



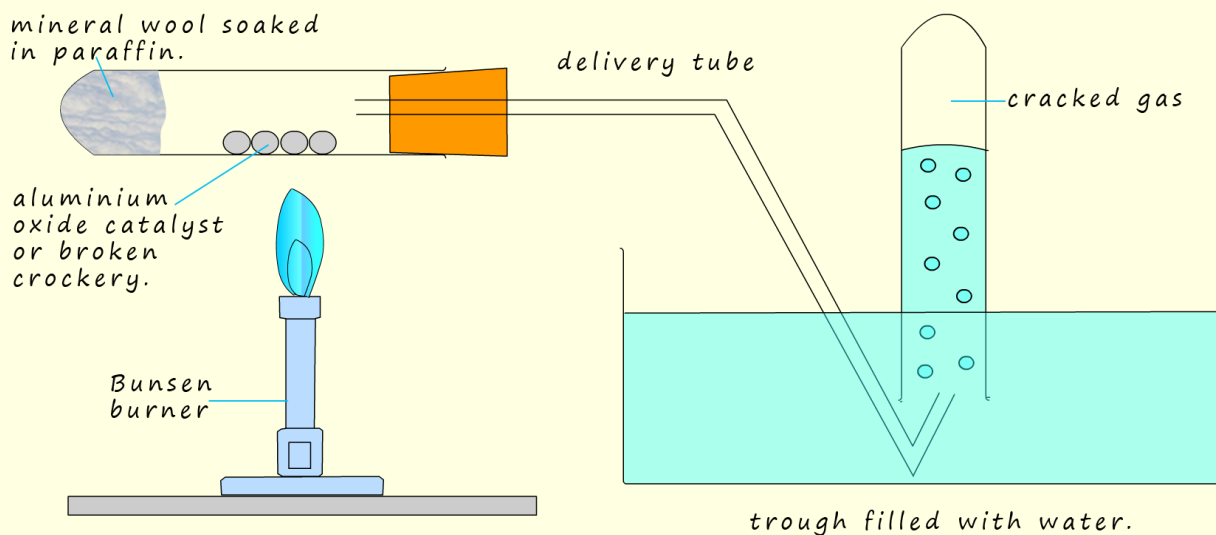
CRACKING

Answer the following questions then check your answers

- 1 What is the difference between an alkane and an alkene?
- 2 What do the words saturated and unsaturated mean?
 - a Name 2 saturated and 2 unsaturated compounds.
 - b Draw the graphical formula or displayed formula of pentane and pentene.
- 3 What test could be used to distinguish between pentane and pentene? State the result of the test.
- 3 Which of the following hydrocarbons are saturated and which are unsaturated.
 - a $C_{15}H_{32}$ b. $C_{20}H_{40}$ c. $C_{50}H_{100}$ d. $C_{30}H_{62}$ e. $C_{12}H_{26}$

4 Why is crude oil refined?

a What does the diagram below show? Explain briefly how to crack paraffin using the apparatus below.



b Which fractions from the oil are in biggest demand? How much of these fractions are produced during distillation?

5 What is cracking?

6 Write word and symbolic equations for the following reactions.

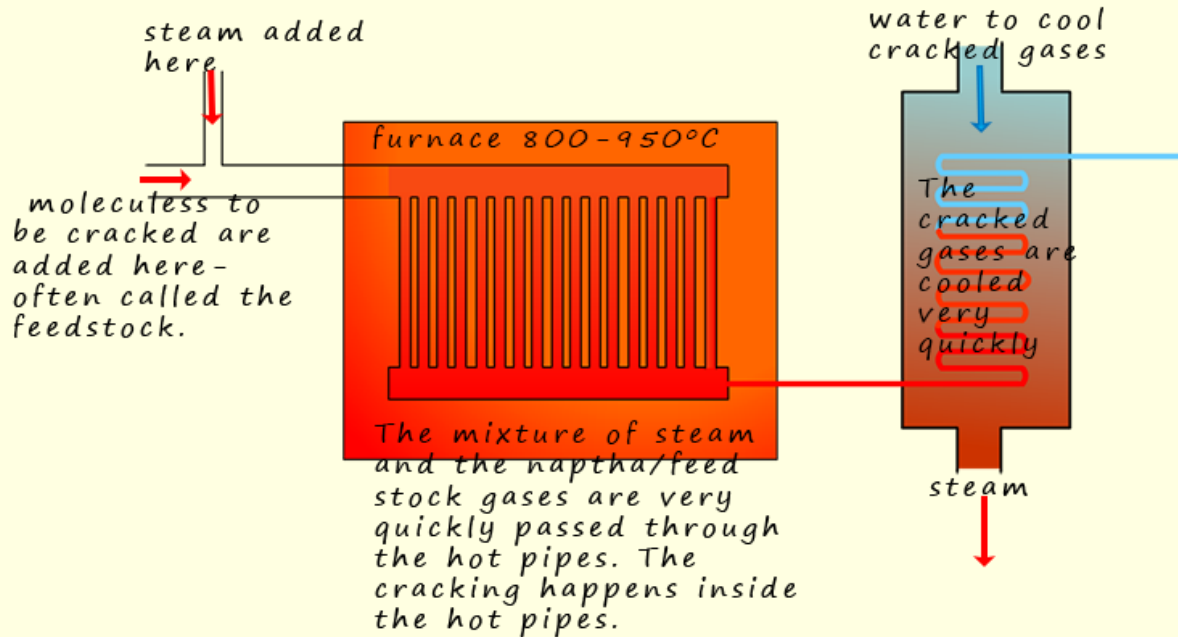
a The cracking of ethane to ethene and hydrogen

