Estrutura da Matéria
2018-2 – Prof. Célio
Aula 7 – Orbitais atômicos e Tabela periódica (cont.)

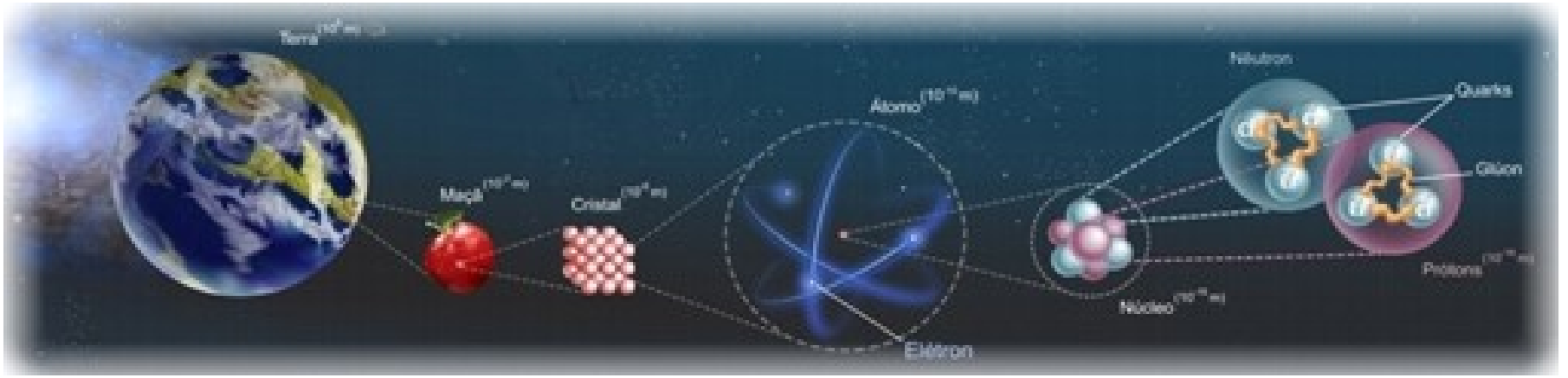
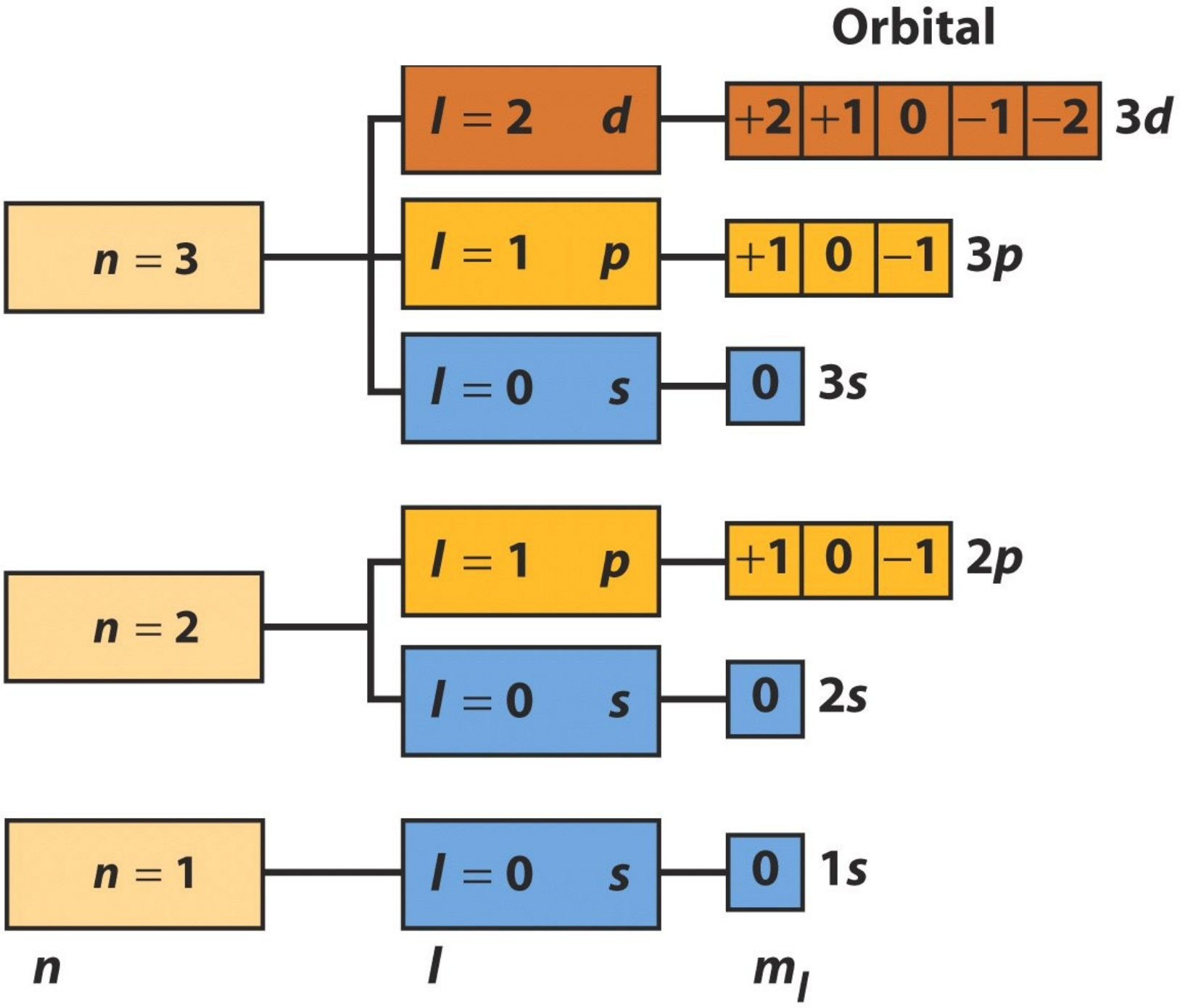


Tabela com os números quânticos para elétrons nos átomos

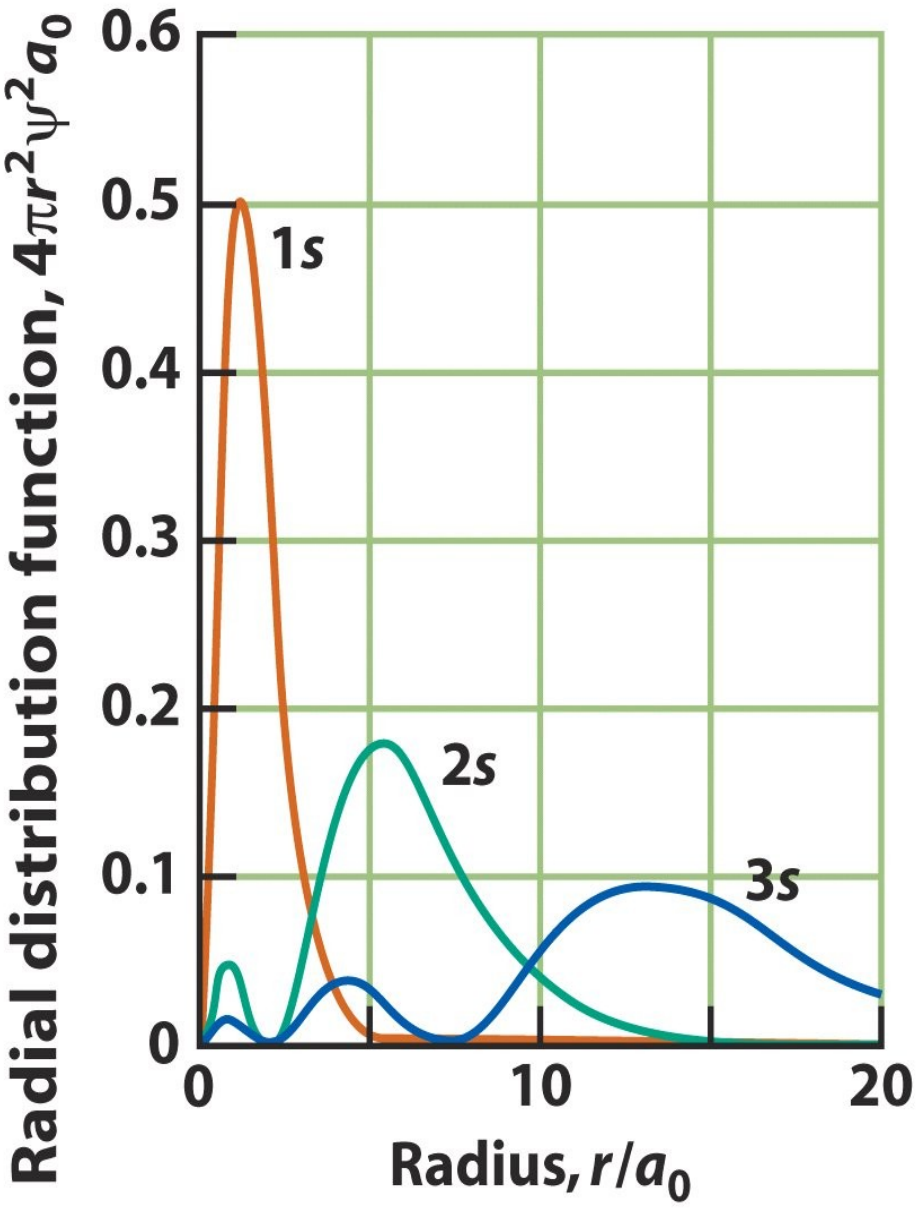
TABLE 1.3 Quantum Numbers for Electrons in Atoms

