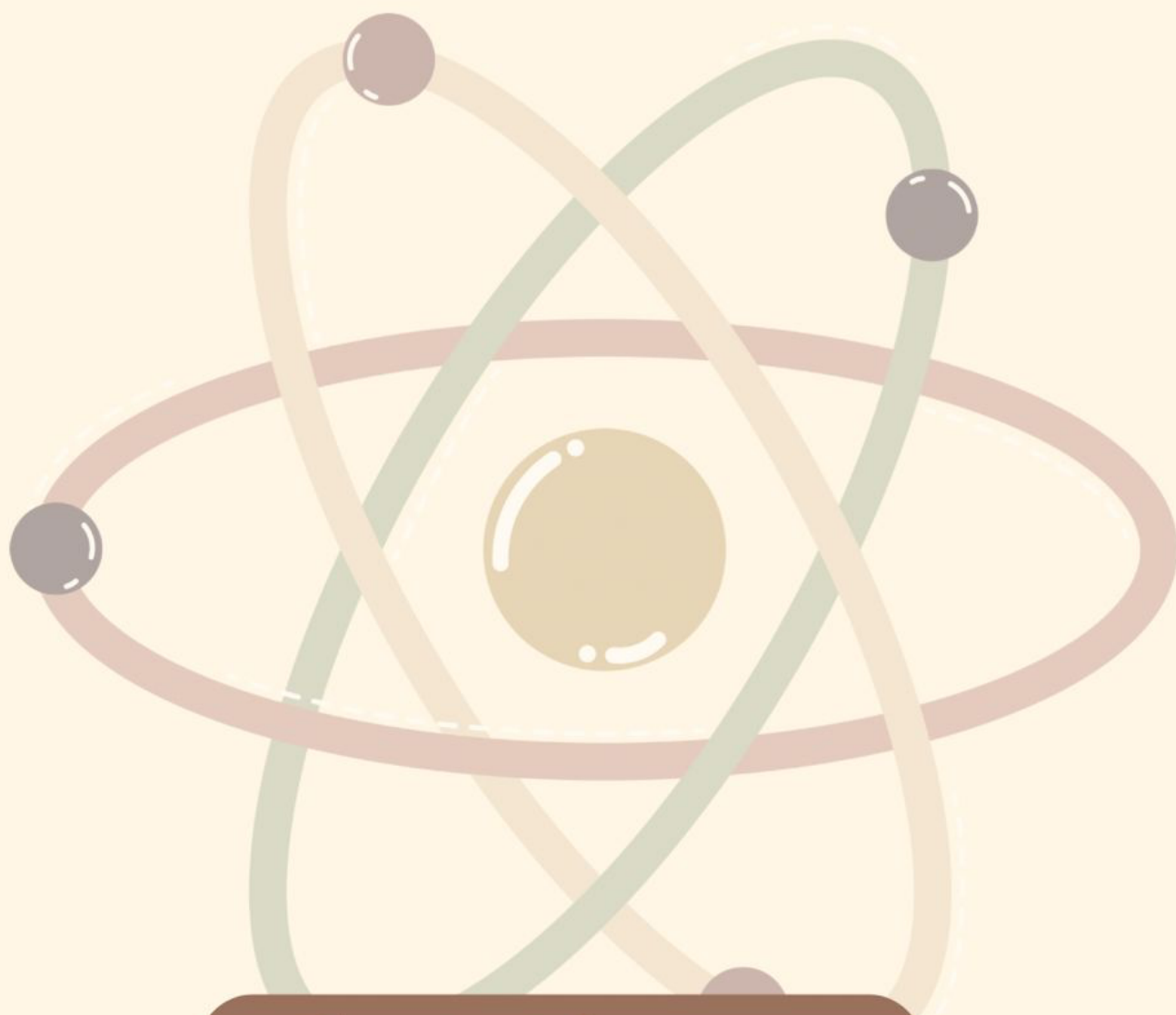


Organic Chimestry



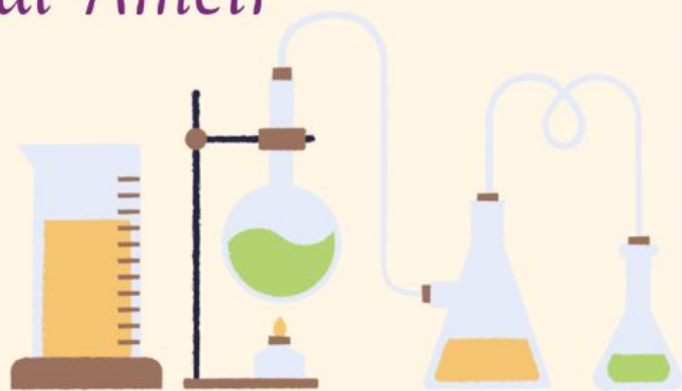
Chapter 2 Summary

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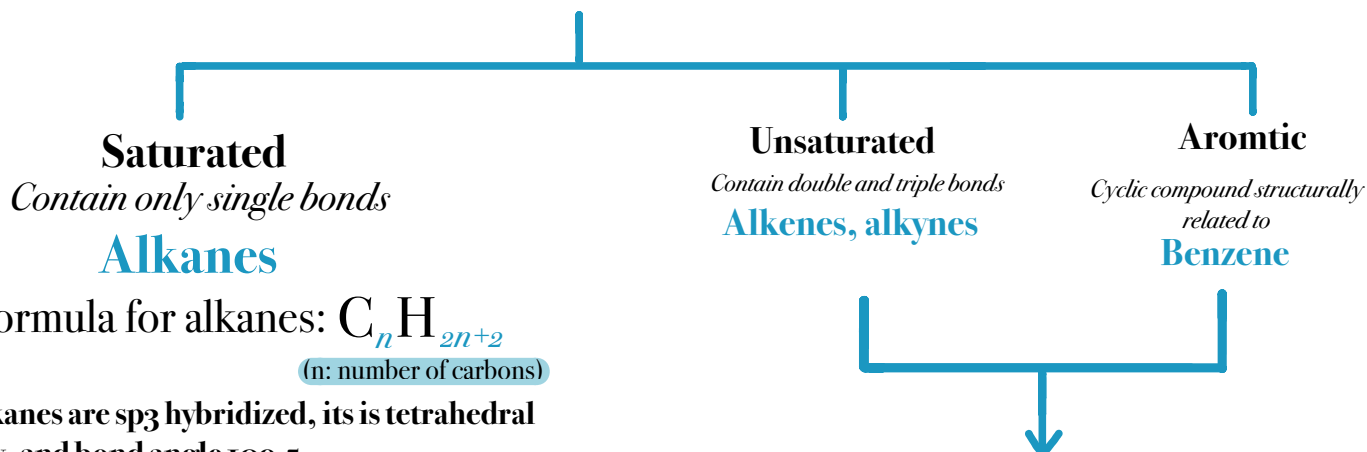
Hemmeh asnan



Organic chemistry chapter 2

Hydrocarbons

Compounds that contain carbon and hydrogen only



General formula for alkanes: $C_n H_{2n+2}$

(n: number of carbons)

Note: all alkanes are sp^3 hybridized, its is tetrahedral in geometry, and bond angle 109.5°

Alkanes are Homologous series, which is a series of compounds in which the members are built up in a regular, repetitive way.

