



education

Department:
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PROVINCE OF KWAZULU-NATAL

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**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

PHYSICAL SCIENCES P2 (CHEMISTRY)

COMMON TEST

MARCH 2020

MARKS : 50

TIME : 1 Hour

This question paper consists of 7 pages and 2 data sheets.

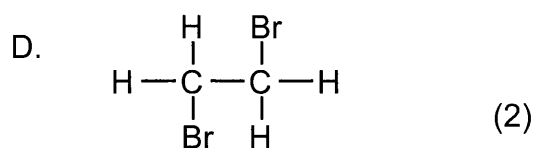
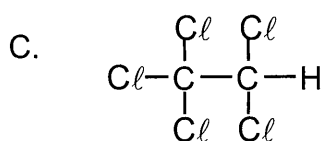
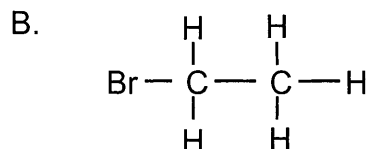
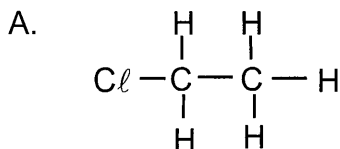
INSTRUCTIONS AND INFORMATION TO CANDIDATES

1. Write your name in the ANSWER BOOK.
2. Answer ALL the questions in the ANSWER BOOK.
3. This question paper consists of FIVE questions.
4. Start EACH question on a NEW PAGE in the ANSWER BOOK.
5. You may use a non-programmable calculator.
6. Number the answers correctly, according to the numbering system used in this question paper.
7. DATA SHEETS and periodic table are attached for your use.
8. Show ALL formulae and substitutions in ALL calculations.
9. Give brief motivations, discussions, et cetera where required.
10. Write neatly and legibly.

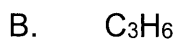
QUESTION 1

Four options are provided as possible answers to the following questions. Each question has only **ONE** correct answer. Choose the answer and write only the letter A, B, C or D next to the question number in the ANSWER BOOK, e.g. 1.5 A

1.1 Which ONE of the following compounds has structural isomers?



1.2 Which of the following organic compounds will **NOT** rapidly decolourise a solution of bromine water?



1.3 Cracking is a type of ...

A. substitution reaction

B. elimination reaction

C. addition reaction

D. esterification reaction (2)

[3 x 2 = 6]

QUESTION 2

The letters A to F in the table below represent six organic compounds. Use the information in the table to answer the questions that follow.

A	But-1-ene	B	hexan-2-one	C	$ \begin{array}{c} \text{H} \\ \\ \text{CH}_3 - \text{C} - \text{CH}_3 \\ \\ \text{OH} \end{array} $
D	$ \begin{array}{c} \text{CH}_2\text{CH}_3 \\ \\ \text{CH}_3\text{CH}_2 - \text{C} - \text{CH}_2\text{CH}_3 \\ \\ \text{CH}_2\text{CH}_3 \end{array} $	E	$ \begin{array}{ccccc} \text{H} & \text{O} & & \text{H} & \\ & & & & \\ \text{H} - \text{C} - & \text{C} - \text{O} - & \text{C} - \text{H} & & \\ & & & & \\ \text{H} & & \text{H} & & \end{array} $	F	$ \begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{C} - \text{CH}_3 \\ \\ \text{OH} \end{array} $

2.1 Write down the LETTER that represents the following:

2.1.1 A ketone. (1)

2.1.2 A tertiary alcohol. (1)

2.1.3 An unsaturated alkane. (1)

2.2 Write down the IUPAC name of:

2.2.1 Compound **D**. (2)

2.2.2 Compound **F**. (2)

2.3 Write down the STRUCTURAL FORMULA for the following:

2.3.1 The polymer formed for Compound **A**. (2)

2.3.2 A FUNCTIONAL isomer for compound **E**. (2)

[11]

QUESTION 3

Three bottles contain pentane, pentanal and pentan-1-ol at room temperature. The molecular formula, molecular mass and vapour pressure for each compound is given in the table below.

