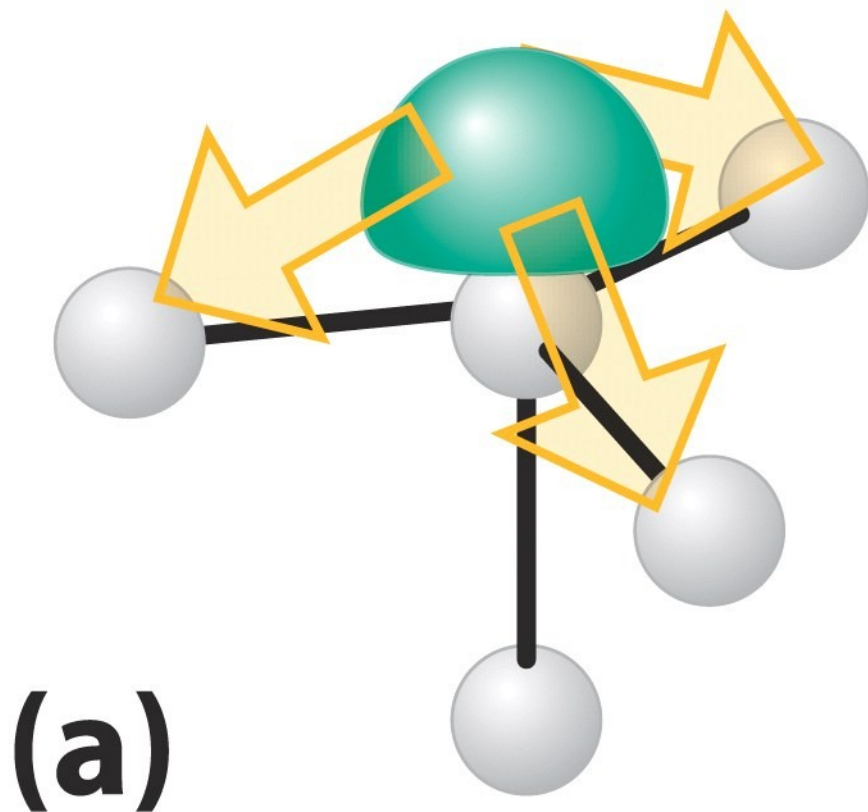
Modelo VSEPR revisto

- Regiões de alta concentração de elétrons ocupam posições que as afastam o máximo possível;
- Todas as ligações se repelem da mesma maneira, independentemente de serem simples, duplas ou triplas;
- A ligação em torno de um átomo central não depende do número de “átomos centrais” da molécula;