Name	Symbol	Values	Specifies	Indicates
principal	n	$1, 2, \ldots$	shell	size
orbital angular momentum*	l	$0, 1, \ldots, n-1$	subshell: $l = 0, 1, 2, 3, 4, \ldots$ $s, p, d, f, g, \ldots$	shape
magnetic	m_l	$l, l-1, \ldots, -l$	orbitals of subshell	orientation
spin magnetic	m_s	$+\frac{1}{2}, -\frac{1}{2}$	spin state	spin direction

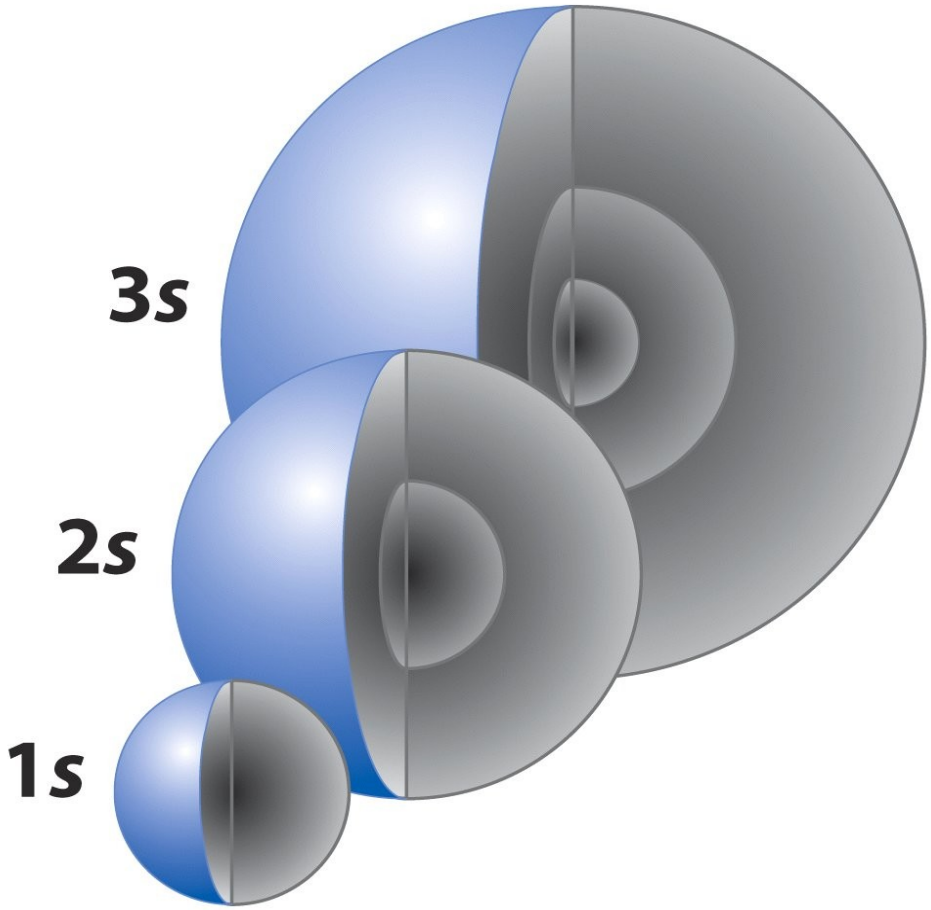
*Also called the *azimuthal quantum number.*


Orbital
n = 3
l = 2 d
+2 +1 0 −1 −2
3d
l = 1 p
+1 0 −1
3p
l = 0 s
0
3s
n = 2
l = 1 p
+1 0 −1
2p
l = 0 s
0
2s
n = 1
l = 0 s
0
1s
n
l
m_l

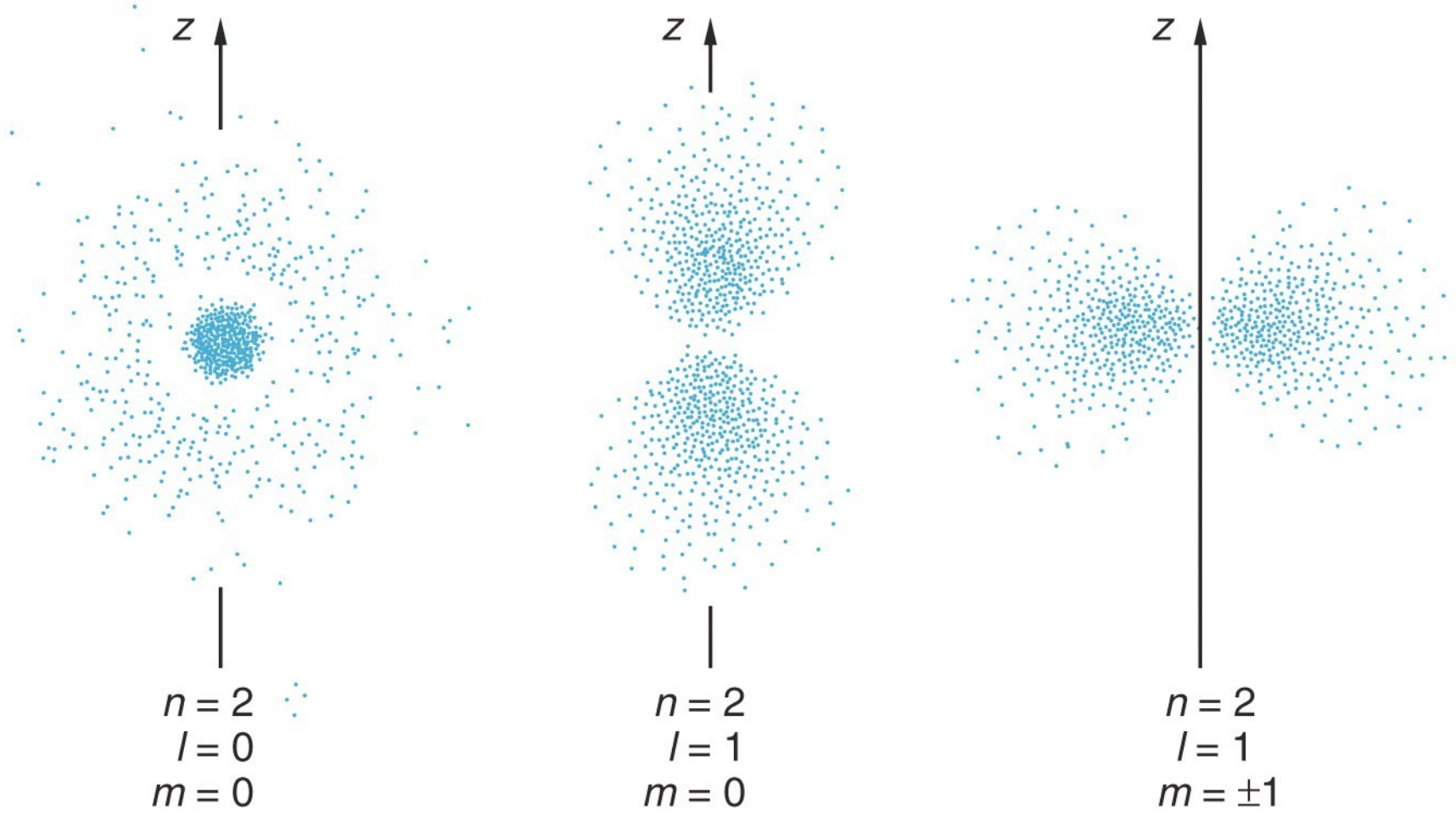
Função de Distribuição Radial



Aparência em 3 dimensões dos orbitais s



Densidades de probabilidade para n=2



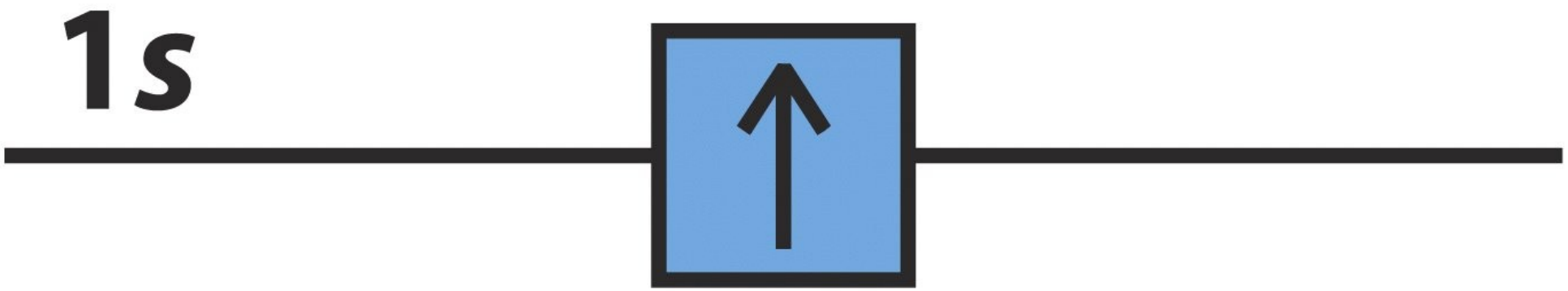
Átomos com muitos elétrons: Preenchimento dos orbitais atômicos

- Dados N elétrons, como eles se distribuem no átomo?

