

# 7500012 – Química Geral

## 20/04/2023

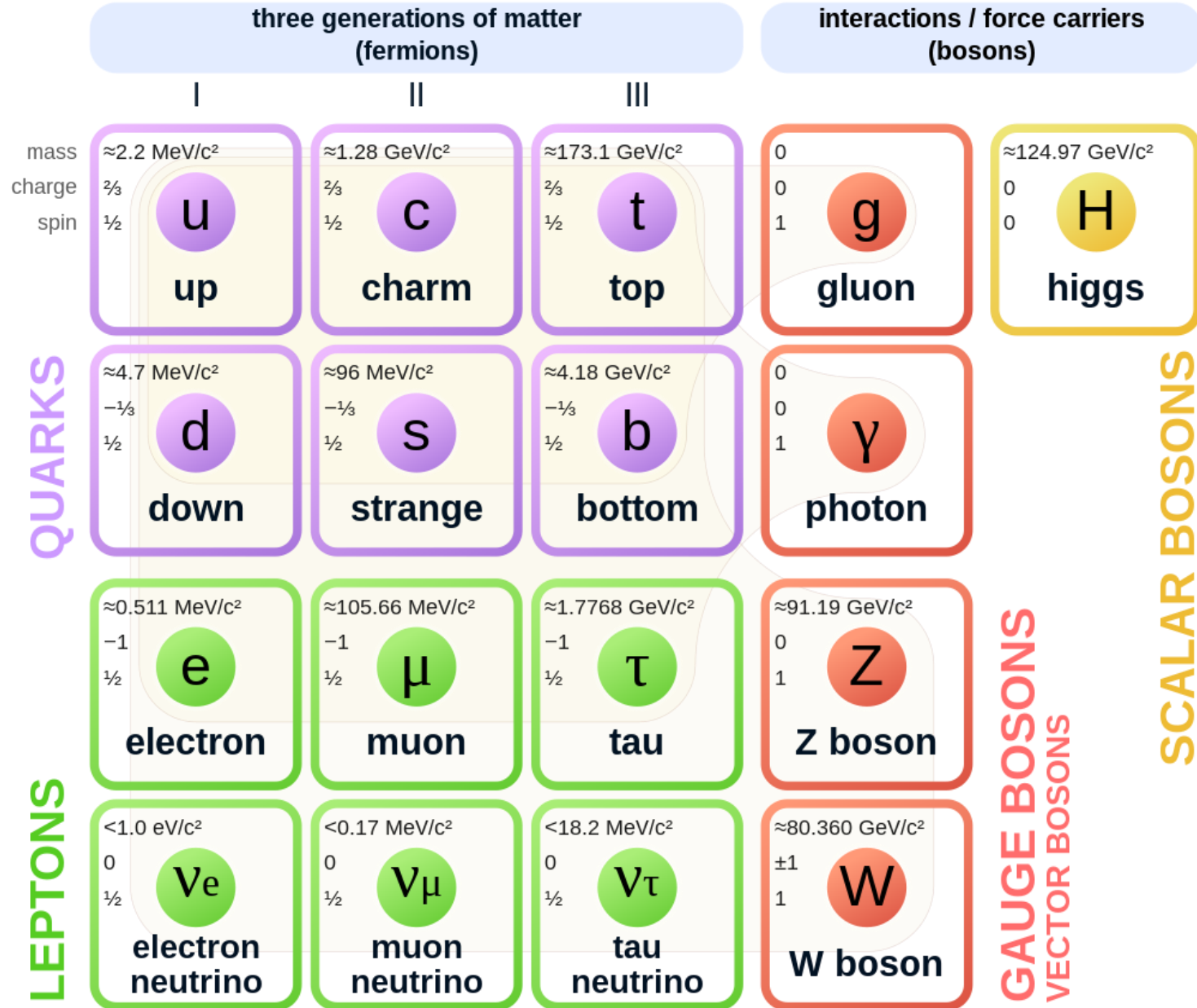
Revisão e Exercícios

Rafael Colombo

# Modelo Padrão

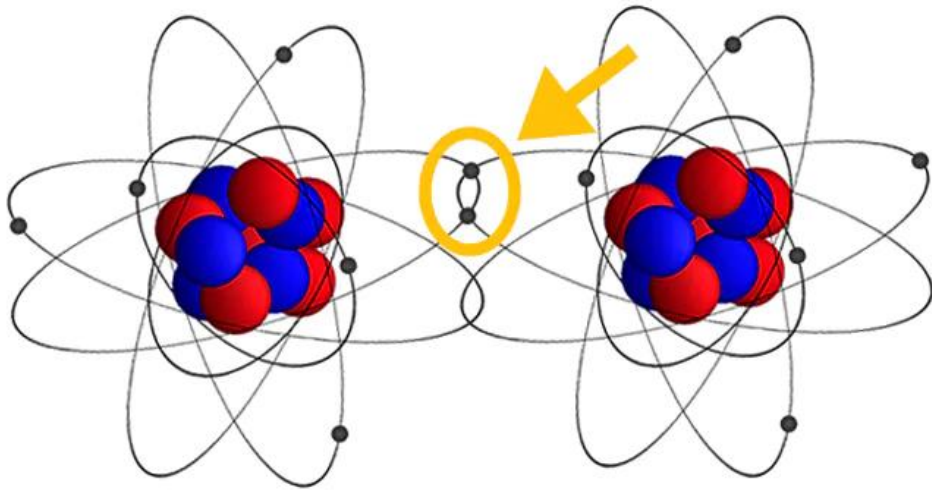
