Chemistry Study Materials for Class 11 (NCERT Based Notes of Chapter- 02)

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Structure of Atom

2. Pauli's Exclusion Principle

It states that ***no two electrons in an atom can have the same set of four quantum numbers***.

i.e. an orbital can accommodate a maximum of only 2 electrons with opposite spin.

If 2 electrons have same values for n, l and m, they should have different values for s.

i.e. if s = +½ for the first electron, it should be -½ for the second electron.

Principal quantum number (n)	Azimuthal quantum number (l)	Magnetic quantum number (m)	Spin quantum number (s)
1	0	**0**	**+½,-½**
	0	**0**	**+½,-½**
		+1	**+½,-½**
2	1	**0**	**+½,-½**
		-1	**+½,-½**
	0	**0**	**+½,-½**
		+1	**+½,-½**
	1	**0**	**+½,-½**
		-1	**+½,-½**
3		**+2**	**+½,-½**
		+1	**+½,-½**
	2	**0**	**+½,-½**
		-1	**+½,-½**
		-2	**+½,-½**

Importance and Applications of Pauli Exclusion Principle

(i)The Pauli Exclusion Principle helps to explain a wide variety of physical phenomena.

(ii) It helps in describing the various chemical elements and how they participate in forming chemical bonds.

(iii) The periodic table can also be defined with the help of this principle.

(iv) Apart from chemistry, the principle is a fundamental principle in quantum mechanics which is mainly studied in physics.

(v) It is also used in astrophysics.

3. Hund's rule of maximum multiplicity

It states that ***electron pairing takes place only after partially filling all the degenerate orbitals***. Orbitals having same energies are called degenerate orbitals. For example the electronic configuration of N is

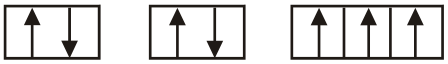
$1s^2\ 2s^2\ 2p_x^1\ 2p_y^1\ 2p_z^1$. and not $1s^2\ 2s^2\ 2p_x^2\ 2p_y^1$.

Electronic Configuration of Atoms

The distribution of electrons into various orbitals of an atom is called its *electronic configuration*. The electronic configuration of different atoms can be represented in two ways.

a) Orbital notation method: In this method the filled orbitals are written in the order of increasing energies. The respective electrons in them are indicated as superscripts as shown in the example given below. For example, the electronic configuration of nitrogen atom (atomic number 7) is written as $1s^2 2s^2 2p_x^1\ 2p_y^1\ 2p_z^1$.

b) Orbital diagram method: In this method the filled orbitals are represented by circles or boxes and are written in the order of increasing energies. The respective electrons are indicated as arrows whose direction represents their spin. For example, the electronic configuration of nitrogen in the orbital diagram notation can be written as



Electronic configurations can also be written in a short hand form. In this method the **last completed orbital shell** is represented in terms of a noble gas. For example, the electronic configuration of lithium and sodium can be written as

Li - [He] $2s^1$

Na - [Ne] $3s^1$

The electrons in the noble gas configuration are termed as ***core electrons*** while the ones in the outer shell are called ***valence electrons.***

The electrons in the completely filled shells are known as *core electrons* and the electrons in the outer most shell are called *valence electrons*.

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