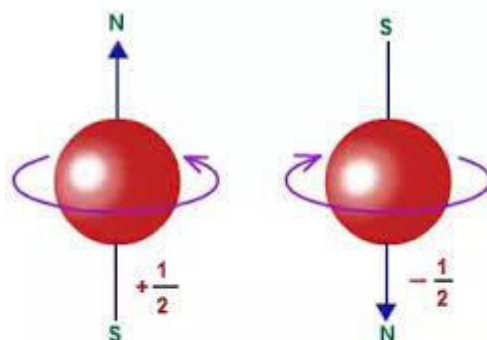


Quantum numbers

- (1) Principal quantum number(n) The **principal quantum number** (symbolized n) is one of four **quantum numbers** assigned to all **electrons** in an **atom** to describe that electron's state. Its values are **natural numbers** (from 1) making it a **discrete variable**.
- (2) Azimuthal quantum number(l) The **azimuthal quantum number** is a **quantum number** for an **atomic orbital** that determines its **orbital angular momentum** and describes the shape of the orbital. The **azimuthal** quantum number is the second of a set of quantum numbers which describe the unique **quantum state** of an electron (the others being the **principal quantum number**, the **magnetic quantum number**, and the **spin quantum number**). It is also known as the **orbital angular momentum quantum number**, **orbital quantum number** or **second quantum number**, and is symbolized as l
- (3) Magnetic quantum number(m) The magnetic quantum number distinguishes the **orbitals** available within a **subshell**, and is used to calculate the azimuthal component of the orientation of orbital in space. Electrons in a particular subshell (such as s, p, d, or f) are defined by values of l (0, 1, 2, or 3). The value of m_l can range from $-l$ to $+l$, including zero. Thus the s, p, d, and f subshells contain 1, 3, 5, and 7 orbitals each, with values of m within the ranges 0, ± 1 , ± 2 , ± 3 respectively.
- (4) Spin quantum number(s). The **Spin Quantum Number** (m_s) describes the angular momentum of an electron. An electron **spins** around an axis and has both angular momentum and orbital angular momentum. Because angular momentum is a vector, the **Spin Quantum Number** (s) has both a magnitude ($1/2$) and direction (+ or -).



The **electron configuration** is the distribution of **electrons** of an **atom** or **molecule** (or other physical structure) in **atomic** or **molecular orbitals**.^[1] For example, the electron configuration of the **neon** atom is $1s^2 2s^2 2p^6$, using the **notation** explained below.

The **electron configuration** of an atomic species (neutral or ionic) allows us to understand the shape and energy of its electrons. Many general rules are taken into consideration when assigning the "location" of the electron to its prospective energy state, however these assignments are

arbitrary and it is always uncertain as to which electron is being described. Knowing the electron configuration of a species gives us a better understanding of its **bonding ability**, **magnetism** and other chemical properties.

An electron **shell** is the set of allowed states, which share the same principal quantum number, n (the number before the letter in the orbital label), that electrons may occupy. An atom's n th electron shell can accommodate $2n^2$ electrons, e.g. the first shell can accommodate 2 electrons, the second shell 8 electrons, and the third shell 18 electrons.

A **subshell** is the set of states defined by a common azimuthal quantum number, ℓ , within a shell. The values $\ell = 0, 1, 2, 3$ correspond to the $s, p, d,$ and f labels, respectively. The maximum number of electrons that can be placed in a subshell is given by $2(2\ell + 1)$.

Maximum number of electrons that can be accommodated in a shell is given by $2n^2$ where $n =$ shell number

- For 1st energy level, $n = 1$ Maximum number of electrons in 1st energy level = $2n^2 = 2 \times (1)^2 = 2$
- For 2nd energy level $n = 2$ Maximum number of electrons in the 2nd energy level = $2n^2 = 2 \times 4 = 8$
- For 3rd energy level $n = 3$ Maximum number of electrons in the 3rd energy level = $2n^2 = 2 \times 9 = 18$
- For 4th energy level $n = 4$ Maximum number of electrons in the 4th energy level = $2n^2 = 2 \times 16 = 32$

The outermost shell of an atom cannot accommodate more than 8 electrons, even if it has a capacity to accommodate more electrons. This is a very important rule and is also called the Octet rule. The presence of 8 electrons in the outermost shell makes the atom very stable.

Maximum no of electrons in different subshell

S=2

P=6

d=10

f=14

Aufbau Principle

The word 'Aufbau' is German for 'building up'. The Aufbau Principle, also called the building-up principle, states that electron's occupy orbitals in order of increasing energy. The order of occupation is as follows:

$1s < 2s < 2p < 3s < 3p < 4s < 3d < 4p < 5s < 4d < 5p < 6s < 4f < 5d < 6p < 7s < 5f < 6d < 7p$

H = $1s^1$

He = $1s^2$

Li = $1s^2, 2s^1$

Be = $1s^2, 2s^2$

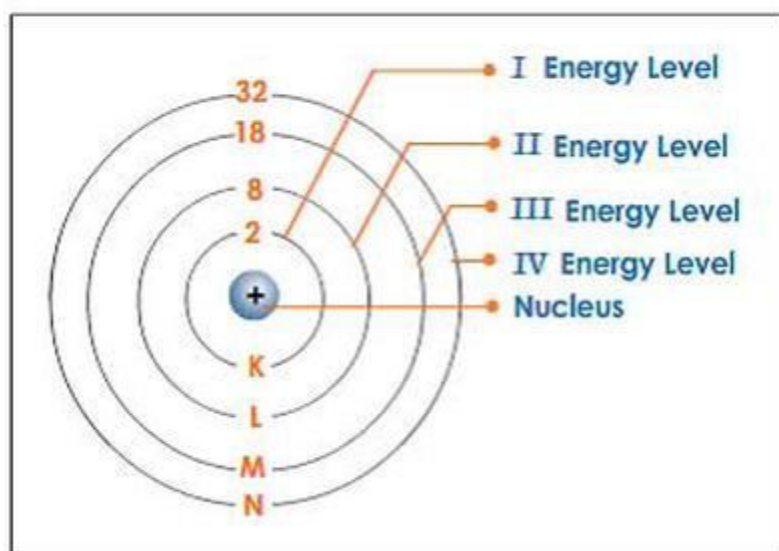
B = $1s^2, 2s^2, 2p^1$

C = $1s^2, 2s^2, 2p^2$

N = $1s^2, 2s^2, 2p^3$

O = $1s^2, 2s^2, 2p^4$

F = $1s^2, 2s^2, 2p^5$



Assignment- Electronic configuration of element from atomic number 11 to 30