education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 12

PHYSICAL SCIENCES: CHEMISTRY (P2)

JUNE 2024

MARKS: 150

TIME: 3 hours

This question paper consists of 14 pages and 4 datasheets.

INSTRUCTIONS AND INFORMATION

1. Write your name in the appropriate space on the ANSWER BOOK.
2. This question paper consists of EIGHT questions. Answer ALL the questions in the ANSWER BOOK.
3. Start EACH question on a NEW page in the ANSWER BOOK.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave ONE line between two sub-questions, e.g. between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. Show ALL formulae and substitutions in ALL calculations.
9. Round off your FINAL numerical answers to a minimum of TWO decimal places.
10. Give brief motivations, discussions, etc. where required.
11. You are advised to use the attached DATA SHEETS.
12. Write neatly and legibly.

QUESTION 1: MULTIPLE CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write the letter (A–D) next to the question numbers (1.1 to 1.10) in the ANSWER BOOK, for example 1.11 E.

1.1 Which ONE of the following compounds belongs to the same homologous series as an ester?

A CH_3COCH_3
B $CH_3CH_2CH_2OH$
C CH_3COOCH_3
D CH_3CH_2CHO (2)

1.2 Molecules with the same molecular formulae, but different types of chains are called …

A Positional isomers
B Chain isomers
C Structural isomers
D Functional isomers (2)

1.3 Consider the reaction represented below.

$$CH_3CH_2CHBrCH_3 + H_2O \longrightarrow CH_3CH_2CHOHCH_3 + HBr$$

Which ONE of the following CORRECTLY gives the type of reaction that takes place and its reaction conditions?

	TYPE OF REACTION	REACTION CONDITIONS
A	Addition	Excess H_2O + acid as catalyst
B	Addition	Pt, Pd or Ni as catalyst
C	Substitution	Dilute strong base + mild heat
D	Substitution	Excess H_2O + mild heat

(2)

1.4 The activation energy for a certain reaction is 70 kJ.molℓ^{-1}. Energy is released when this reaction takes place.

Which ONE of the following is correct for the reverse reaction?

	Activation Energy (E_A)	Heat of Reaction (ΔH)
A	$E_A < 70$ kJ.molℓ^{-1}	$\Delta H > 0$
B	$E_A < 70$ kJ.molℓ^{-1}	$\Delta H < 0$
C	$E_A > 70$ kJ.molℓ^{-1}	$\Delta H < 0$
D	$E_A > 70$ kJ.molℓ^{-1}	$\Delta H > 0$

(2)

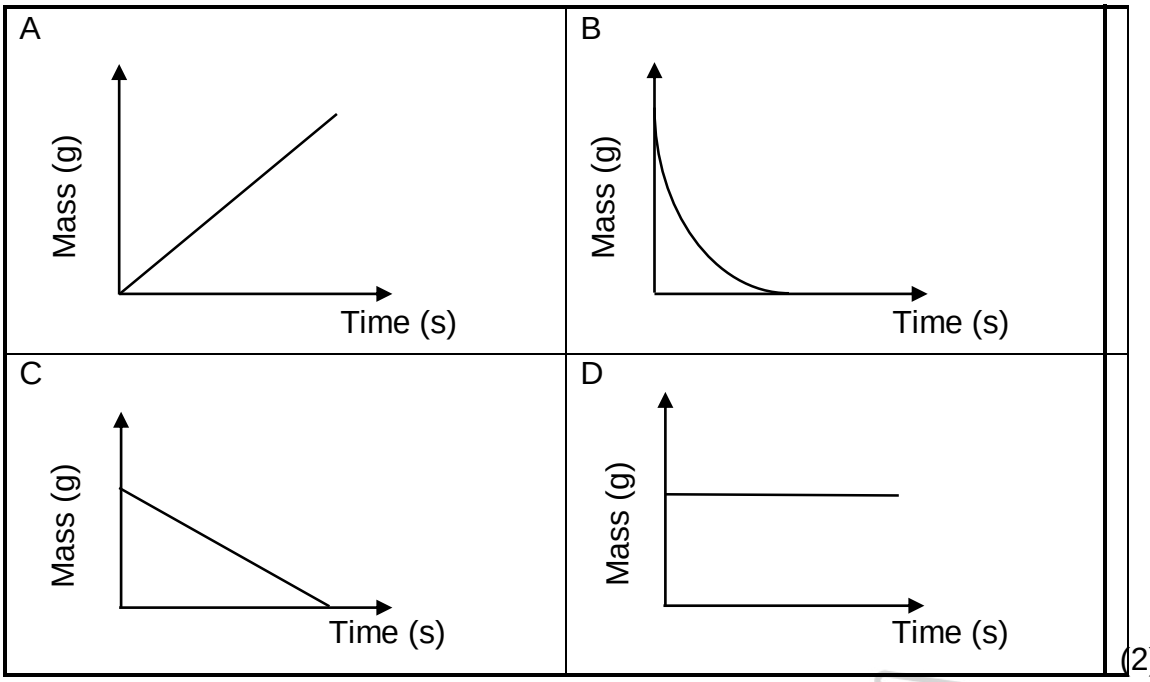
1.5 The following reaction has reached equilibrium in a closed container at a temperature of 359 K:

