

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

Chapter 1+2 Review

Ionic and covalent bonds

metal with
non metal

* Metals *Loss electron*

* non metals *gain electron*

→ Polar

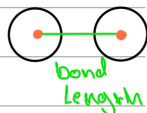
N-C, C-O

→ non-Polar

*Identical atom
and C-H*

Some terms :

• **Bond energy** :- energy required to break 1 mole of bond.
(endothermic)

• **Bond length** :- the distance between 2 nuclei of atoms 

• **Valence electrons** : electrons that locate in the most outer shell

• **Resonance structure** : σ bonds and atoms localized, π bonds and lone-pair of electrons are delocalized.

• **Formal charge** : actual charge of a given atom.

• **Isomers** : Molecule have the same molecule formula.

• **Constitutional isomers** : Same molecular formula but different arrangement of atoms.

• **hydrocarbons** : Compound contain only carbon and hydrogen atoms

• alkanes: no double bond nor triple bond.

• alkenes: Contains carbon-carbon double bond (C=C)

• alkynes: Contains carbon-carbon triple bond (C≡C)

length strength

C-C C≡C

✓ ✓

C=C C=C

✓ ✓

C≡C C-C

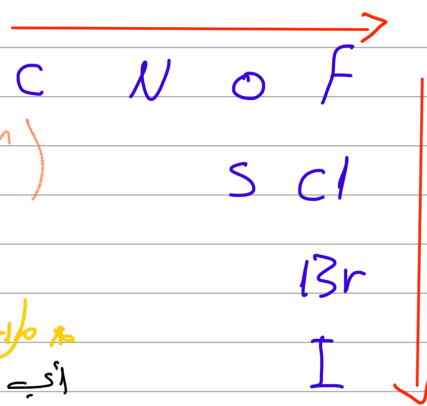
😊 على هذا الترتيب المزدوج

* Note: the more electropositive is the less electronegative.

• electronegativity: Ability of an atom to withdrawn electron (in bond) to itself.

• From up to down it decreases.

• From C to F it increases (I don't distinguish between right and left 😊🤔)



* ملاحظة بالترتيب: لو انشأنا عن ذرتين مثل الكلور والأكسجين أجب دقة أقل (electronegativity) واختار واختار الأكسجين لأنه أكثر دقة (حاولوا انفسهم 😊)

نرجع لجماعة الهيدروكربونات:

* Remember carbon atom can form maximum 4 bond and hydrogen 1 bond

• σ bond: head by head overlap (the hybridization of carbon depends of σ -bond)

• π bond: side by side overlap

4- σ bonds	sp^3	109.5	Tetrahedral
3- σ bonds	sp^2	120	trigonal planar
2- σ bonds	sp	180	linear

Formal charge calculation:

number of valence electrons in an isolated atom

number of intervening electrons around atom after homolytic cleavage

Chapter 2 : Let's talk about alkanes & cycloalkanes

* Alkanes \rightarrow general formula ($C_n H_{2n+2}$)
Hybridization (sp^3)

Some physical properties

insoluble
in H_2O

Cause of absence
of H-bonding with
 H_2O

In general they
have low b.p

when molar mass increases
the b.p increase
But, for identical molar
masses, as symmetrical
increases, b.p decreases

about b.p

- Some Notes :-
1. hydrocarbons are non-polar molecules
 2. alkanes are soluble in non-polar molecules

Nomenclature of alkanes :



for unbranched Alkanes :-

CH_4	methane		heptane
CH_3-CH_3	ethane		heptane
$CH_3CH_2CH_3$	propane		octane
$CH_3CH_2CH_2CH_3$	butane		nonane
	pentane		decane

Note
we use IUPAC
and Common
systems.

for branched Alkanes :

1. choose the longest chain to determine the parent name.
 2. Number in from the end that is nearer to the substituent.
 3. Determine the position of each substituent on the longest chain.
- * If a kind identical substituent use prefixes as "di, tri, tetra".

4. write substituent first the **parent name** → which is determined in the first step.

Now, what about the substituents name?

* We have 2 groups

halogens

F - Fluoro

Cl - Chloro

Br - Bromo

I - Iodo

alkyl group

CH_3 methyl

C_2H_5 ethyl

C_3H_7

Propyl $\text{CH}_2\text{CH}_2\text{CH}_3$

Isopropyl $\text{CH}_3\text{CH}(\text{CH}_3)$

C_4H_9

Butyl $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

sec-butyl $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2$

isobutyl $\text{CH}_2\text{CH}(\text{CH}_3)_2$

Tert-butyl $\text{C}(\text{CH}_3)_3$

Notes :- If u have 2 equal long of carbon chain, select the most branches.

If branching occurs at equidistant (number the chain according to the alphabetical order).

Some time we need to compare the numbering from 2 end as this:



From right: 2, 2, 7 ✗

From left: 1, 6, 6 ✓

here $1 < 2$

But, Be careful the prefixes "di, tri" are not included in the alphabetical order.

In the common name write the organic part at the 1st.

To draw molecules, start with parent name then number the chain from any end.

NOTE :- n-hexane mean no branching (n = normal)

Classification of carbon: It depends on the number of

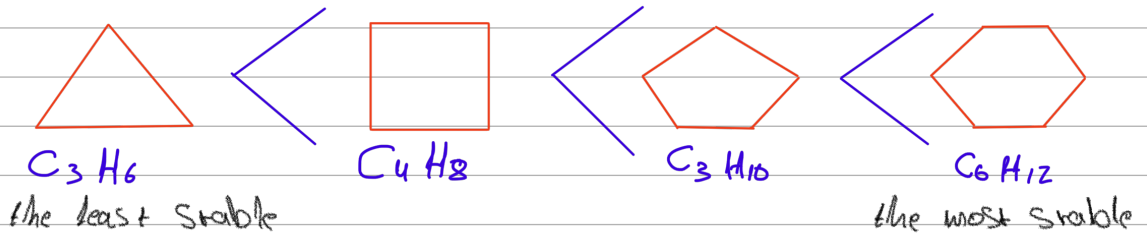
primary secondary tert- quaternary

Carbon atom, which H is bond to it.

