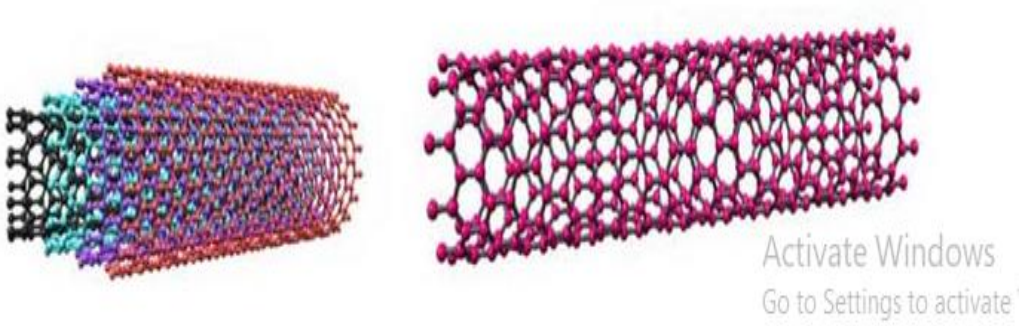
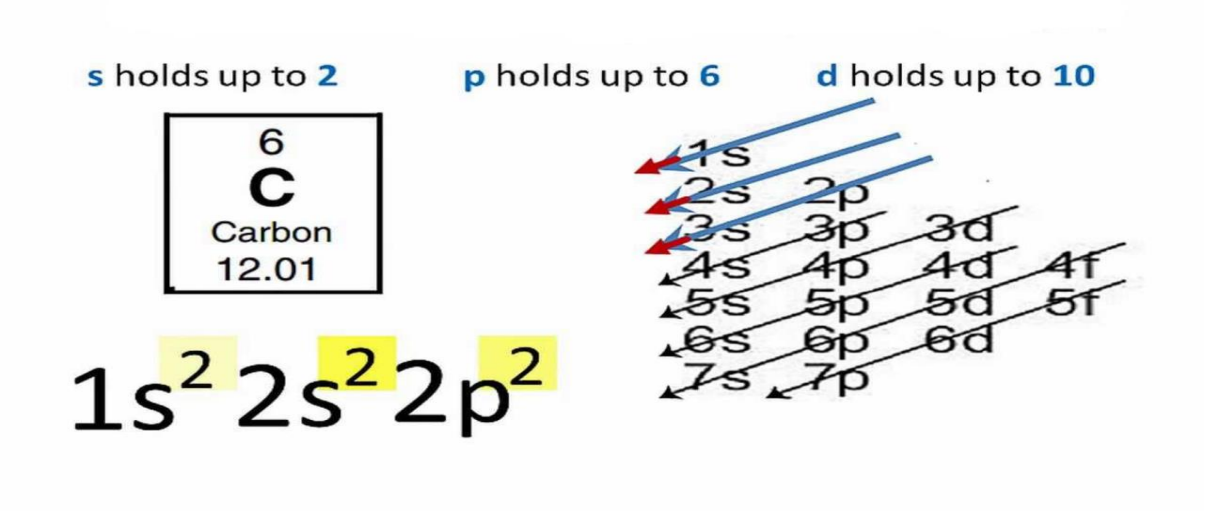


A single-walled nanotube (SWCNT) consists of a single layer of graphite (called graphene) arranged in a circular cylinder. A multi-walled nanotube (MWCNT) consists of multiple layers of graphene arranged in coaxial cylinders, each layer separated by 0.34 nanometers.



10 - Carbon Atom :

Carbon is the sixth element of the periodic table, listed at the top of the fourth column. Each individual carbon atom has six electrons, which are distributed in the ground state over the lowest energy levels of the carbon atom as follows: 1s2 2s2 sp2.