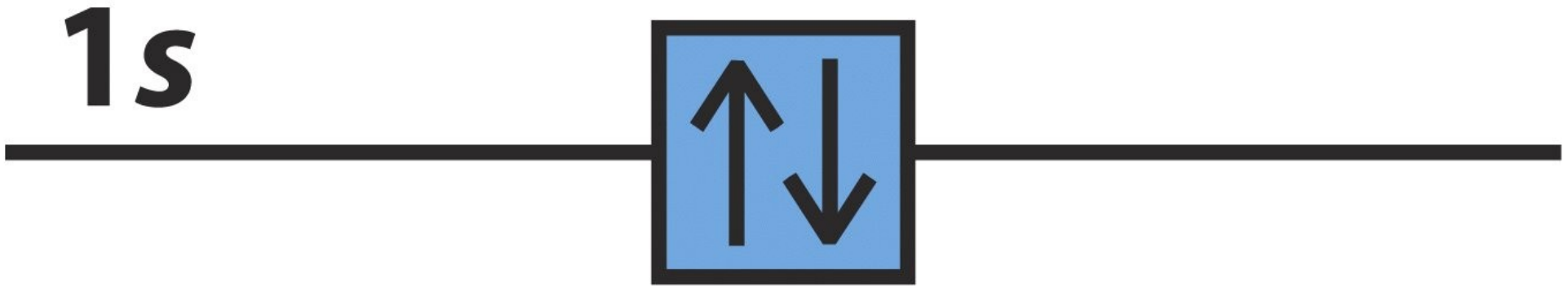
n					
1	K	s^2			
2	L	s^2	p^6		
3	M	s^2	p^6	d^{10}	
4	N	s^2	p^6	d^{10}	f^{14}
5	O	s^2	p^6	d^{10}	f^{14}
6	P	s^2	p^6	d^{10}	
7	Q	s^2			

Princípio da construção

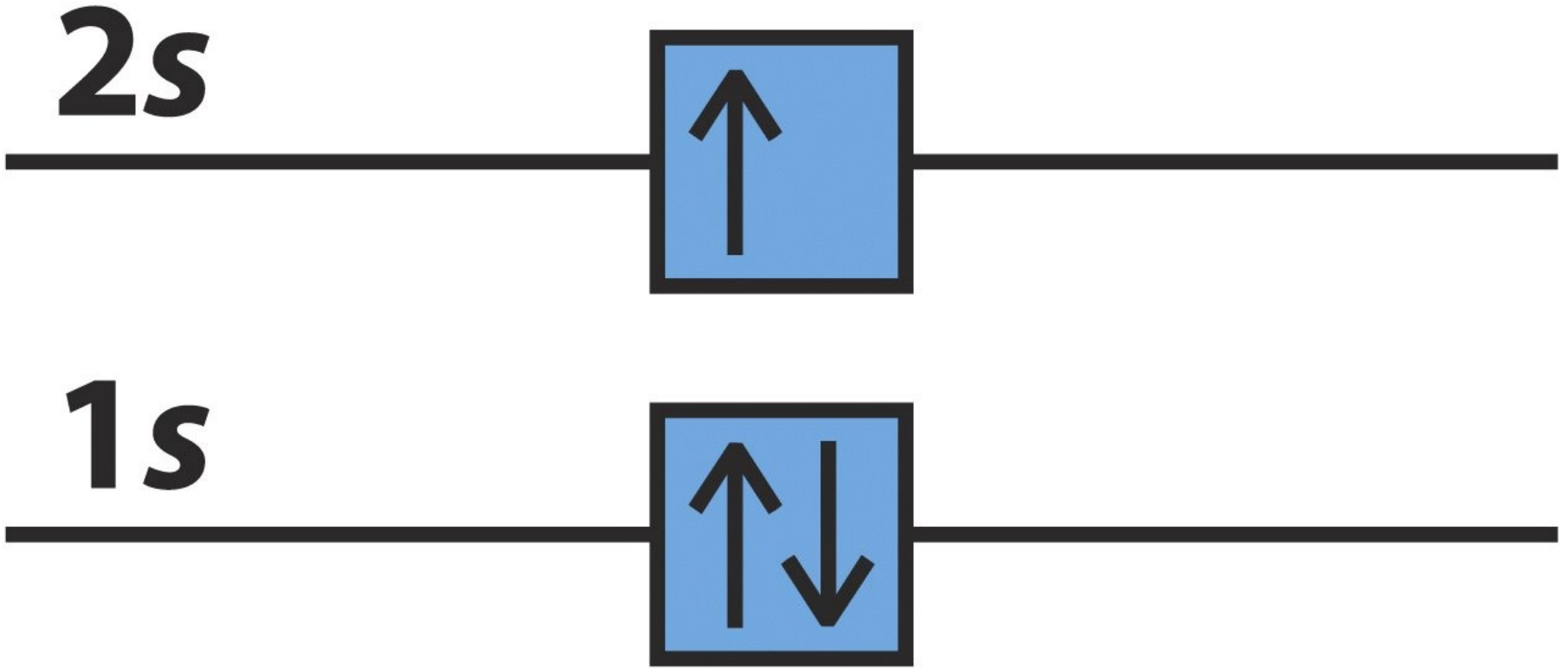
- Adicione elétrons, um após o outro, aos orbitais, na ordem da figura seguinte, porém não coloque mais de dois elétrons por orbital. → Princípio da exclusão de Pauli
- Se mais de um orbital em uma camada estiver disponível, adicione elétrons com spins paralelos aos diferentes orbitais daquela subcamada até completá-la, antes de emparelhar dois elétrons em um dos orbitais. → Regra de Hund