If the H attached to one carbon, it would classify as primary.

Cycloalkanes: the general formula is C_nH_{2n}

Examples:



* Naming of cycloalkanes:-

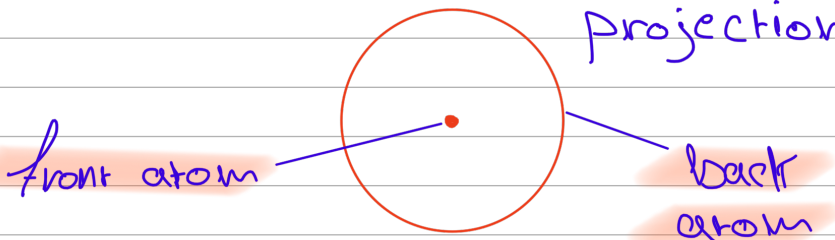
- presence of one substituent (no need of numbering)
- presence of 2 substituents :-
 - a) give number (1) for carbon according to alphabetical order.
 - b) give the second substituent a lower number.

The conformation:

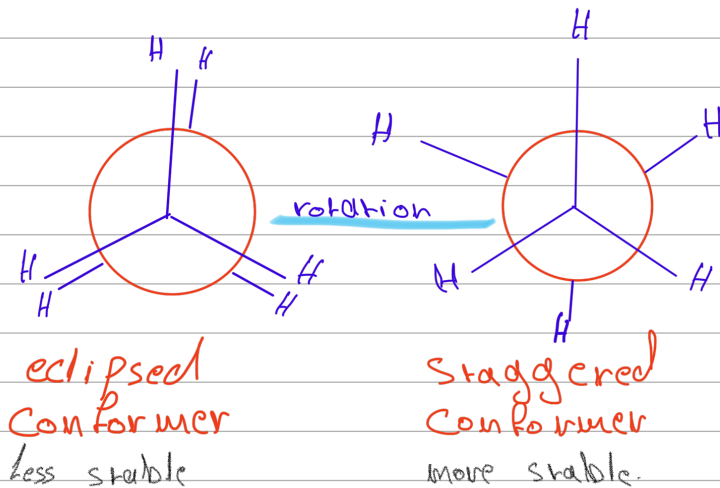
* first alkane

this is call Newman projection.

Note: the bond between 2 carbon is σ -bond.



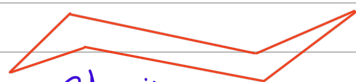
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• Conformation of cyclohexane has no angle strain (109.5) and we present 2 conformation structure :-



Boat



Chair

Note: In chair conformation every carbon has 1 axial and 1 equatorial in the plane.

Another Note: If ring flip each ax. bond becomes eq and eq. bond becomes ax. bond.

* Equatorial bond is more stable than an axial bond
the large groups (atom) prefer eq.

Cis-trans concept :

If 2 substituents

up, up	Cis
Down, Down	
up, Down	

Note: No relationship between up, down and ax, eq.

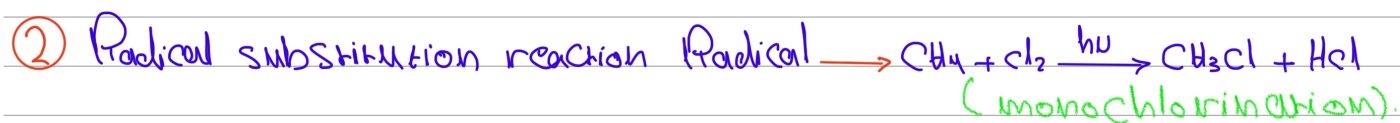
من الآن و صاعدا ح يدخلوا بالتسمية إذا :
If a cyclic has 2 substituents (not 1 nor 3) and these 2 substituents aren't located at same carbon, we should use the term (cis-trans).

Note: the cis-trans isomerism can't be generated by rotation around σ

* They have different physical properties (boiling point, melting point) and can be separated by using physical method (such as distillation).

Note: U can't find a relationship (cis-trans) and (conformers) at same time.

Reactions of Alkanes :



Note: Different environment of H will produce different product

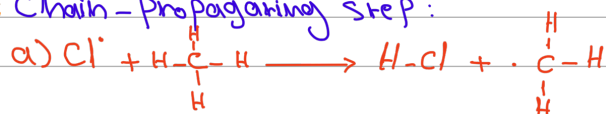
Mechanism of reaction:



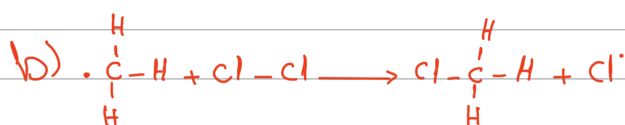
Step 1: initiating step (production of radical)



Step 2: Chain-propagating step:



Here Radical is consumed in reactant and another radical is produced in product. Step 2 will be repeated to get more.



Step 3: Chain-Terminating step.



Here Radical is consumed and no radical is produced.



End of Ch.2

By Lujain Ahmad

بالتوفيق و لا تنسوننا من صالح الدعاء

From Dr. Kamal swaidan slides