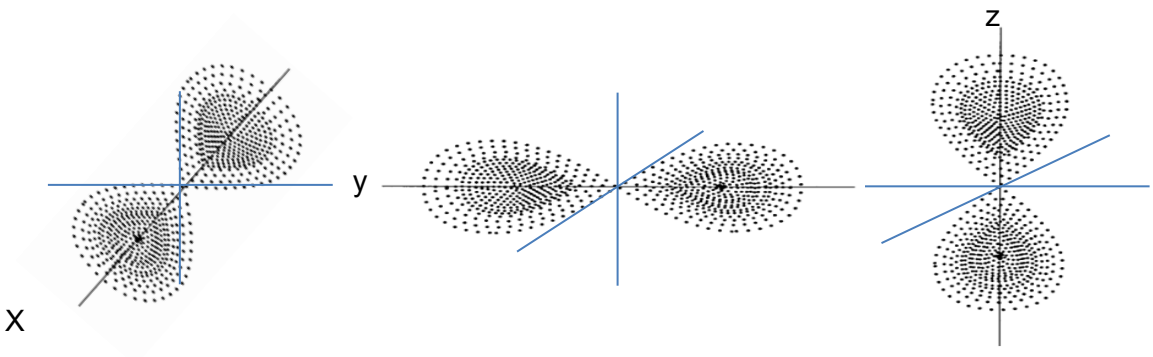


The first K shell contains only the s orbital. This orbital contains two electrons with the same quantum number (n=1) but different spin directions according to the Pauli rule. The charge in it is distributed sphe ıcleus .

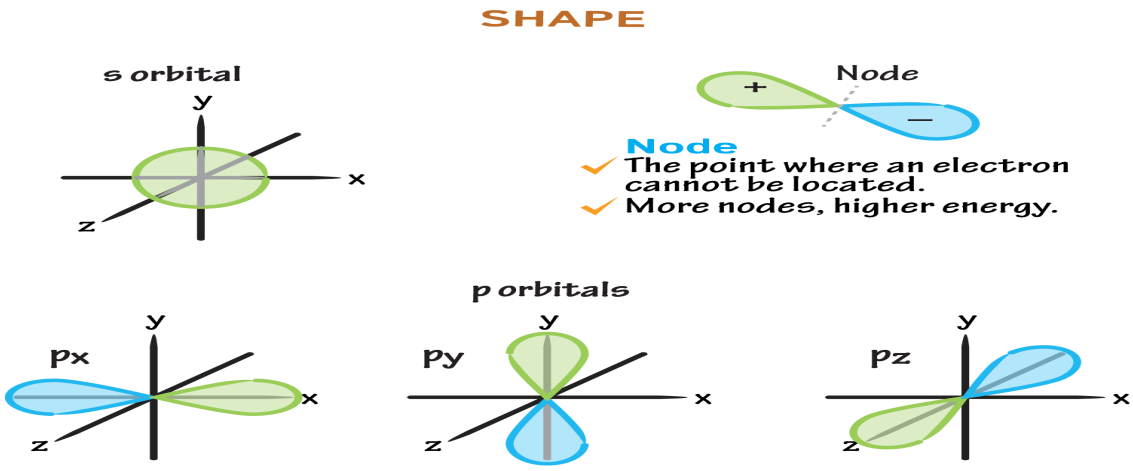


[HughO.Pierson] , (1993)] Shipment distribution in orbital

The remaining four electrons are in the L shell, which includes the (s) and (p) orbitals. Each orbital contains two electrons, and the four electrons have the same quantum number (n=2). They are responsible for forming bonds with the atoms adjacent to them. The charge in the (p) orbital is directional and distributed symmetrically around its axis.

