

Instructions:

- ✓ If a substance is 2 words – ensure to only leave one space between the words
- ✓ The a number is a subscript- just leave it as a normal number – eg C2H4
- ✓ Leave no spaces between words in organic UIPAC names

Combustion and esterification

Alkanes

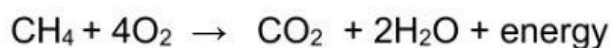
Alkanes are fossil fuels

name	Phase
methane	Gas
ethane	Gas
propane	Gas
butane	Gas
pentane	Liquid
hexane	liquid
heptane	Liquid
octane	liquid
nonane	Liquid
decane	Liquid
More than 17 carbons	Waxy solids

Combustion of alkanes (Badenhorst's line 7 hasn't done yet)

When alkanes combust (burn in oxygen) they always forms water and carbon dioxide

Eg



The reason alkanes (and alcohols) are used as fuels is because they have very exothermic reactions when burned in oxygen.

There's a little trick to balancing these reactions-
leave the oxygen till the end.

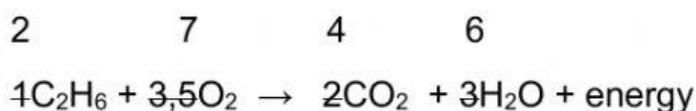


Notice there are 7 oxygen on the right hand side (4 + 3).

Now I'm going to balance the left hand side oxygen by writing a 3,5 in front the oxygen.



But obviously we cannot leave the reaction as it is- so we double everything, to get rid of the half.



Exercise:

Now balance the following combustion reactions



Esterification (in preparation for the prac)

Esters are made by reacting alcohols and carboxylic acids together.

Concentrated _____ is used as the catalyst during the reaction.

It is also known as a _____ agent.

Eg

Methanol + **prop**anoic acid → **methylprop**anoate + water

(*don't leave a space between the words for esters)

The alcohol always becomes the 'side chain' in the ester and the carboxylic acid always becomes the 'main chain' (ending in oate).

Exercise: write the name of the products that form below

2.1 methanol + ethanoic acid → +

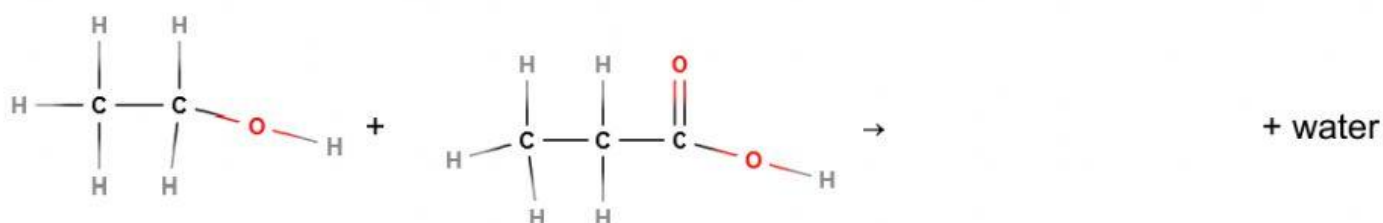
2.2 ethanol + propanoic acid → +

2.3 propan-1-ol + butanoic acid → +

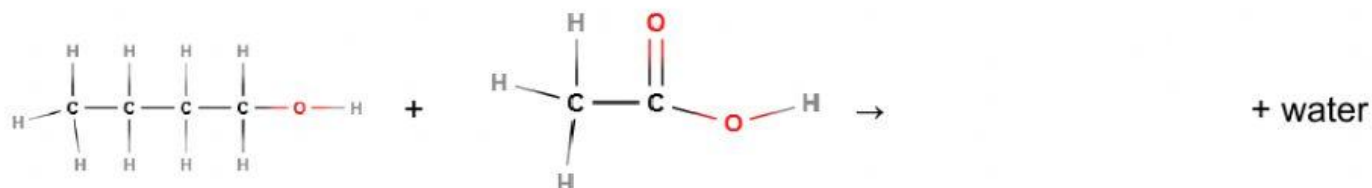
2.4 butan-1-ol + metanoic acid → +

2.5 pentan-1-ol + petanoic acid → +

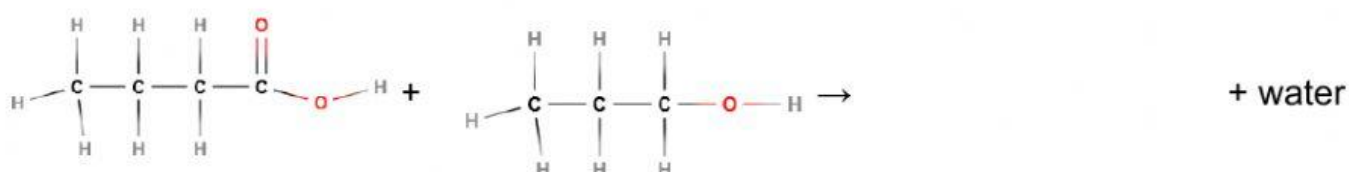
3.1 Write the IUPAC names of the alcohols, carboxylic acids and esters that form in the reactions below.



