



# education

DEPARTMENT: EDUCATION  
MPUMALANGA PROVINCE

**GRADE 12**

**PHYSICAL SCIENCES MONTHLY TEST**

**APRIL 2020**

**TOPIC: ORGANIC MOLECULES**

**QUESTION PAPER**

**MARKS: 55**

**TIME: 1:10 HOURS**

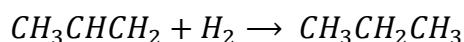
**This question paper consists of 6 pages**

## INSTRUCTIONS

1. Attempt ALL questions
2. Round off your final answers to a minimum of TWO decimal places.
3. Write neatly and legibly.

## QUESTION 1

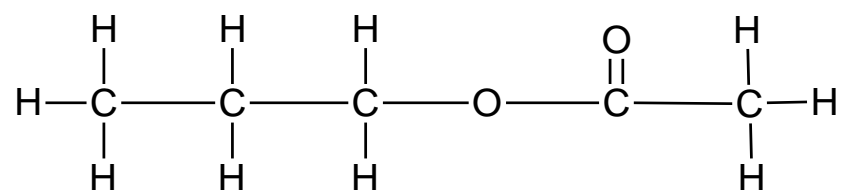
1.1. Consider the reaction represented by the equation below:



This reaction is an example of ...

- A hydration.
- B dehydration.
- C substitution.
- D hydrogenation. (2)

1.2. Consider the structural formula of a compound below.



Which ONE of the following pairs of reactants can be used to prepare this compound in the laboratory?

- A Propanoic acid and ethanol
- B Propanoic acid and methanol
- C Ethanoic acid and propan-1-ol
- D Methanoic acid and propan-1-ol (2)

1.3 Which ONE of the following compounds has dipole-dipole forces between its molecules?

- A Ethanal
- B Ethane
- C Ethene
- D Ethyne (2)

1.4 Which ONE of the following is a product formed during the hydrolysis of bromoethane?

- A Water

- B Ethene  
 C Ethanol  
 D Bromine

(2)

1.5 Which ONE of the following is the EMPIRICAL FORMULA of 1,2-dichloroethane?

- A  $CHCl$   
 B  $CH_2Cl$   
 C  $CHCl_2$   
 D  $C_2H_4Cl_2$

(2)

## QUESTION 2

Consider the following representation of organic molecules **A** to **J** listed in the table below to answer the questions that follow.

<b>A</b>	Butan-2-ol	<b>B</b>	$  \begin{array}{c}  O \\     \\  H - C - O - H  \end{array}  $
<b>C</b>	$  \begin{array}{ccccccc}  & & & CH_3 & & & \\  & & &   & & & \\  CH_3 - & CH_2 - & CH_2 - & C - & CH_3 \\  & & &   & \\  & & & OH &  \end{array}  $	<b>D</b>	$CH_2 = CH - Cl$
<b>E</b>	$  \begin{array}{ccccccc}  & & H & & O & & \\  & &   & &    & & \\  CH_3 - & CH_2 - & C - & C - & H \\  & &   & & & & \\  & & CH_2 & & & & \\  & &   & & & & \\  & & CH_3 & & & &  \end{array}  $	<b>F</b>	$  \begin{array}{ccccccc}  H & H & & O & & & \\    &   & &    & & & \\  H - C - & C - & O - & C - & H \\    &   & & & & & \\  H & H & & & & &  \end{array}  $

<b>G</b>	4-methylpentanoic acid	<b>H</b>	Pentanal
<b>I</b>	$  \begin{array}{c}  \text{H} \quad \text{H} \\    \quad   \\  \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\    \quad   \\  \text{H} \quad \text{H}  \end{array}  $	<b>J</b>	C <sub>4</sub> H <sub>8</sub>

- 2.1 Choose from the list a substance that is used in the laboratory preparation of F. Write down the **LETTER** only. (2)
- 2.2 Which ONE of the above represents a SECONDARY alcohol? (1)
- 2.3 Write down the name for compound **D**. (2)
- 2.4 Write down the letter that represents an aldehyde. (1)
- 2.5 Write down the homologous series to which compounds **B** belongs. (1)
- 2.6 Draw the STRUCTURAL FORMULA of compound **G**. (2)
- 2.7 Draw the STRUCTURAL FORMULA of the functional group for compound **H**. (1)

**[10]**

### QUESTION 3

- 3.1 The boiling point of methane is -161° C and the boiling point of pentane is 36° C.

