



Education

**KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA**

PHYSICAL SCIENCES P2 (CHEMISTRY)

COMMON TEST

MARCH 2017

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

TIME: 1 hour

MARKS: 50

This question paper consists of 6 pages.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. You may use a non-programmable calculator.
3. You may use appropriate mathematical instruments.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Give brief motivations, discussions, et cetera where required.
6. Round off your final numerical answers to a minimum of TWO decimal places.

QUESTION 1: MULTIPLE CHOICE

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A - D) next to the question number (1.1 – 1.3) in the ANSWER BOOK, for example 1.1 D.

- 1.1 Which one of the following statements best describes why butane is non-polar? (2)
- A Butane contains only single bonds between atoms.
 - B Butane has an even number of carbon atoms.
 - C Butane is a linear molecule hence is symmetrical.
 - D The electronegativity difference between C and H atoms is so small as to be considered non-polar.
- 1.2 Which ONE of the following statements is CORRECT? Alkynes ... (2)
- A have the general formula C_nH_{2n} .
 - B are unsaturated hydrocarbons.
 - C readily undergo substitution reactions.
 - D have one double bond between two carbon atoms.
- 1.3 Which one of the following reaction types describes the conversion of ETHANE to ETHENE? (2)
- A Hydrogenation
 - B Substitution
 - C Dehydrogenation
 - D Addition

[6]

QUESTION 2

The letters **A** to **H** in the table below represent eight organic compounds.

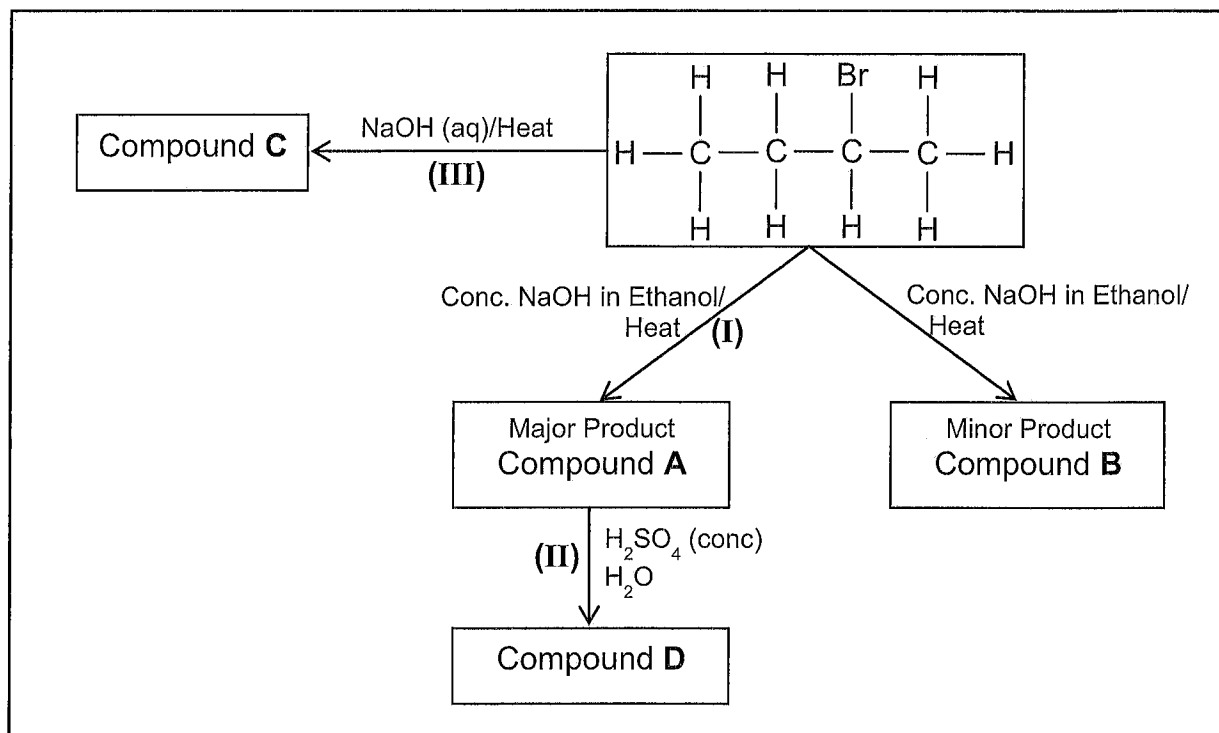
A	$\text{CH}_3\text{C}(\text{CH}_3)_2\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_3$	B	$ \begin{array}{cccccc} & \text{H} & & \text{H} & & \text{H} & & \text{H} & & \text{O} \\ & & & & & & & & & \\ \text{H} & - \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} \\ & & & & & & & & & \\ & \text{H} & & \text{H} & & \text{H} & & \text{H} & & \text{H} \end{array} $
C	$ \begin{array}{c} \text{O}-\text{H} \\ \\ \text{CH}_3\text{C}(\text{CH}_3)\text{CH}_3 \end{array} $	D	CH_2CH_2
E	$ \begin{array}{ccccccc} & & \text{Br} & & & \text{Cl} & \\ & & & & & & \\ \text{H}_2\text{C} & - & \text{CH} & - & \text{CH}_2 & - & \text{CH}_2 \\ & & & & & & \\ & \text{Cl} & & & & & \end{array} $	F	$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{O}-\text{H} \\ \\ \begin{array}{ccccc} \text{H} & & & & \text{H} \\ & & & & \\ \text{H}-\text{C} & - & \text{C} & - & \text{C}-\text{H} \\ & & & & \\ \text{H} & & \text{H} & & \text{H} \end{array} \end{array} $
G	$ \begin{array}{ccccc} & \text{H} & & \text{O} & & \text{H} \\ & & & & & \\ \text{H} & - \text{C} & - & \text{C} & - & \text{C} & - \text{H} \\ & & & & & \\ & \text{H} & & & & \text{H} \end{array} $	H	$\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$