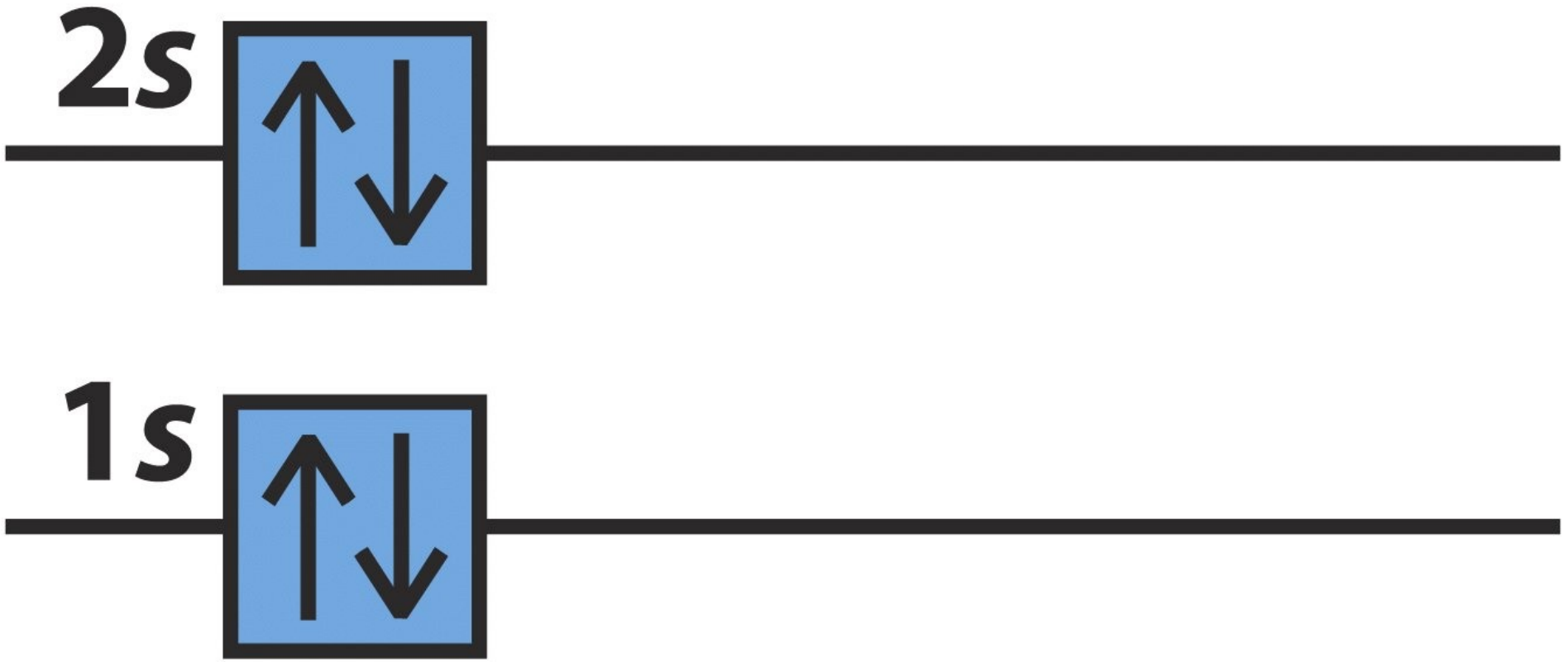
1 H $1s^1$



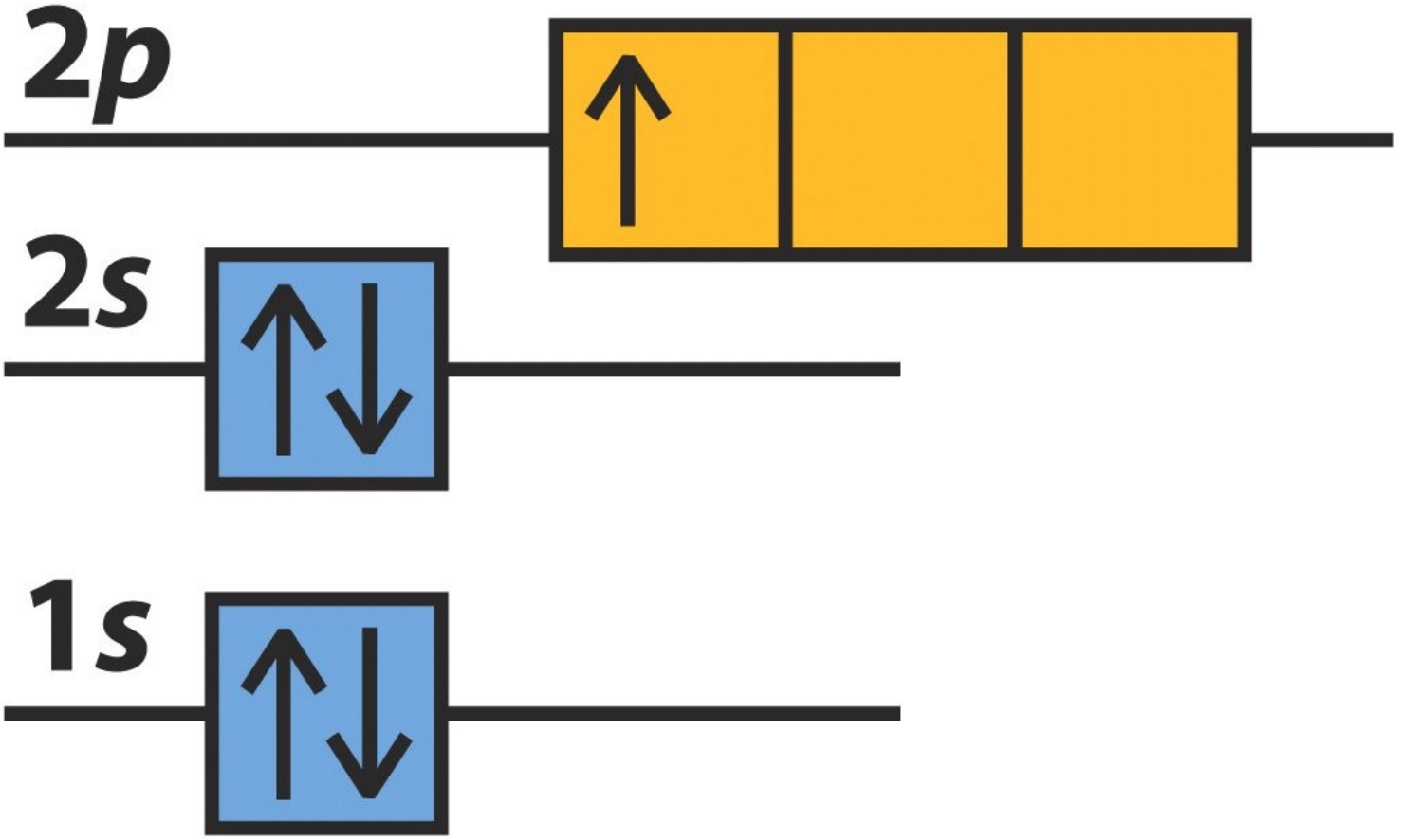
2 He $1s^2$



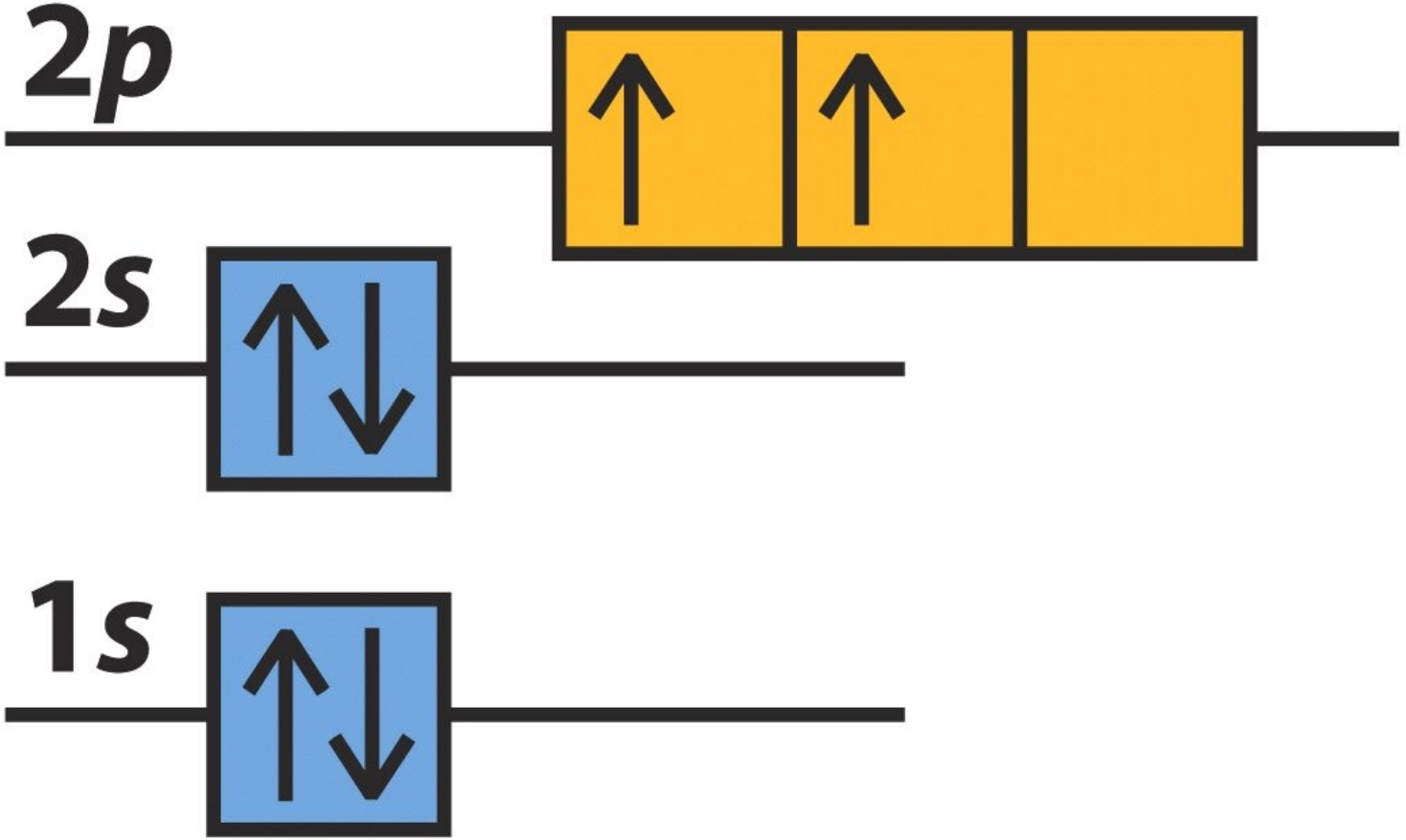
3 **Li $1s^2 2s^1$, [He]$2s^1$**



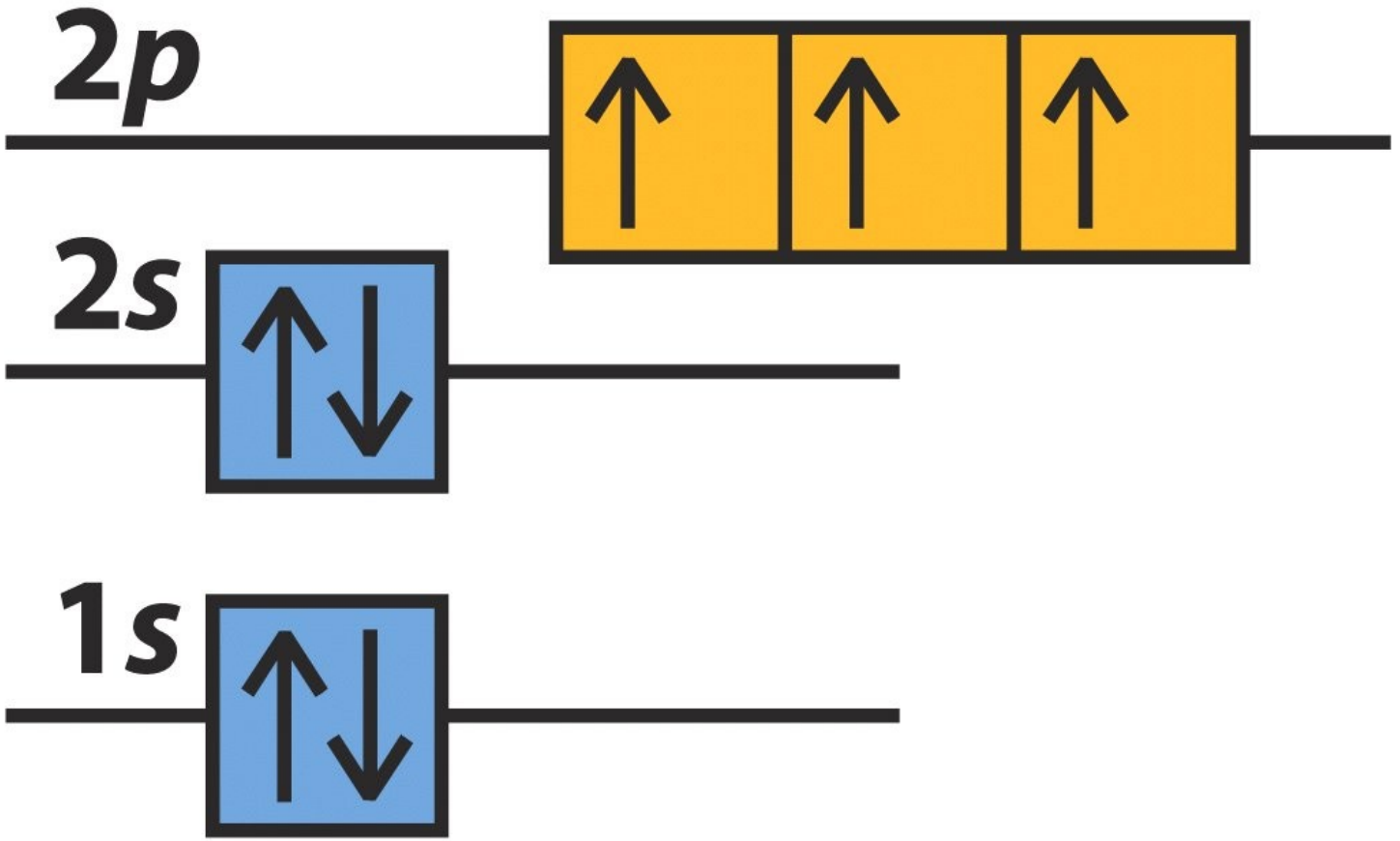
4 Be $1s^2 2s^2$, $[He]2s^2$