$$4NH_3(g) + 5O_2(g) \rightleftharpoons 4NO(g) + 6H_2O(g) + \text{energy}$$

Which ONE of the following will increase the equilibrium concentration of NH_3?

A Add a catalyst.
B Remove NO(g) from the container.
C Increase the volume of the container.
D The temperature is increased to 400 K. (2)

1.6 Which ONE of the following graphs shows the mass of a catalyst against time at the end of the chemical reaction?



(2)

1.7 At a temperature of 150°C substances A(g) and B(s) are placed in a closed container. The concentration of A(g) is 0,0002 mol.dm^{-3} at equilibrium.
Equal amounts of P(g) and Q(g) are formed.
The Kc value = 0,123
The equilibrium concentrations of P and Q will be …

A 1,57 x 10 $^{-2}$mol.dm^{-3}
B 2,46 x 10 $^{-4}$mol.dm^{-3}
C 1,23 x 10 $^{-4}$mol.dm^{-3}
D 4,92 x 10 $^{-4}$mol.dm^{-3} (2)

1.8 Which ONE of the following is a conjugate acid-base pair in the following reaction?

$$CH_3COOH + NH_3 \longrightarrow CH_3COO^- + NH_4^+$$

	ACID	CONJUGATE BASE
A	NH_3	NH_4^+
B	CH_3COO^-	NH_4^+
C	CH_3COOH	NH_3
D	CH_3COOH	CH_3COO^-

(2)

1.9 A weak acid HA dissociates in aqueous solution as shown below.

$$HA\ (aq) \rightleftharpoons H^+(aq) + A^-(aq) \qquad \Delta H = +\ 20\ kJmol^{-1}$$

Which ONE of the following changes will result in an increase in the $[H^+]$ of the solution?

A Addition of a little aqueous sodium hydroxide solution
B Raising the temperature of the solution
C Dissolving a little of the sodium salt,NaA, in the solution.
D Adding a catalyst to the solution (2)

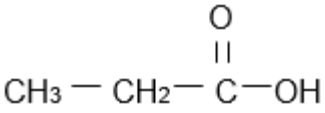
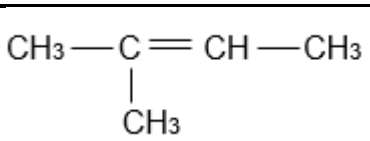
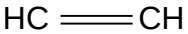
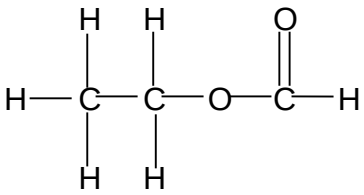
1.10 Which ONE of the following solutions has the HIGHEST pH value?

