Chem 2

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21. September 2022

1 Overview

1.1 Grading

Only the better two tests get counted and make up 80% of the grade. Homework & Assignments should be submitted within online within two weeks and make up 20% of the grade. A bonus of 4% can be earned with consistent presence

1.2 Test Dates

9.11.2022
14.12.2022
25.01.2023

2 Lessons

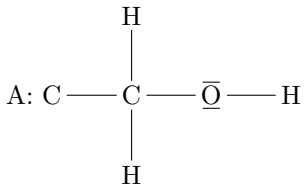
2.1 Lesson 1 - 21.09.2022

Revision of principles learned in Chem 1, which bear relevance in Chem 2. Important things to remember:

- 1. Distinction Atom / Molecule
- 2. Polar / Non-Polar
  - A molecule is polar if the majority of bond in said molecule are polar. A bond is polar if one Atom in the bond has a higher electronegativity.
  - Important Polar Bonds
    - C - O
    - O - H
    - N - H
  - Important Non-Polar Bonds
    - C - C
    - C - H
  - Boiling Points are related to the inter-molecular bond strength. (The higher the bond strength between molecules the higher the boiling point)
  - There are three relevant inter-molecular bond forces (here ranked by strength from weakest to strongest)
    - Van der Walls forces
      Occurs in non-polar bonds.
      non-polar molecules gain in bond strength the longer the "chain" of the molecule and the less "branched" it is.
    - The Dipol-Dipol Force
      Occurs in polar bonds
    - Hydrogen Bond (Wasserstoffbrücken)
      Occurs in polar bonds involving a Hydrogen Atom (Overrules the Dipol-Dipol Force)
- 3. SP3 Hybridisierung
  - the S1 Orbital can be combined with the P Orbital to form the SP3 Orbital, which is on a single energy level.

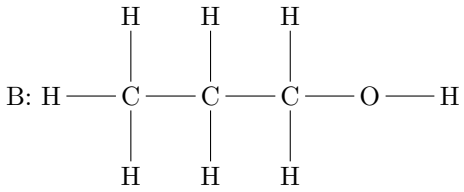
Examples:

- A:



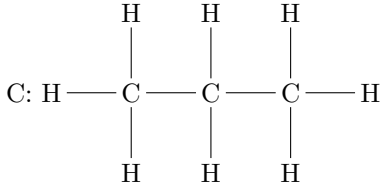
  - A Has 3 Non Polar Bonds (C-C, C-H, C-H)
    and 3 Polar Bonds (C-O, C-H) and is therefore Non-Polar.

- B:



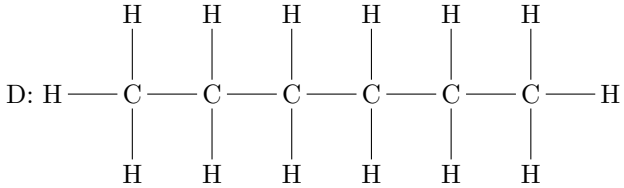
  - B has 7 Non Polar Bonds (C-H * 7)
    and 2 Polar Bonds (C-O, O-H) is therefore Non-Polar. (more than A)

- C:



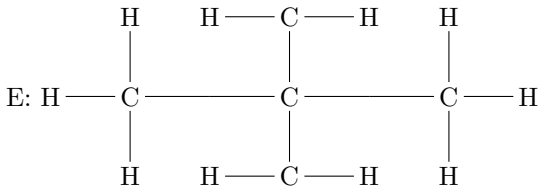
  - C has 10 Non Polar Bonds (C-H * 7) and 0 Polar Bonds and is therefore exclusively Non-Polar.

- D:

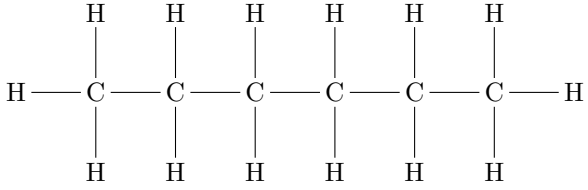


  - D has 19 Non Polar Bonds (C-C * 5, C-H * 14) and is therefore exclusively Non-Polar.

- E:



  - E has 19 Non Polar Bonds (C-C * 5, C-H * 14) and is therefore exclusively Non-Polar.
    It however has a lower boiling point than item D, because the Van der waals bonds are weaker when more "nested".