3.2



3.3



Exercise 4: Write the IUPAC name of the products that form

4.1 pentanoic acid + butan-1-ol → + water

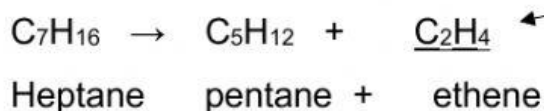
4.2 hexanoic acid + propan-1-ol → + water

4.3 hexan-1-ol + butanoic acid → + water

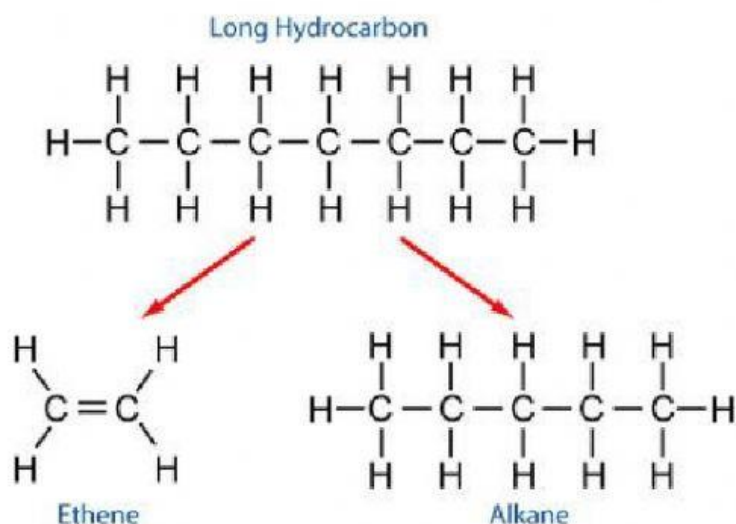
Cracking

Cracking: the chemical process in which longer chain hydrocarbon molecules are broken down into shorter more useful molecules.

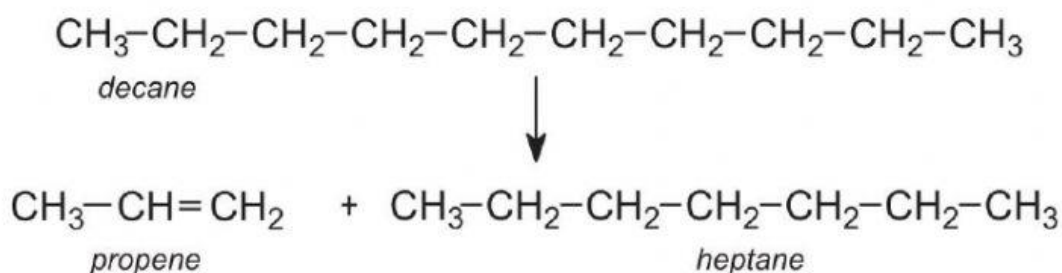
Eg



How many carbons and hydrogens are left over?

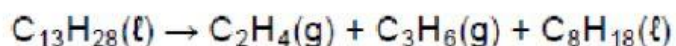


Eg 2



Eg 3

The reaction represented by the equation below takes place in the presence of a catalyst.



Exercise

Complete the following

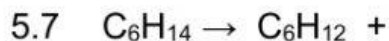
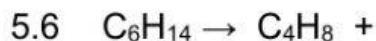
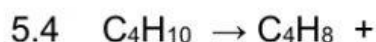
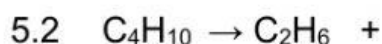
5.1 The following equation represents the cracking of a hydrocarbon at high temperature and pressure:



Which ONE of the following is the IUPAC name of product Y?

- A Prop-1-ene
- B Propane
- C Ethene
- D Ethane

Remember to take into consideration the 2 in front of the C_2H_4 when counting how many Carbons and hydrogens you'll have left over



(Structural) Isomers

Organic compounds which have the same molecular formula but different structural formula

There are different types of isomers:

Positional isomers: Same molecular formula, but different positions of the side chain, substituents or functional groups on the parent chain

