

Crude oil

Why is crude oil so useful?

D: Identify the key terms; hydrocarbon, mixture, element

C: Describe how crude oil is formed

B: Explain the composition of crude oil – what it is made of?

A: Analyse structural formulae for alkanes

A*: Link the use of crude oil to economic and environmental considerations

Starter

1. Copy title, date, and driving question – rate your starting grade
2. On post it notes list all the uses of crude oil you can think of.

Crude oil

- Crude oil is a mixture.

It contains hundreds of different compounds. Some are small but most are large.

- Nearly all of these compounds contain carbon and hydrogen only.
- They are called hydrocarbons.

Hydrocarbons are molecules that contain carbon and hydrogen only.

What is oil?

Oil is a mixture of substances called
HYDROCARBONS.



So, what two **elements** are in a
hydrocarbon?

Hydrocarbon or not?

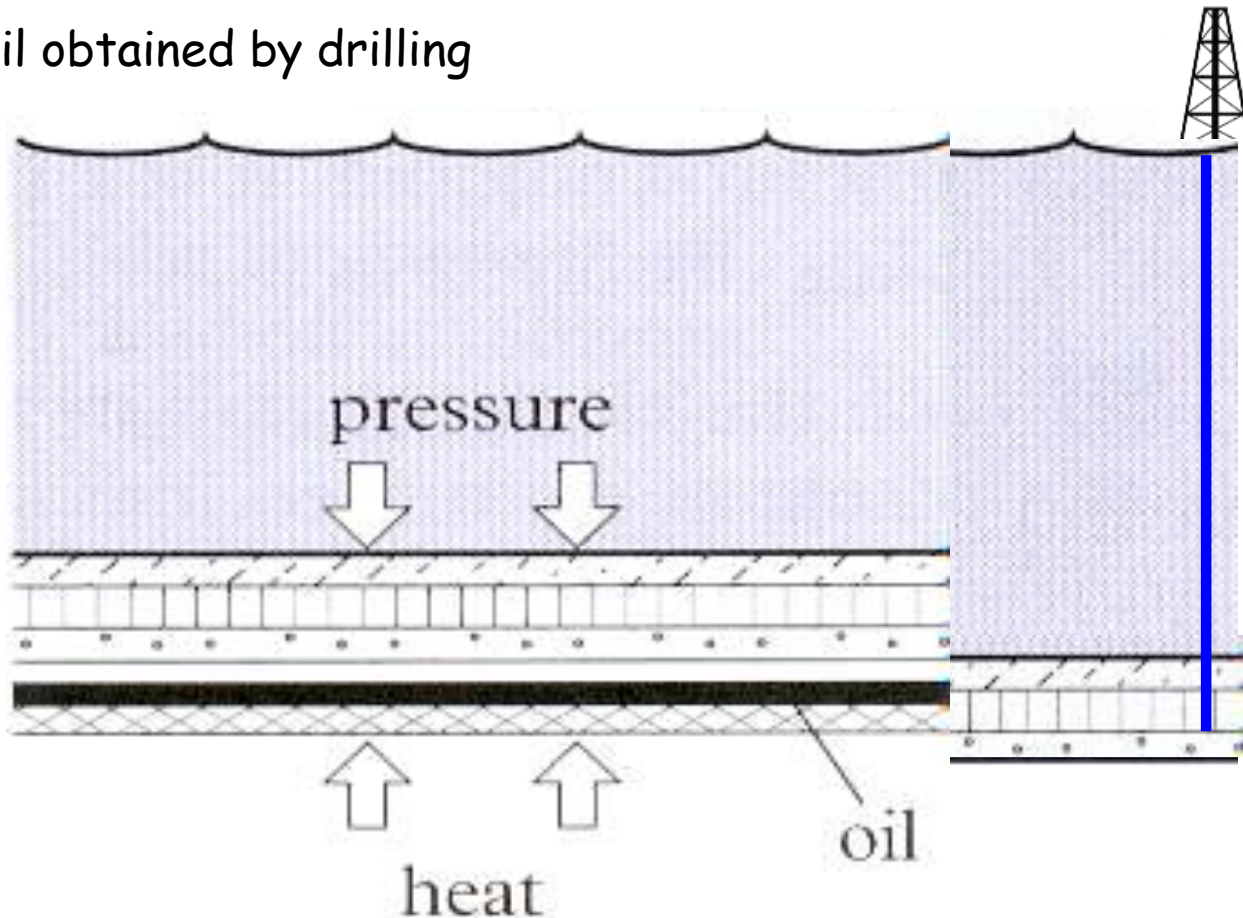