**Comments made by Nkosi, a Grade 12 learner:**

*"Pentane has a longer carbon chain than methane therefore more bonds need to be broken to separate the molecule into its individual atoms. Breaking of these bonds requires energy which explains why pentane has a higher boiling point than methane."*

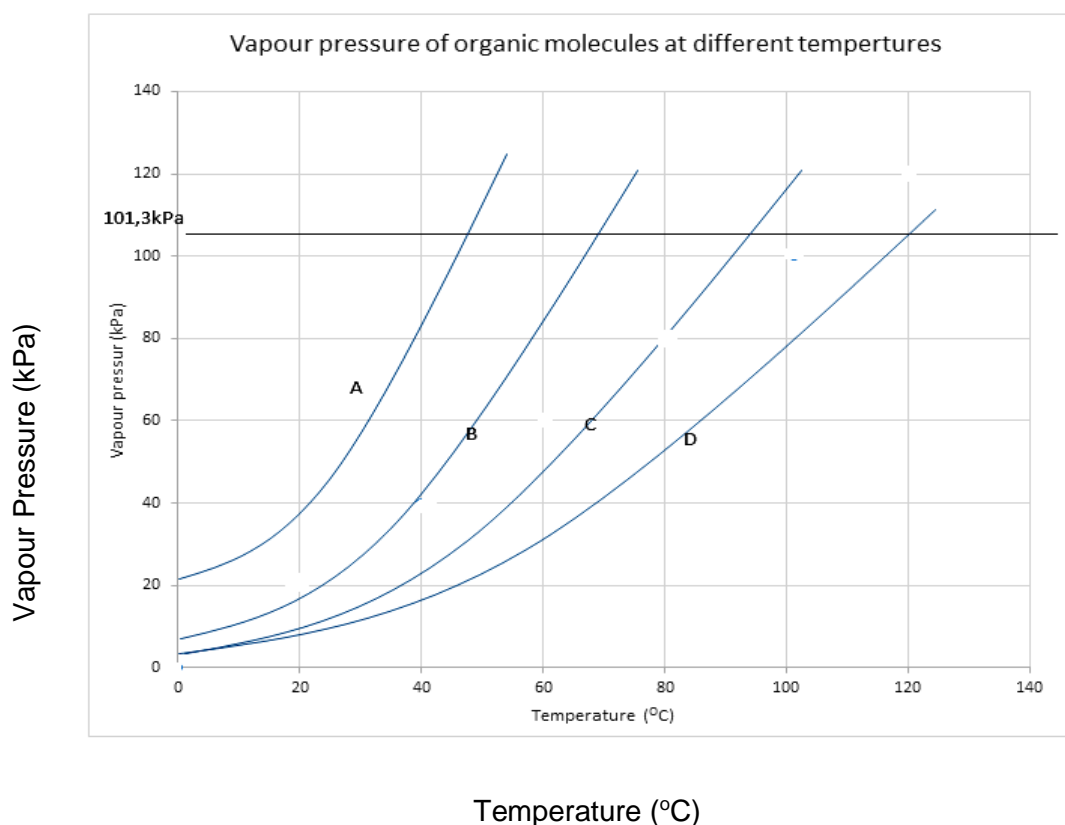
- 3.1.1 Consider Nkosi's explanation and EXPLAIN why it is **INCORRECT**. (1)
- 3.1.2 Provide a correct explanation for the difference in the boiling points. (2)
- 3.1.3 Write down the NAME and draw the STRUCTURAL FORMULA of an isomer of pentane which has a lower boiling point than pentane. (3)