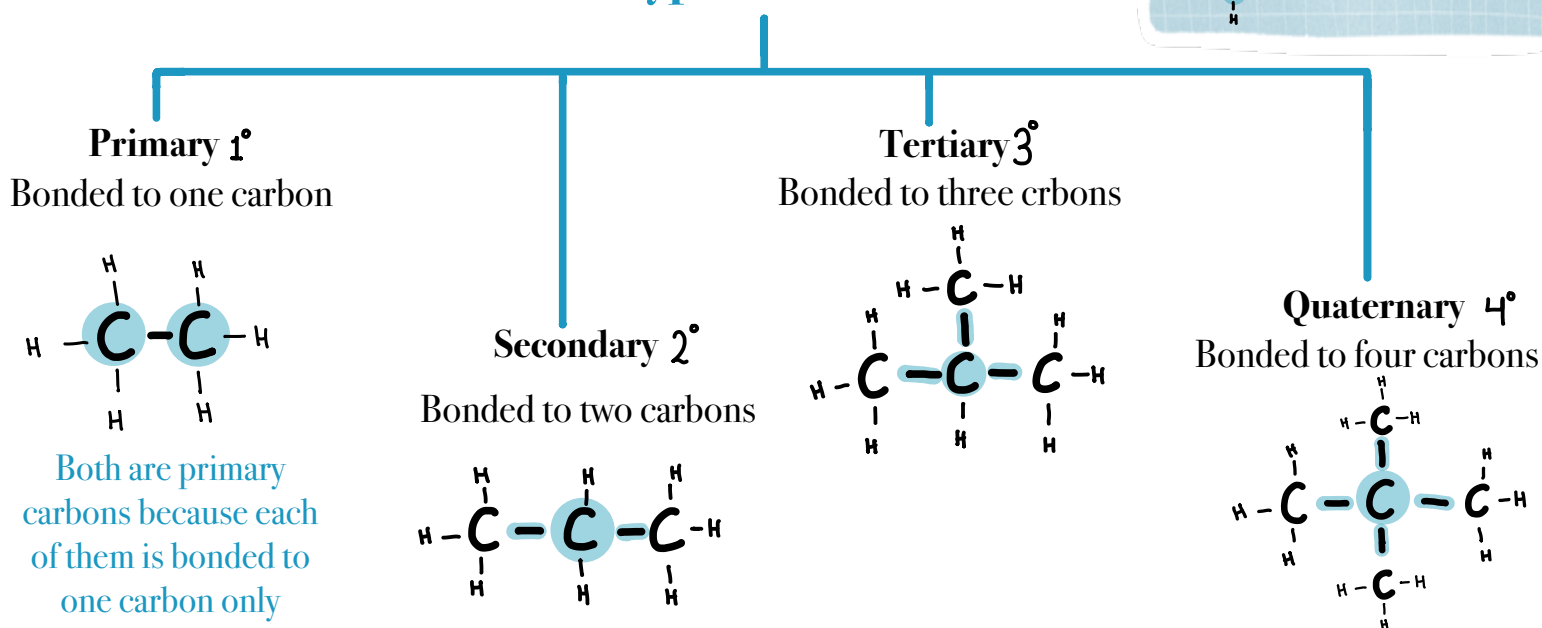
Compounds in homologous series differ by a regular unit of structure, have similar propertiest structure.

Table 12.2 Parent names (حفظواظ (رح نستخدمهم بالتسمية)

Number of Carbons	Structure	Name
1	CH_4	Methane
2	CH_3CH_3	Ethane
3	$CH_3CH_2CH_3$	Propane
4	$CH_3CH_2CH_2CH_3$	Butane
5	$CH_3CH_2CH_2CH_2CH_3$	Pentane
6	$CH_3CH_2CH_2CH_2CH_2CH_3$	Hexane
7	$CH_3CH_2CH_2CH_2CH_2CH_2CH_3$	Heptane
8	$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3$	Octane
9	$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$	Nonane
10	$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$	Decane

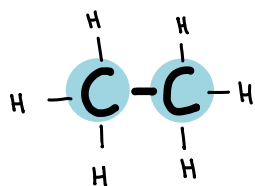
Types of carbons

ملاحظة: الكربونات التي لا ترتبط بأي كاربون غير مطلوبة
 ex: $\begin{matrix} H \\ | \\ H-C-Br \\ | \\ H \end{matrix}$



Primary 1°

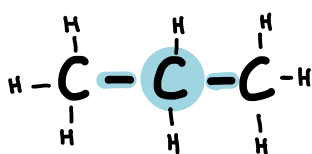
Bonded to one carbon



Both are primary carbons because each of them is bonded to one carbon only

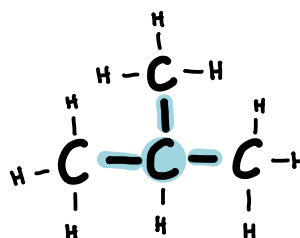
Secondary 2°

Bonded to two carbons



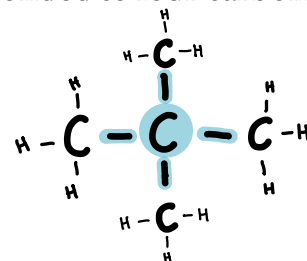
Tertiary 3°

Bonded to three carbons



Quaternary 4°

Bonded to four carbons



Hydrogens are also classified based on the carbon they are bonded to. For example, a hydrogen that is bond to a secondary carbon is called a secondary hydrogen.

NOTE: There is no quaternary hydrogen, because a carbon that is bonded to four carbons can not be bonded to a hydrogen.

After we talked about parent names, we will talk about substituents.