- 2.1 Write down the:
- 2.1.1 Letter that represents a tertiary alcohol. (1)
 - 2.1.2 Name of the homologous series to which compound G belongs. (1)
 - 2.1.3 Letter of the compound that represents a saturated hydrocarbon. (1)
 - 2.1.4 IUPAC name of compound B. (2)
 - 2.1.5 IUPAC name of compound E. (2)
- 2.2 Compound H has two (2) isomers. (2)
- 2.2.1 Write down the structural formula of one of the isomers of compound H. (2)
 - 2.2.2 Write down the IUPAC name of the other isomer of compound H. (2)
(NOT the compound identified in 2.2.1)
 - 2.2.3 What type of isomers are these in relation to compound H? (1)

[12]

QUESTION 3

- 3.1 Study the flow diagram below, which represents various organic reactions, and answer the questions that follow.



- 3.1.1 Give the IUPAC name of compound B. (2)
- 3.1.2 What type of elimination reaction is represented by (I). (1)
- 3.1.3 Use condensed formulae to write down a balanced equation for reaction (II). (3)
- 3.1.4 Using structural formulae, write down a balanced equation for reaction (III). (3)
- 3.2 Learners are required to prepare butyl propanoate in the laboratory.

The following procedure is followed:

- 2 ml of reactant A (organic acid) and 2 ml of the reactant B (alcohol) are placed in a test tube.
- The test tube is then heated in a water bath.

- 3.2.1 Give the IUPAC name of the alcohol used in this preparation. (2)
- 3.2.2 Draw the structural formula for the organic acid used in this preparation. (2)
- 3.2.3 Will the learners be able to smell the product immediately? Give a reason. (2)
- 3.2.4 Why is the test tube heated in a water bath and not over an open flame. (1)

[16]

QUESTION 4

A group of learners investigated the boiling points of four (4) alcohols. Their results are given in the table below.