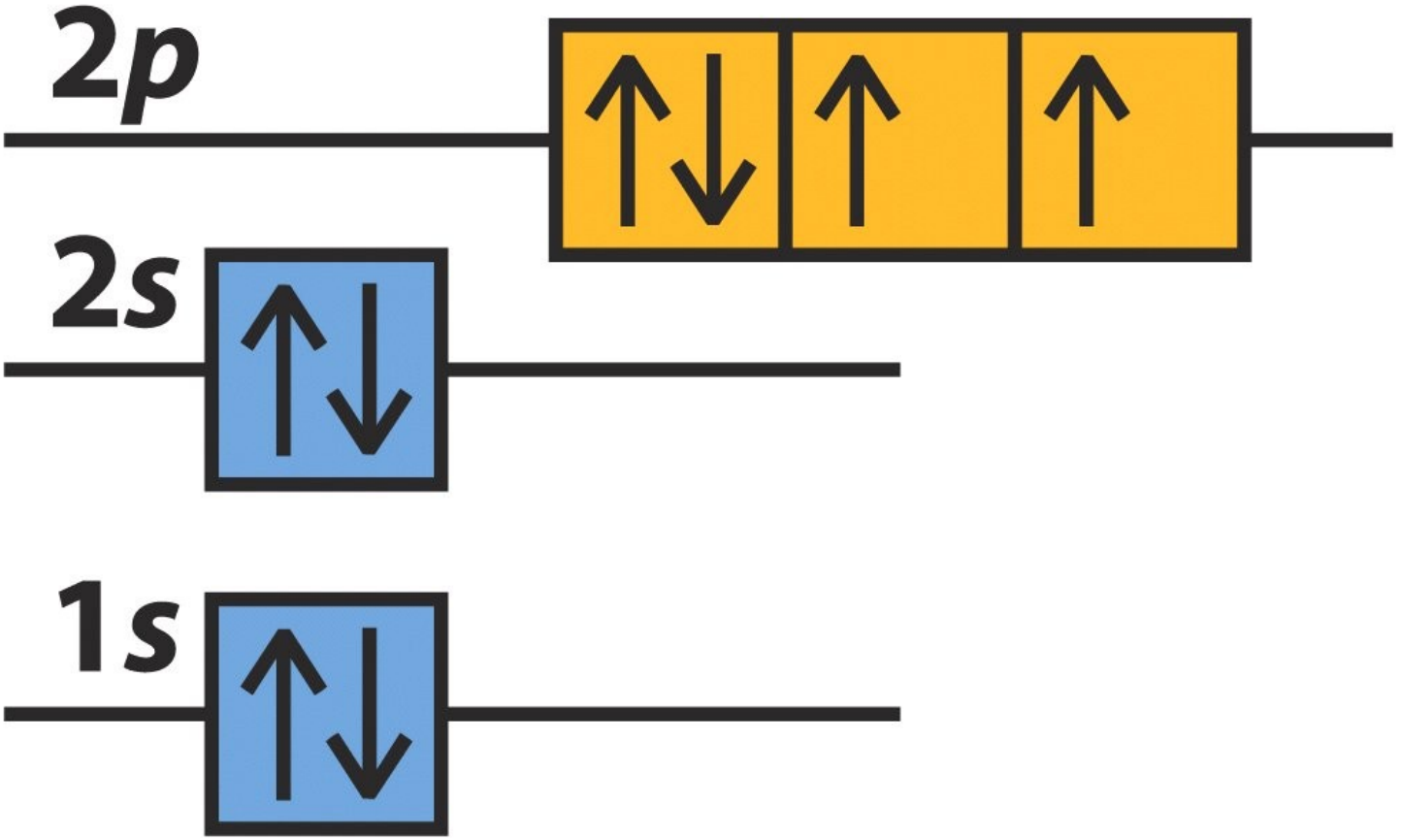
5 B $1s^2 2s^2 2p^1$, [He]$2s^2 2p^1$



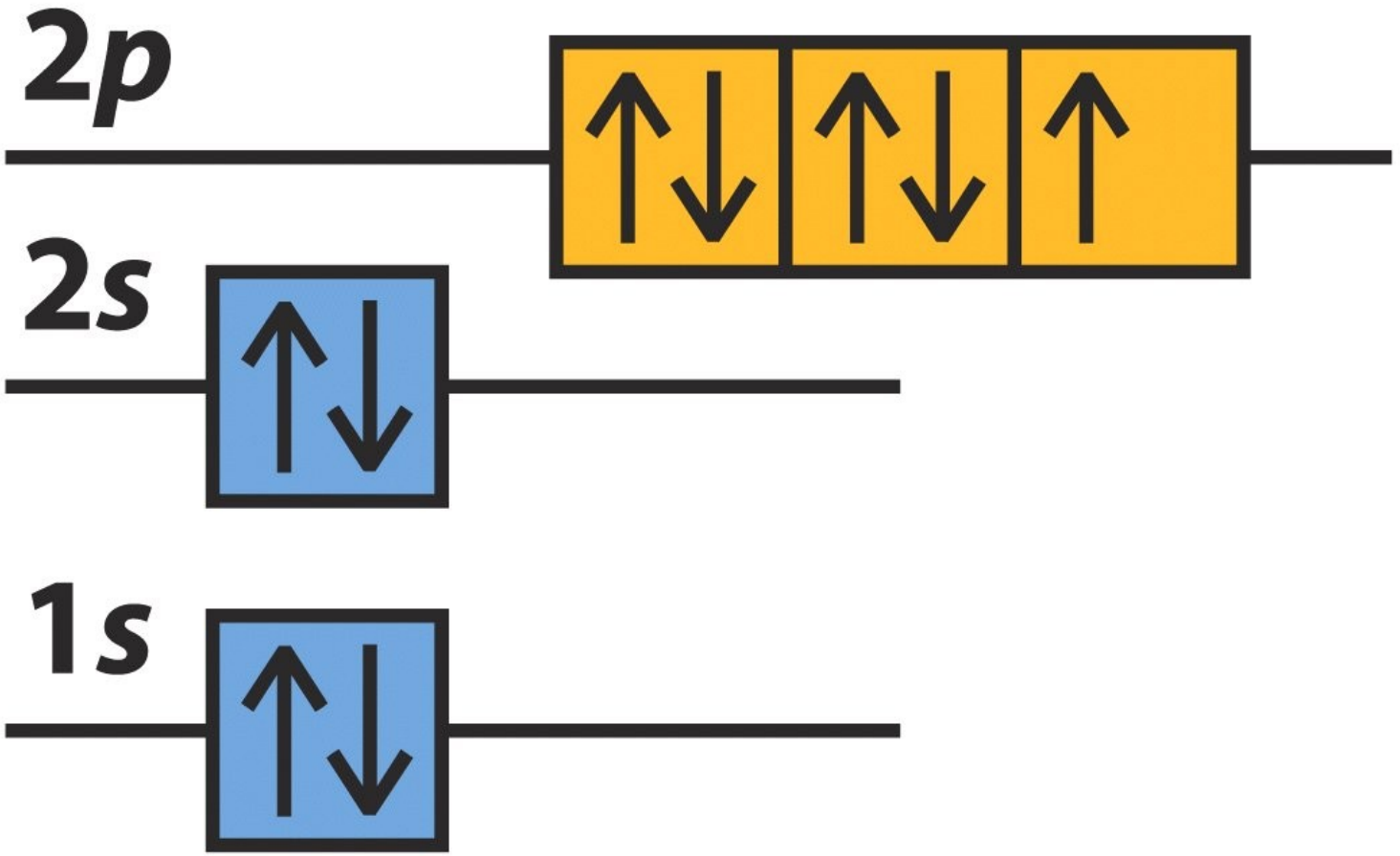
6 C $1s^2 2s^2 2p^2$, [He]$2s^2 2p^2$



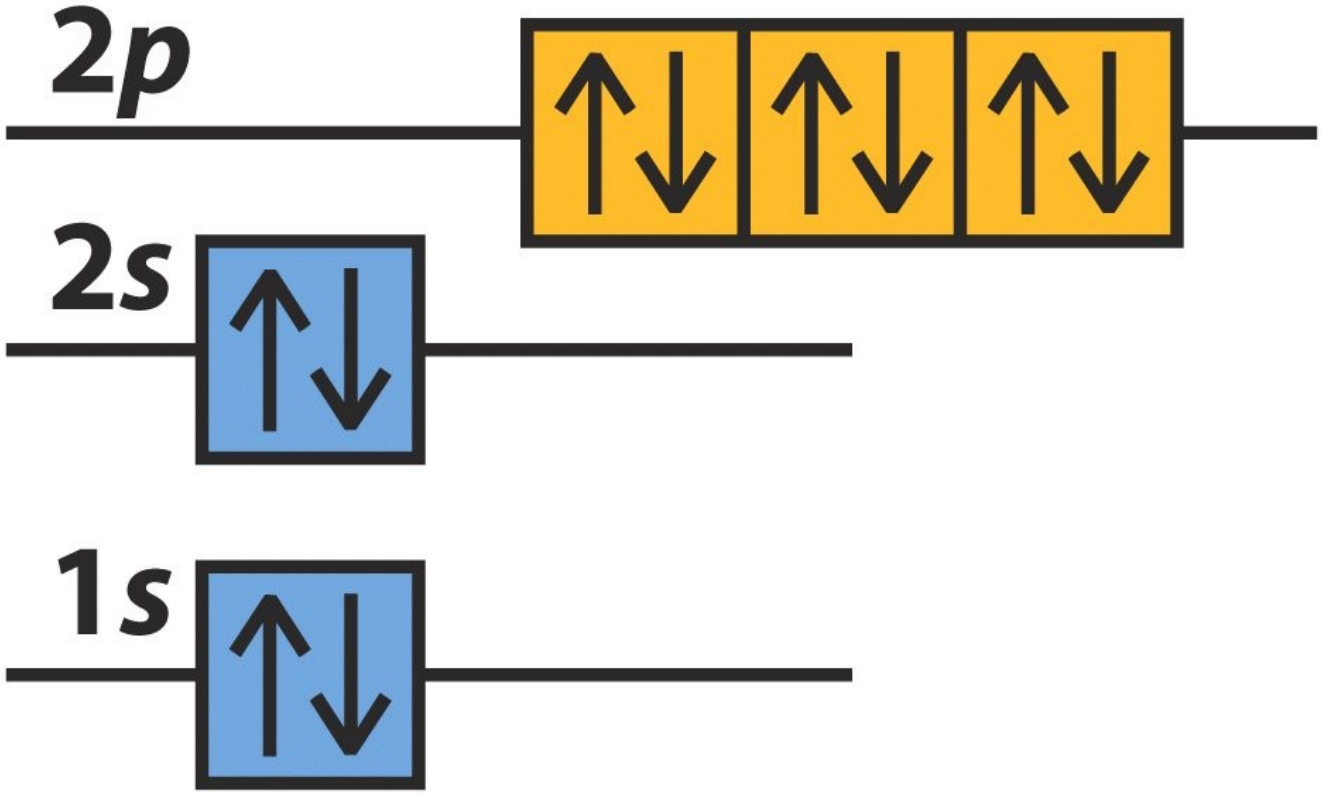
7 N $1s^2 2s^2 2p^3$, [He]$2s^2 2p^3$



