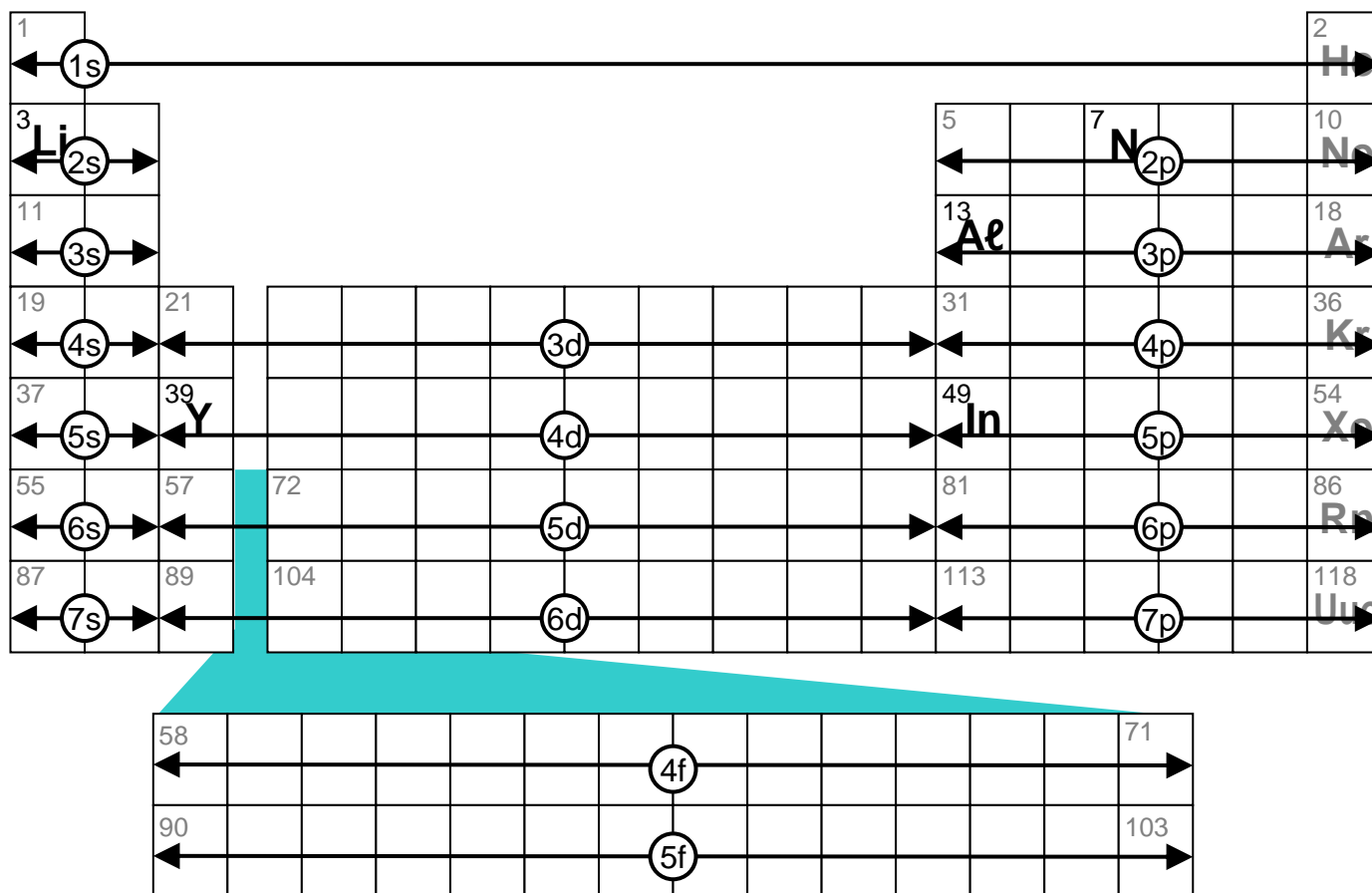
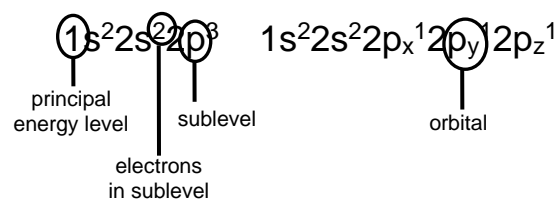


