

4

HALO ALKANES



- Functional group **X** = halogen
- Starts with fluoro, chloro, bromo, iodo
- Treat like a side chain; give no preference to halogen when counting; use alphabetical (e.g. bromo before methyl before iodo...)
- Slightly polar (but not enough to mix with water)
- London & dipole-dipole forces

The next homologous series we will study is the HALOALKANES. These are just the same as ALKANES except one or more of the side chains is a halogen (F, Cl, Br, I). We name the side chains as indicated in the summary above with fluoro- instead of methyl (e.g.) and again we use a number before the "fluoro" to indicate which carbon the halogen is attached to. Note that the halogens are given the general symbol "X" for the general formula for this group, $C_nH_{2n+1}X$.

Note: For each of the homologous series we have covered so far [1 - 4 ... there are 9 in total ☺] some properties such as polarity and IMF are included in the summaries. Write these summaries (in the green boxes) into your notes for each homologous series, and we will come back to the extra info at a later stage.

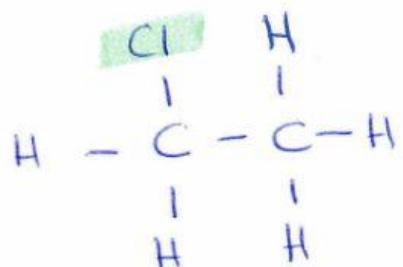
Examples:

Try to draw the following in your books and then check on the next page for the answers to help you:

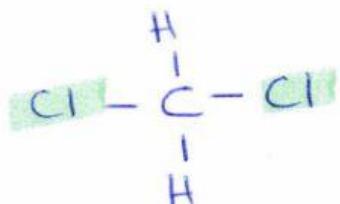
- 1) Chloroethane (no numbers because whichever C you put the Cl on, it will be where you start counting)
- 2) Dichloromethane (no numbers used as chlorine can only go on 1 C)
- 3) 1,2-dichloroethane
- 4) 2-chloro-3-methylpentane (note the name has **chloro** and then **methyl**, alphabetically)
- 5) 3-**bromo**-3-**ethyl**pentane
- 6) 2-**bromo**-3-**chloro**hexane

Answers:

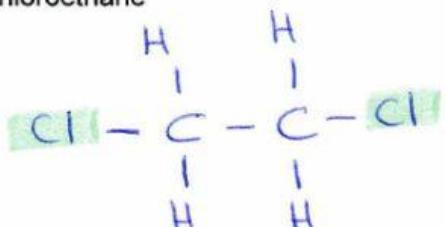
1) Chloroethane



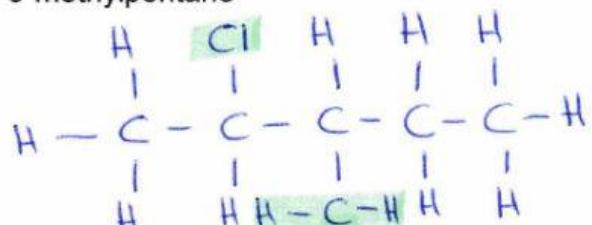
2) Dichloromethane



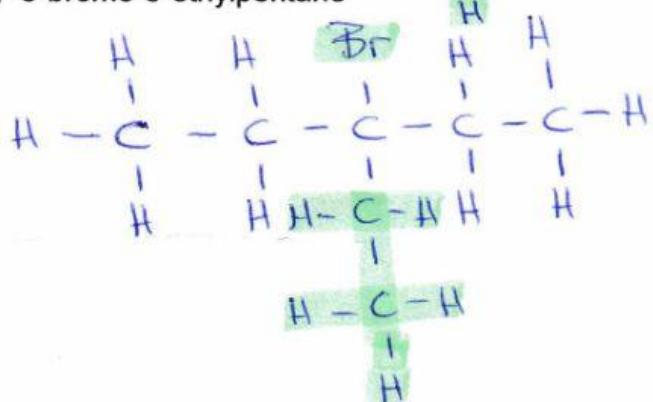
3) 1,2-dichloroethane



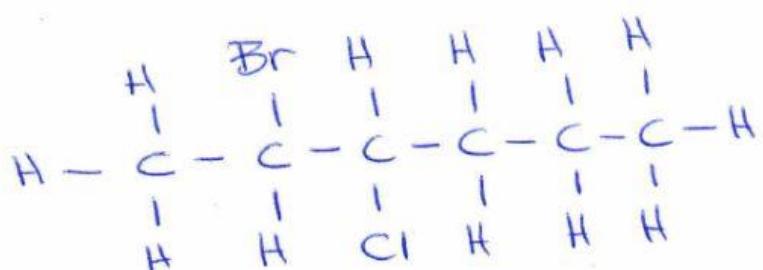
4) 2-chloro-3-methylpentane



5) 3-bromo-3-ethylpentane



b) 2-bromo-3-chlorohexane



DEFINITIONS:

Functional groups: The distinctive group of atoms attached to a carbon chain that **all the members of the homologous series have in common** (and it is responsible for the specific properties of that group).