A $0,1\ mol{\cdot}dm^{-3}\ Mg(OH)_2$
B $0,1\ mol{\cdot}dm^{-3}\ NH_3$
C $0,1\ mol{\cdot}dm^{-3}\ HC\ell$
D $0,1\ mol{\cdot}dm^{-3}\ H_2SO_4$ (2)

[20]

QUESTION 2 (Start on a new page)

Study the following organic compounds, represented by the letters **A** to **I** in the table below:

A	2-methylpropane	**F**	
B	Butane	**G**	
C	C_2H_3Br	**H**	
D	Butan-1-ol	**I**	
E	Butan-2-ol		

2.1 Write down the letter(s) that represent(s) the following:

2.1.1 Two compounds that are CHAIN ISOMERS. (1)

2.1.2 A PRIMARY alcohol. (1)

2.1.3 A weak MONOPROTIC ACID (1)

2.2 Compound **G** is a hydrocarbon.

2.2.1 Define the term *hydrocarbon*. (2)

2.2.2 Is compound **G** SATURATED or UNSATURATED?

Give a reason for your answer. (3)

2.2.3 Write down the IUPAC name of compound **G**. (2)

2.3 Write down the NAME of the homologous series to which compound **C** belongs. (2)

2.4 Compound **I** is the product of an esterification reaction.

Write down the:

2.4.1 IUPAC name for compound **I** (2)

2.4.2 STRUCTURAL formula of the alcohol from which compound **I** is synthesized (2)

2.4.3 IUPAC name of the carboxylic acid from which it is synthesized (2)

2.5 The table contains compounds which are functional isomers.

2.5.1 Define the term *functional isomers*. (2)

2.5.2 Write down the LETTERS that represent two compounds that are functional isomers. (2)
[22]

QUESTION 3 (Start on a new page.)

A student performs an experiment to compare the boiling points of organic compounds belonging to different homologous series.
Butan-1-ol, butanoic acid and butanal are used.
He then recorded the results on the table given below.

Name	Boiling point (^{0}C)
Compound A	76
Compound B	118
Compound C	164

3.1 Define the term *vapour pressure* (2)

3.2 For this experiment give the:

3.2.1 Independent variable (1)

3.2.2 Dependent variable (1)

3.3 Is the boiling point of butan-1-ol HIGHER or LOWER than the boiling point of propan-1-ol? Explain the answer by referring to the INTERMOLECULAR FORCES. (3)

3.4 Write down the STRUCTURAL FORMULA for the FUNCTIONAL group of:

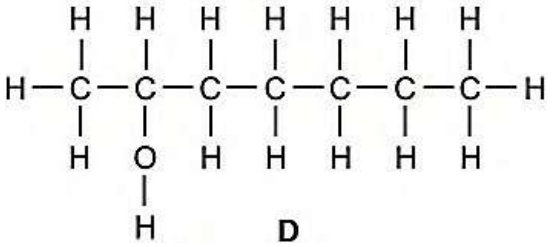
3.4.1 Compound **A** (2)

3.4.2 Compound **C** (2)

3.5 Is the vapour pressure of butanal be LOWER or HIGHER than the vapour pressure of butan-1-ol? Explain your answer by referring to the type of INTERMOLECULAR FORCES present and ENERGY. (4)
[15]

QUESTION 4 (Start on a new page)

Consider the following organic reactions **I** to **IV** involving organic compounds **A** to **E**.

I	**A +** Br_2 $\xrightarrow{\text{UV light}}$ **B +** HBr
II	**B** + concentrated alcoholic KOH → **C** + KBr + H_2O
III	**C** + H_2O $\xrightarrow{\text{Dilute } H_3PO_4}$  **D**
IV	**A** $\xrightarrow{\text{600 (}^0\text{C) Catalyst}}$ C_4H_{10} **+ E**

4.1 For the above reactions, write down the type of:

4.1.1 Reaction **I** (1)

4.1.2 Reaction **III** (1)

4.1.3 Reaction **IV** (1)

4.2 Write down the IUPAC name for compound **D**. (2)

4.3 Write the molecular formula for each of the following:

4.3.1 Compound **A** (2)

4.3.2 Compound **E** (2)

4.4 Draw the structural formula of compound **B**. (2)

4.5 Write down the balanced chemical equation for complete COMBUSTION of $\mathbf{C_4H_{10}}$ using MOLECULAR FORMULAE. (3)

4.6 For Reaction **II**

4.6.1 Draw the STRUCTURAL FORMULA of compound **C** (2)

4.6.2 State TWO reaction conditions. (2)

[18]

QUESTION 5 (Start on a new page.)

5.1 A group of learners uses the reaction of hydrochloric acid with magnesium ribbon to investigate the factors that influence rate of reaction.

The balanced equation for the reaction is given below:

$$Mg(s) + 2HC\ell\,(ag) \longrightarrow MgC\ell_2(ag) + H_2(g)$$

The hydrochloric acid is in EXCESS, and the same mass of magnesium is used in ALL the experiments.

Experiment	REACTION CONDITIONS			
	Concentration of $HC\ell(ag)(mol.dm^{-3})$	Temperature (^0C)		State of division of 0,24g Magnesium
		Before	After	
1	2	35	57	Powder
2	2	30	48	Ribbon
3	2	20	33	Ribbon
4	1,5	30	45	Ribbon

5.1.1 Define the term *rate of reaction*. (2)

5.1.2 In which experiment is the reaction rate HIGHEST? Explain your answer. (3)

5.2 The reaction in Experiment **2** is compared to the reaction in Experiment **4**.

5.2.1 Write down ONE control variable for this comparison. (1)

5.2.2 How does the amount of hydrogen gas produced in Experiment **2** compare to the amount produced in Experiment **4** if the same volume of acid is used in both experiments?

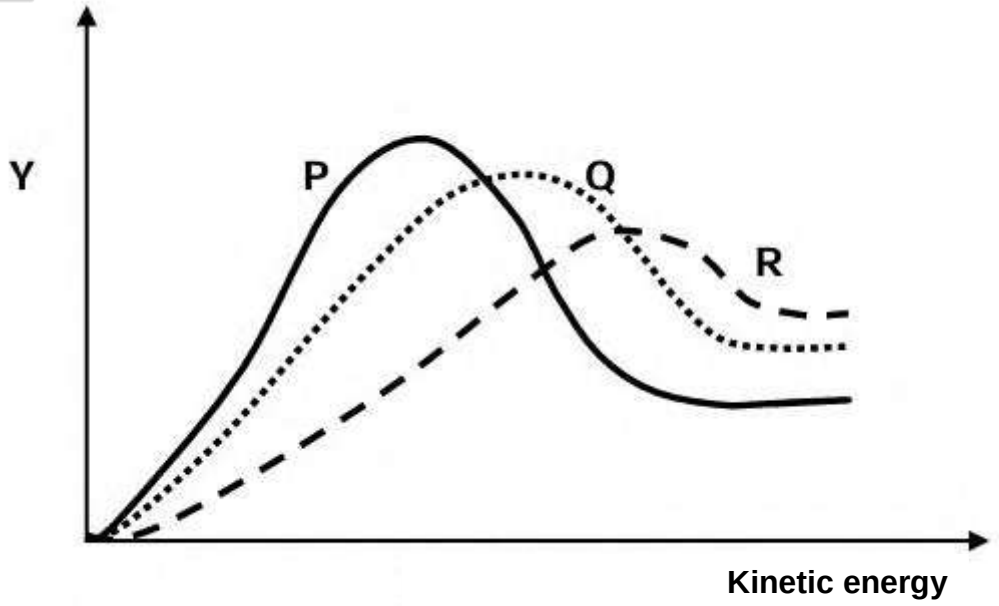
Write down only HIGHER THAN, SMALLER THAN or EQUAL TO.

Give a reason for your answer. (2)

5.3 Give a reason why it is not a fair test to compare the rate of reaction of Experiment **1** with that of Experiment **3**. (1)

5.4 Calculate the mass of hydrochloric acid that remains in the flask at the completion of the reaction in Experiment **1** if the initial volume of the hydrochloric acid is 80 cm^3. (7)

5.5 The Maxwell-Boltzman distribution curves labelled **P**, **Q** and **R** for the reactions in experiments **1**, **2** and **3** in random order are shown below.