b The cracking of decane to pentane and pentene.

c The cracking of octane to butane and one other product.

d The cracking of nonane to propane and one other product.

- 7 Why is cracking important?
8. What use is made of small unsaturated hydrocarbons produced by cracking?
What are they used to make?
9. What is the difference between catalytic and thermal cracking?
10. How is steam cracking different from catalytic cracking?



- a. What is steam cracking used to primarily produce?

3 Which of the following hydrocarbons are saturated and which are unsaturated.

a. $C_{15}H_{32}$ b. $C_{20}H_{40}$ c. $C_{50}H_{100}$ d. $C_{30}H_{62}$ e. $C_{12}H_{26}$

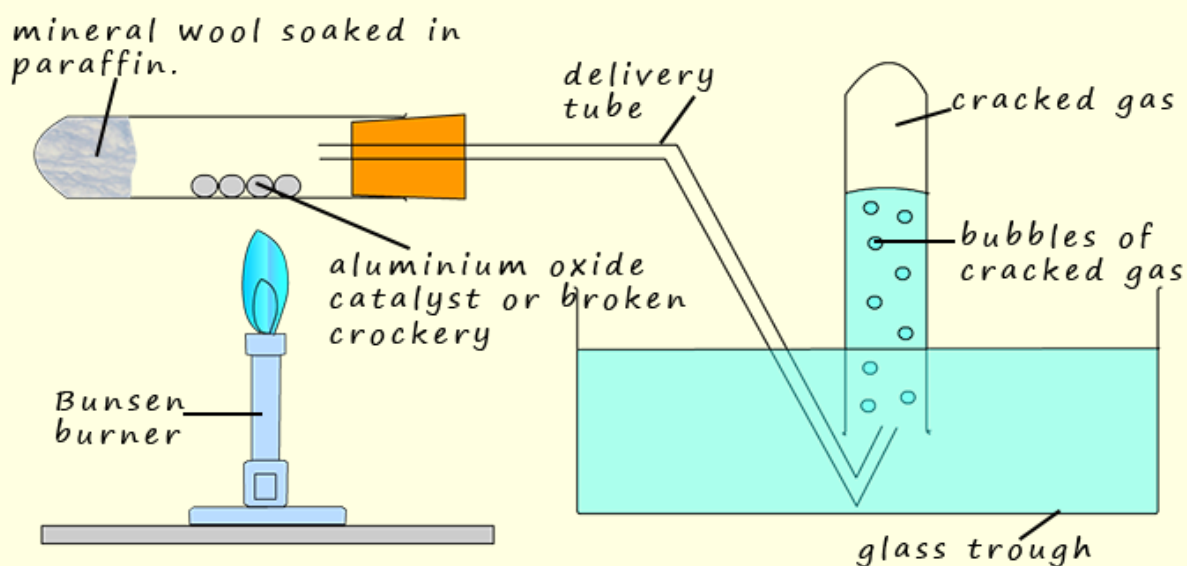
Saturated hydrocarbons have the general formula C_nH_{2n+2}

Unsaturated hydrocarbons have the general formula C_nH_{2n}

4 Why is crude oil refined?

Useless in raw state as it's a mixture, at the refinery many valuable hydrocarbons fractions are obtained from the mixture once it is separated out into its various fractions.

a. What does the diagram below show? Catalytic cracking. The catalyst is heated until it is hot, then the Bunsen flame is passed over the mineral wool soaked in paraffin, this vapourises the paraffin. The hot vapours then pass over the hot catalyst and are cracked. The cracked gas travels along the delivery tube and is collected underwater.