What is a **hydrocarbon** then?
Write your own definition of this
keyword



How crude oil was formed

- Microscopic plants and animals die and fall to the sea bed
- Layers of sand and mud form on top
- Pressure and high temperature cause oil to form
- Oil obtained by drilling



**PRODUCE A FLOW
CHART TO SHOW
HOW CRUDE OIL
WAS FORMED**

**USE QUICK
SKETCHES AND
ONLY 10 KEYWORDS**

The importance of oil

- These hydrocarbons are vital to our way of life.
- We use them as highly portable fuels for many forms of transport.
- We also use them as raw materials from which a huge range of useful everyday substances are made.

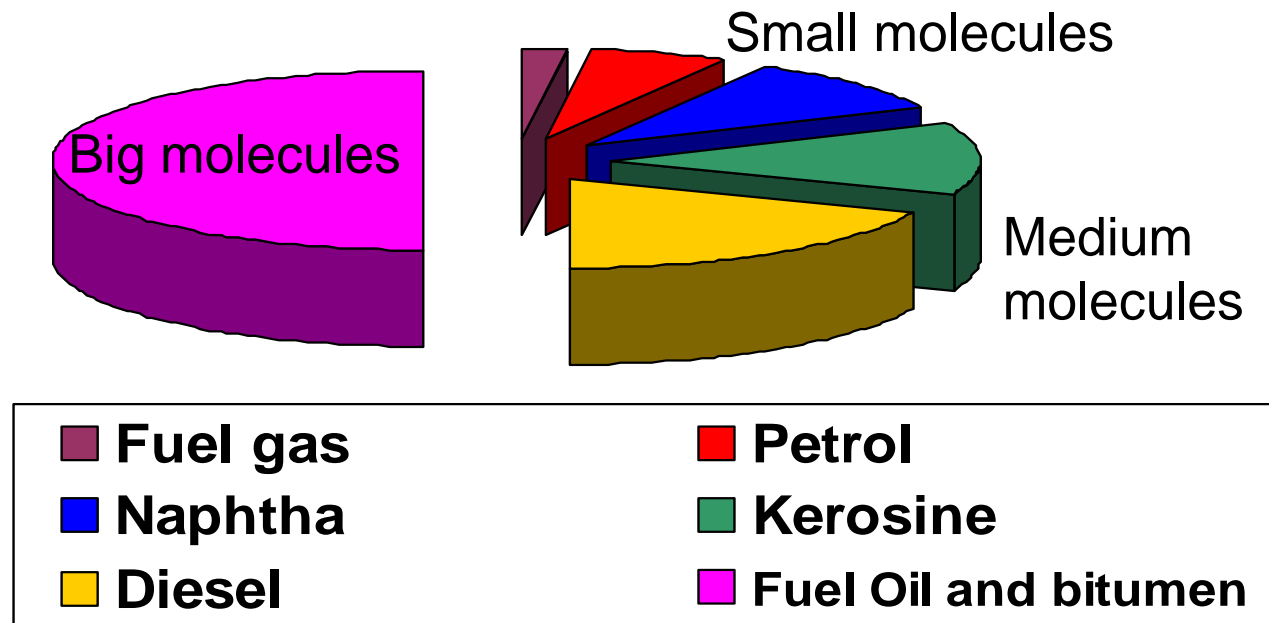


Making oil useful

- Although we can get useful substances from oil, crude oil itself has no uses.
- In order to make crude oil into useful substances we first have to separate the mixture into molecules of similar size.
- This is done in an oil refinery.