*O que é importante?*

# Standard Model of Elementary Particles



# Ligação Química: Clássico

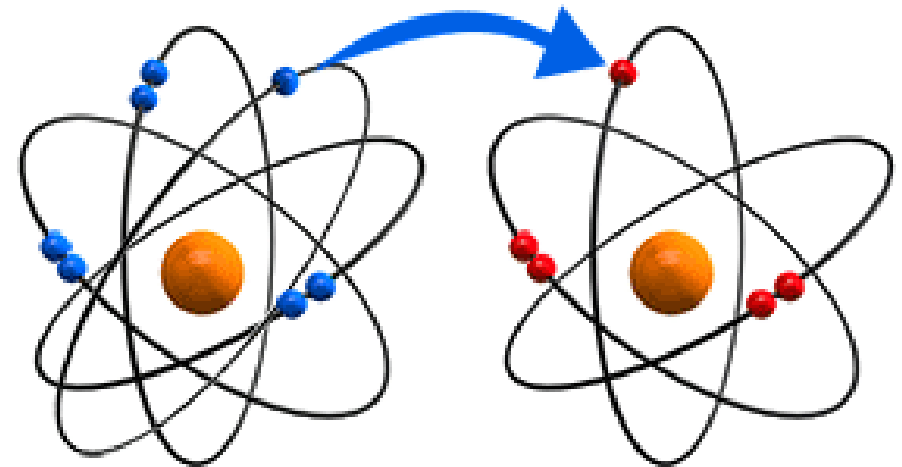
A chemical bond formed when atoms share electrons



