

SUMMARY / Summary of the Quantum Model of the Atom

Principal Energy Levels Principal energy levels are identified by principal quantum number, n , a series of integers: $n = 1, 2, 3, \dots, 7$. Generally, energy increases with increasing n : $n = 1 < n = 2 < n = 3$.

Sublevels

Each principal energy level—each value of n —has n sublevels. These sublevels are identified by the principal quantum number followed by the letter s, p, d , or f . Sublevels that are not needed by the elements that are known today are shown below in color.

Energy Trend	n	Number of Sublevels	Identification of Sublevels
Increasing energy ↓	1	1	1s
	2	2	2s, 2p
	3	3	3s, 3p, 3d
	4	4	4s, 4p, 4d, 4f
	5	5	5s, 5p, 5d, 5f, 5g
	6	6	6s, 6p, 6d, 6f, 6g, 6h
	7	7	7s, 7p, 7d, 7f, 7g, 7h, 7i

Increasing energy →

For any given value of n , energy increases through the sublevels in the order of s, p, d, f : $2s < 2p$; $3s < 3p < 3d$; $4s < 4p < 4d < 4f$; etc.

Note: The range of energies in consecutive principal energy levels may overlap. Example: $4s < 3d < 4p$. However, for any given sublevel, energy and orbital size increase with increasing n : $1s < 2s < 3s \dots$; $2p < 3p < 4p \dots$; etc.

Orbitals and Orbital Occupancy

Each kind of sublevel contains a definite number of orbitals that begin with 1 and increase in order with odd numbers: $s, 1$; $p, 3$; $d, 5$; $f, 7$.

An orbital may be occupied by 0, 1, or 2 electrons, but never more than 2. Therefore, the maximum number of electrons in a sublevel is twice the number of orbitals in the sublevel.

Sublevel	Orbitals	Maximum Electrons per Sublevels
s	1	2
p	3	6
d	5	10
f	7	14