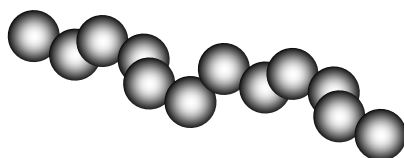
What is crude oil?

- Crude oil is a mixture of different sized hydrocarbons. The exact composition depends upon where the oil comes from but typically it contains a lot of big molecules.



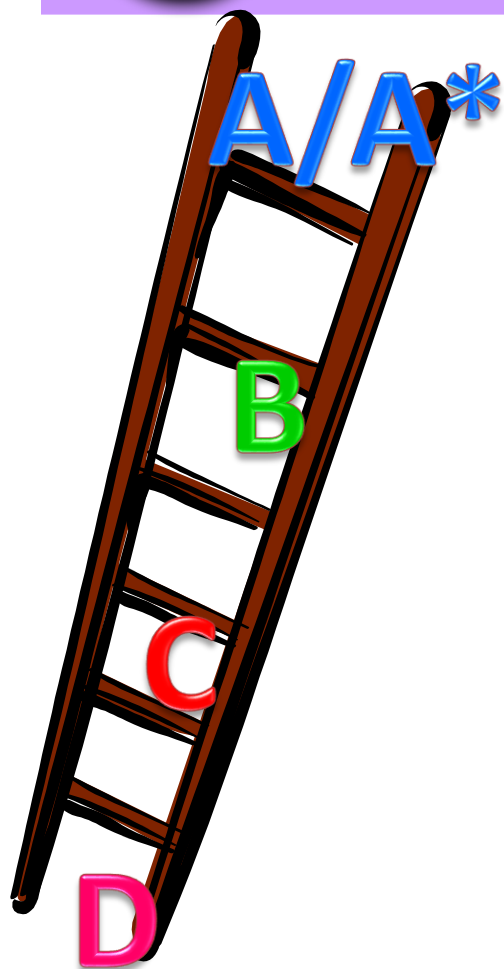
Carbon: Organic Chemistry

- Carbon is an unusual atom in that it is able to form very strong covalent bonds with other carbon atoms.
- When we then include it's ability to also bond with other elements we open up the possibility of the highly diverse and complex molecules (like DNA) that have led to the possibility of life.
- Because of this, the chemistry of carbon containing compounds is often called **organic chemistry**.





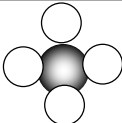
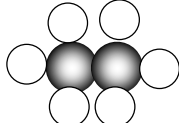
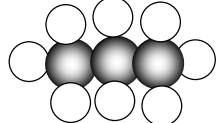
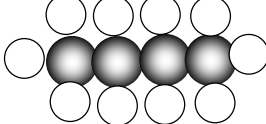
Progress Check



- A: Analyse structural formulae for alkanes
- A*: Link the use of crude oil to economic and environmental considerations
- Explain the composition of crude oil – what it is made of?
- Describe how crude oil is formed
- Identify the key terms; hydrocarbon, mixture, element

Alkanes

- The simplest hydrocarbons form a series of compounds known as alkanes.
- These all consist of carbon and hydrogen only and every carbon has four single covalent bonds.

Hydrocarbon	Formula	Structure
Methane	CH_4	
Ethane	C_2H_6	
Propane	C_3H_8	
Butane	C_4H_{10}	

○ hydrogen

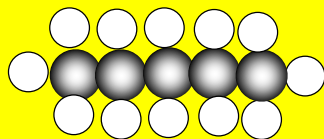
● carbon

Names of Alkanes

- The names of the 4 simplest alkanes are methane, ethane, propane and butane.
- After that the names are systematic (like the words used to describe geometric shapes.) E.g.
 - 5 carbons = pentane C_5H_{12}
 - 6 carbons = hexane C_6H_{14}
 - 7 carbons = heptane C_7H_{16}
 - 8 carbons = octane C_8H_{18}
 - 9 carbons = nonane C_9H_{20}
 - 10 carbons = decane $\text{C}_{10}\text{H}_{22}$