covalent bond

GameSmarz

The attraction between oppositely charged ions

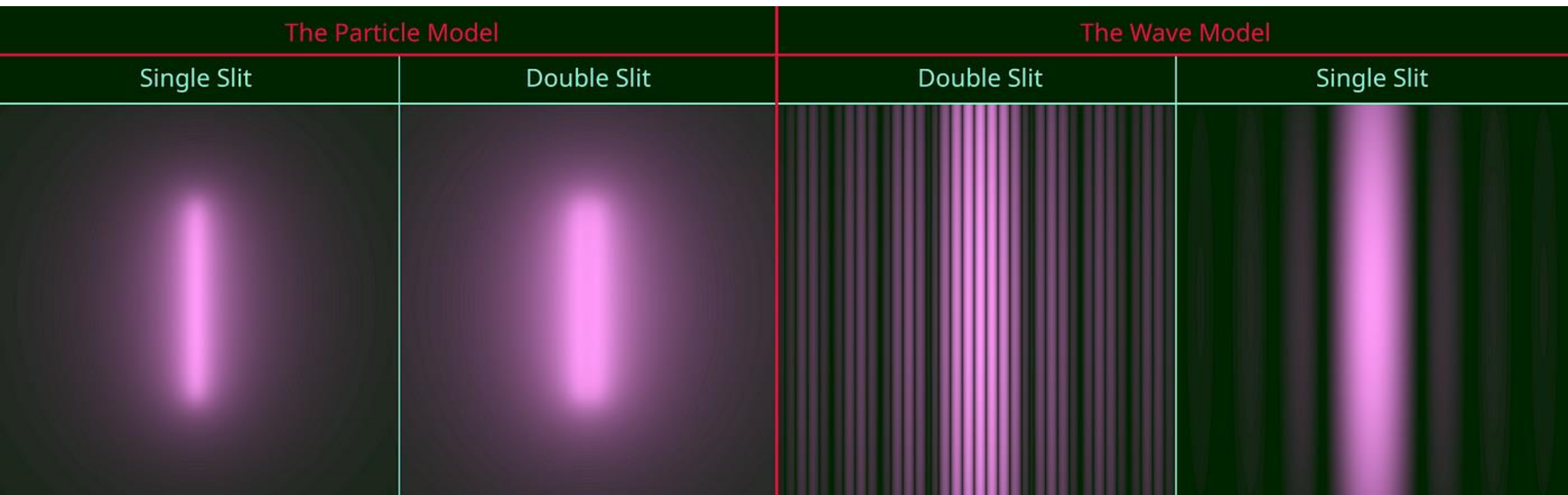


ionic bond

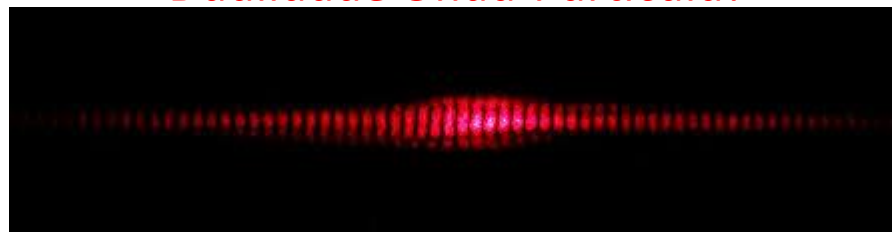
GameSmarz

# Ligação Química: Quântico

\*Thomas Young, 1801