2.2 Lesson 2 - 28.09.2022

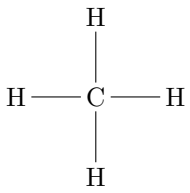
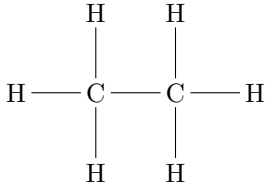
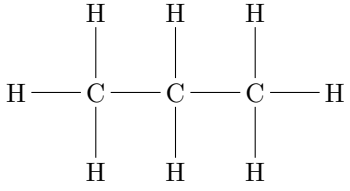
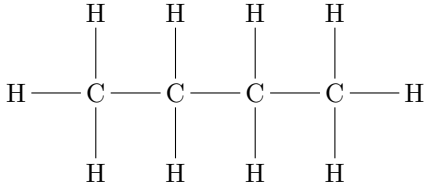
Organic Chemistry
What is Organic Chemistry

- Old - The Chemistry of Alive Stuff
- New - The Chemistry of Carbon including some exceptions

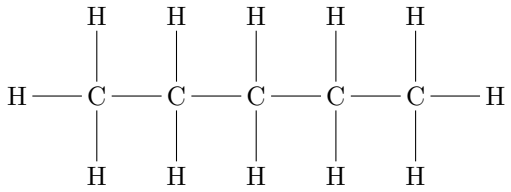
Hydrocarbons

- Saturated Hydrocarbons
  - Just single bonds
- Unsaturated Hydrocarbons
  - Allows all bonds

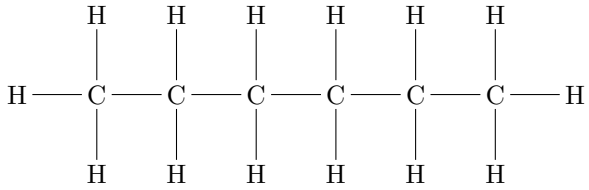
Alkane

- Methane - C1H4
- 
- Ethane - C_2H_6
- 
- Propane - C_3H_8
- 
- Butane - C_4H_{10}
- 

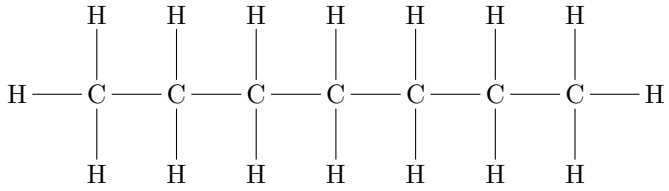
- Pentane - C_5H_{12}



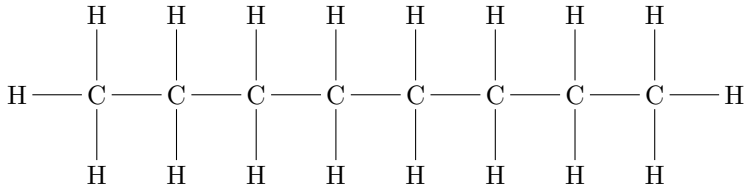
- Hexane - C_6H_{14}



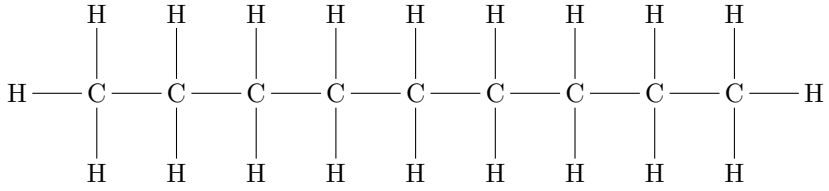
- Heptane - C_7H_{16}



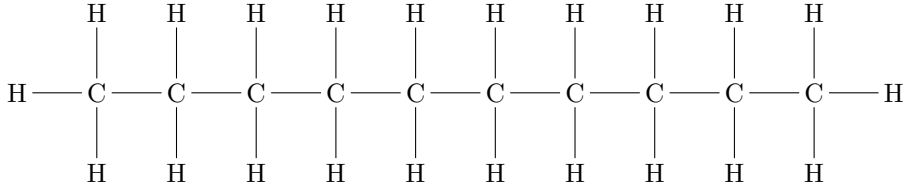
- Octane - C_8H_{18}



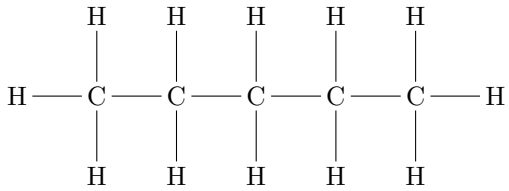
- Nonane - C_9H_{20}



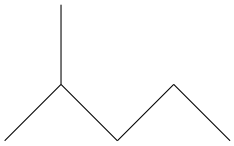
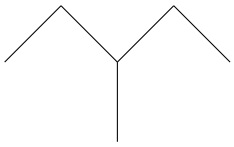
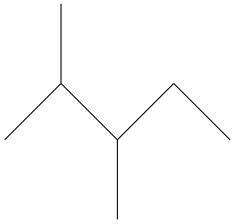
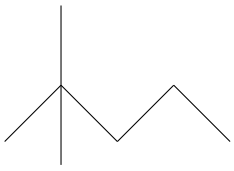
- Decane - $C_{10}H_{22}$