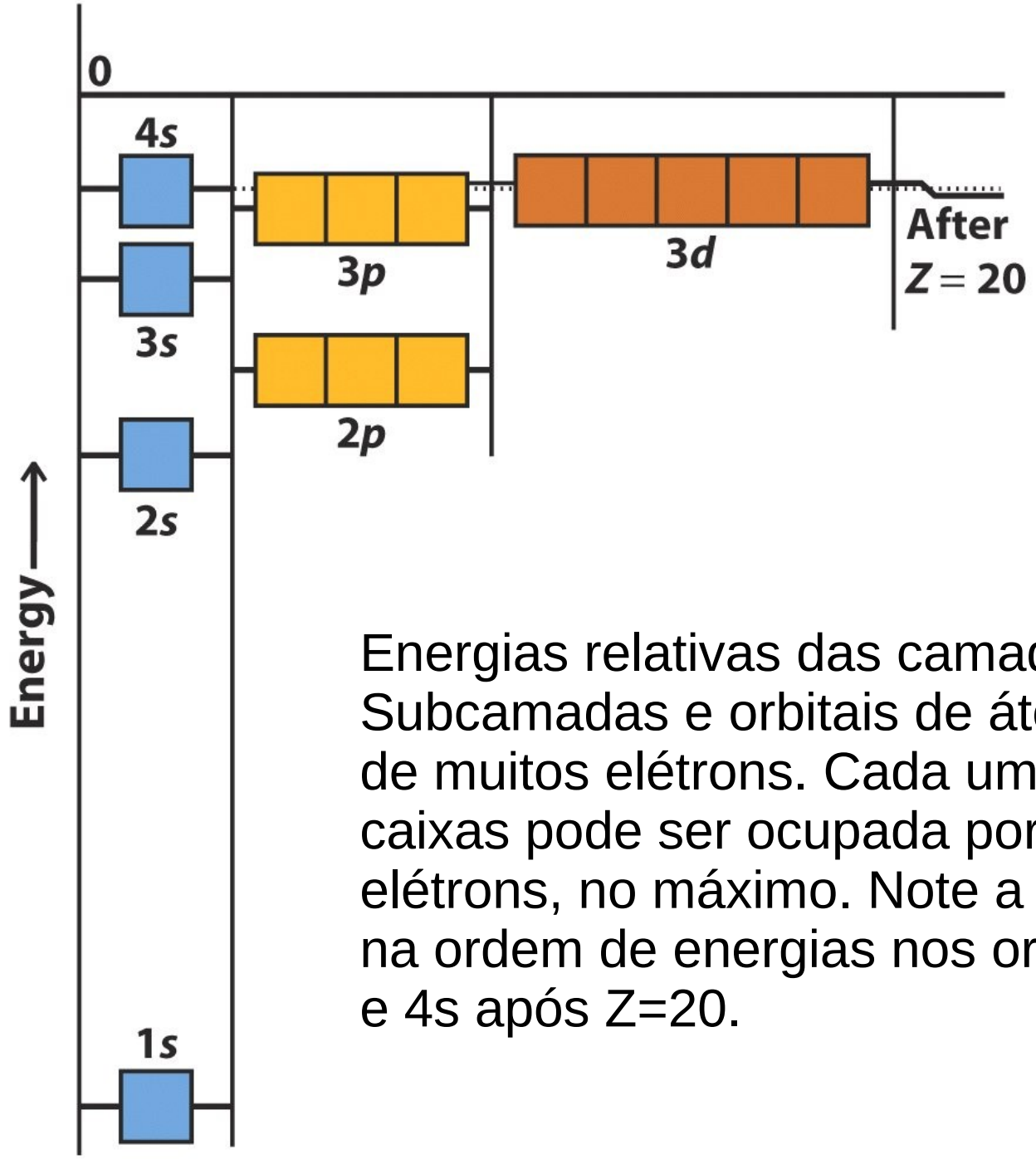
8 O $1s^2 2s^2 2p^4$, [He]$2s^2 2p^4$



9 **F $1s^2 2s^2 2p^5$, [He]$2s^2 2p^5$**

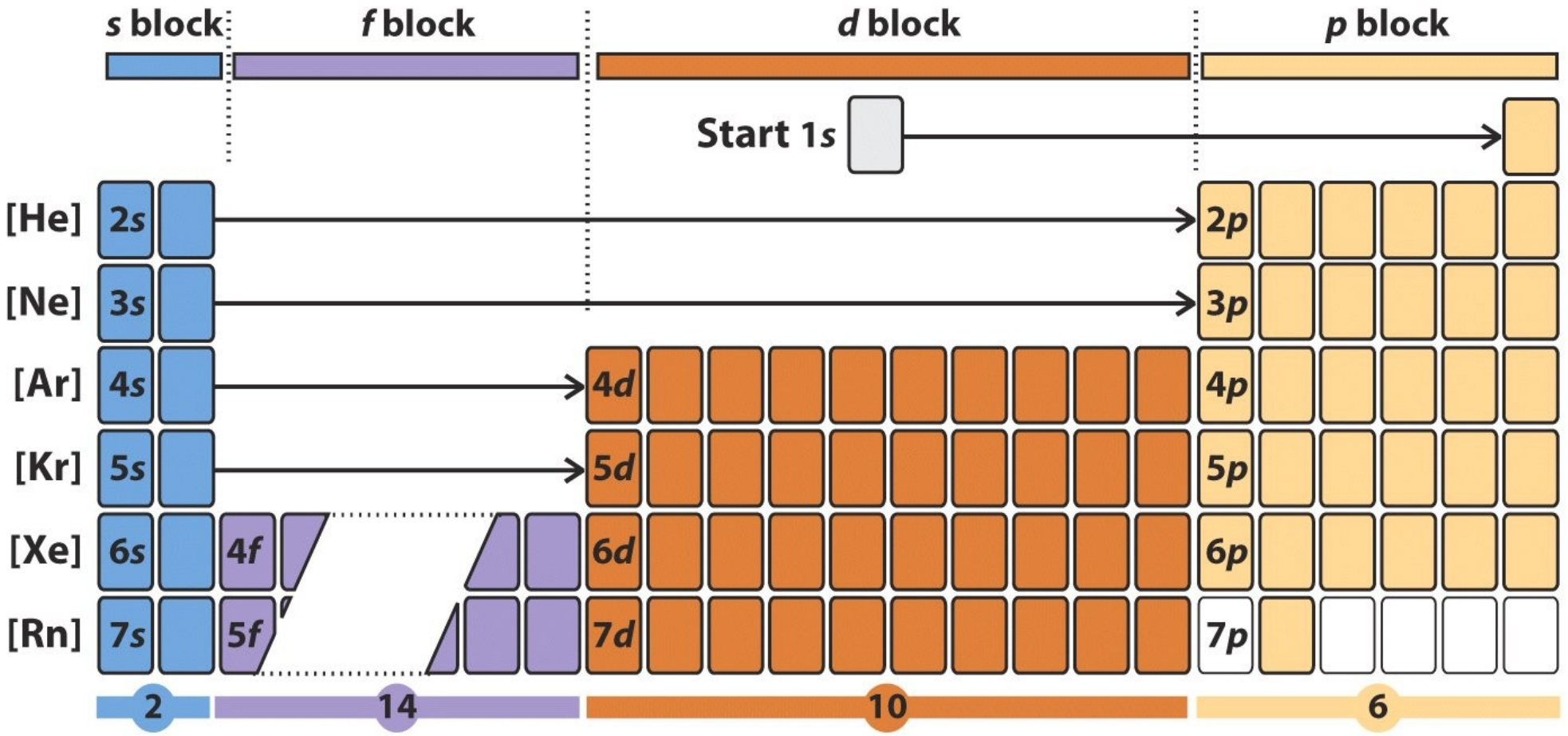


10 **Ne $1s^2 2s^2 2p^6$, [He]$2s^2 2p^6$**



