Organic chemistry

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Ref.: organic chemistry, sixth edition (1992)
by: Morrison and Boyd

- أسسيا الكيمياء العضوية / تأليف أ.د. يوسف علي القتاني

Organic chemistry

- organic chemistry is the chemistry of the compounds of carbon.
- chemical compounds were divided into two classes :
  1- inorganic compounds ; were those obtained from minerals
  2- organic compounds : were those obtained from vegetable or animal source and laboratory
- organic chemistry is a field of immense importance to technology ; it is the chemistry of dyes and drugs, paper and ink, paints and plastics, gasoline and rubber tries ; it is the chemistry of the food we eat and clothing we wear.
- organic chemistry is fundamental to biology and medicine.

Hybridization التهجين

التهجين : هو عملية اذابة ترتيب الالكترونات تصغير الذوبان بين الاوربيتالات لتكوين اوربيتالات جديدة متجانسة متساوية في الشكل والطاقة والمتدرجة منها الارتباط مع ذرات اخرى .

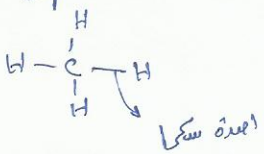
alkanes : sp^3

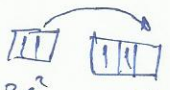
تهجين كل ذرة كاربون في الالكانات هو sp^3

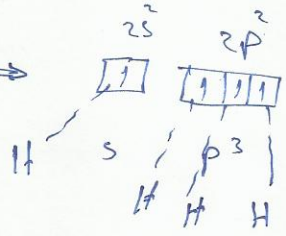
Ex. CH_4

$_6C : 1s^2 2s^2 2p^2$

$_1H : 1s^1$







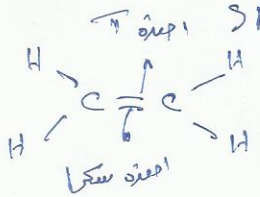
- tetrahedral shape
- trigonal pyramid

alkenes : sp^2

تهجين كل ذرة كاربون تتصل بأصرة مزدوجة هو sp^2

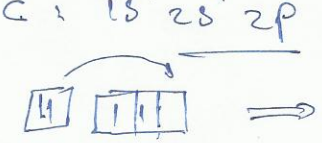
Ex. $CH_2 = CH_2$

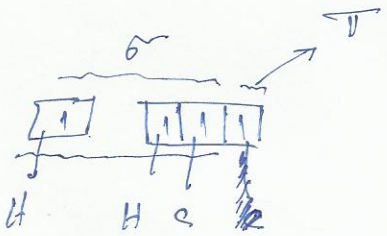
sp^2 sp^2



Planar shape

$_6C : 1s^2 2s^2 2p^2$





sp^2

alkynes : sp

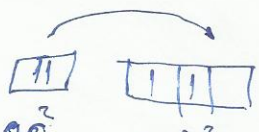
تهجين كل ذرة كاربون تتصل بأصرة ثلاثية هو sp

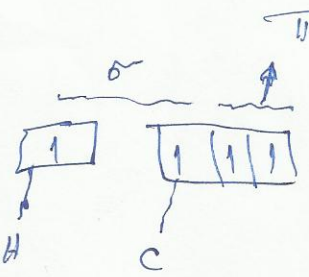
$H-C\equiv C-H$

sp sp

Linear shape

$_6C : 1s^2 2s^2 2p^2$

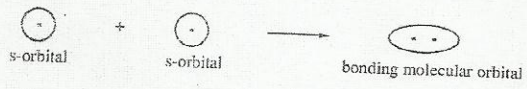




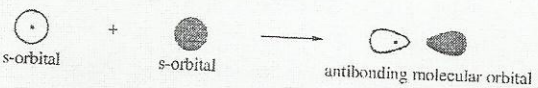
1.4 Sigma (σ-) and pi (π-) bonds

The electrons shared in a covalent bond result from an overlap of atomic orbitals to give a new molecular orbital. Electrons in the 1s- and 2s-orbitals combine to give sigma (σ-) bonds.

When two 1s-orbitals combine *in-phase*, this produces a *bonding molecular orbital.*

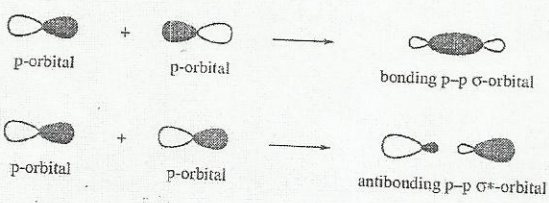


When two 1s-orbitals combine *out-of-phase*, this produces an *anti-bonding molecular orbital.*

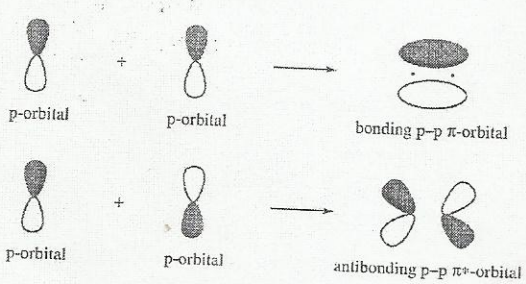


Electrons in the p-orbitals can combine to give σ- or π-bonds.

- *Sigma* (σ-) *bonds* are strong bonds formed by head-on overlap of two atomic orbitals.



- *Pi* (π-) *bonds* are weaker bonds formed by side-on overlap of two p-orbitals.



Only σ- or π-bonds are present in organic compounds. All single bonds are σ-bonds, while all multiple (double or triple) bonds are composed of one σ-bond and one or two π-bonds.

Ionic, covalent, coordinate and hydrogen bonds

الأواصر الأيونية، التساهمية، التناسقية والهيدروجينية.

- Ionic bonds are formed between molecules or between atoms with opposite charges. The negatively charged anion will electrostatically attract the positively charged cation. This is present in salts.

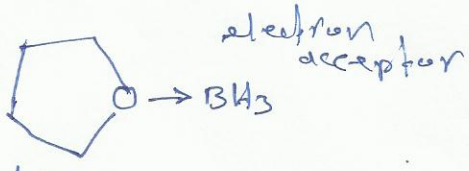
cation (+) ------ Anion (−) e.g. Na^{+} ..... Cl^{-}

- covalent bonds are formed when a pair of electrons is shared between two atoms. Each atom donates one electron, and a single line represent the two-electron bond.

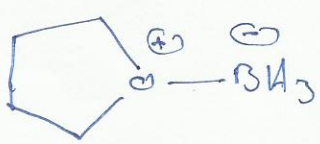
Atom – Atom e.g. Cl — Cl :Cl: :Cl:

17
Cl : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

- coordinate (or dative) bonds are formed when a pair of electrons is shared between two atoms. one atom donates both electrons, and a single line or an arrow represents the two-electron bond.



or



- Hydrogen bonds are formed when the partially positive (δ+) hydrogen of one molecule interacts with the partially negative (δ−) heteroatom (eg. oxygen or nitrogen) of another molecule

Molecule – $H^{\delta+}$ ..... Heteroatom – molecule eg. $HO-H^{\delta+}$ ..... $O^{\delta-}H_2$