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# Hibridação – Aula 14

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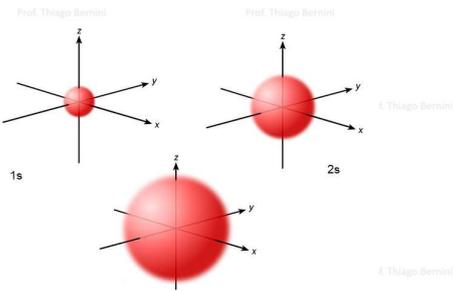
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## Orbital s

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O orbital s tem simetria **esférica** ao redor do núcleo.

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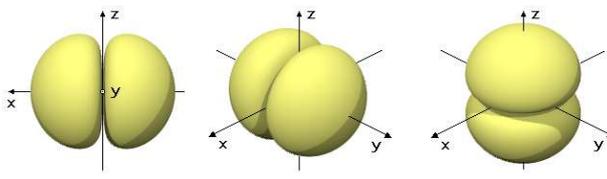
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## Orbital p

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A forma geométrica dos orbitais **p** é a de duas esferas achatadas até o ponto de contato, (o núcleo atômico) e orientadas segundo os eixos de coordenadas.



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### Orbital p

The diagram illustrates the three p orbitals:  $P_x$  (yellow),  $P_y$  (cyan), and  $P_z$  (red). Each orbital is shown as a pair of lobes oriented along its respective axis. The final part of the diagram shows the combined  $P$  sub level, which consists of all three orbitals together.

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### Ligações Covalentes

- Resultam da sobreposição dos orbitais atômicos dos átomos que participam da ligação.
- Os átomos compartilham o par eletrônico existente na ligação.
- Podem ser do tipo sigma ou pi.

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### Exemplo de ligação em orbitais

Exemplo:  $F_2$

Diagram illustrating the atomic orbital configuration for  $F_2$  (Fluorine, atomic number 9). The configuration is shown as  $1s^2 2s^2 2p^5$  for each atom. The orbitals are represented by boxes containing pairs of electrons (up and down arrows). The diagram shows the overlap of the  $2p$  orbitals from two fluorine atoms to form molecular orbitals.

The diagram shows the overlap of  $p$  orbitals along the x-axis. The resulting molecular orbitals are shown as combinations of the atomic orbitals, with bonding orbitals having lower energy and antibonding orbitals having higher energy.

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## Hibridação ou Hibridização

Consiste na mistura de orbitais atômicos puros formando novos orbitais híbridos. São 3 tipos:  $sp^3$ ,  $sp^2$ ,  $sp$ .

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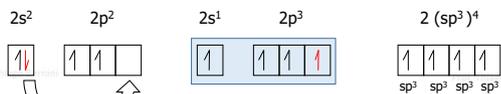
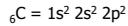
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## Hibridação $sp^3$

> Hibridização " $sp^3$ ": São quatro orbitais híbridos construídos a partir de um orbital "s" e três orbitais "p".

Exemplo: Carbono



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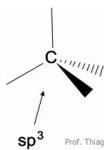
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## Hibridação $sp^3$

> A geometria dos 4 orbitais  $sp^3$  é tetraédrica (os 4 orbitais partem do centro do tetraédro e dirigem-se, cada um, para um dos vértices do tetraédro).

> O ângulo entre os orbitais  $sp^3$  será de  $109^\circ 28'$ .

> Acontece no Carbono que se liga através de 4 ligações simples.



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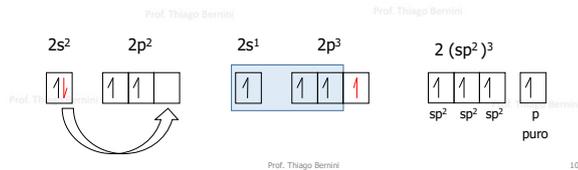
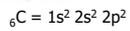
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## Hibridação $sp^2$

- > Hibridização " $sp^2$ ": São três orbitais híbridos construídos a partir de um orbital "s" e dois orbitais "p".

Exemplo: Carbono




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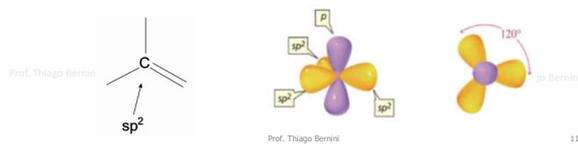
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## Hibridização $sp^2$

- > Os **três** orbitais híbridos  $sp^2$  situam-se num mesmo plano formando ângulos de  $120^\circ$  entre si (geometria trigonal plana).

- > Acontece com Carbono que possua uma dupla ligação.

- > No Carbono do tipo  $sp^2$  existirá um orbital p "puro" que será responsável pela ligação covalente do tipo pi.




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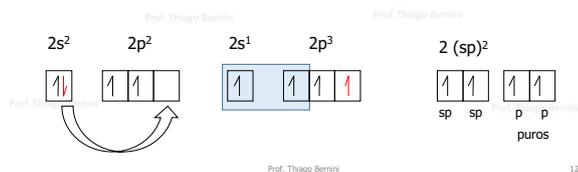
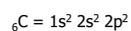
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## Hibridação $sp$

- > Hibridização " $sp$ ": São dois orbitais híbridos construídos a partir de um orbital "s" e um orbital "p".

Exemplo: Carbono




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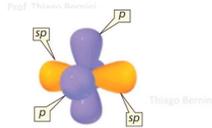
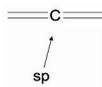
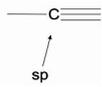
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## Hibridação sp

> Os orbitais híbridos sp formam um ângulo de  $180^\circ$  entre si.

> A geometria molecular será linear.

> Acontece em Carbonos com duas duplas ou Carbono com uma tripla ligação.



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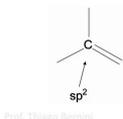
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Elemento	Hibridação	Tipo de ligação	Geometria
Carbono	sp <sup>3</sup>	4 lig. simples	Tetraédrica
Carbono	sp <sup>2</sup>	1 lig. dupla e 2 lig. simples	Trigonal plana
Carbono	sp	1 lig. simples e 1 lig. tripla ou 2 lig. duplas.	Linear

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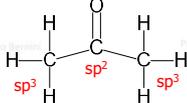
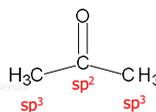
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