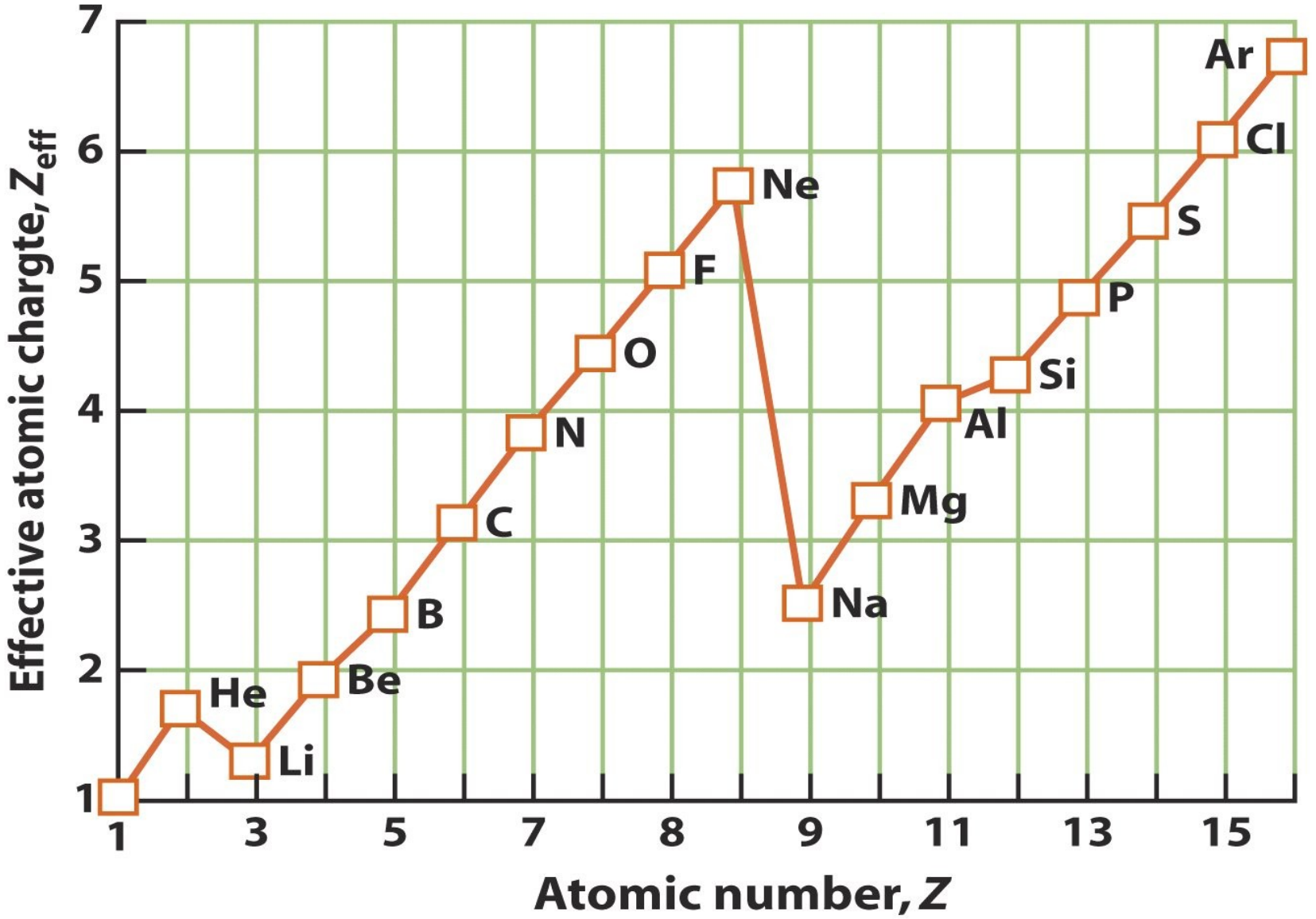
Energias relativas das camadas, Subcamadas e orbitais de átomos de muitos elétrons. Cada uma das caixas pode ser ocupada por dois elétrons, no máximo. Note a mudança na ordem de energias nos orbitais 3d e 4s após Z=20.

