



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

MOGALAKWENA DISTRICT

PHYSICAL SCIENCES

GRADE 12

NATIONAL SENIOR CERTIFICATE

TOPIC TEST
ORGANIC REACTIONS
2026 TERM 1

stanmorephysics.com

MARKS: 60

DURATION: 1hr: 20min

INSTRUCTIONS AND INFORMATION

1. Answer ALL questions in the
2. Number the answers correctly according to the numbering system used in this question paper.
3. Leave one line between two sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
4. Give brief motivations, discussions, et cetera where required.
5. Write neatly and legibly.

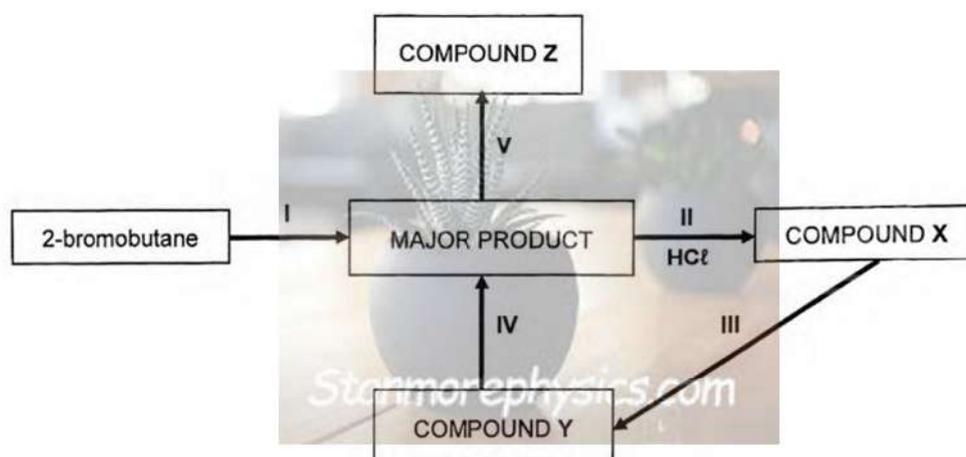
QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write down only the letter A, B, C or D next to the question number (1.1) in your ANSWER SHEET/BOOK.

1.1	When butane is subjected to high temperatures and pressures, the following reaction takes place: Butane \rightarrow methane + Y Which ONE of the following represents Y? A CHCCH ₃ B CH ₂ CHCH ₃ C CH ₃ CH ₂ CH ₃ D CH ₃ CHCHCH ₃	(2)
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QUESTION 2

In the flow diagram below, I, II, III, IV and V are organic reactions. X, Y and Z represent organic compounds.