Name of compound	Boiling points (°C)
propan-1-ol	97
butan-1-ol	117
pentan-1-ol	137
hexan-1-ol	157

- 4.1 Write down an investigative question for this investigation. (2)
- 4.2 State one variable, besides atmospheric pressure, that must be kept constant for this investigation. (1)
- 4.3 Define boiling point. (2)
- 4.4 Explain the trend in boiling points in this investigation. (3)
- 4.5 Which of these alcohols will have the lowest vapour pressure? (2)
- Give a reason.

[10]**QUESTION 5**

Polymerisation is the formation of macromolecules by the joining together of a large number of monomers. One such process results in the formation of polyethene.

- 5.1 Define a monomer. (2)
- 5.2 Name the type of polymerisation that takes place here. (1)
- 5.3 Draw the structural formula of the monomer of polyethene. (2)
- 5.4 Give one use of polyethene. (1)

[6]**TOTAL MARKS: [50]**

Relative Atomic Masses C – 12 O – 16 H – 1



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MEMORANDUM

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This memorandum consists of 3 pages.

QUESTION 1: MULTIPLE CHOICE

- 1.1 C ✓✓ (2)
1.2 B ✓✓ (2)
1.3 C ✓✓ (2) [6]

QUESTION 2

- 2.1
2.1.1 C ✓ (1)
2.1.2 Ketone ✓ (1)
2.1.3 A ✓ (1)
2.1.4 Pentanal ✓✓ (2)
2.1.5 2-bromo-1,4-dichlorobutane ✓✓ (2)



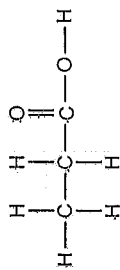
- 2.2.2 Ethyl methanoate ✓✓ (2)
2.2.3 Functional group isomers ✓ (1) [12]

QUESTION 3

- 3.1 3.1.1 But-1-ene ✓✓ (2)
3.1.2 Dehydrohalogenation ✓ (1)
3.1.3 $\text{CH}_3\text{CH}=\text{CHCH}_3 + \text{H}_2\text{O} \xrightarrow{\text{H}_2\text{SO}_4}$ Balancing (3)
3.1.4
- $$\begin{array}{c} \text{H} & \text{H} & \text{H} & \text{H} \\ | & | & | & | \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ | & | & | & | \\ \text{H} & \text{Br} & \text{H} & \text{H} \end{array} + \text{NaOH} \longrightarrow \begin{array}{c} \text{H} & \text{H} & \text{H} & \text{H} \\ | & | & | & | \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ | & | & | & | \\ \text{H} & \text{O} & \text{H} & \text{H} \end{array} + \text{NaBr} \quad \checkmark$$
- ✓ Balancing (3)

3.2 3.2.1 Butan-1-ol ✓✓ (2)

3.2.2



✓ functional group
✓ whole structure correct

(2)

3.2.3 No. ✓

The catalyst was not added. ✓

OR

 H_2SO_4 (conc) was not added. ✓ OR reaction is very slow. ✓

(2)

3.2.4 The alcohol is highly flammable. ✓

(1)

[16]

QUESTION 4

4.1 How does the boiling point of alcohols vary with an increase in chain length/
molecular mass? ✓✓ (2)

4.2 All the alcohols are primary alcohols. ✓ (1)

4.3 Boiling point is the temperature at which a compound's vapour pressure is
equal to the atmospheric pressure. ✓✓ (2 or 0) (2)

4.4 As the chain length/ molecular mass increases boiling point increases. ✓

The van der Waals forces increases. or intermolecular forces strength
increases ✓ (3)More energy is needed to separate the chains or more energy is needed to
break the intermolecular bond (overcome the intermolecular forces). ✓

4.5 Hexan-1-ol ✓

It has the highest boiling point. ✓

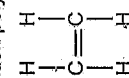
(2)

[10]

QUESTION 5

5.1 Small organic molecules that can be covalently bonded to each other in a
repeating pattern. ✓✓ (2)Unit molecule resulting in the formation of a repeating pattern in a large
molecule.

5.2 Addition polymerisation. ✓ (1)



5.4 Manufacture of plastic bags. ✓

Manufacture of plastic bottles. ✓ (any 1)

(1)

[6]

TOTAL MARKS:

[50]