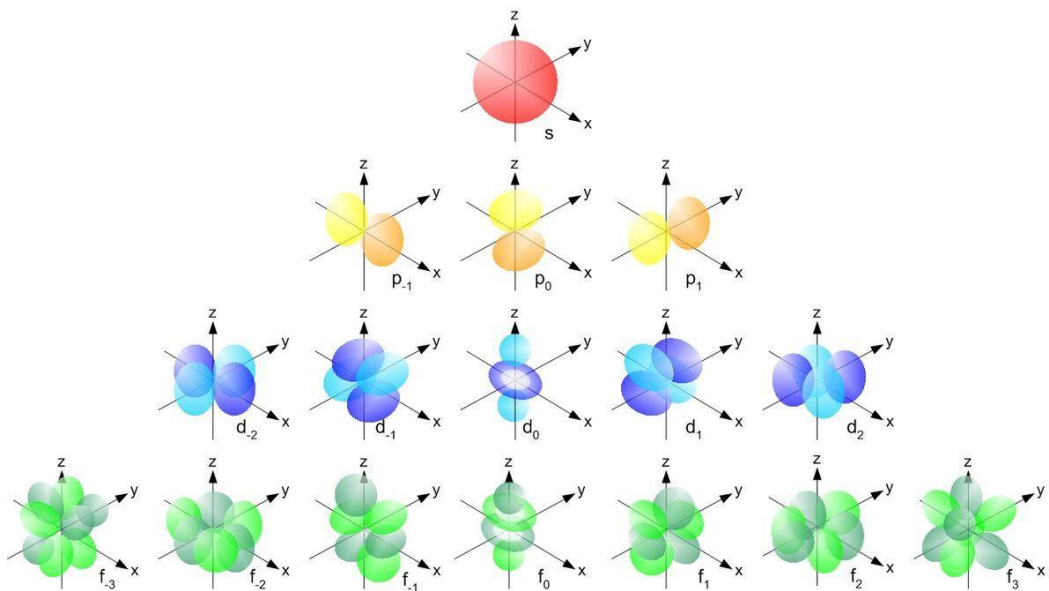


*Dualidade Onda-Partícula!*



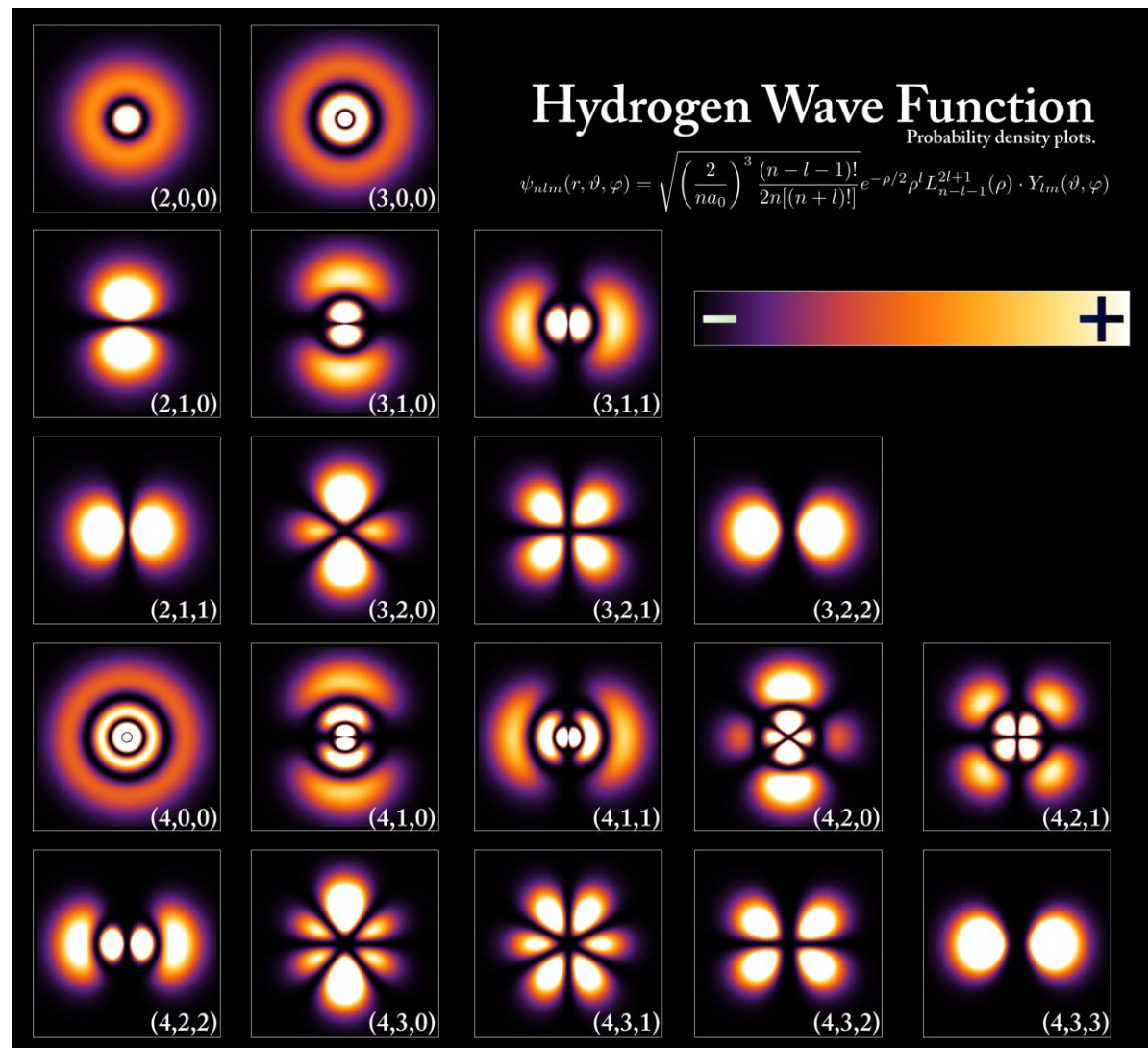
# Ligação Química: Quântico

Funções de onda: Descrição da densidade de probabilidade de encontrar uma partícula em x e t

