



Basic Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES P2: CHEMISTRY

COMMON TEST

MARCH 2015

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MARKS: 50

TIME : 1 hour

This question paper consists of 9 pages

INSTRUCTIONS AND INFORMATION TO CANDIDATES

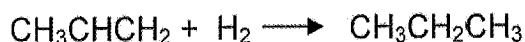
1. This question paper consists of **FIVE** questions.
2. Answer **ALL** the questions in the ANSWER BOOK.
3. This question paper consists of **TWO** sections:

SECTION A	(8 marks)
SECTION B	(42 marks)
4. Start EACH question on a NEW page in the ANSWER BOOK.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Leave ONE line between two sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
7. Give brief motivations, discussions, et cetera where required.
8. Write neatly and legibly.

SECTION A**QUESTION 1: MULTIPLE-CHOICE**

Four possible options are provided as answers to the following questions. Each question has only ONE correct answer. Choose the answer and write ONLY the letter (A – D) next to the question number (1.1 – 1.4) in the ANSWER BOOK.

1.1 Consider the reaction:

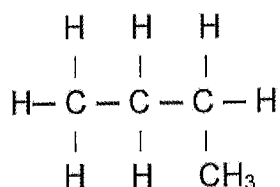


This reaction can be classified as ...

- A. hydration
- B. substitution
- C. dehydration
- D. hydrogenation

(2)

1.2



The name of the above compound is:

- A. propane
- B. 3-methylpropane
- C. butane
- D. 1-methylpropane.

(2)

1.3 Which one of the following statements concerning PROPANE is **INCORRECT**?

- A. It has a higher boiling point than ethane.
- B. Its general formula is C_nH_{2n} .
- C. It is a saturated compound.
- D. Its reaction with oxygen is strongly exothermic.

(2)

1.4 Polymers are made of giant molecules composed of repeating units called

- A isomers.
- B hydrocarbons.
- C both A and B.
- D monomers.

(2)

[8]

TOTAL SECTION A:

[8]

SECTION B

QUESTION 2

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

<p style="text-align: center;">A</p> $\text{HC}\equiv\text{CCH}_2\text{CH}_3$	<p style="text-align: center;">B</p> $\begin{array}{c}\text{CH}_3\text{CH}_2\text{CHCH}_3 \\ \\ \text{OH}\end{array}$
<p style="text-align: center;">C</p> $\begin{array}{c}\text{CH}_3 \\ \\ \text{CH}_2=\text{C}-\text{CH}_2 \\ \\ \text{CH}_3\end{array}$	<p style="text-align: center;">D</p> $\begin{array}{c}\text{O} \\ \\ \text{CH}_3\text{CCH}_3\end{array}$
<p style="text-align: center;">E</p> $\left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right)_n$	<p style="text-align: center;">F</p> $\begin{array}{c}\text{CH}_3\text{CH}_2\text{CH}_2\text{CHCH}_3 \\ \\ \text{CH}_3\end{array}$

- 2.1 Write down the IUPAC name of compound **A**. (2)
- 2.2 Draw the structural formula for an isomer of **B** that is a tertiary alcohol. (2)
- 2.3 In the above compounds, identify the alkene (write down **ONLY** the letter). (1)
- 2.4 Write down the IUPAC name of compound of **D**. (2)
- 2.5 Draw the structural formula for a functional isomer of compound **D**. (2)
- 2.6 Write down the general formula for the group of compounds to which **A** belongs. (1)
- 2.7 Name the type of polymerisation that produces **E**. (1)
- 2.8 Name the products formed from the combustion of **A**. (2)

- 2.9 A student uses bromine water to distinguish between compounds C and F. She adds bromine water to each in two different test tubes. The test tubes are labelled **X** and **Y**. She makes the following observations for each of the test tubes:

X : decolourises bromine water immediately.

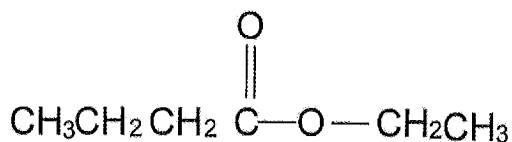
Y : decolourises bromine water only after placing the test tube in the sunlight.

- 2.9.1 Which compound, C or F, is in test tube **X**? (1)
- 2.9.2 Name the type of reaction taking place in test tube **Y**.
(Choose from: **Addition** , **Substitution** or **Elimination**) (1)
- 2.9.3 Write down the structural formula of the organic product formed in test tube **Y**. (2)
- 2.9.4 Why would chlorine water NOT be suitable to conduct this investigation? (2)

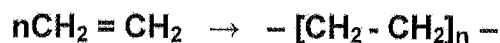
[19]

QUESTION 3

Esters are formed from the reaction of an alcohol and a carboxylic acid.



- 3.1 Write down the IUPAC name of the above ester. (2)
- 3.2 Write down the NAME of the:
- 3.2.1 carboxylic acid and the (1)
- 3.2.2 alcohol that is used in the synthesis of this ester. (1)
- 3.3 Name the catalyst that is used in this reaction. (1)
- 3.4 What is the **NAME or FORMULA** of the inorganic product that is formed during this reaction? (1)
- 3.5 Draw the structure of the carboxylic acid which is an isomer of the above ester (2)
- 3.6 The polymerisation of ethene to produce polythene is represented by the equation below:



- 3.6.1 Define the term *macromolecule*. (1)
- 3.6.2 Name **ONE** industrial use of polythene. (1)

[10]

QUESTION 4

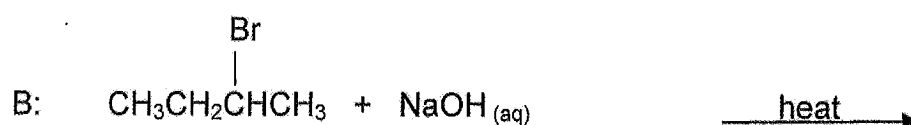
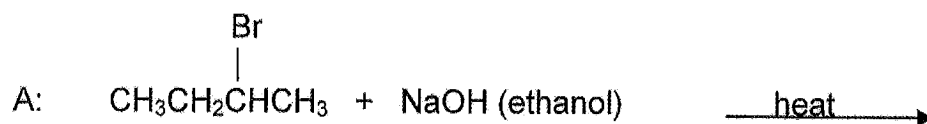
Three hydrocarbons (A, B and C) with a molecular formula C_5H_{12} are used to investigate the effect of **chain length** on the **boiling point** of hydrocarbons. The results obtained are given in the table below.

HYDROCARBON	BOILING POINT ($^{\circ}C$)
A	36
B	28
C	10

- 4.1 What is a hydrocarbon? (1)
- 4.2 Are these hydrocarbons saturated or unsaturated? **Give a reason for your answer.** (2)
- 4.3 Write down a possible structural formula for **B**. (2)
- 4.4 Explain why hydrocarbon **C** has the lowest boiling point. In the explanation refer to the MOLECULAR STRUCTURE of the compound, INTERMOLECULAR FORCES and the ENERGY required. (3)
- 4.5 How will the vapour pressure of compound **A** compare to that of butan-1-ol? (Write down only **HIGHER THAN** or **LOWER THAN** or **EQUAL TO**). (1)
- [9]

QUESTION 5

Consider the following two organic reactions:



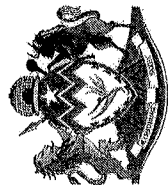
5.1 Write down the IUPAC name of the major organic product in reaction A. (2)

5.2 In terms of the types of reactions, how is reaction A differ from reaction B? (2)

[4]

TOTAL SECTION B = [42]

GRAND TOTAL = [50]



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PHYSICAL SCIENCES P2: (CHEMISTRY)

MEMORANDUM

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N.B. This memorandum consists of 4 pages including this page.

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Physical Sciences/P2

2
NSC - Memorandum

March 2015 Common Test

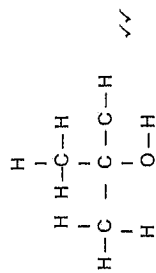
QUESTION 1

- 1.1 D✓✓ (2)
1.2 C✓✓ (2)
1.3 B✓✓ (2)
1.4 D✓✓ (2)

[08]

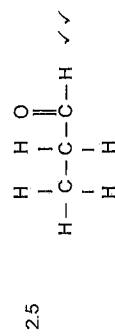
QUESTION 2

2.1 but-1-yne✓ (2)



2.3 C ✓ (1)

2.4 propanone ✓✓ (2)



2.6 $\text{C}_n\text{H}_{2n-2}$ ✓ (1)

2.7 Addition ✓ (1)

2.8 carbon dioxide✓ and water ✓ (2)

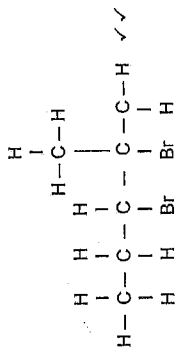
2.9.1 C ✓ (1)

2.9.2 Substitution ✓ (1)

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2.9.3



2.9.4 Chlorine water is colourless✓, colour change will not be detected. ✓

QUESTION 3

3.1 ethyl✓ butanoate ✓

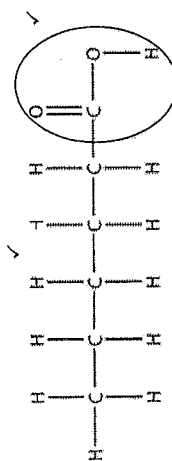
3.2.1 butanoic acid ✓

3.2.2 Ethanol ✓

3.3 Sulphuric acid ✓

3.4 Water or H₂O ✓

3.5



3.6.1 a molecule containing a large number of atoms ✓

3.6.2 (Any ONE)

used to make plastic bags / squeeze bottles /clingwrap ✓

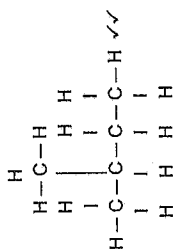
QUESTION 4

4.1 Compound consisting of carbon and hydrogen ONLY. ✓ (1)

4.2 Saturated ✓

The molecular formula satisfies the general formula, C_nH_{2n+2} OR
 All carbon-to-carbon bonds are only single bonds OR
 Every carbon atom is bonded to four other atoms.

4.3



4.3

Molecular structure:

Compound C has more substituents than A and B / has increased branching /
 has a decreased surface area. ✓

Intermolecular forces:

Less or weaker intermolecular forces / London forces. ✓

Energy

Less energy required to break intermolecular forces/ London forces. ✓

4.5 Higher than ✓

QUESTION 5

5.1 but✓-2-ene✓ (2)

5.2 A : dehydrohalogenation / elimination ✓

B : hydrolysis / substitution ✓