Functional groups for the series we have studied so far:

Alkenes: double bond

Alkynes: triple bond

Haloalkanes: halogen (X)

(Alkanes don't really have a specific functional group.)

Homologous series: A series of compounds that have the same general formula.

Eg: Alkanes, alkenes, alkynes, haloalkanes

Naming rules

Now that we have learned the basics of drawing organic structures, write down the following rules that explain how to name structures and then try them out in the examples that follow.

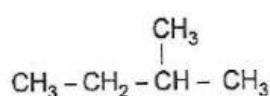
1. Find the longest chain of carbons
2. Identify the functional group and then the side chains (remember halogens are treated like side chains)
3. Number the carbon atoms so that double and triple bonds or other functional groups are closest to carbon atom "1".
4. If there aren't any double bonds or triple bonds, use the side chains (alkyl or halogen) alphabetically to number the carbon atoms
5. If the same side chain occurs more than once, add the "di" (two), "tri" (three), or "tetra" (four) to the name of the side chain.
6. Put the name together, numbers separated by commas (1,1) and numbers separated from words by hyphens (1-methyl). And no spaces between words.

Exercises - Naming:

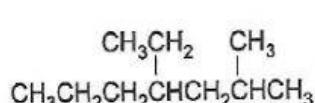
Give the IUPAC (i.e. the official chemical) name for the following:

(Draw the structure in your book so you can write in the numbers for the Carbons and then fill in the answer. Remember you don't number from the left! Start numbering closest to functional group or side chain.)

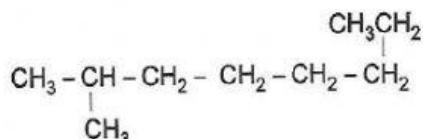
4.1



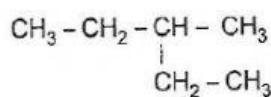
4.2



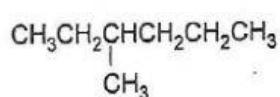
4.3



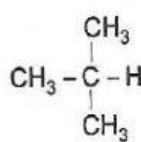
4.4



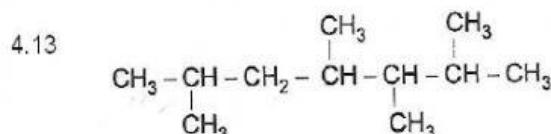
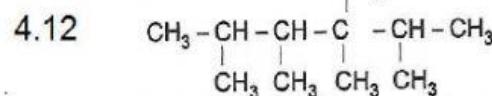
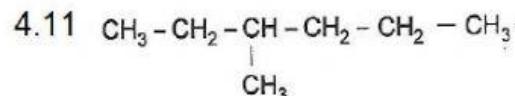
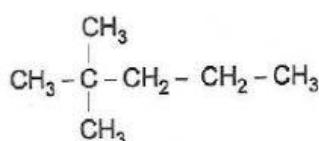
4.5



