education

Department:
Education
PROVINCE OF KWAZULU-NATAL

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.

Please Turn Over

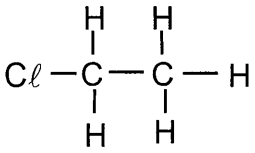
INSTRUCTIONS AND INFORMATION TO CANDIDATES

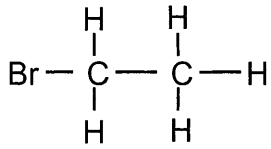
1. Write your name in the ANSWER BOOK.
2. Answer ALL the questions in the ANSWER BOOK.
3. This question paper consists of FIVE questions.
4. Start EACH question on a NEW PAGE in the ANSWER BOOK.
5. You may use a non-programmable calculator.
6. Number the answers correctly, according to the numbering 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.

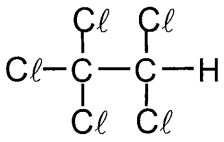
QUESTION 1

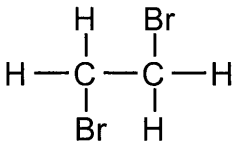
Four options are provided as possible answers to the following questions.
Each question has only **ONE** correct answer. Choose the answer and write only the letter A, B, C or D next to the question number in the ANSWER BOOK, e.g. 1.5 A

1.1 Which ONE of the following compounds has structural isomers?

A. 

B. 

C. 

D. 

(2)

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

A. C_2H_6

B. C_3H_6

C. C_4H_6

D. C_4H_8 (2)

1.3 Cracking is a type of …

A. substitution reaction

B. elimination reaction

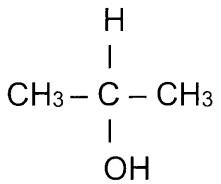
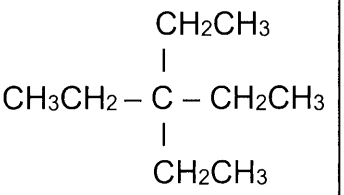
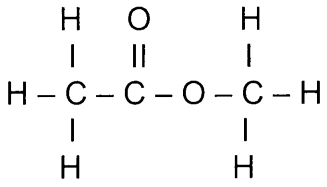
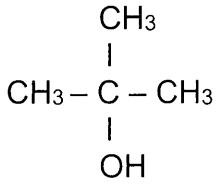
C. addition reaction

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**	
D		**E**		**F**	

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_5H_{12}	72	60
Pentanal	$C_5H_{10}O$	86	4,7
Pentan-1-ol	$C_5H_{12}O$	88	0,29

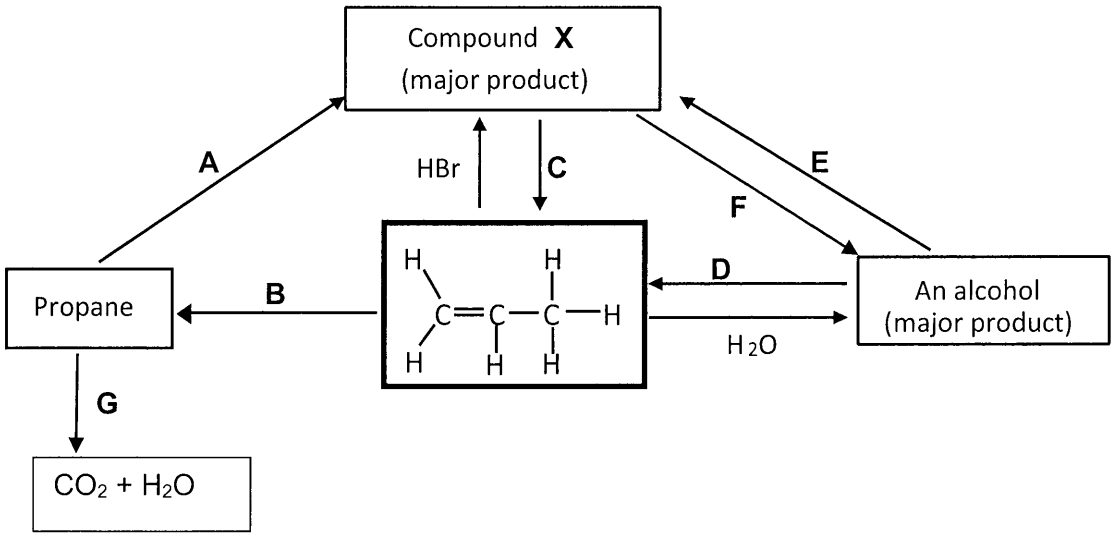
3.1 Define the term *VAPOUR PRESSURE*. (2)