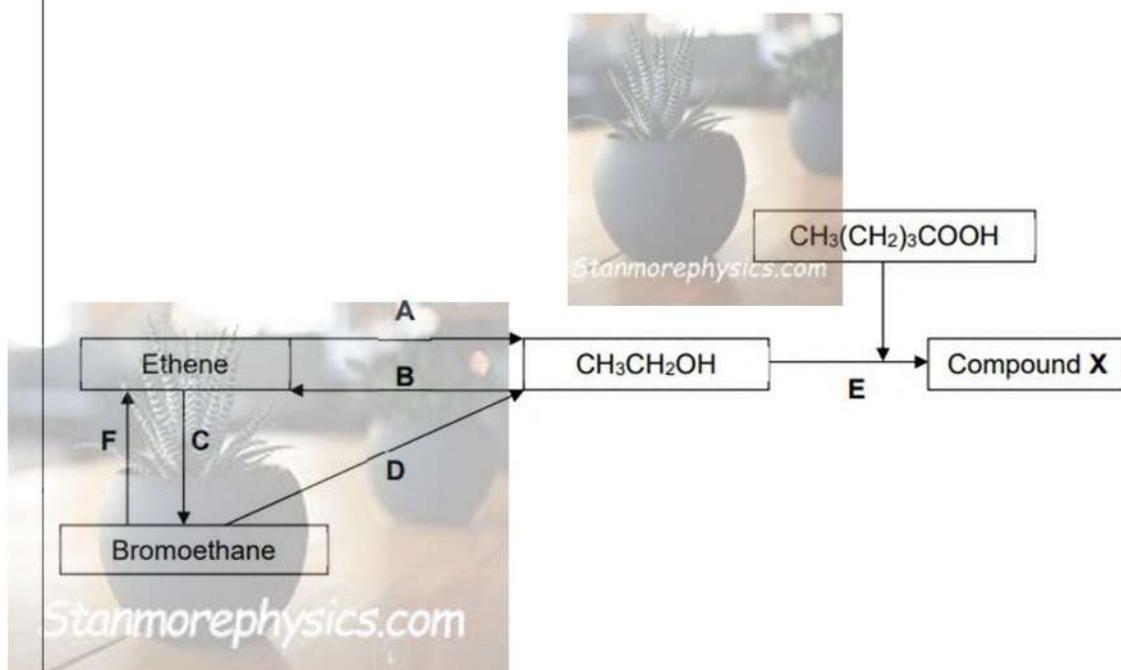


2.1	Reaction I is an elimination reaction	
2.1.1	Name the type of elimination reaction taking place.	(2)
2.1.2	2.1.2 Write down the structural formula for the MAJOR PRODUCT formed.	(2)
2.1.3	Write down the balanced equation for the reaction using MOLECULAR FORMULAE.	(3)
2.2	Reaction II is an addition reaction Write down the IUPAC name of COMPOUND X	(2)
2.3	In reaction III, COMPOUND X, is heated with dilute sodium hydroxide.	
2.3.1	Name the type of reaction taking place.	(1)
2.3.2	Write down the IUPAC name of COMPOUND Y.	(1)
2.4	In reaction IV, COMPOUND Y, is heated under reflux with concentrated sulfuric acid	
2.4.1	Name the type of reaction taking place.	(2)
2.4.2	Write down the NAME or FORMULA of the INORGANIC product formed	(1)
2.5	Compound Z is a saturated hydrocarbon.	

2.5.1	Name the type of addition reaction represented by reaction V.	(2)
2.5.2	Write down the NAME or FORMULA of the catalyst used in reaction V.	(1)
		(0)

QUESTION 4

The flow diagram below shows how ethene can be used to prepare various organic compounds. The letters A to F represent different organic reactions.



4.1	Identify the type of reaction represented by:	
4.1.1	B	(1)
4.1.2	D	(1)
4.2	Write down TWO reaction conditions for reaction B.	(1)

4.3	For reaction A, write down the:	
4.3.1	NAME of the inorganic reaction.	(1)
4.3.2	CHEMICAL FORMULA of the catalyst needed.	(1)
4.4	For reaction C:	
4.4.1	Use STRUCTURAL FORMULAE and write down a balanced chemical equation.	(3)
4.4.2	Explain why no water should be present during this reaction.	(1)
4.5	Reaction E represents the conversion of alcohol into organic compound X. Write down the:	
4.5.1	Type of reaction.	(1)
4.5.2	CHEMICAL FORMULA of the catalyst needed.	(1)
4.5.3	STRUCTURAL FORMULA of compound X.	(1)
<p>The flow diagram below shows how ethene can be used to prepare various organic compounds. The letters A to F represent different organic reactions.</p>		

4.5	<p>Reaction E represents the conversion of alcohol into organic compound X.</p> <p>Write down the:</p>	
4.5.4	<p>IUPAC name of compound X.</p>	2
4.6	<p>Reaction F takes place in the presence of warm, concentrated NaOH. Use CONDENSED STRUCTURAL FORMULAE and write down a balanced equation for the reaction.</p>	3
4.7	<p>Large straight-chained alkanes can be catalytically cracked to produce shorter- chained alkenes and branched alkanes which are more suitable for use in petrol. The reaction below indicates the catalytic cracking of octane.</p> <p>$\text{CH}_3(\text{CH}_2)_6\text{CH}_3 \rightarrow \text{CH}_2=\text{CH}_2 + \text{Compound Y}$</p>	
4.7.1	<p>Write down the IUPAC name of compound Y.</p>	1
4.7.2	<p>Briefly explain why shorter-chained alkenes and branched alkanes are more suitable for use in petrol than large straight- chained alkanes.</p>	2

(2 2)

QUESTION 3

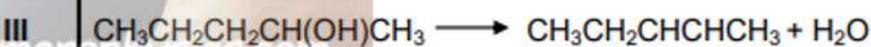
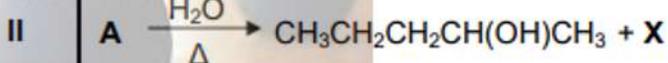
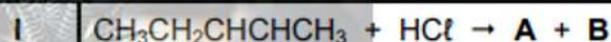
3.1 Consider the cracking reaction below.