5.5.1 Write down the name of the label, **Y**, on the vertical axis. (1)

5.5.2 Which curve (**Q**, **P** or **R**) represents the results of Experiment **3**? (1)

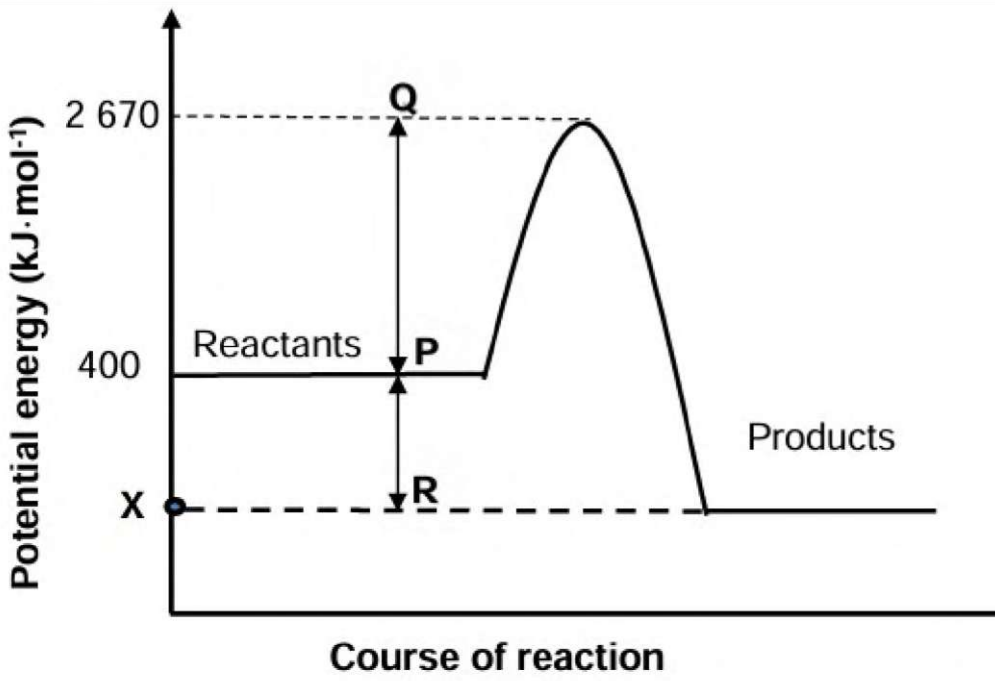
5.5.3 With the aid of the collision theory explain the effect of TEMPERATURE on reaction rate. (4)
[22]

QUESTION 6 (Start on a new page)

Consider the following balanced chemical equation:

$CH_4(g) + 2O_2(g) \rightleftharpoons CO_2(g) + 2H_2O(\ell)$ $\Delta H = - 216,7\ kJ \cdot mol^{-1}$

The graph below shows the potential energy against the course of this reaction.



6.1 Define the term *activation energy.* (2)

6.2 Is the reaction Endothermic or Exothermic? Give a reason for the answer. (3)

6.3 What do the following sections of the graph represents?

6.3.1 **RP** (1)

6.3.2 **QP** (1)

6.4 Determine BY CALCULATION the value of **X**. (3)

6.5 What effect will the addition of suitable catalyst to the reaction mixture have on the activation energy of the reaction? Choose from INCREASES, DECREASES or NO EFFECT. (1)

[11]

QUESTION 7 (Start on a new page.)

Consider the reaction represented by the balance equation below.

$$4HC\ell(g) + O_2(g) \rightleftharpoons 2H_2O(g) + 2C\ell_2(g) \quad \Delta H < 0$$

Initially 1,5 mole of $HC\ell(g)$ and 2 mole of $O_2(g)$ were mixed in a sealed 5 dm^3 container which had 18g of $H_2O(g)$. The reaction reached equilibrium after 20 minutes at 600°C and 0.6 mole of $C\ell_2(g)$ was present in the container.