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 FISIESE WETENSKAPPE GRAAD 12
VRAESTEL 2 (CHEMIE)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

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

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ or/*of* $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$
$\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$	$pH = -\log[H_3O^+]$
$K_w = [H_3O^+][OH^-] = 1 \times 10^{-14}$ at/*by* 298 K	
$E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$ / $E^{\theta}_{sel} = E^{\theta}_{katode} - E^{\theta}_{anode}$ or/*of* $E^{\theta}_{cell} = E^{\theta}_{reduction} - E^{\theta}_{oxidation}$ / $E^{\theta}_{sel} = E^{\theta}_{reduksie} - E^{\theta}_{oksidasie}$ or/*of* $E^{\theta}_{cell} = E^{\theta}_{oxidising\ agent} - E^{\theta}_{reducing\ agent}$ / $E^{\theta}_{sel} = E^{\theta}_{oksideermiddel} - E^{\theta}_{reduseermiddel}$	

TABLE 3: THE PERIODIC TABLE OF ELEMENTS

KEY

Atomic number

Electronegativity → 29 / 1,9 / Cu / 63,5 ← Symbol

Relative atomic mass (approximately)

I	II	III	IV	V	VI	VII	0
1 2,1 H 1							2 He 4
3 1,0 Li 7	4 1,5 Be 9	5 2,0 B 11	6 2,5 C 12	7 3,0 N 14	8 3,5 O 16	9 4,0 F 19	10 Ne 20
11 0,9 Na 23	12 1,2 Mg 24	13 1,5 Aℓ 27	14 1,8 Si 28	15 2,1 P 31	16 2,5 S 32	17 3,0 Cℓ 35,5	18 Ar 40
19 0,8 K 39	20 1,0 Ca 40	21 1,3 Sc 45	22 1,5 Ti 48	23 1,6 V 51	24 1,6 Cr 52	25 1,5 Mn 55	26 1,8 Fe 56	27 1,8 Co 59	28 1,8 Ni 59	29 1,9 Cu 63,5	30 1,6 Zn 65	31 1,6 Ga 70	32 1,8 Ge 73	33 2,0 As 75	34 2,4 Se 79	35 2,8 Br 80	36 Kr 84
37 0,8 Rb 86	38 1,0 Sr 88	39 1,2 Y 89	40 1,4 Zr 91	41 Nb 92	42 1,8 Mo 96	43 1,9 Tc	44 2,2 Ru 101	45 2,2 Rh 103	46 2,2 Pd 106	47 1,9 Ag 108	48 1,7 Cd 112	49 1,7 In 115	50 1,8 Sn 119	51 1,9 Sb 122	52 2,1 Te 128	53 2,5 I 127	54 Xe 131
55 0,7 Cs 133	56 0,9 Ba 137	57 La 139	72 1,6 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 1,8 Tℓ 204	82 1,8 Pb 207	83 1,9 Bi 209	84 2,0 Po	85 2,5 At	86 Rn
87 0,7 Fr	88 0,9 Ra 226	89 Ac															

58 Ce 140	59 Pr 141	60 Nd 144	61 Pm	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
90 Th 232	91 Pa	92 U 238	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr