

In Context

Subject area: Organic chemistry

Level: 14–16 years (Higher)

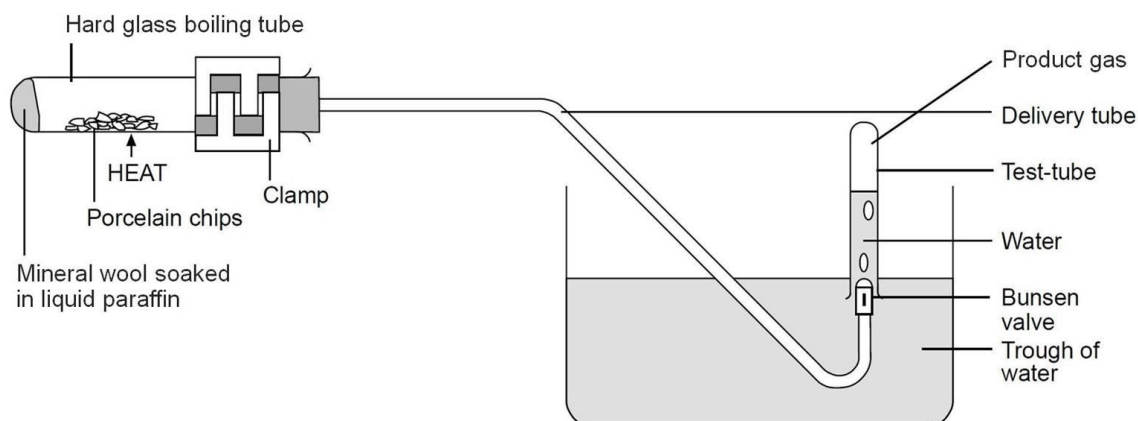
Topic: Cracking hydrocarbons

Source: rsc.li/2SCxbLL

1. A teacher shows a class an experiment in which liquid paraffin is cracked.

Watch the video at <https://youtu.be/ZYyKUePdC2Y>

Here is a diagram of the equipment used.



Source: Royal Society of Chemistry

a) Porcelain chips are used because they catalyse the reaction.

Define 'catalyse'?

b) Using the diagram, what evidence is there that smaller molecules are made in the experiment?

Explain your answer.

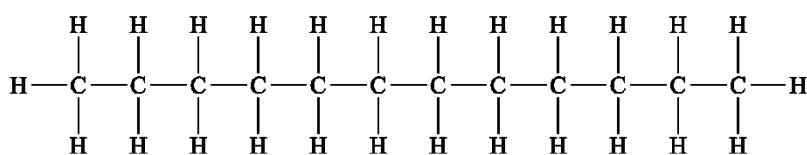
c) Using the diagram, describe how you think the experiment works.

d) What evidence is there from the diagram that the product gas is insoluble in water?

e) Suggest why a special valve called a Bunsen valve is used in the experiment.

Paraffin is a mixture of large hydrocarbon molecules.

The structure of one of these molecules, called dodecane, is shown below.



f) State the molecular formula of dodecane.

Dodecane is a member of a homologous series.

g) Give two characteristics of molecules in a homologous series.

h) To which homologous series does dodecane belong?

i) What is the general formula of the homologous series in part h)?

j) Which of these molecules do not belong to the same homologous series as dodecane?

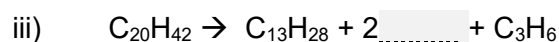
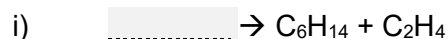
Write 'Yes' or 'No' into the right-hand column in the table.

Molecular formula of substance	The same homologous series as dodecane ('Yes' or 'No')
C_8H_{16}	
$C_{13}H_{28}$	
C_5H_{12}	
$C_{23}H_{46}$	
$C_{50}H_{102}$	

k) Dodecane may be cracked to form smaller alkanes and alkenes.

Write a symbol equation to show dodecane being cracked to form ethene as one of the products, together with a different product.

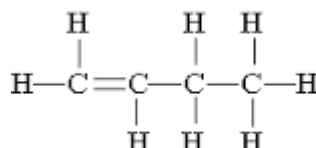
l) Complete the symbol equations for the following cracking processes.



m) State a use for the products formed from a cracking reaction.

Smaller alkanes	<input type="text"/>
Alkenes	<input type="text"/>

The molecule shown below can form from a cracking reaction.



n) What is the name of this molecule?

o) State whether this molecule is saturated or unsaturated.

Give a reason for your answer.