We will talk about two types of substituents: **Alkyls and halogens**

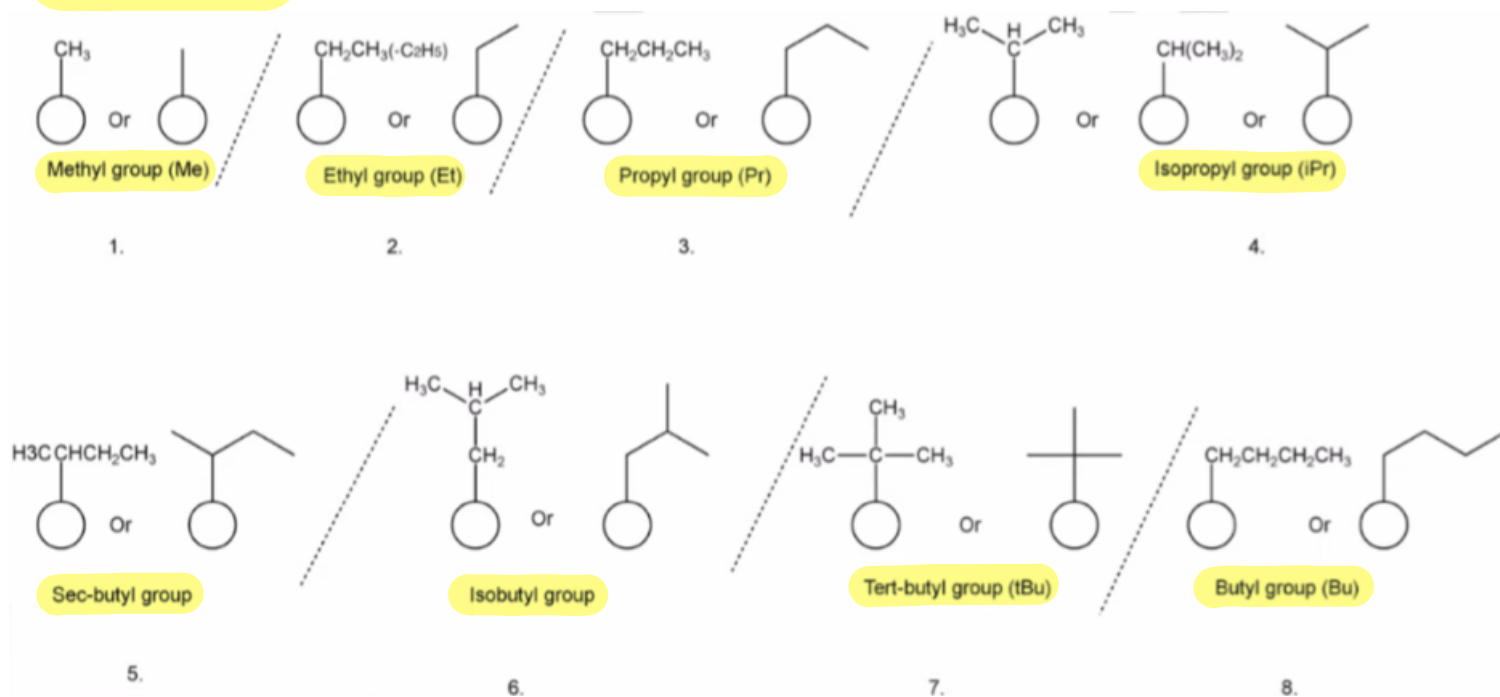
1. Alkyls (Symbolized with **R**):

General formula: C_nH_{2n+1} (n: number of carbons)

Alkyls are named by changing the **ane** ending of alkanes to **yl**.

ex: Hexane \longrightarrow Hexyl

MEMORIZE:



2. Halogens (Symbolized with **X**):

Halogens are: Cl, Br, F, I

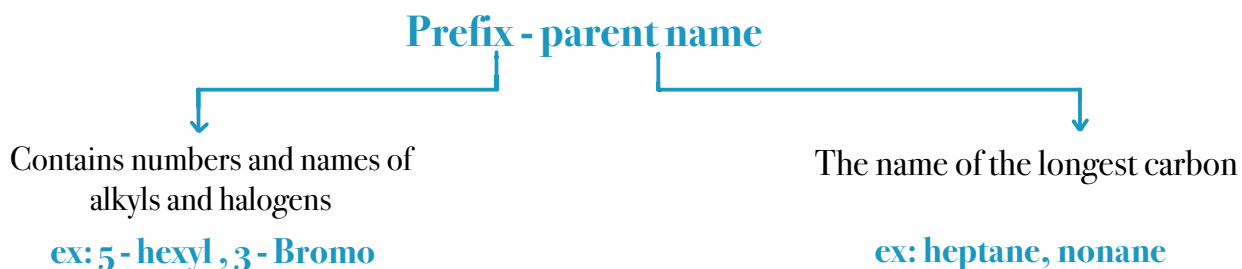
When halogens are substituents they are called: Chloro, Bromo, Fluoro, Iodo