○ hydrogen

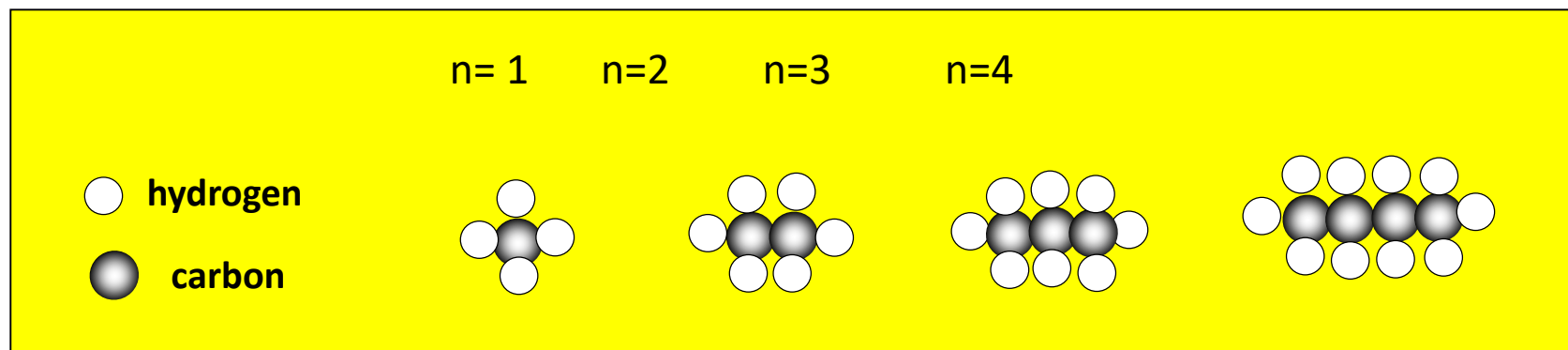
● carbon



pentane

Homologous Series

- Alkanes all have very similar structures.
- They have a CH_3 at each end of the molecule.
- What differs is the number of CH_2 groups between the two ends.
- These all consist of carbon and hydrogen only and every carbon has four single covalent bonds.
- It is possible to build up a series by simply adding an extra CH_2 group
- This leads to a general formula of $\text{C}_n\text{H}_{2n+2}$



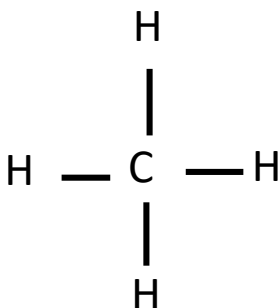
- What will be the formula for alkanes containing the following numbers of carbons?

Number of carbons	Formula
12	$\text{C}_{12}\text{H}_{26}$
16	$\text{C}_{16}\text{H}_{34}$
31	$\text{C}_{31}\text{H}_{64}$
19	$\text{C}_{19}\text{H}_{40}$

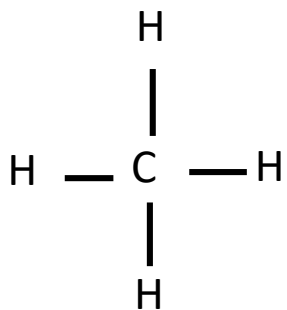
Formulae and Models of Alkanes

- Although normal chemical formula - like C_5H_{12} - are used to describe alkanes they do not convey which atom is joined to which other atom.
- To get around this we often used displayed formula to describe organic molecules.
- Displayed formula show which 4 atoms each carbon is bonded to but even these do not show the actual 3D shapes. For that we use models.