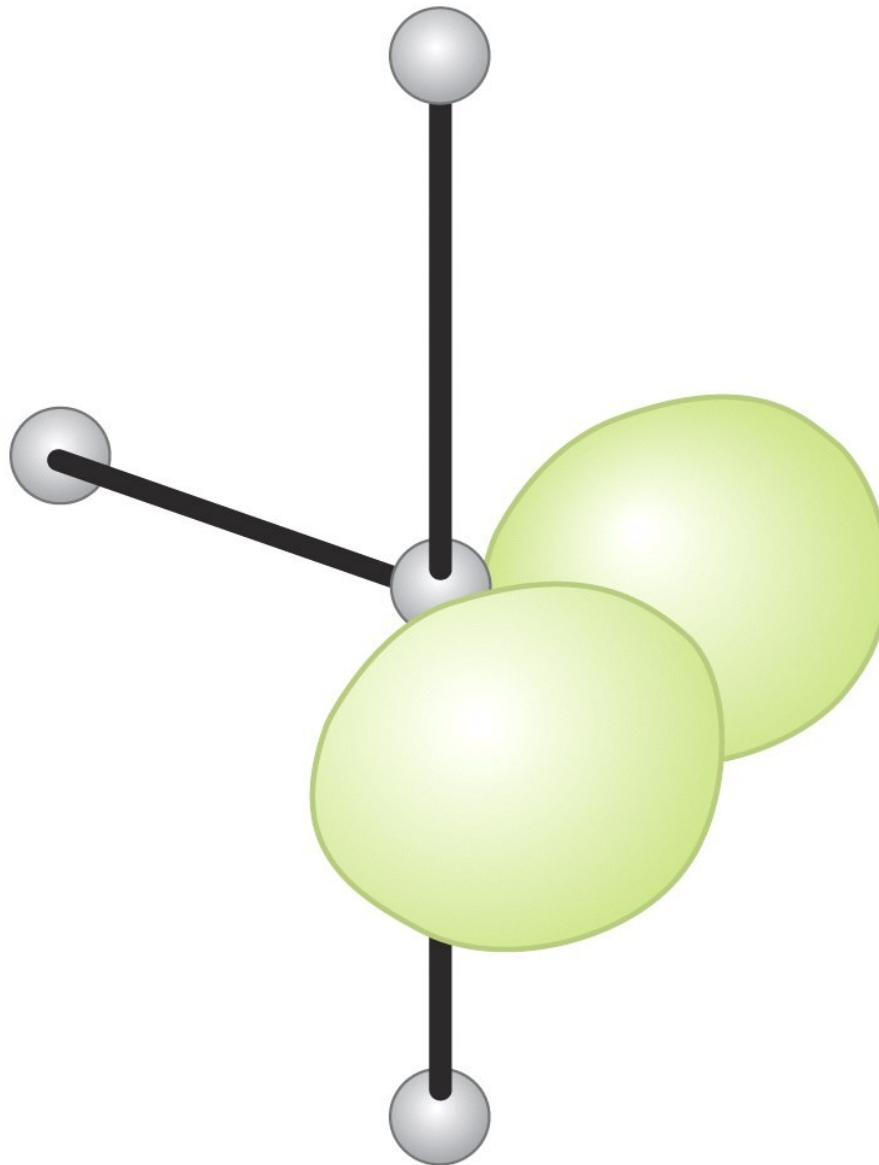
Modelo VSEPR revisto

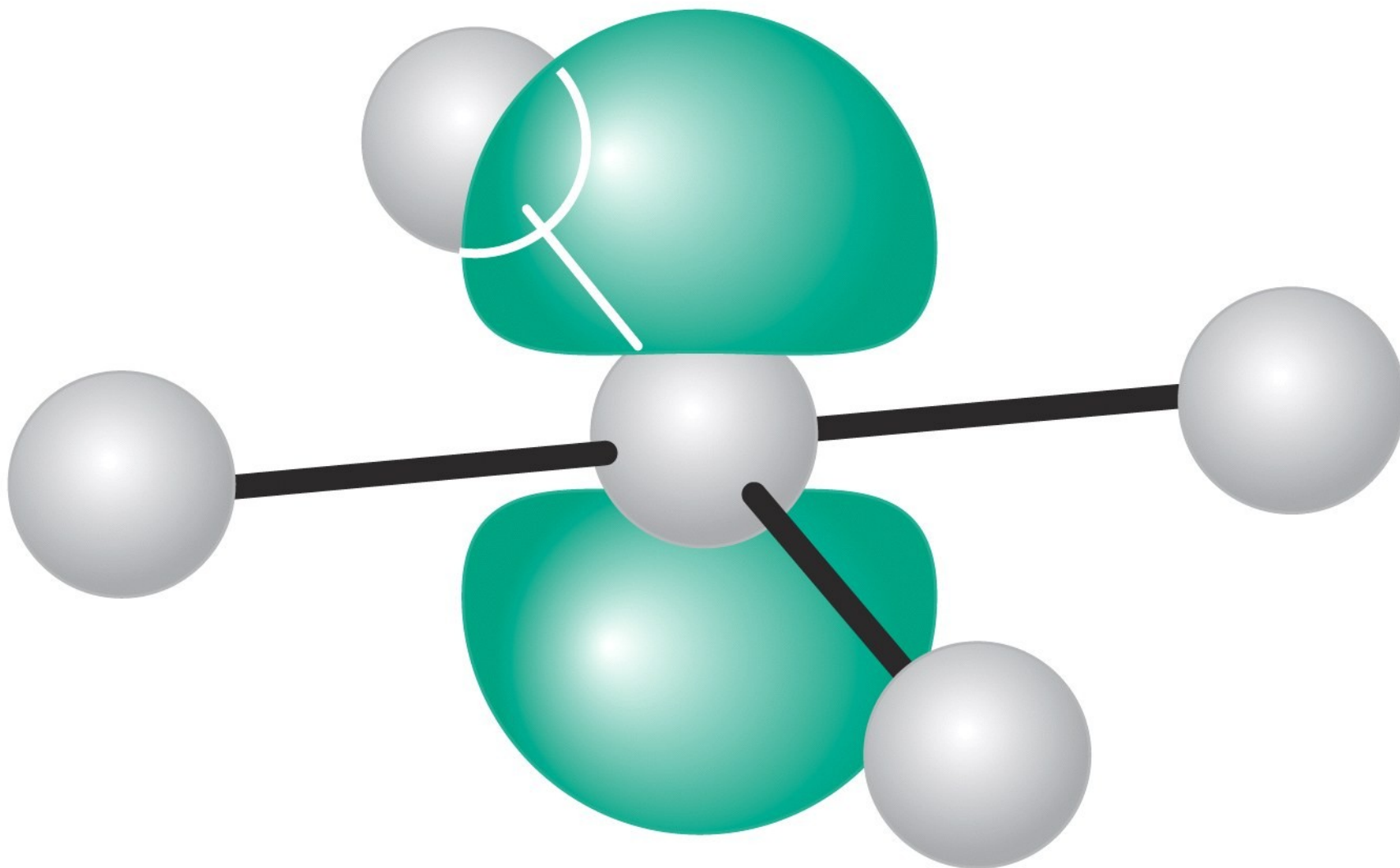
- Os pares de elétrons isolados contribuem para a forma da molécula, embora eles não sejam incluídos na descrição da forma molecular;
- Os pares de elétrons isolados exercem uma repulsão maior do que os pares de elétrons de ligação e tendem a comprimir os ângulos de ligação.