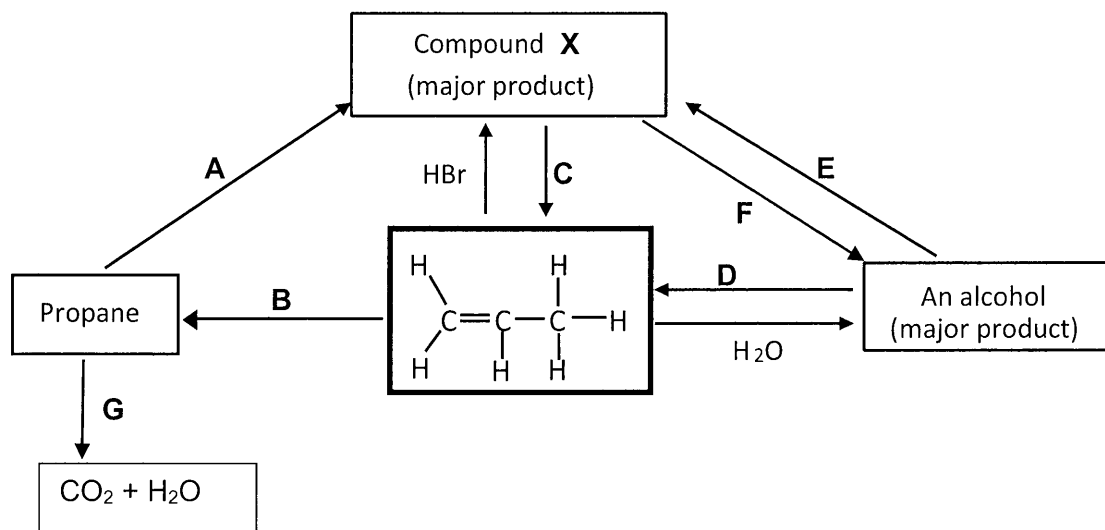
ORGANIC COMPOUND	MOLECULAR FORMULA	MOLAR MASS(g.mol ⁻¹)	VAPOUR PRESSURE (kPa) at 20°C
Pentane	C ₅ H ₁₂	72	60
Pentanal	C ₅ H ₁₀ O	86	4,7
Pentan-1-ol	C ₅ H ₁₂ O	88	0,29

- 3.1 Define the term *VAPOUR PRESSURE*. (2)
- 3.2 Which ONE of the above compounds will have the highest boiling point? Give a reason for your answer. (2)
- 3.3 The vapour pressure of pentan-1-ol is much lower than that of pentanal and pentane. Explain this difference by referring to the TYPES AND STRENGTHS of the intermolecular forces of the three compounds. (5)

[9]

QUESTION 4

The diagram below shows how an ALKENE can be used to prepare other organic compounds. The letters A to G represent different organic reactions.



4.1 Write down the type of reaction represented by:

- 4.1.1 A (1)
- 4.1.2 B (1)
- 4.1.3 D (1)
- 4.1.4 G (1)

4.2 Write down the IUPAC name of compound X. (2)

4.3 For REACTION C, write down:

- 4.3.1 The type of elimination reaction. (1)
- 4.3.2 **TWO** reaction conditions. (2)

4.4 Name the type of substitution reaction represented by F. (1)

4.5 Write a balanced equation, using structural formulae, for reaction D. (3)

[13]

QUESTION 5

A South African company that produces toiletries decided to make a new strawberry scented bubble bath for children. The compound responsible for the strawberry scent is pentyl butanoate.