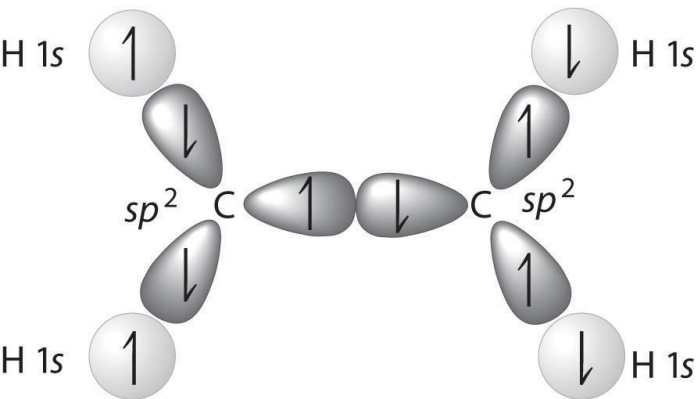


$$|\psi(x, t)|^2 dx$$

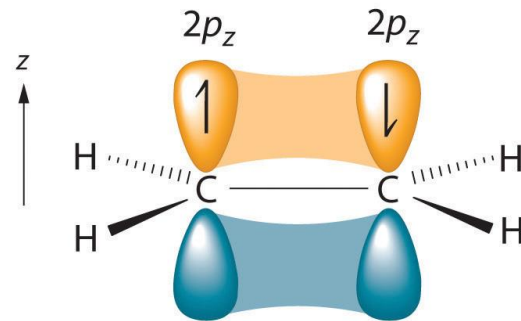
*E as ligações químicas?*



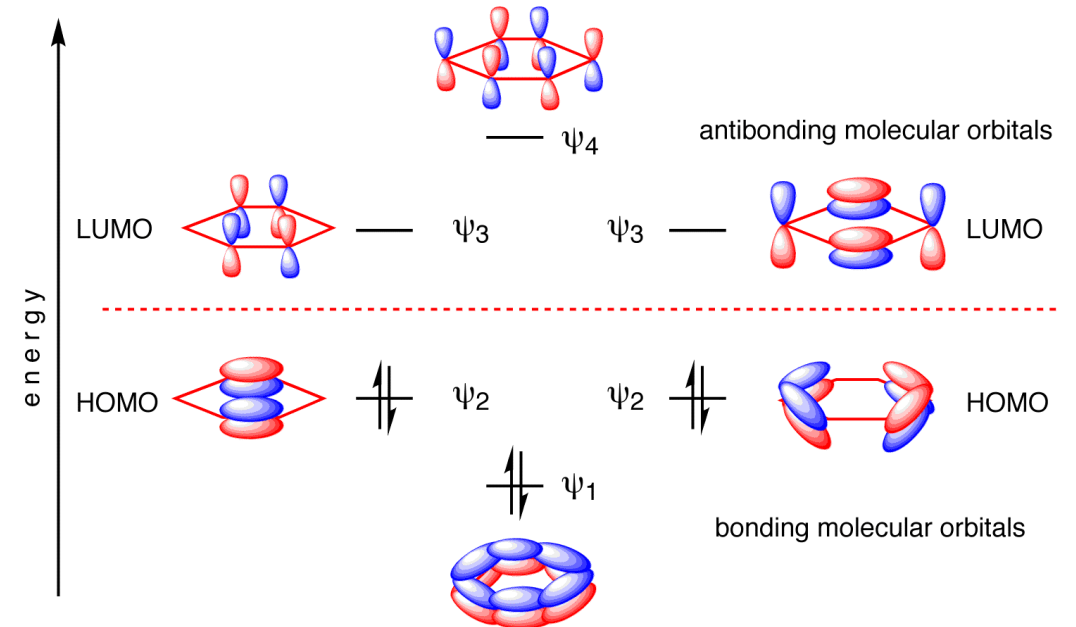
# Ligação Química: Quântico



(a)  $C_2H_4$   $\sigma$ -bonded framework



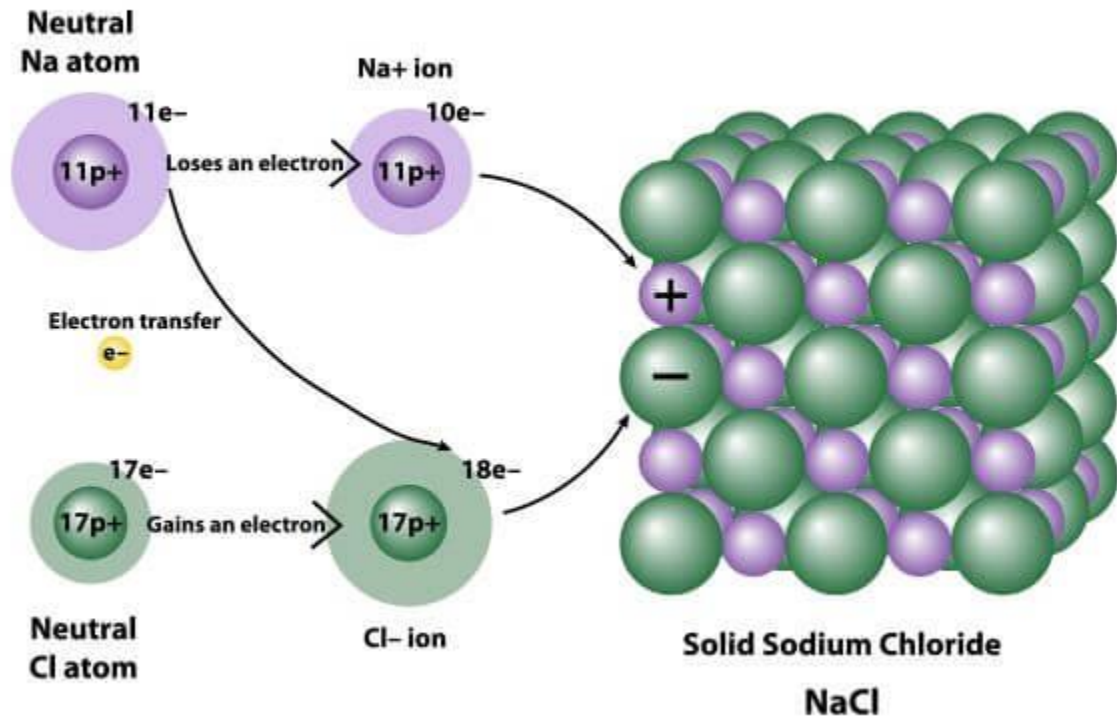
(b)  $C_2H_4$   $\pi$  bonding



the  $\pi$  molecular orbitals for benzene. The dashed line represents the energy of an isolated p orbital – all orbitals below this line are bonding, all above it are antibonding. Benzene has six electrons in its  $\pi$  system so all the bonding MOs are fully occupied

# Ligação Iônica

## Ionic Bonding



*Arranjo Estrutural!  
Efeito eletrostático!*

# Ligação Iônica

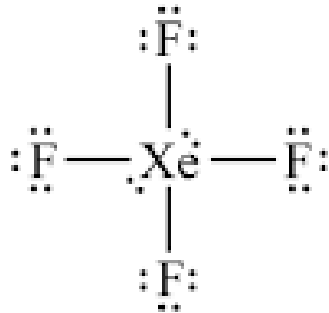
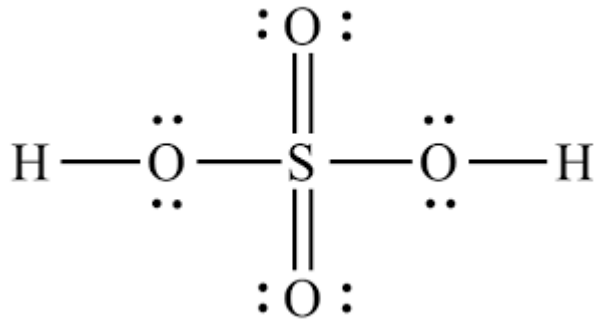
1. Que tipo de estrutura eletrônica é formada ao juntar Li e F? Desenhar.
2. Que tipo de estrutura eletrônica é formada ao juntar Li e O? Desenhar.
3. Qual a formula esperada para o compost iônico formado entre  $\text{Fe}^{3+}$  e  $\text{S}^{2-}$ ?  
E entre  $\text{Au}^{3+}$  e  $\text{Cl}^-$ ?



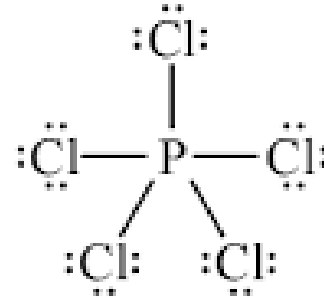
# Ligação Covalente

Regra do Octeto Expandido: Entre não-metálicos, terceiro período e abaixo.

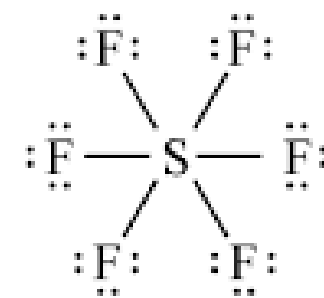
Como fica a distribuição eletrônica??



