

**REVISION: ORGANIC MOLECULES**
**25 MARCH 2014**

**Lesson Description**

In this lesson we revise:

- Organic Molecules
- Properties of Organic Molecules
- Organic Reactions


**Improve your skills**
**Organic Molecules**
**Question 1**

Draw the structural formulae for the following compounds:

- 1.1. heptane
- 1.2. 2-butene
- 1.3. 2-methylpropene
- 1.4. Methanal
- 1.5. Methyl ethanoate
- 1.6. Propanol

**Question 2**
*(Adapted from November 2010 Paper 2 – Question 3)*

The chemical properties of organic compounds are determined by their functional groups. The letters A to F in the table below represent six organic compounds.

<b>A</b> $  \begin{array}{ccccccc}  & \text{H} & & \text{H} & & \text{H} & & \text{H} \\  &   & &   & &   & &   \\  \text{H} & - & \text{C} = & \text{C} - & \text{C} - & \text{C} - & \text{H} \\  &   & & & &   & &   \\  & \text{H} & & & & \text{H} & & \text{H}  \end{array}  $	<b>B</b> $  \begin{array}{c}  \text{H} \\    \\  \text{H} - \text{C} - \text{H} \\    \\  \text{H} \quad \quad \quad \text{H} \\    \quad \quad \quad   \\  \text{H} - \text{C} - \text{C} - \text{C} - \text{H} \\    \quad \quad   \quad \quad   \\  \text{Br} \quad \text{H} \quad \quad \text{H}  \end{array}  $	<b>C</b> $  \begin{array}{ccccccc}  & & & & \text{H} & & \\  & & & &   & & \\  & & & & \text{H} - \text{C} - \text{H} & & \\  & & & &   & & \\  \text{H} & & \text{H} & & \text{H} & & \text{H} \\    & &   & &   & &   \\  \text{H} - \text{C} - & \text{C} - & \text{C} - & \text{C} - & \text{C} - & \text{C} - & \text{H} \\    & &   & &   & &   \\  \text{H} & & \text{H} & & \text{H} & & \text{H} \\  & & & &   & & \\  & & & & \text{H} - \text{C} - \text{H} & & \\  & & & &   & & \\  & & & & \text{H} & &   \end{array}  $
<b>D</b> Methanal	<b>E</b> $  \begin{array}{ccc}  \text{H} & & \text{O} \\    & &    \\  \text{H} - \text{C} - & \text{C} - & \text{O} - \text{H} \\    & & \\  \text{H} & &   \end{array}  $	<b>F</b> Methyl methanoate

2.1 Write down the letter that represents the following:

- 2.1.1 An alkene
- 2.1.2 An aldehyde

2.2 Write down the IUPAC name of the following

- 2.2.1 Compound B
- 2.2.2 Compound C

2.3 Write down the structural formula of compound D

- 2.4 Write down the IUPAC name of the carboxylic acid shown in the table  
 2.5 Write down the structural formula of compound F.

## Properties of Organic Molecules

### Question 1

(Adapted from Additional Exemplar 2008 – Paper 2)

Hydrocarbons are simple organic compounds. The homologous series called alkanes is one group of hydrocarbons. One physical property of alkanes is shown in the table below.

Name	Boiling point (°C)	Isomer	Boiling point of Isomer (°C)
Methane	-161,0	-	-
Ethane	-88,5	-	-
Butane	-1	Methylpropane	-12
Pentane	34	2-methylbutane	28
Hexane	68,7	2,3-dimethylbutane	58

- 1.1. Define the concept homologous series  
 1.2. Explain the change in boiling points of the alkanes from methane to hexane.  
 1.3. How do the boiling points of the straight chain compounds differ from that their corresponding isomers? Give a reason for this difference.

### Question 2

(Adapted from February / March 2009 – Paper 2)

There are two structural isomers for the organic compound with molecular formula  $C_2H_4O_2$

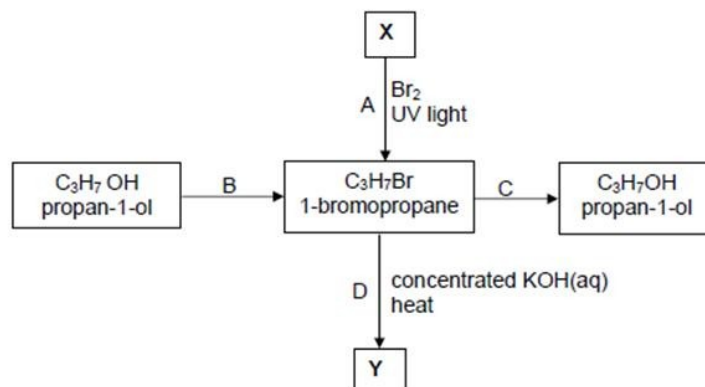
- 2.1. Define the term structural isomer.  
 2.2. Write down the structural formula of these two isomers and next to each its IUPAC name.  
 2.3. State with reach which ONE of these isomers:  
 2.3.1. has the higher boiling point  
 2.3.2. has the higher vapour pressure

## Organic Reactions

### Question 1

(Adapted from Additional Exemplar 2008 – Paper 2)

Some organic reactions are shown in the flow diagram below

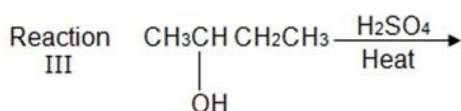
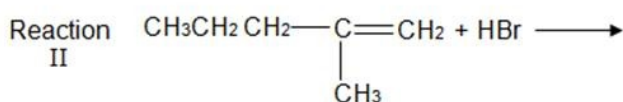
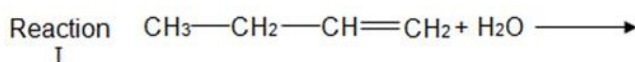


- 1.1. Name the reactions illustrated by A, B, C and D
- 1.2. Use condensed structural formulae to write a balanced equation for reaction C.
- 1.3. Write down the structural formula for compound X.
- 1.4. In order to obtain product Y,  $C_3H_7Br$  is heated with a concentrated solution of KOH under reflux. Use condensed structural formulae to write a balanced equation for the reaction.
- 1.5. A group of learners decide to heat  $C_3H_7Br$  with dilute sodium hydroxide, instead of the concentrated potassium hydroxide, under reflux. Write down the IUPAC name of the organic compound they will obtain.

## Question 2

(Adapted from Feb 2009 – Paper 2)

Most organic compounds can undergo substitution or addition or elimination reactions to produce a variety of organic compounds. Some incomplete organic reactions are represented below:



- 2.1. Name the type of reaction represented by reaction III
- 2.2. Both reactions I and II are examples of addition reactions. Name the type of addition that is represented by each reaction.
- 2.3. Write down the structural formula and IUPAC name of the major product formed in reaction I