Atomic Structure: Orbitals

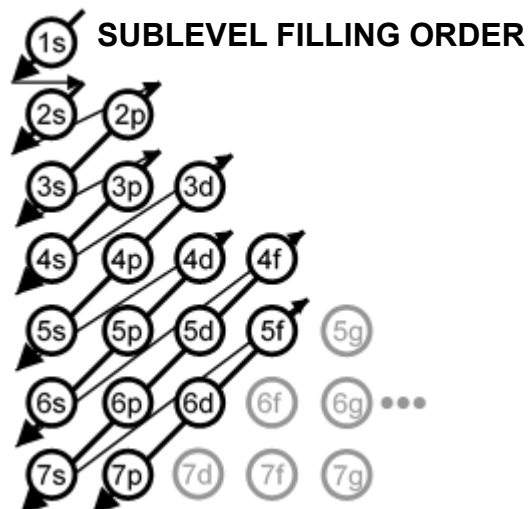
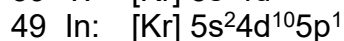
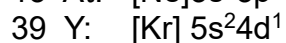
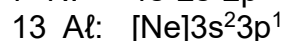
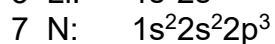
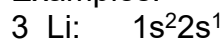
Filling order for sublevels in relation to the periodic table:



NOTATION



Examples:



MAXIMUM SUBLEVEL CAPACITY

Sublevel	Number of Orbitals	Number of Electrons
s	1	2
p	3	6
d	5	10
f	7	14

QUANTUM NUMBERS

Letter Designation	Principal Quantum Number (n)	Angular Momentum Number (ℓ) (subshell)					Magnetic Quantum Number (m) ($-\ell \leq m \leq \ell$) (orbitals)		Spin (s) $\pm\frac{1}{2}$
		s	p	d	f	...			
		0					1s	0	
L	2	0					2s	0	
L	2		1				2p	-1, 0, +1	
M	3	0					3s	0	
M	3		1				3p	-1, 0, +1	
M	3			2			3d	-2, -1, 0, +1, +2	
	⋮								
	n	0	1	2	...	n-1			

IRREGULARITIES

Some irregularities occur within the periodic table (e.g., chromium and copper). These elements do not follow the normal sublevel filling order. These irregularities can be explained by applying the following rule:

A half-filled or completely-filled sublevel is more stable than an incompletely-filled sublevel. Stable electron configurations are more likely than unstable ones.

Example: Chromium, atomic number 24.

In normal order: $[\text{Ar}] \underset{4s}{\text{FILLED}} \uparrow \uparrow \uparrow \uparrow \uparrow \text{INCOMPLETE} \text{ } 3d \text{ } \uparrow \uparrow \uparrow \uparrow \uparrow$ INCORRECT

By the rule: $[\text{Ar}] \underset{4s}{\text{HALF-FILLED}} \uparrow \uparrow \uparrow \uparrow \uparrow \text{HALF-FILLED} \text{ } 3d \text{ } \uparrow \uparrow \uparrow \uparrow \uparrow$ CORRECT

Example: Copper, atomic number 29.

In normal order: $[\text{Ar}] \underset{4s}{\text{FILLED}} \uparrow \uparrow \uparrow \uparrow \uparrow \text{INCOMPLETE} \text{ } 3d \text{ } \uparrow \uparrow \uparrow \uparrow \uparrow$ INCORRECT

By the rule: $[\text{Ar}] \underset{4s}{\text{HALF-FILLED}} \uparrow \uparrow \uparrow \uparrow \uparrow \text{FILLED} \text{ } 3d \text{ } \uparrow \uparrow \uparrow \uparrow \uparrow$ CORRECT