R is a symbol for alkyl
 R-H stands for alkane
 X is a symbol for halogen
 R-X stands for halide



IUPAC Rules for Naming Alkanes

The name of any organic compound composed of two parts :



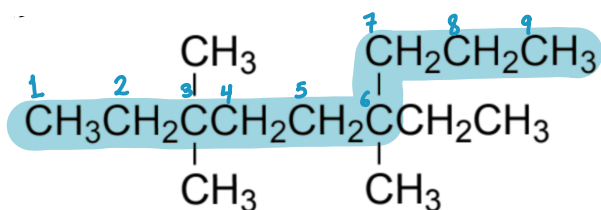
When we name compounds we might use:



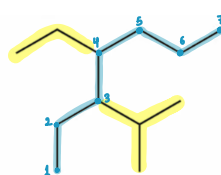
Steps of naming:

1. We determine the longest hydrocarbon chain and name it based on the number of carbons. (4 → Butane , 5 → Pentaneetc)

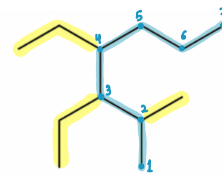
Examples:



1.



2.



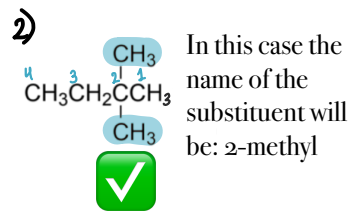
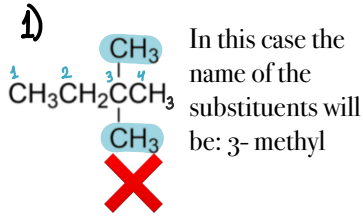
If we had to choose which chain is the longest, we choose the one with more substituents.

In the previous example we choose the second chain because it has 3 substituents whereas the first chain has only 2 substituents

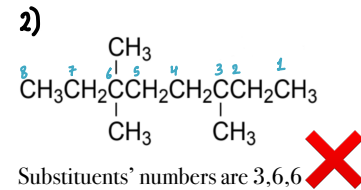
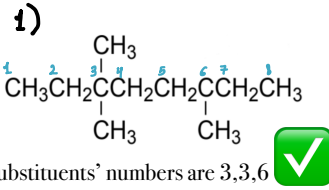
Note: Sometimes we might have two longest chains that have the same number of substituents, in this case it does not matter which one we choose since both will have the same name.

2. Name the substituents, if it was an alkyl we name it based on its parent alkane by changing the -ane ending to -yl. ex: a 2 carbon substituent is called ethyl, if it was a halogen we just add o to the end of its name ex: chloro, bromo, iodo, fluoro.

3. When we number the substituent attached to the chain we have to take the lowest possible number



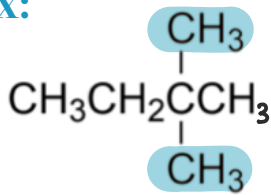
The second naming is the correct one because the number before the substituent is the lowest possible (we choose numbering it with 2 not 3).



إذا ما عرفت من أي طرف ترقيم، أجمع أرقام التفرعات من الجهتين والتي مجموعها أقل هو الصح، في المثال التالي: في المرة الأولى مجموع أرقام التفرعات هو 12، في المرة الثانية المجموع 15، بالتالي الترقيم الأول هو الصحيح لأن مجموع أرقام التفرعات أقل. في بعض الحالات ممكن يكون مجموع الأرقام في الحالتين نفس الشيء، هنا نقارن أول حرف من التفرعات التي على الجوانب ونبدأ الترقيم من التفرع التي حرفه أول أبجدياً.

4. If there are two or more identical groups are attached to the root chain, prefixes such as di-, tri-, and tetra- can be used.

Ex:



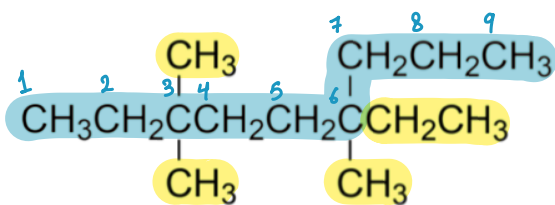
In this compound there are two identical substituents which are both methyl, so we name them 2,2-dimethyl

5. Different types of substituents are listed alphabetically but the prefixes such as di- and tri- and tetra and sec are not considered for alphabetizing, iso and cyclo are considered.