3.2 Draw the STRUCTURAL FORMULAE of the positional isomer of but-1-ene.(2)

The following graph shows the relationship between vapour pressure of organic molecules and temperature. The bold line indicates the external atmospheric pressure. The four curves (**A**, **B**, **C** and **D**) represent the organic molecules belonging to the following homologous series: **an unbranched alkane, a branched alkane, an unbranched primary alcohol and an unbranched aldehyde.**

All four molecules have the same number of C atoms

#### VAPOUR PRESSURE OF ORGANIC COMPOUNDS AT DIFFERENT TEMPERATURES



3.3 Define the term homologous series. (2)

3.4 Which ONE of the four curves (**A**, **B**, **C** or **D**) represents the;

3.4.1 Straight chain alkane (1)

3.4.2 Single branched alkane (1)

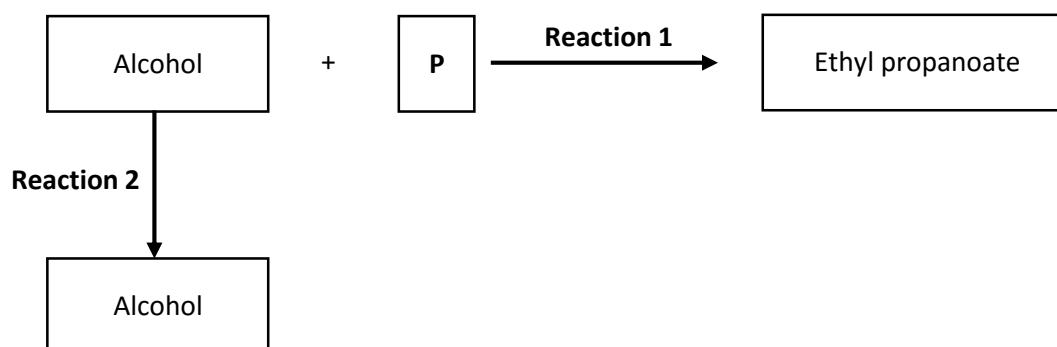
3.5 Fully EXPLAIN your choice in QUESTION 3.4 by referring the TYPE and STRENGTH of the INTERMOLECULAR FORCES. (3)

3.6 Which ONE of the four curves (**A**, **B**, **C** or **D**) represents the

3.6.1 Primary alcohol (1)

**QUESTION 4**

- 4.1 The flow diagram below shows two organic reactions. The letter **P** represents an organic compound.



Use the information in the flow diagram to answer the question that follow.

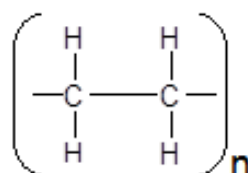
Write down the:

- 4.1.1 Type of reaction of which **Reaction 1** is an example. (1)
- 4.1.2 STRUCTURAL FORMULA of the functional group of ethyl propanoate. (1)
- 4.1.3 IUPAC name of compound **P** (1)
- 4.2 5.325g of an ester contain 3,758g carbon, 0,316g hydrogen and 1,251g oxygen.
- 4.2.1 Determine the empirical formula of this ester. (6)
- 4.2.2 If the molar mass of the ester is  $136\text{g mol}^{-1}$ , what is its molecular formula? (2)

**Reaction 2** takes place in the presence of an acid catalyst and heat.

Write down the:

- 4.3.1 Type of reaction of which **Reaction 2** is an example (1)
- 4.3.2 NAME or FORMULA of the acid catalyst (1)
- 4.3.3 STRUCTURAL FORMULA of the alkene (2)
- 4.4 The condensed formula of a polymer is shown below.



Write down the:

- 4.4.1 STRUCTURAL FORMULA of the monomer that is used to prepare the above polymer. (2)
- 4.4.2 Type of polymerisation reaction (ADDITION or CONDENSATION) that is used to prepare this polymer. (1)