Drawing Conventions:
Example: Pentane

- 
- CH3 — CH2 — CH2 — CH2 — CH3
- 

Isomers
Example: Hexane

- 
- 
- 
- 
- 

2.3 Lesson 3 - 05.10.2022

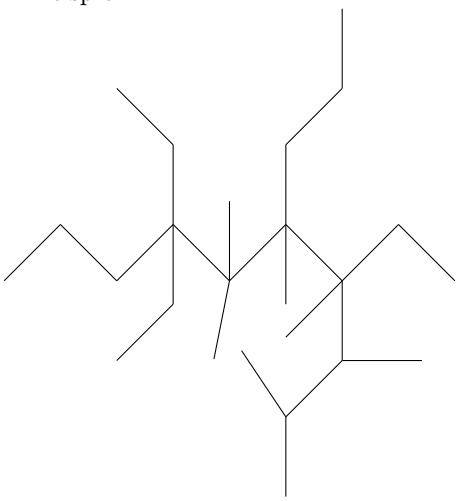
Benennung von Alkanen mit IUPAC
Rezept:

- Längste C-Kette gibt Stammnamen
- Nummerieren der Stammkette
- Lage der Seitenketten durch vorherige Nummern angeben
- Länge der Seitenkette: Stamm + yl
- Bei mehreren gleichen Seitenketten: Di-, Tri-, Tetra-, Penta-, ...
- Seitenketten alphabetisch nach Stamm eingeben
- Stammname hinten hinschreiben

Rechtschreibregeln:

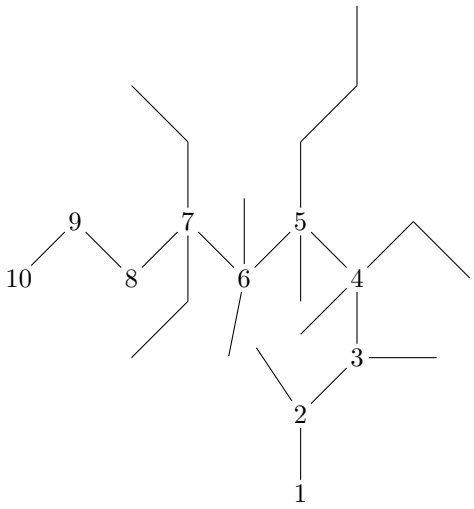
- Zwischen zwei Zahlen: Beistrich
- Zwischen Zahl und Buchstabe: Bindestrich
- Erster Buchstabe groß, alle anderen klein
- Wörter zusammenschreiben

Beispiel:



1. - Längste C-Kette gibt Stammnamen.
Hier ist die längste Kette ein Decan, und bildet somit den Stamm des Moleküls.

2. Nummerieren der Stammkette



3. - Lage der Seitenketten durch vorherige Nummern angeben.
4. - Länge der Seitenkette: Stamm + yl.

N C-Atom	Kette
2	Methyl
3	Methyl
4	Methyl
4	Ethyl
5	Methyl
5	Propyl
6	Methyl
6	Methyl
7	Ethyl
7	Ethyl

Kette	Anzahl
Methyl	6
Ethyl	3
Propyl	1

Bei mehreren gleichen Seitenketten: Di-, Tri-, Tetra-, Penta-, ...:

6 Methyl-Ketten $\Longrightarrow$ Hexamethyl
3 Ethyl-Ketten $\Longrightarrow$ Triethyl
1 Propyl-Kette $\Longrightarrow$ Propyl

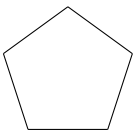
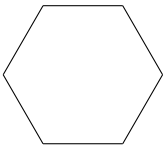
Seitenketten alphabetisch nach Stamm eingeben:

der Hex & Tri Prefix ist nicht teils des Stammes und wird somit nicht im Sortieren betrachtet.

Lösung:

$4,7,7-Triethyl-2,3,4,5,6,6-Hexamethyl-5-Propyldecan$

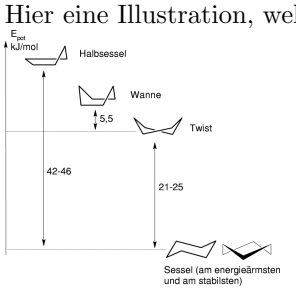
Ringförmige Alkane

Structure	Composition	Name
	C_3H_6	Cyclopropan
	C_4H_8	Cyclobutan
	C_5H_{10}	Cyclopentan
	C_6H_{12}	Cyclohexan

Cyclohexan liegt nicht flach und hat in dem 3-Dimensionalen Raum zwei verschiedene Formen:

- Sesselform (am energieärmsten deswegen die häufigste und stabilste)
- Halbsesselform
- Twist
- Wanne

Hier eine Illustration, welche die Struktur der Formen zeigt:



Hier eine Illustration, welche die Energie der Formen zeigt: