Summary of Quantum Numbers

n = 1, 2, 3,….	Principal Quantum Number (Describes the size and energy of orbital)
ℓ = 0, 1, 2, 3…(n-1)	Orbital (angular) Quantum Number (Describes the shape of the orbital)
m_ℓ = 0,±1, ±2, ±3,….., ±ℓ	Magnetic Quantum Number (Describes the orientation of the orbital in space)

Orbital – probability density (electron cloud) associated with $\Psi(\mathbf{r},t)$

Spectroscopic Notation

1. States with the same 'n' form a shell.
2. States with the same 'n' and 'ℓ' form subshells.

n	shell symbol	ℓ	subshell symbol
1	K	0	s
2	L	1	p
3	M	2	d
4	N	3	f

n	l	m_l	Spectroscopic Notation	Shell
1	0	0	$1s$	K
2	0	0	$2s$	L
2	1	−1, 0, 1	$2p$	
3	0	0	$3s$	
3	1	−1, 0, 1	$3p$	M
3	2	−2, −1, 0, 1, 2	$3d$	
4	0	0	$4s$	N

and so on.

Selection Rule for Allowed Transitions

To conserve total angular momentum (atom + photon) in optical transitions, the quantum number 'ℓ' of the atom can only change by one unit:

$$\boxed{\Delta\ell = \pm 1}$$