$AX_4E \rightarrow$ Bipirâmide trigonal

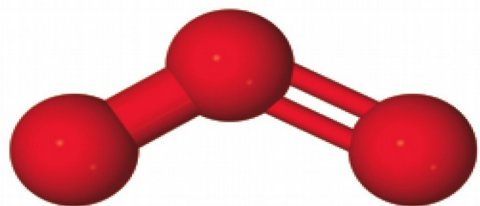


$AX_3E_2 \rightarrow$ Bipirâmide trigonal

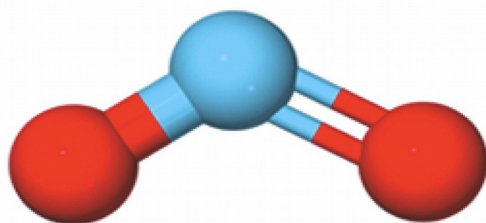




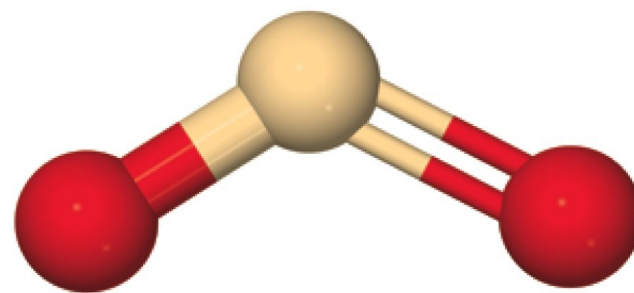
$AX_2E \rightarrow$ Forma molecular angular