XeF<sub>4</sub>  
36 valence  
electrons



PCl<sub>5</sub>  
40 valence  
electrons



SF<sub>6</sub>  
48 valence  
electrons




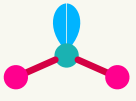
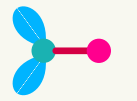


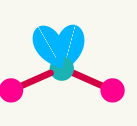
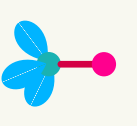

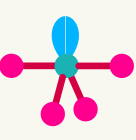
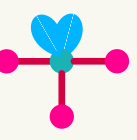
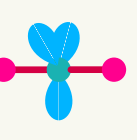
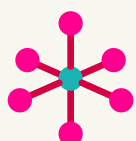
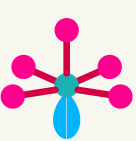
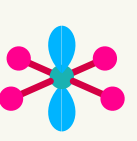
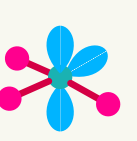
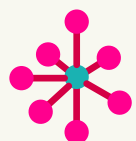

# Ligação Covalente

Modelo VSEPR: Ligações e pares isolados

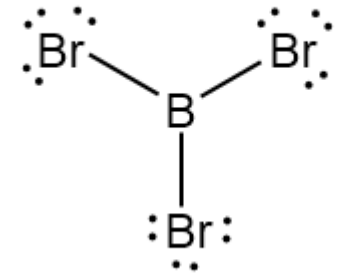
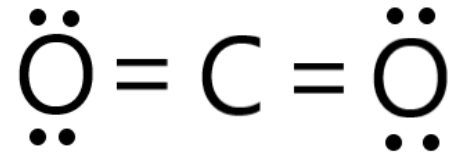
1. Desenhar a estrutura
2. Localizar elétrons em ligações
3. Localizar pares de elétrons não-ligados

Exemplos:

1.  $\text{CO}_2$  - Linear
2.  $\text{BBr}_3$  - Trigonal
3.  $\text{O}_3$  - Angular
4.  $\text{NH}_3$  - Pirâmide trigonal
5.  $\text{H}_2\text{O}$  - Angular
6.  $\text{CH}_4$  - Tetraédrica
7.  $\text{PCl}_5$  - Bipirâmide trigonal
8.  $\text{SF}_4$  - Gangorra
9.  $\text{ClF}_3$  - Forma T
10.  $\text{SF}_6$  - Octaédrica
11.  $\text{XeF}_4$  - Quadrado Planar

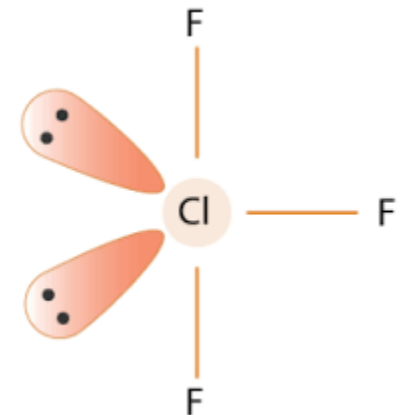
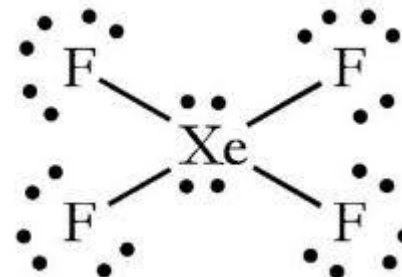
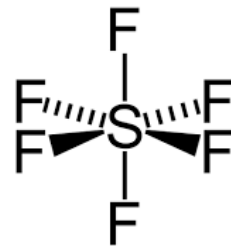
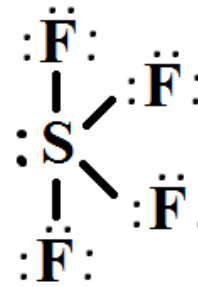
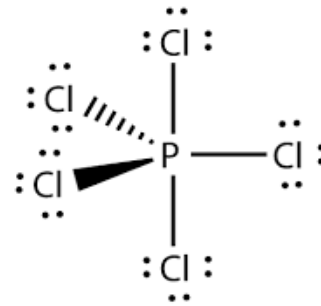
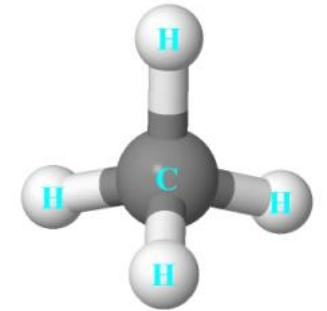
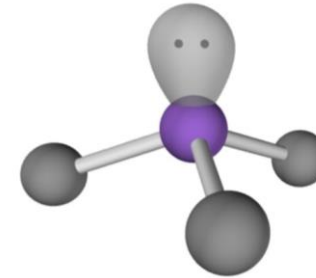
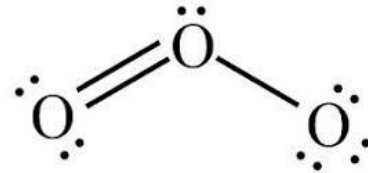
Electron Pairs	L.P: 0	L.P: 1	L.P: 2	L.P: 3
2	 Linear	 Linear		
3	 Trigonal Planar	 Bent	 Linear	
4	 Tetrahedral	 Trigonal Pyramidal	 Bent	 Linear
5	 Trigonal Bipyramidal	 See-saw	 T-Shaped	 Linear
6	 Octahedral	 Square Pyramidal	 Square Planar	 T-Shaped
7	 Pentagonal Bipyramidal	 Pentagonal Pyramidal		