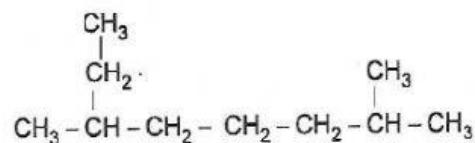
4.6



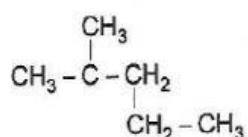
4.7



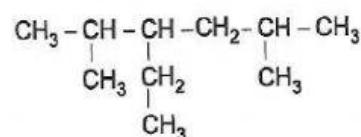
4.14



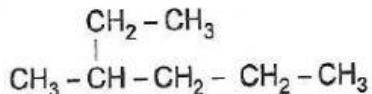
4.15



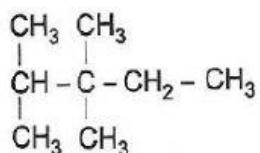
4.16



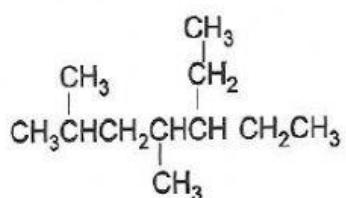
4.8



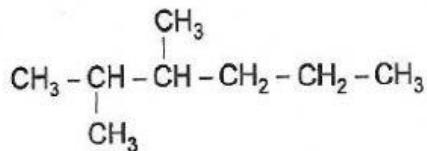
4.17



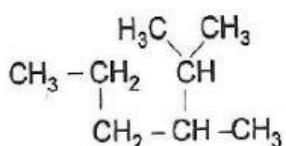
4.9



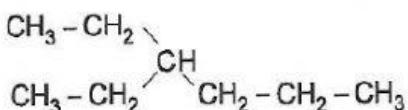
4.18



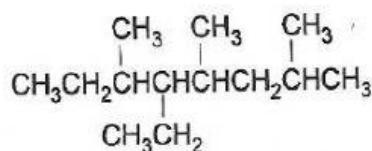
4.10



4.19

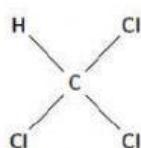


4.20

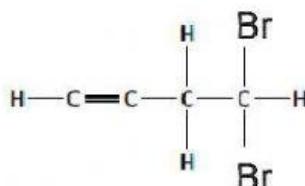


Question 7 (excuse the strange numbering – it comes from the exercises in your printed notes)

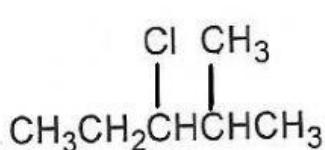
7.1



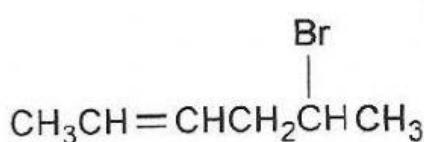
7.9



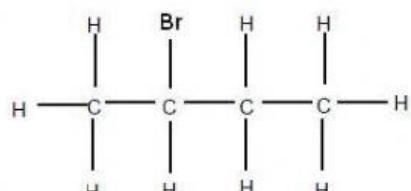
7.2



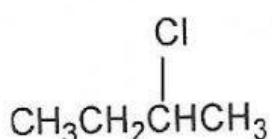
7.10



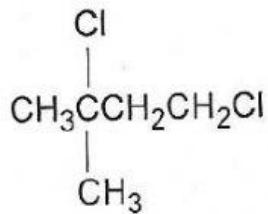
7.3



7.11

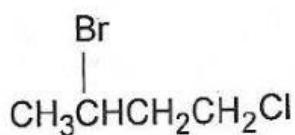


7.4

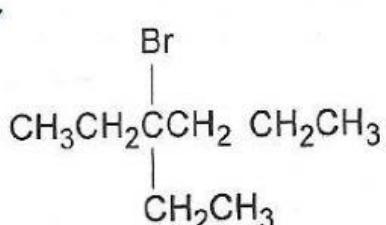


7.5 Cl(CH₂)₆ I

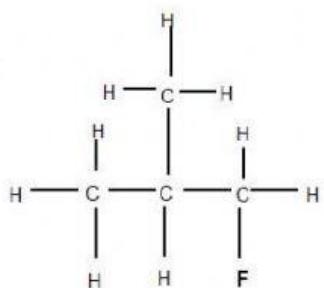
7.6



77

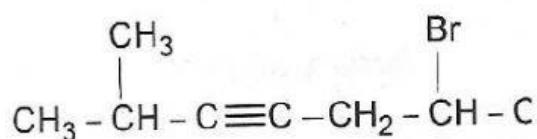


7.8

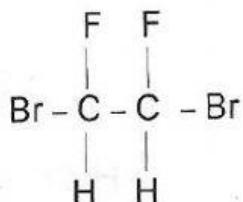


7.12 $\text{BrCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{F}$

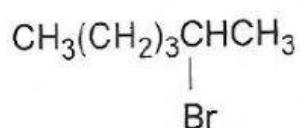
7.13



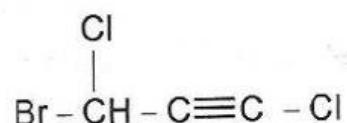
714



7.15



7.16



Exercises - Haloalkanes:

Question 8: Draw the structural formulae for the following in your books:

8.1 2-chloro-3,3-dimethylhexane

8.2 3,3-dichloro-2-methylhexane

8.3 3-bromo-3-ethylpentane

8.4 3-bromo-5-chloro-3-methylheptane

8.5 3-iodo-2,2,4,4-tetramethylpentane

8.6 hexafluoroethane

8.7 tetrachloroethene

8.8 4-bromo-4-ethyl-2-methylhexane