23 Ozone, O_3



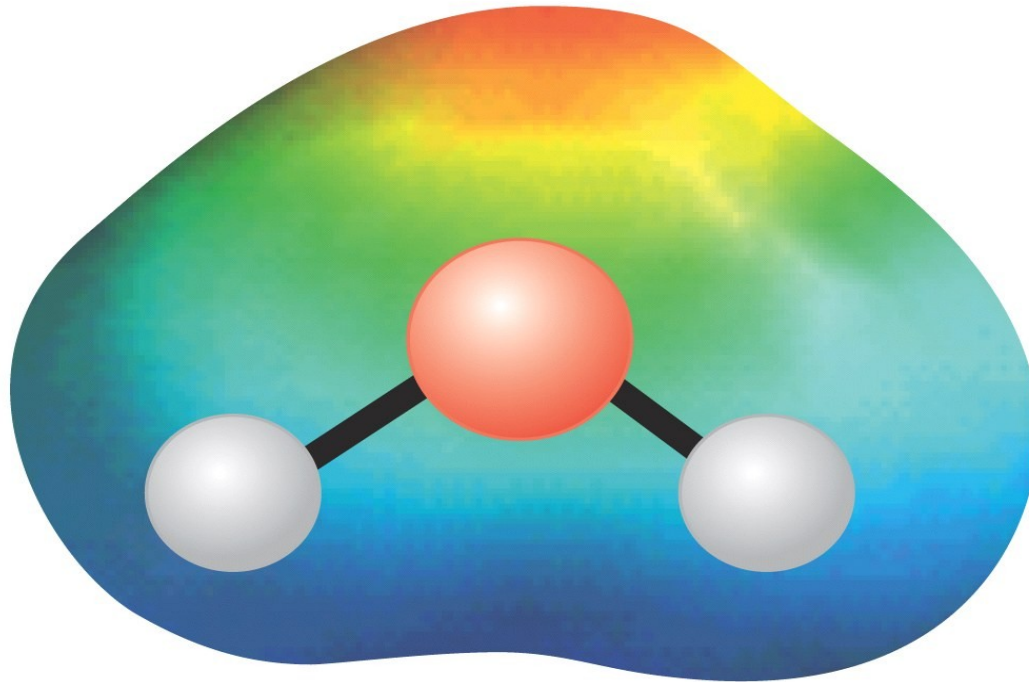
24 Nitrite ion, NO_2^-



25 Sulfur dioxide, SO_2

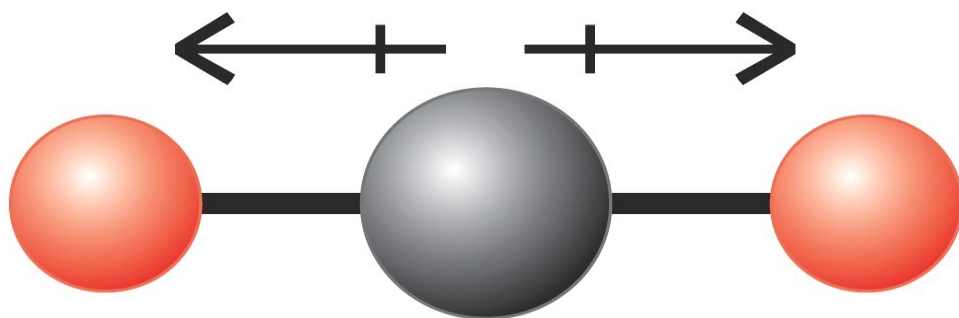
Moléculas Polares

- São moléculas com momento de dipolo diferente de zero.

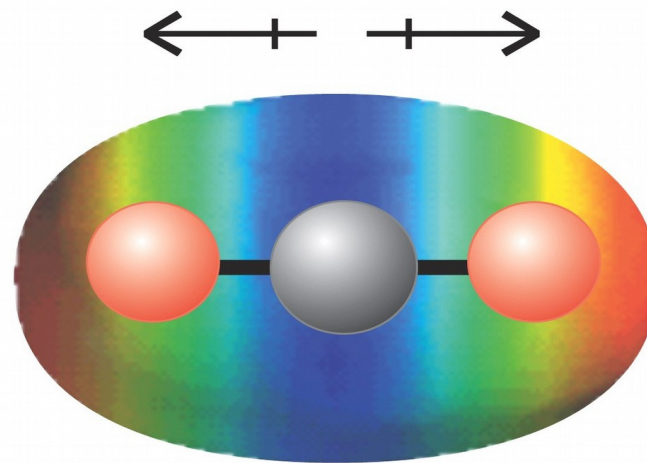


28 Water, H₂O

Moléculas poliatômicas:
molécula polar X ligação polar

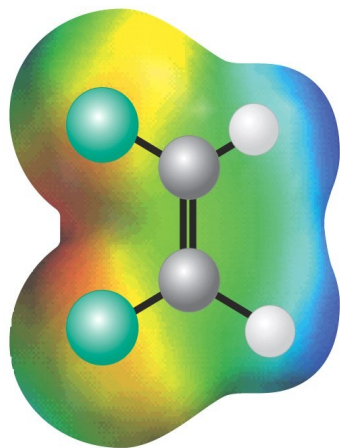


26 Carbon dioxide, CO_2

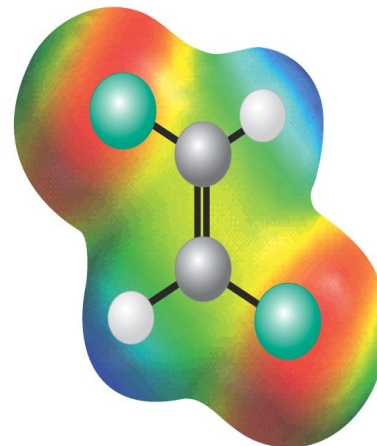


27 Carbon dioxide, CO_2

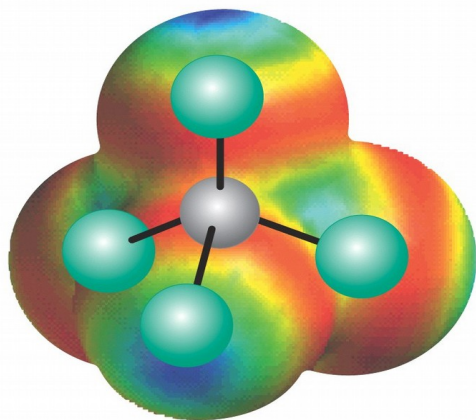
A forma de uma molécula define a sua polaridade



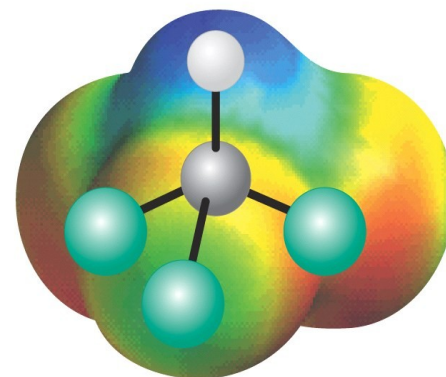
29 *cis*-Dichloroethene, $\text{C}_2\text{H}_2\text{Cl}_2$



30 *trans*-Dichloroethene, $\text{C}_2\text{H}_2\text{Cl}_2$



31 Tetrachloromethane, CCl_4



32 Trichloromethane, CHCl_3

Bibliografia

- Atkins e Jones, Princípios de Química, cap. 3, ed. Bookman (2006).