

In context

Subject area: Organic chemistry

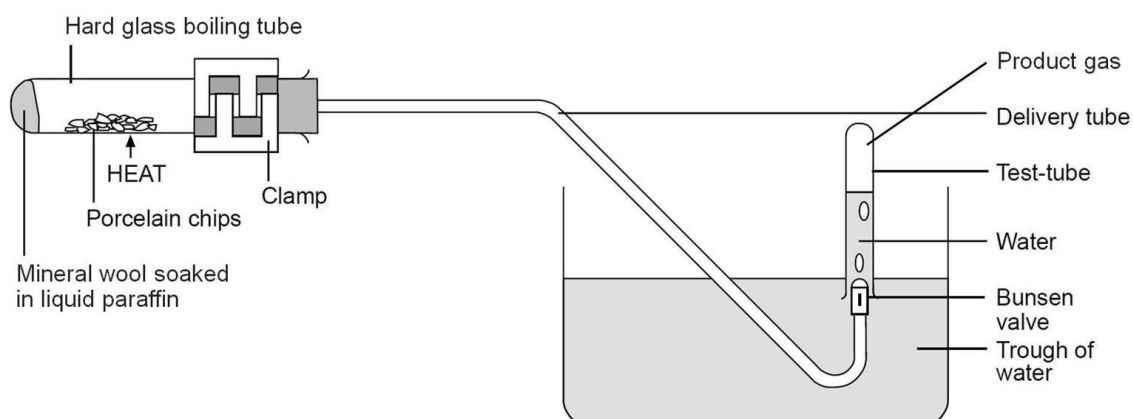
Level: 14–16 years (Foundation)

Topic: Cracking hydrocarbons

Source: [rsc.li/2SCxbLL](https://www.rsc.li/2SCxbLL)

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

Here is a diagram of the equipment used.



Source: Royal Society of Chemistry

a) Suggest what happens to liquid paraffin when it is 'cracked'.

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

What is the meaning of the word 'catalyse'?

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

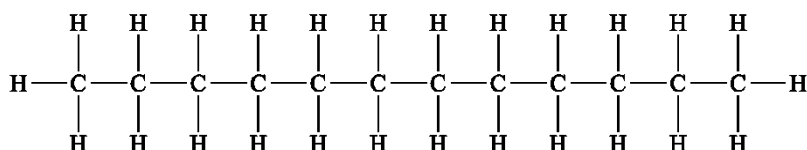
Explain your answer.

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

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

Paraffin is a mixture of large molecules.

The structure of one of these molecules is shown below.



f) Which elements are present in the molecule?

g) What is the name of substances containing the elements in part f)?

h) This molecule is also a member of a homologous series.

What is a homologous series?

i) What is the name of this homologous series?

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

k) The molecule above is called dodecane.

What is the molecular formula of dodecane?

l) 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}	<input type="text"/>
$C_{13}H_{28}$	<input type="text"/>
C_5H_{12}	<input type="text"/>
$C_{23}H_{46}$	<input type="text"/>
$C_{50}H_{102}$	<input type="text"/>

m) The molecules made from cracking long chain molecules can be very useful.

Give a use for these molecules.

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

2. When a long chain molecule is cracked, a substance called ethene is normally made.

a) Draw the structure of an ethene molecule.

b) To which homologous series does ethene belong?

Another molecule that has a similar name to ethene is ethane.

One of these molecules is described as 'saturated' and the other as 'unsaturated'.

c) Define each of these terms?

d) Write 'unsaturated' or 'saturated' in the correct spaces next to the names below:

Ethene	
Ethane	

e) Complete the word equation that shows octane being cracked to make ethene.

Write the name of the other product into the space.

Octane → + ethene