3.1.1 Define cracking. (2)

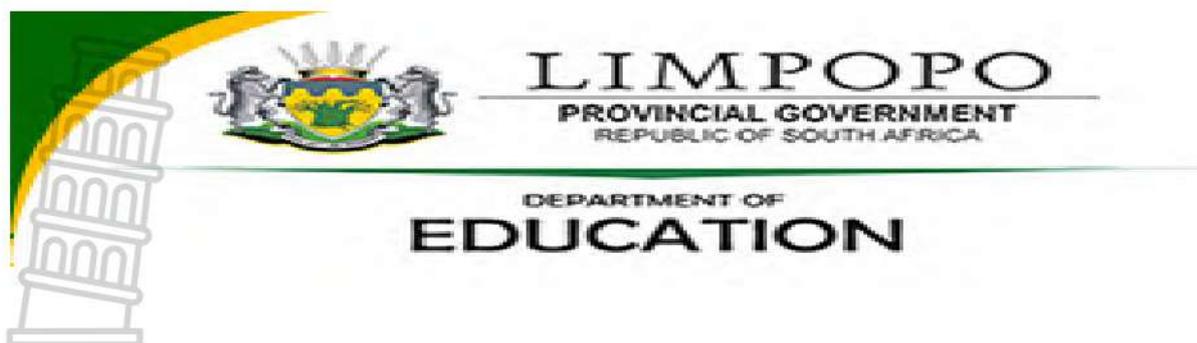
3.1.2 Write down the values represented by **x**, **y** and **z** in the equation above. (3)Compound C_6H_{14} undergoes complete combustion.

3.1.3 Using MOLECULAR FORMULAE, write down the balanced equation for this reaction. (3)

3.2 Consider the equations for reactions I to III below
A and **B** represent organic compounds that are POSITIONAL ISOMERS. **X** is an inorganic product.

	Write down the:	
3.2.1	Definition of <i>positional isomers</i> .	(2)
3.2.2	Type of reaction represented by reaction I.	(1)
3.2.3	STRUCTURAL formula of compound B.	(3)
3.2.4	Formula of X	(1)
3.2.5	Inorganic reagent for reaction III.	(1)
	Compound A can be converted directly to the organic product of reaction III.	
3.2.6	Besides heat, write down the reaction condition needed for this conversion.	(1)
3.2.7	Write down TWO terms that describe this type of reaction.	(2)
		(19)

TOTAL: 60 MARKS



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MARKING GUIDELINE

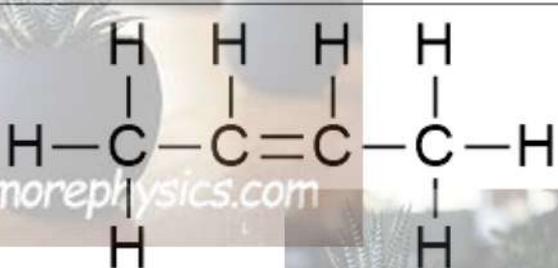
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QUESTION 1

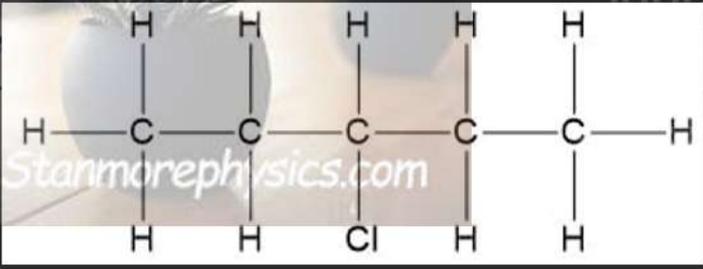
1.1	B	(2)
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QUESTION 2

2.1.1	Dehydration ✓✓	(2)
2.1.2	 <p>✓✓</p> <p>Marking criteria</p> <ul style="list-style-type: none"> • Functional ground correctly 1/2 • While structure 2/2 	(2)
2.1.4	$C_4H_9Br + NaOH \rightarrow C_4H_8 + NaBr + H_2O$ LHS ✓ RHS ✓ BAL ✓ NOTE: if structural formula used, max 2/3	(3)
2.4	2-chlorobutane ✓✓	(2)
2.3.1	Hydrolysis or substitution ✓	(2)
2.3.2	butan-2-ol ✓✓	(2)
2.4.1	Elimination or dehydration ✓	(2)

2.4.2	water ✓	(1)
2.5.1	hydration ✓	(1)
2.5.2	Platinum/Pt or Nickel/Ni or Palladium /Pd ✓	(1)
		[14]

