Orbitals and Electron Configurations

There are four types of orbitals, or pathways, in which electrons can orbit:

s → simplest; spherical in shape

p → dumbbell-shaped; x,y and z axes

d
→ much more complex
f

Order in which electrons fill orbitals: s → p → d → f

s orbitals → 1 pair electrons (2)

p orbitals → 3 pairs electrons (6)

d orbitals → 5 pairs electrons (10)

f orbitals → 7 pairs electrons (14)

Order of filling: 1s 2s 2p 3s 3p 4s

(then becomes more complicated) 3d 4p 5s 4d 5p….

Examples of how electrons will fill energy levels:

			TOTAL
1st shell →	s orbitals only	(1s)	2
2nd shell →	s and p orbitals	(2s 2p)	8
3rd shell →	s, p and d orbitals	(3s 3p 3d)	18
4th shell →	s, p, d and f orbitals	(4s 4p 4d 4f)	32
5th shell →	s, p, d and f orbitals	(5s 5p 5d 5f)	32

Examples of specific atoms and their electron configurations:

Symbol	Element	# electrons	# energy levels	Configuration
He	Helium	2	1	$1s^2$
Be	Beryllium	4	2	$1s^2 2s^2$
O	Oxygen	8	2	$1s^2 2s^2 p^4$
Na	Sodium	11	3	$1s^2 2s^2 p^6 3s^1$
Si	Silicon	14	3	$1s^2 2s^2 p^6 3s^2 p^2$
Ca	Calcium	20	4	$1s^2 2s^2 p^6 3s^2 p^6 4s^2$