Tabela Periódica

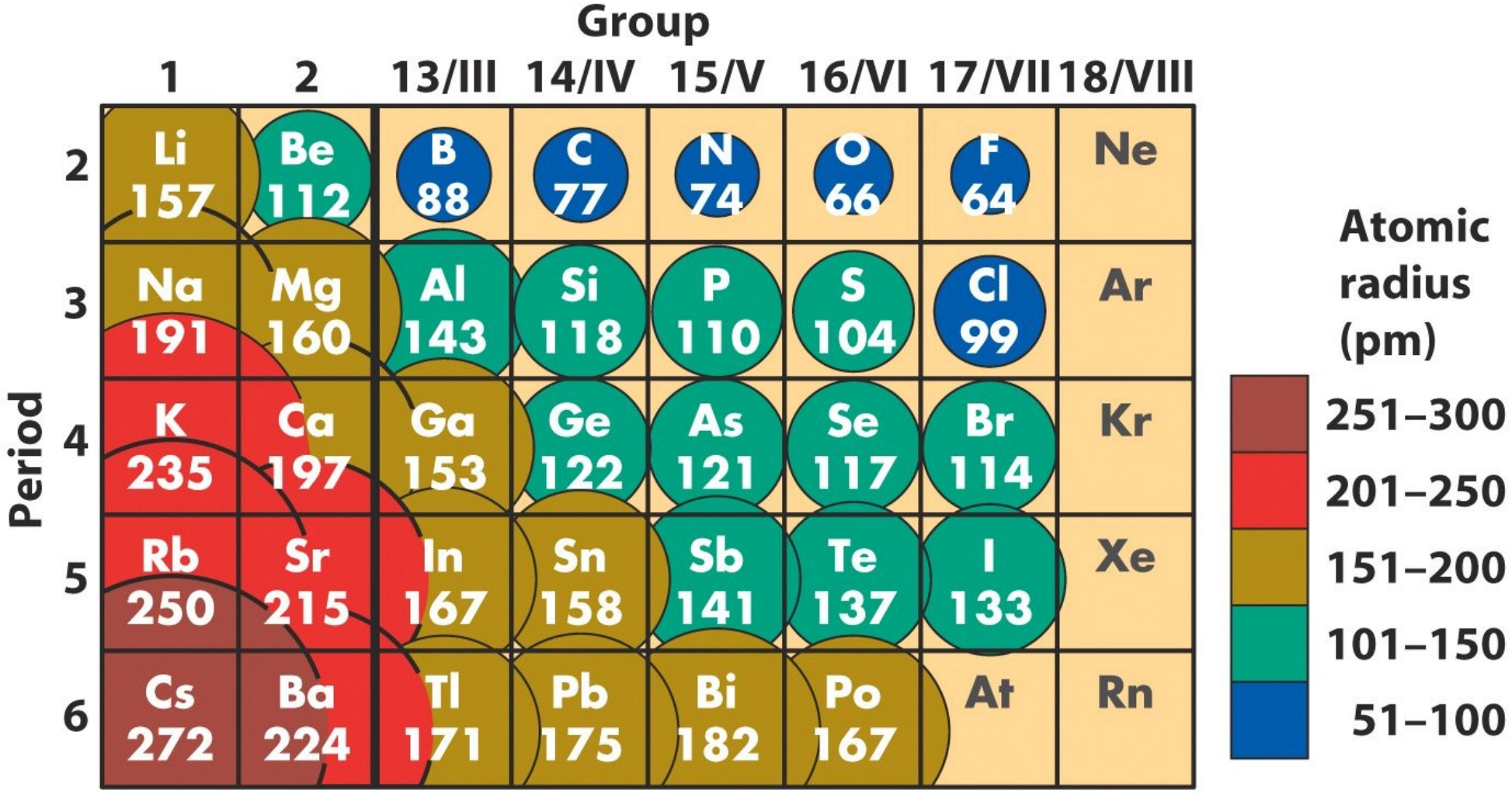


Propriedades periódicas

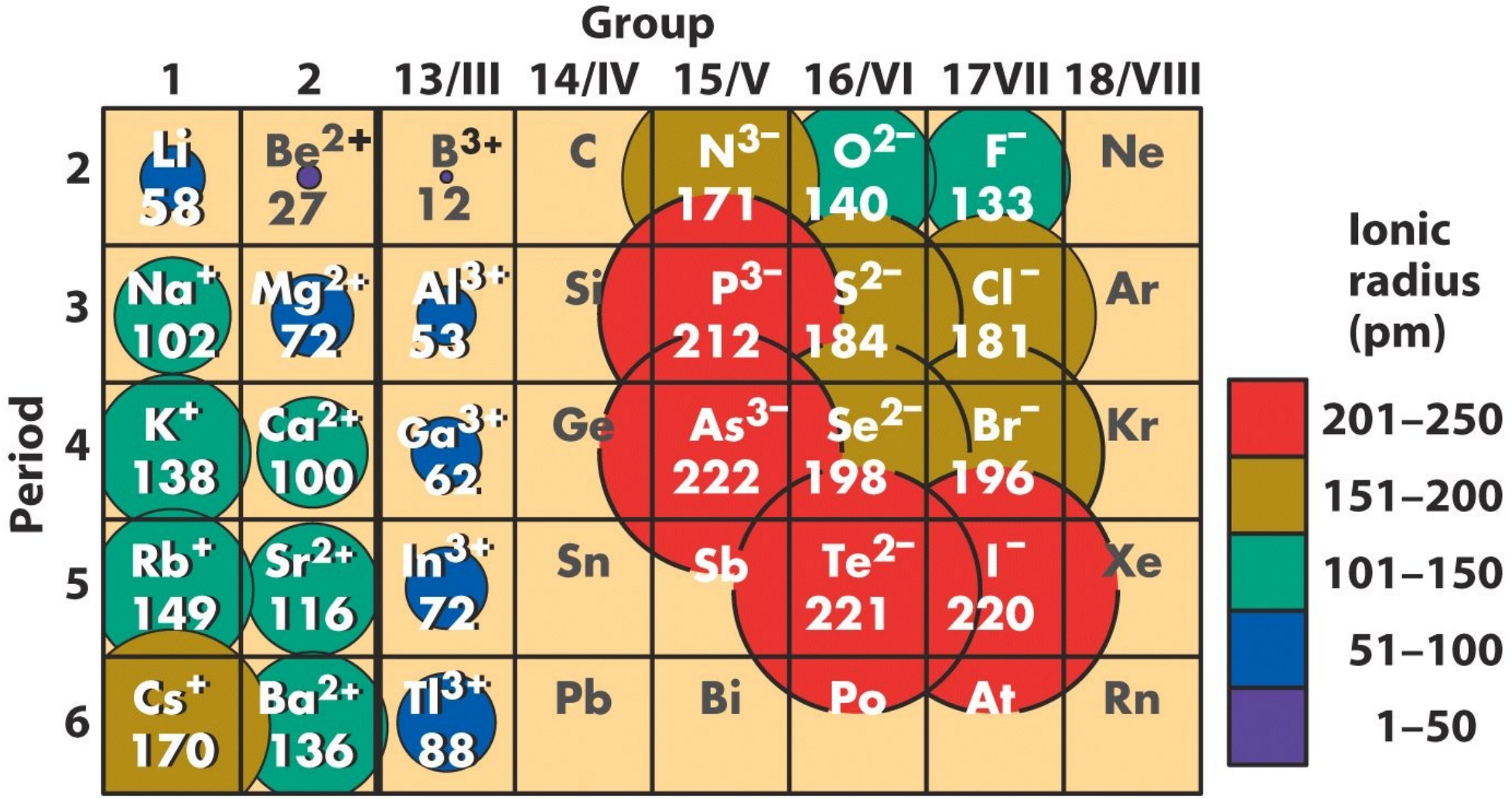
Carga Efetiva



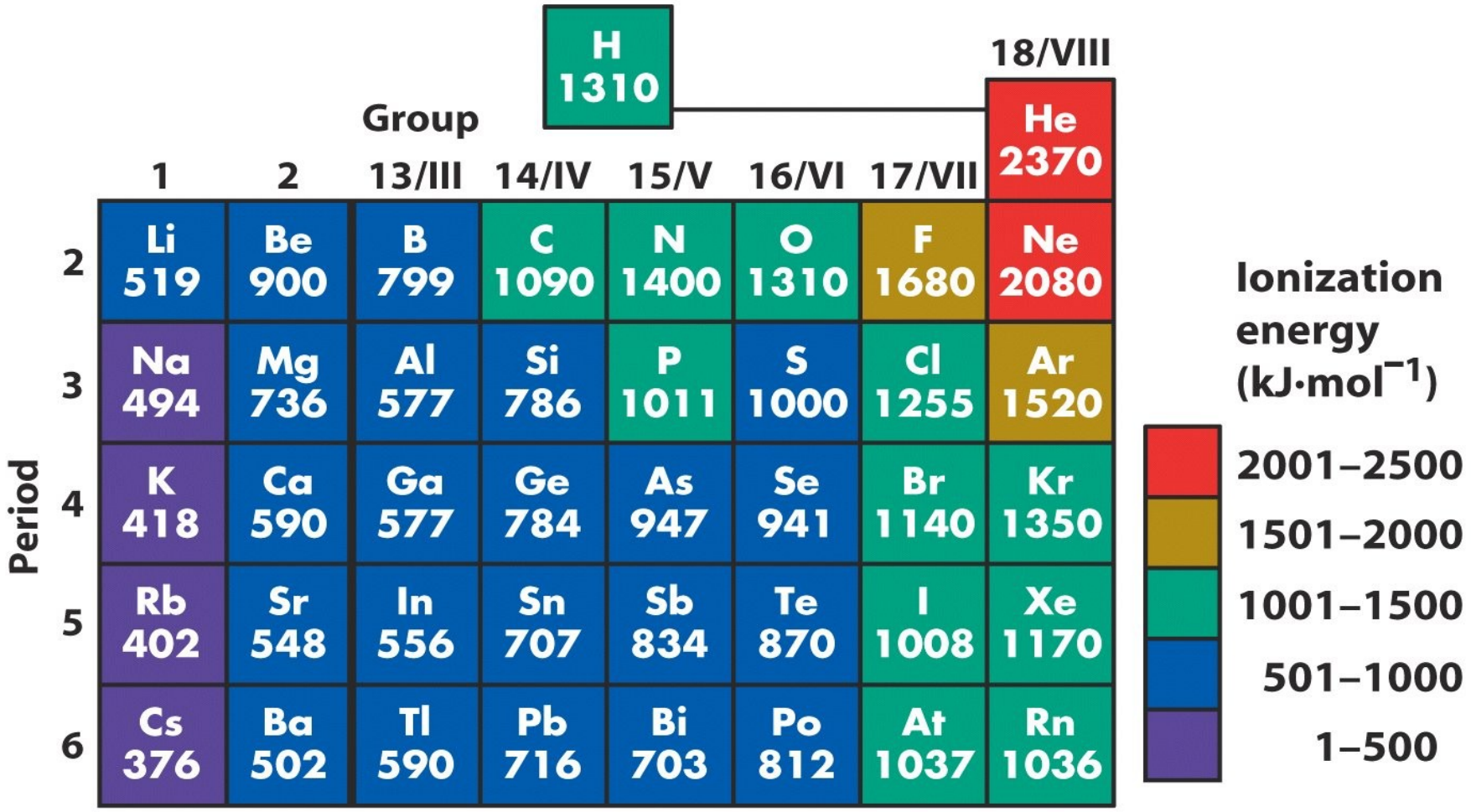
Propriedades Periódicas



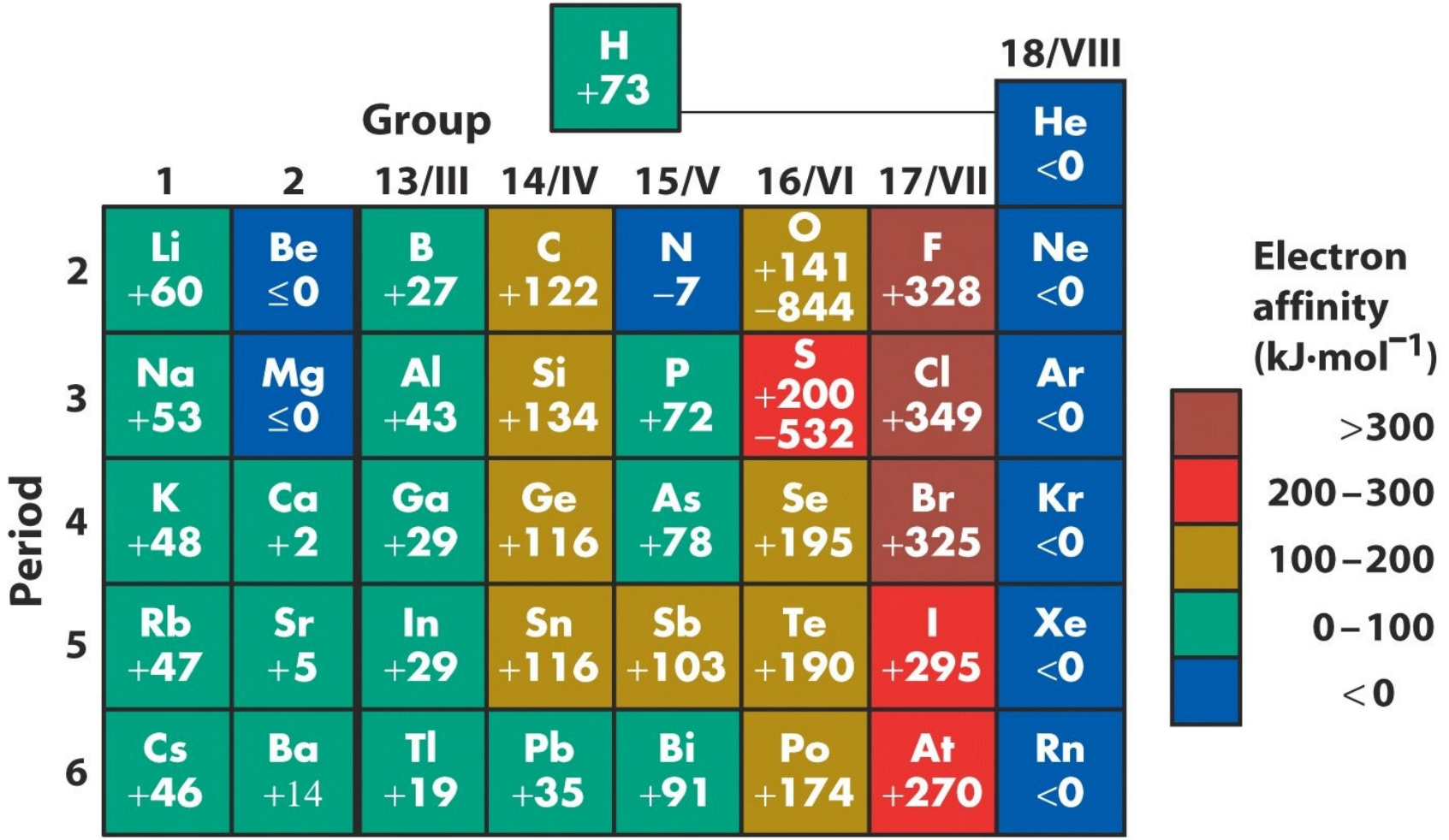
Propriedades Periódicas



Propriedades Periódicas
Energia de ionização



Propriedades Periódicas
Afinidade eletrônica



Bibliografia

- Atkins e Jones, Princípios de Química, cap. 1, ed. Bookman (2012).