QUESTION 3

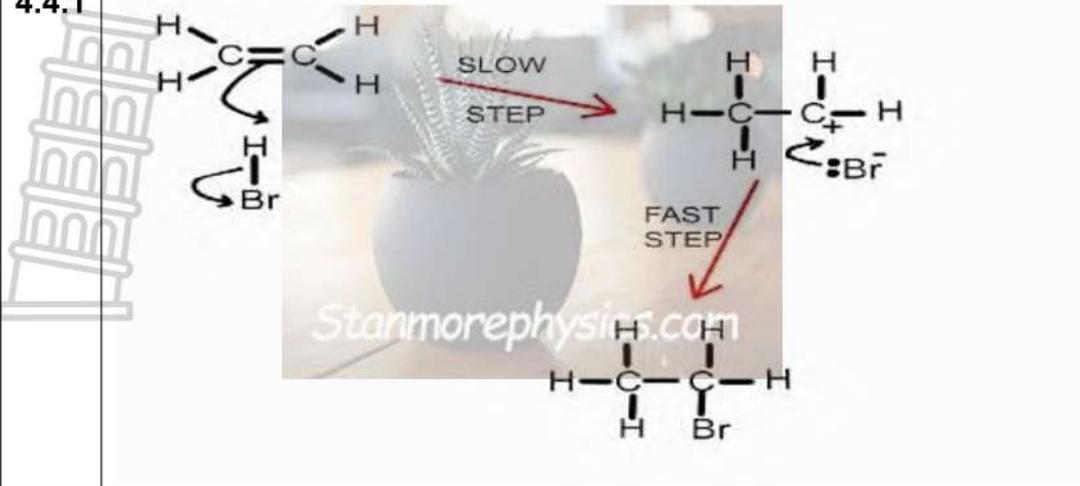
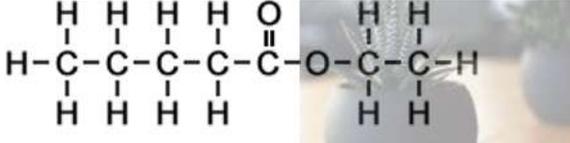
3.1.1	The chemical process in which longer chain hydrocarbon molecules are broken down to shorter (more useful) molecules. ✓✓	(2)
3.1.2	X = 12 ✓ Y = 2 ✓ Z = 4 ✓	(3)
3.1.3	$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$ ✓ Bal ✓	(3)
3.2.1	Compounds with same molecular formula, but different positions of the side chain, substituents or functional groups on the parent chain. ✓✓	(2)
3.2.2	Addition/ hydrohalogenation/ hydrochlorination ✓	(1)
3.2.3	 <p style="text-align: center;">○ ○</p>	(3)

	<ul style="list-style-type: none"> • Chlorine atom bonded to any C atom✓ • Correct functional group on third C- atom✓ • Whole structure correct. ✓ 	
3.2.4	HCl✓	(1)
3.2.5	Concentrated sulphuric acid✓	(1)
3.2.6	<p>Concentrated strong base/ concentrated NaOH/KOH/LiOH/sodium hydroxide/ potassium hydroxide/ lithium hydroxide.</p> <p>OR</p> <p>Strong base/ NaOH/KOH/ Sodium hydroxide/ potassium hydroxide/ lithium hydroxide in ethanol.</p>	(1)
3.2.7	<p>Elimination ✓</p> <p>Dehydrohalogenation/Dehydrochlorination✓</p>	(2)
		(19)

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QUESTION 4

4.1.1	Elimination ✓	
4.1.2	Substitution ✓	
4.2.	<ul style="list-style-type: none"> • Catalyst✓ • heat✓ 	
4.3		
4.3.1	water✓	
4.3.2	H_2SO_4/H_3PO_4 ✓	

4.4.1		(3)
4.4.2	To avoid the formation of the hydroxyl group ✓	(1)
4.5.1	Esterification ✓	(1)
4.5.2	Concentrated sulphuric acid ✓	(1)
4.5.3		(4)
4.5.4	Ethyl ✓ pentanoate ✓	(2)
4.6	$CH_3CH_2Br + NaOH \checkmark \checkmark \rightarrow CH_2CH_2 \checkmark + H_2O + NaBr \checkmark$	(3)
4.7.1	Hexane or 2-methylpentane.	(1)
4.7.2	In shorter chained alkenes and branched alkanes, the surface area is less ✓ / will have weaker I.M.F / less activation energy / more flammable / higher vapour pressure.	(2)
		(22)