Functional isomers: Same molecular formula, but different functional groups

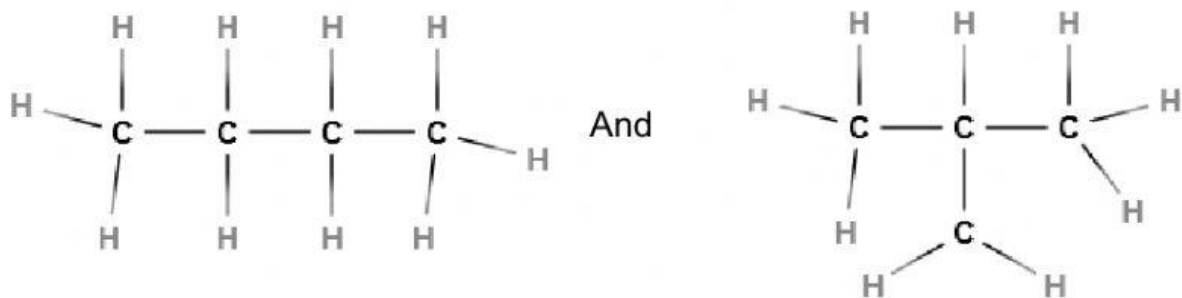
Chain isomers: Same molecular formula, but different types of chains

If you need a bit more help understanding this concept, watch this little video

Exercise:

- First write the molecular formula underneath each compound and then
- Identify what types of isomers the following are

6.1



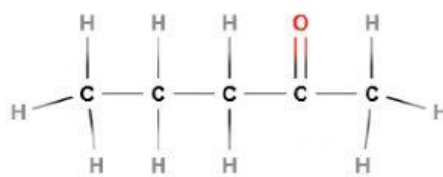
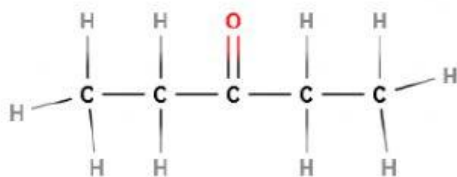
Positional isomers

Functional isomers

Chain isomers

Not isomers – they are the same molecule but with a bend in the chain

6.2



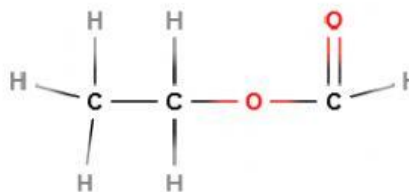
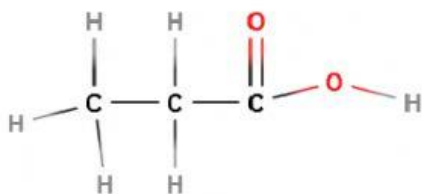
Positional isomers

Functional isomers

Chain isomers

Not isomers – they are the same molecule but with a bend in the chain

6.3



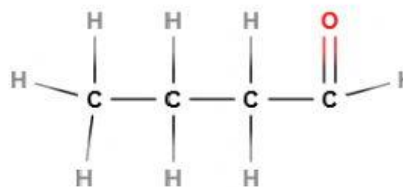
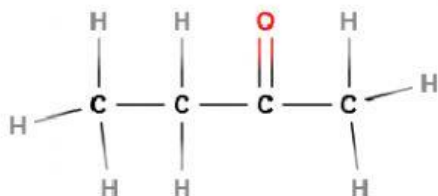
Positional isomers

Functional isomers

Chain isomers

Not isomers – they are the same molecule but with a bend in the chain

6.4



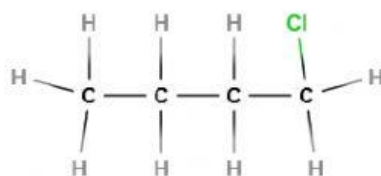
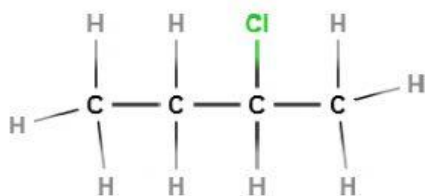
Positional isomers

Functional isomers

Chain isomers

Not isomers – they are the same molecule but with a bend in the chain

6.5



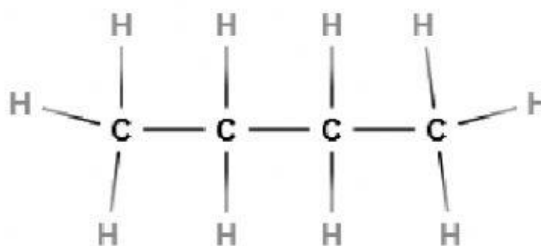
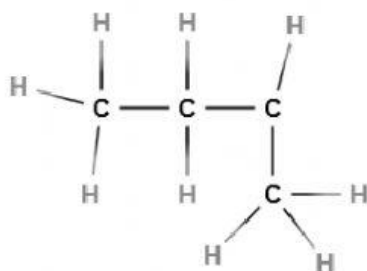
Positional isomers

Functional isomers

Chain isomers

Not isomers – they are the same molecule but with a bend in the chain

6.6



Positional isomers

Functional isomers

Chain isomers

Not isomers – they are the same molecule but with a bend in the chain

Exercise

7.1 $C_2H_4O_2$

Give the names of the 2 isomers of the above molecule

7.2 Which of these molecules will have the highest melting point? (give IUPAC name)

7.3 Which of these molecules will have the highest volatility? (give IUPAC name)