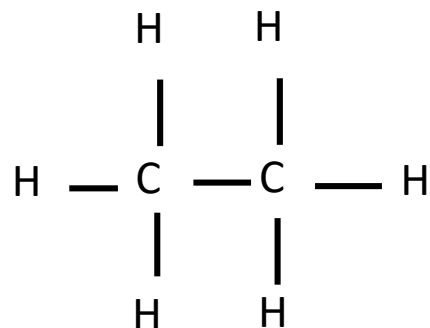
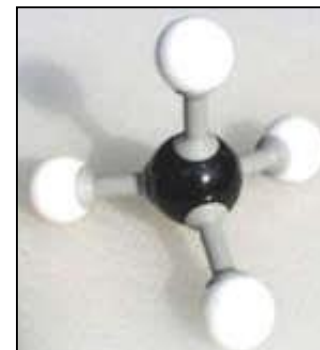
methane, CH_4



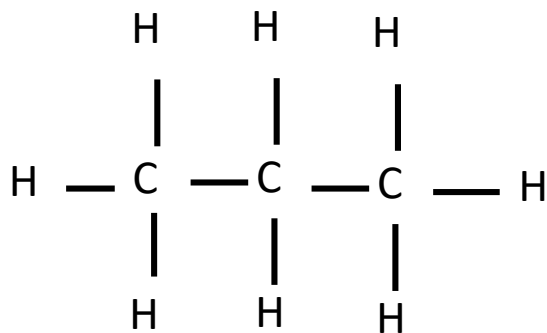
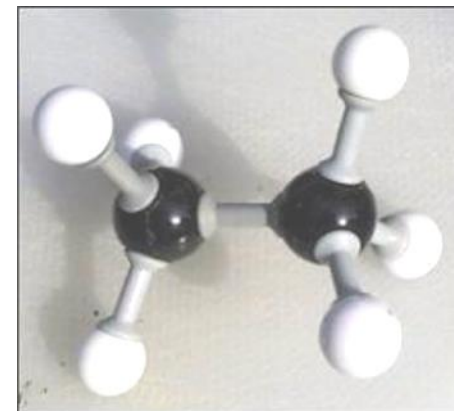
Alkanes



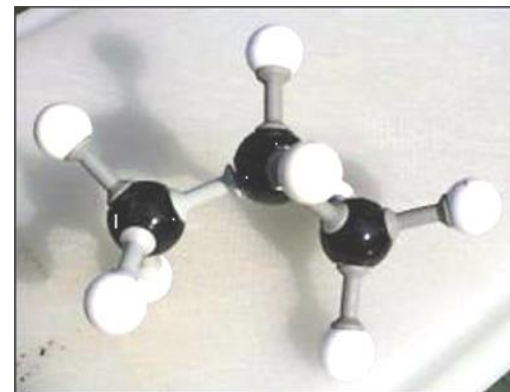
methane, CH₄



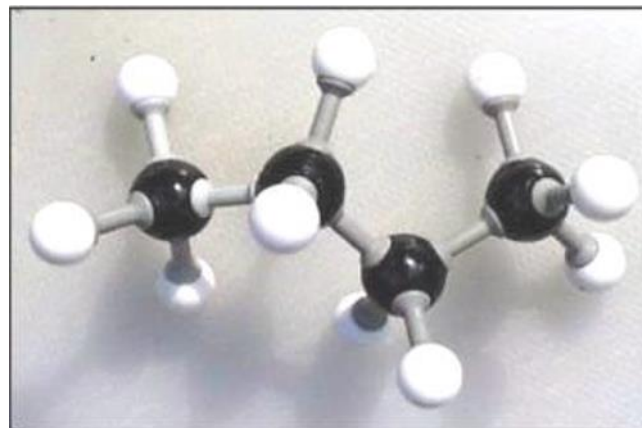
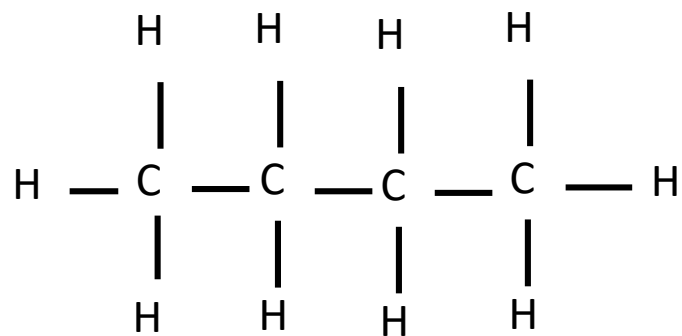
ethane, C₂H₆