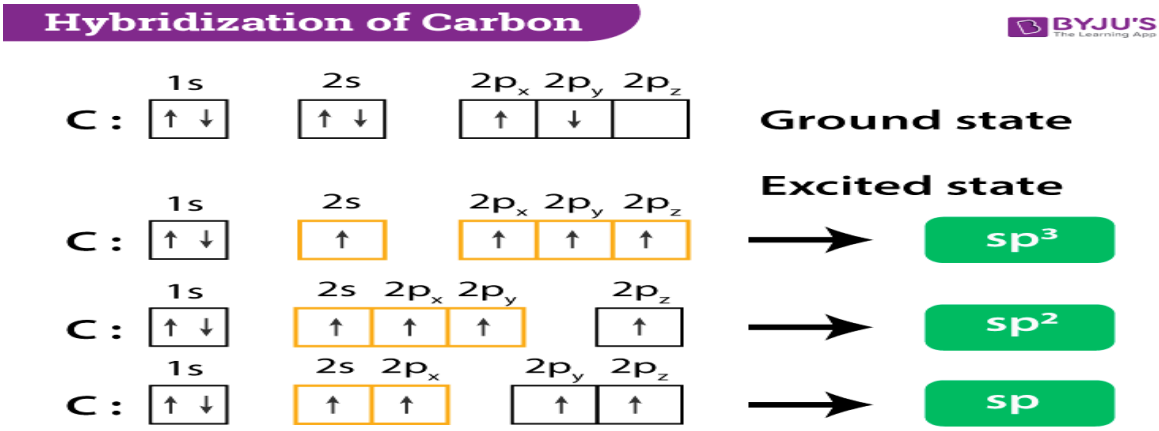


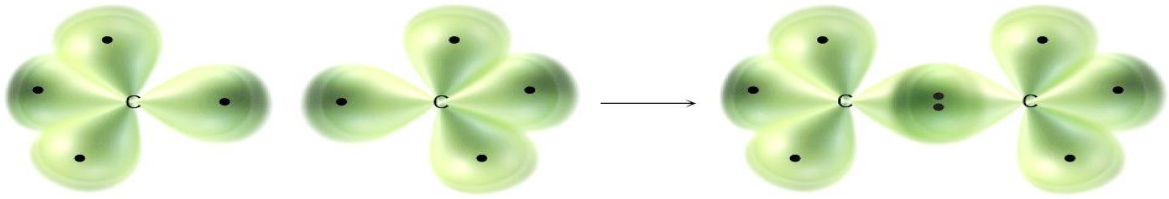
Orbital compounds p

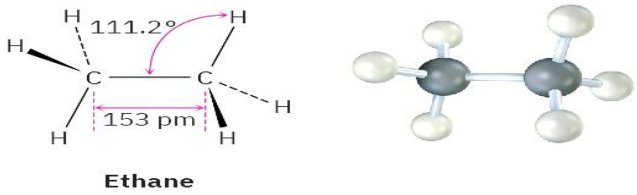


Carbon Atoms Hybridization :

When carbon atoms come together to form a solid, the electron distribution in their outer shell changes into three states depending on the number of bonds they form with neighboring atoms, as follows:



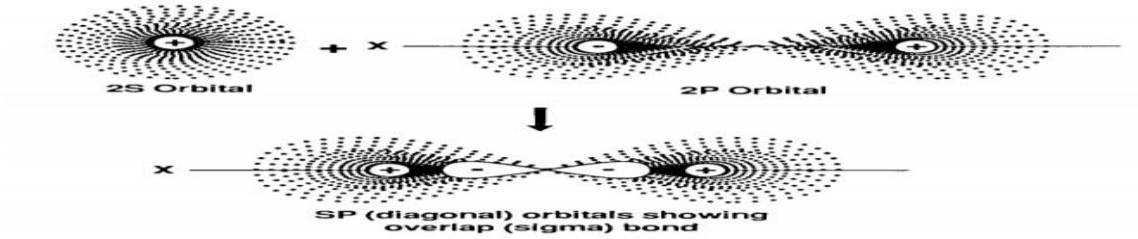




Ethane

1 - 2sp hybridization : The (s) orbital overlaps with a (p) orbital compound by transferring one of the electrons from the(s)orbital to the(p)orbital.

The (sp) bond formed is of the strong (σ) type and includes two (sp) hybridized atomic orbitals, each of which contains a single electron and the angle between them is (180°) due to the repulsion between them. Two electrons remain in two un hybridized (p) orbitals that contribute to the formation of weak (π) bonds. These orbitals create a linear molecule in the form of a chain .



(Sp) hybrid orbitals

2 - 2Sp^2 hybridization : The (s) orbital overlaps with two (p) orbital compounds by transferring one electron from the (s) orbital to the (p) orbital. The (sp2) bonds generated from the (σ) type include three hybridized atomic orbitals located in one plane, each containing a single

electron, and only one electron remains in a non-hybridized (p) orbital, which contributes to the formation of a (π) bond.