# Ligação Covalente



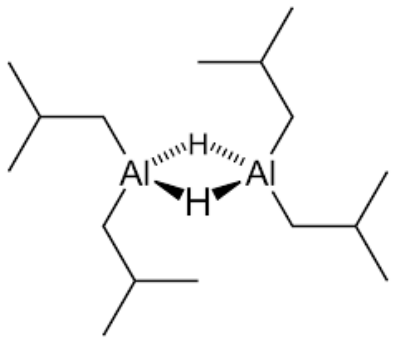
Exemplos:

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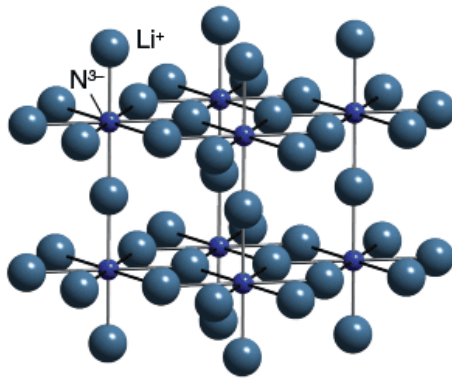


# Observações

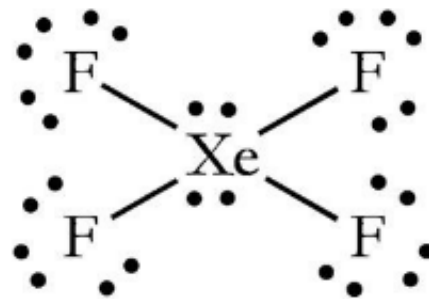
- Não associar elementos específicos a tipos de ligações ou limitações
  - Ex. “Gases nobres não fazem ligações” – Tem certeza?
  - Ex. “Alumínio, cobre, ferro etc só fazem ligação iônica” – Não é bem assim...
  - Ex. “Precisa de 8 elétrons em valência para estabilidade” – Vários exemplos mostrando o contrário.



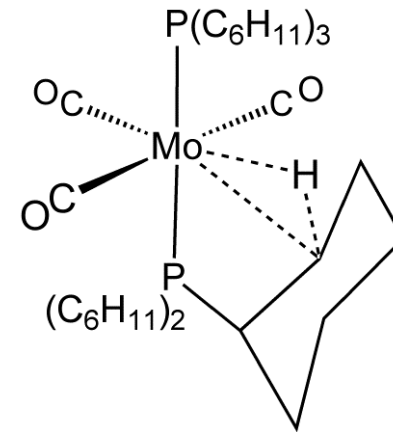
Al covalente?



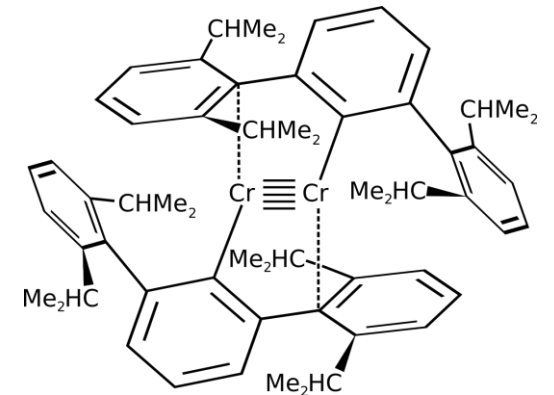
N iônico?



Xe com ligações?



2 elétrons em 3 centros?



Ligação quintupla?

# Observações

- Pensar em eletrostática, eletronegatividade, imaginar a organização de átomos e elétrons no espaço.
- Software simples e freeware para desenhar moléculas: Avogadro