6. IUPAC names for hydrocarbons are written as one word. Numbers are separated from each other by commas and are separated from letters by hyphens. There is no space between the last named substituent and the following parent/root

7. We write the name of the whole compound based on the previous rules, the arrangement of the name is substituents then parent name

After we discussed rules of naming, let's try naming the following compound



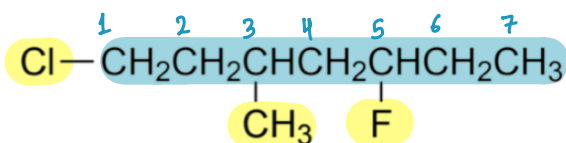
1. Determine the longest chain, it is 9 carbons so its name is nonane

2. Name the substituents, there are 3 methyl and 1 ethyl.

3. There are three identical substituents which are methyl, so we name them 3,3,6-trimethyl. There is one ethyl on the 6th carbon so we name it 6-ethyl.

4. The name of the whole compound is 6-ethyl-3,3,6-trimethylnonane

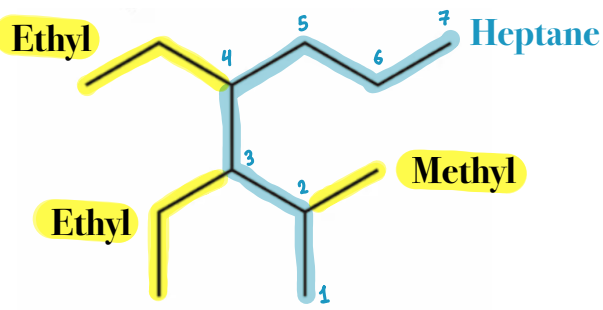
Remember!! We list the substituents alphabetically, this is why ethyl comes before methyl.



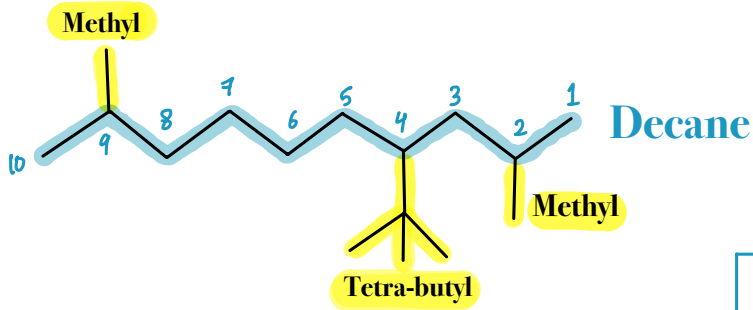
1. Longest carbon chain is 7 carbons so it is heptane

2. The names of the substituents are chloro, fluoro and methyl

3. the name of the whole compound is 1-chloro-5-fluoro-3-methylheptane



3,4-diethyl-2-methylheptane

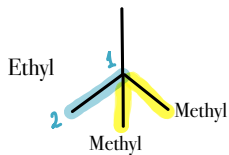


The two methyl are named 2,9-dimethyl
The four carbon substituents is called tetra-butyl

We don't take the prefixes in consideration when we arrange based on the alphabets

4-tetra-butyl-2,9-dimethyldecane

Another way of naming tetra-butyl is:



1,1-diMethylEthyl

This name is a special case where the **di** is considered in the alphabetical order

هذه الحالة الوحيدة التي يدخل فيها ال **di** في الترتيب الأبجدي

In this case the name will be:

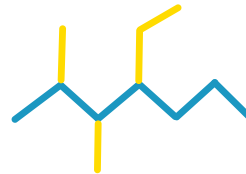
4-(1,1-diMethylEthyl)-2,9-dimethyldecane

Now let's try drawing a named compound:

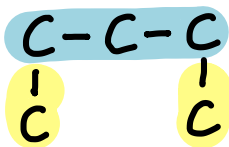
1. 5-tert-butylDecane



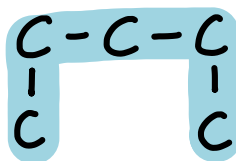
2. 4-ethyl-2,3-dimethylheptane



Q: why is 1,3-dimethylpropane not correct and what is the correct name?



✗ because the three carbon chain is not the longest chain



✓ the five carbone chain is the longest chain and the correct name is **pentane**

طريقة حل هذا النوع من الأسئلة: نرسم المركب المكتوب بشكل خطأ بالسؤال بعدين نعيد تسمية هذا المركب بشكل صحيح بناءً على الرسمة