- 5.1 Name the homologous series to which pentyl butanoate belongs. (1)
- 5.2 Using structural formulae, write down the reaction for the preparation of pentyl butanoate. (4)
- 5.3 One of the organic reactants above is made up of 54,55% C, 36,36% O and H. If the molar mass of this compound is 88 g.mol^{-1} , determine the molecular formula of this compound. (5)
- 5.4 Provide the IUPAC name for the reactant identified in 5.3 above. (1)
- [11]**

TOTAL MARKS: [50]

**DATA FOR PHYSICAL SCIENCES GRADE 12
PAPER 2 (CHEMISTRY)**

**GEGEWENS VIR FISIIESE WETENSKAPPE GRAAD 12
VRAESTEL 2 (CHEMIE)**

TABLE 1: PHYSICAL CONSTANTS/TABEL 1: FISIIESE KONSTANTES

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Standard pressure <i>Standaarddruk</i>	p^θ	$1,013 \times 10^5 \text{ Pa}$
Molar gas volume at STP <i>Molêre gasvolume by STD</i>	V_m	$22,4 \text{ dm}^3 \cdot \text{mol}^{-1}$
Standard temperature <i>Standaardtemperatuur</i>	T^θ	273 K
Charge on electron <i>Lading op elektron</i>	e	$-1,6 \times 10^{-19} \text{ C}$
Avogadro's constant <i>Avogadro-konstante</i>	N_A	$6,02 \times 10^{23} \text{ mol}^{-1}$

TABLE 2: FORMULAE/TABEL 2: FORMULES

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ or/of $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$
$\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$	$\text{pH} = -\log[\text{H}_3\text{O}^+]$
$K_w = [\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14} \text{ at/by } 298 \text{ K}$	
$E_{\text{cell}}^\theta = E_{\text{cathode}}^\theta - E_{\text{anode}}^\theta / E_{\text{sel}}^\theta = E_{\text{katode}}^\theta - E_{\text{anode}}^\theta$ or/of $E_{\text{cell}}^\theta = E_{\text{reduction}}^\theta - E_{\text{oxidation}}^\theta / E_{\text{sel}}^\theta = E_{\text{reduksie}}^\theta - E_{\text{oksidasie}}^\theta$ or/of $E_{\text{cell}}^\theta = E_{\text{oxidising agent}}^\theta - E_{\text{reducing agent}}^\theta / E_{\text{sel}}^\theta = E_{\text{oksideermiddel}}^\theta - E_{\text{reduseermiddel}}^\theta$	

TABLE 3: THE PERIODIC TABLE OF ELEMENTS

I														II														III														IV														V														VI														VII														0																																																																																																																																																									
1 H 1														4 Be 9														5 B 11														6 C 12														7 N 14														8 O 16														9 F 19														10 Ne 20																																																																																																																																																									
11 Na 23														12 Mg 24														13 Al 27														14 Si 28														15 P 31														16 S 32														17 Cl 35,5														18 Ar 40																																																																																																																																																									
19 K 39														20 Ca 40														21 Sc 45														22 Ti 48														23 V 51														24 Cr 52														25 Mn 55														26 Fe 56														27 Co 59														28 Ni 59														29 Cu 63,5														30 Zn 65														31 Ga 70														32 Ge 73														33 As 75														34 Se 79														35 Br 80														36 Kr 84													
37 Rb 86														38 Sr 88														39 Y 89														40 Zr 91														41 Nb 92														42 Mo 96														43 Tc 96														44 Ru 101														45 Rh 103														46 Pd 106														47 Ag 108														48 Cd 112														49 In 115														50 Sn 119														51 Sb 122														52 Te 128														53 I 127														54 Xe 131													
55 Cs 133														56 Ba 137														57 La 139														58 Ce 140														59 Pr 141														60 Nd 144														61 Pm 145														62 Sm 150														63 Eu 152														64 Gd 157														65 Tb 159														66 Dy 163														67 Ho 165														68 Er 167														69 Tm 169														70 Yb 173														71 Lu 175																											
87 Fr 226														88 Ra 226														89 Ac 227														90 Th 232														91 Pa 231														92 U 238														93 Np 237														94 Pu 244														95 Am 243														96 Cm 247														97 Bk 247														98 Cf 251														99 Es 252														100 Fm 257														101 Md 258														102 No 259														103 Lr 262																											

KEY

Atomic number

Electronegativity

Symbol

Relative atomic mass (approximately)

29

1,9

63,5