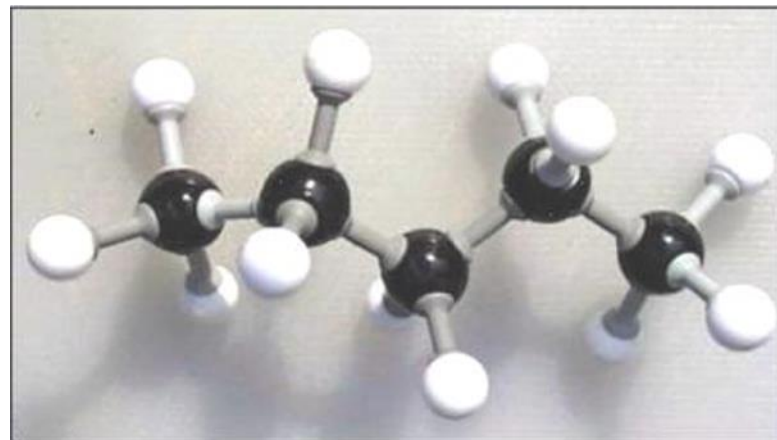
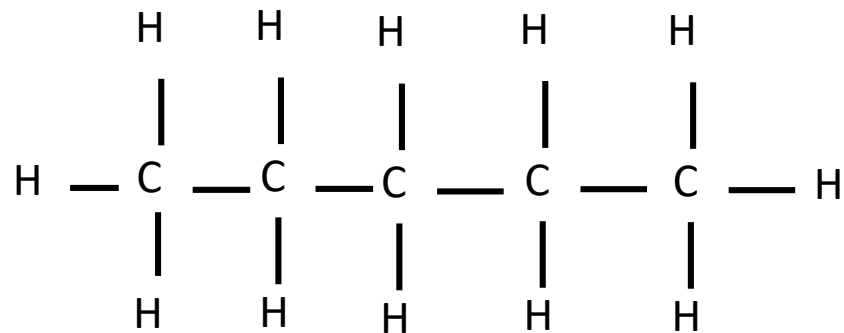
propane, C₃H₈