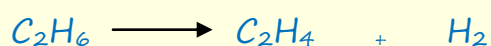
b Which fractions from the oil are in biggest demand? How much of these fractions are produced during distillation? Small chain hydrocarbons like petrol and diesel in largest demand, smallest demand for larger molecules such as waxes and greases. Distillation does produce enough of the small chain hydrocarbons to meet worldwide demand. Distillation produces too much of the larger hydrocarbon molecules.

5 What is cracking? Breaking larger chain molecules into smaller more useful ones.

6 Write word and symbolic equations for the following reactions.

a The cracking of ethane to ethene and hydrogen

ethane \longrightarrow ethene + hydrogen



b The cracking of decane to pentane and pentene.

decane \longrightarrow pentane + pentene



c The cracking of octane to butane and one other product.

octane \longrightarrow butane + butene



d The cracking of nonane to propane and one other product.

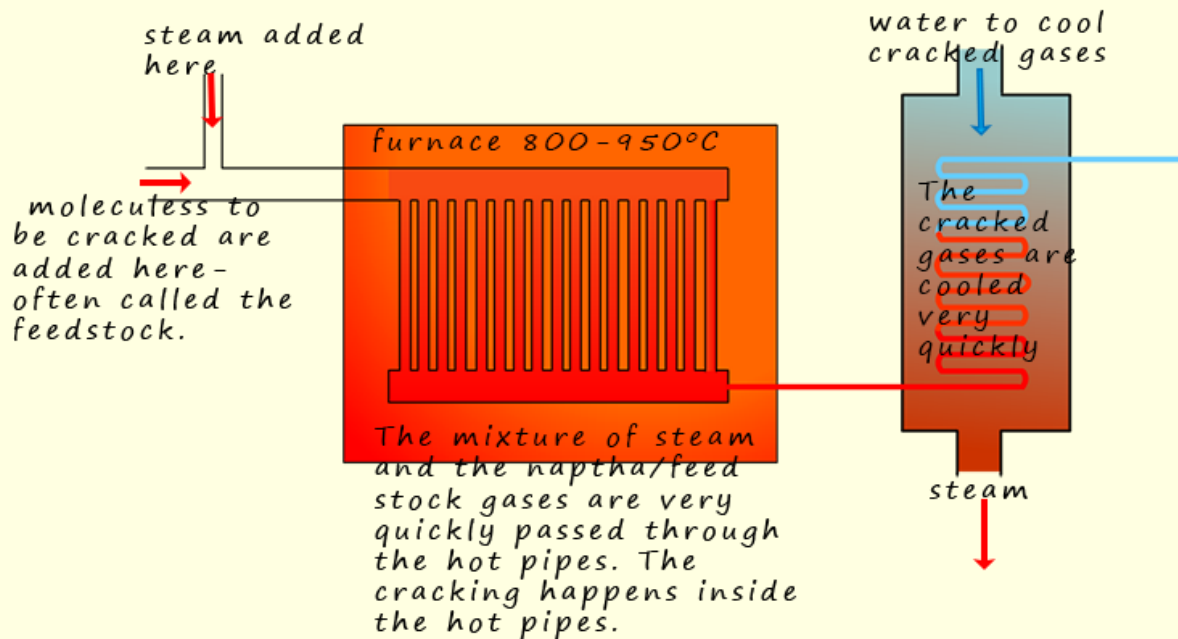
nonane \longrightarrow propane + hexene



7 Why is cracking important?

Turns large unwanted molecules in smaller more useful molecules which are in large demand.

8. What use is made of small unsaturated hydrocarbons produced by cracking? What are they used to make? *Used as starter materials to make polymers/plastics and as a feedstock for the chemical industry.*
9. What is the difference between catalytic and thermal cracking? *Thermal uses heat to shatter or crack the molecules, whereas catalytic cracking uses a catalyst.*
10. How is steam cracking different from catalytic cracking? *No catalyst needed.*



- a. What is steam cracking used to primarily produce? *Ethene and propene for use in polymer manufacture.*