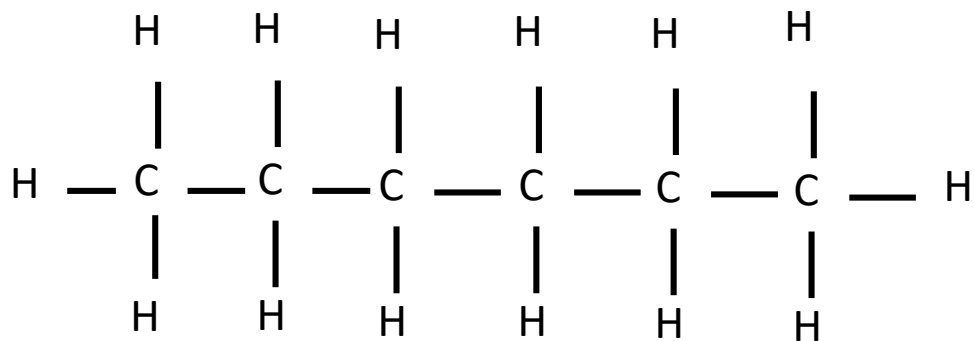
butane, C_4H_{10}



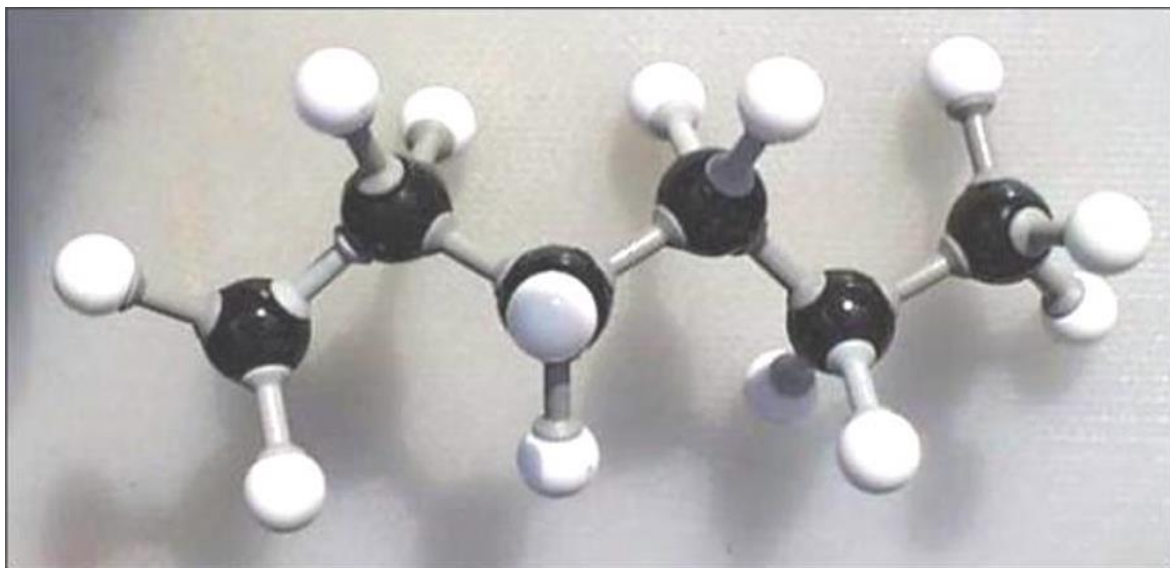
pentane, C_5H_{12}



hexane, C_6H_{14}

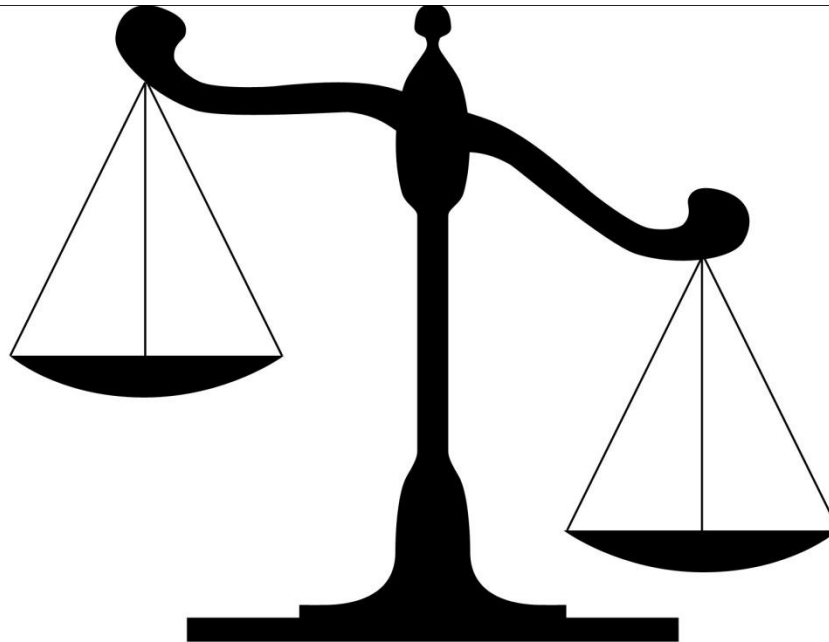


Notice
the carbon chain
is not really
straight



and so on.....

What are the advantages and disadvantages of crude oil?



**Put the statements into pros and cons of oil.
Can you think of any extra ones?**

**EXTENSION: Which statements relate to the environment?
The economy? The social implications?**

Draw a spider diagram and add key points from today's lesson