7.1 Define the term *chemical equilibrium*. (2)

7.2 How does the rate of forward reaction compare to the rate of the reverse reaction after 10 minutes? Choose from HIGHER THAN, LOWER THAN or EQUAL TO. (1)

7.3 Calculate the value of Kc at 600°C (8)

7.4 State *Le Chatelier's principle* (2)

7.5 The volume of the container is now decreased to 2,5 dm^3 while the temperature is kept constant.
How will each of the following be affected? Choose from INCREASES, DECREASES or REMAINS THE SAME.

7.5.1 The value of Kc (1)

7.5.2 The mass of $C\ell_2(g)$ in the container. (1)

7.6 Explain your answer to QUESTION 7.5.2 by referring to *Le Chatelier's Principle* (2)

7.7 The temperature of the container is now increased, and equilibrium is re-established

7.7.1 How does the new value of Kc at this temperature compare to the one obtained at 600°C? Choose from HIGHER THAN, LOWER THAN or EQUAL TO (1)

7.7.2 Explain the answer to QUESTION 7.7.1 by referring to *Le Chatelier's Principle* (2)
[20]

QUESTION 8 (Start on a new page.)

A group of learners use 35 cm^3 standard solution of 0,1 $mol.dm^{-3}$ sodium hydroxide solution to standardize an oxalic acid solution of volume 40 cm^3.
At the endpoint, 12 cm^3 of the sodium hydroxide remains unreacted.

8.1 Define a *standard* solution (2)

The net ionic equation is given below:

$$C_2H_2O_4 + 2\ OH^- \rightleftharpoons C_2O_4^{2-} + 2H_2O$$

8.2 Identify the conjugate acid-base pairs (4)

8.3 Is oxalic acid a weak or a strong acid? Explain the answer (3)

8.4 H_2CO_3 undergoes ionisation in a TWO step process as shown below:

I $H_2CO_3 + H_2O \rightleftharpoons HCO_3^- + H_3O^+$

II $HCO_3^- + H_2O \rightleftharpoons X + H_3O^+$

8.4.1 Identify a substance in the above reactions that can act as an *ampholyte*. (2)

8.4.2 Write down the formula of the substance(s) that is represented by **X** in reaction **II** (2)

8.5 A sulphuric acid solution is prepared by dissolving 5,25 g of H_2SO_4 in 250 $cm^3$of water.

Calculate the following:

8.5.1 The number of moles of sulphuric acid in the original standard solution. (4)

8.5.2 pH of the solution. (5)
[22]

TOTAL: 150

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 electron*	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* $E^{\theta}_{cell} = E^{\theta}_{oxidising\ agent} - E^{\theta}_{reducing\ agent}$ / $E^{\theta}_{sel} = E^{\theta}_{oksideermiddel} - E^{\theta}_{reduseermiddel}$	
$n = \frac{Q}{e}$	$n = \frac{Q}{q_e}$
$q = I\Delta t$	

TABLE 3: THE PERIODIC TABLE OF ELEMENTS

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

Ce 58 140	Pr 59 141	Nd 60 144	Pm 61	Sm 62 150	Eu 63 152	Gd 64 157	Tb 65 159	Dy 66 163	Ho 67 165	Er 68 167	Tm 69 169	Yb 70 173	Lu 71 175
Th 90 232	Pa 91	U 92 238	Np 93	Pu 94	Am 95	Cm 96	Bk 97	Cf 98	Es 99	Fm 100	Md 101	No 102	Lr 103

KEY/*SLEUTEL*

Atomic number
Atoomgetal

Electronegativity
Elektronegatiwiteit

29
1,9 Cu
63,5

Symbol
Simbool

Approximate relative atomic mass
Benaderde relatiewe atoommassa

TABLE 4A: STANDARD REDUCTION POTENTIALS
TABEL 4A: STANDAARD-REDUKSIEPOTENSIALE

Half-reactions/*Halfreaksies*	E^{θ} (V)
$F_2(g) + 2e^- \rightleftharpoons 2F^-$	+ 2,87
$Co^{3+} + e^- \rightleftharpoons Co^{2+}$	+ 1,81
$H_2O_2 + 2H^+ + 2e^- \rightleftharpoons 2H_2O$	+1,77
$MnO_4^- + 8H^+ + 5e^- \rightleftharpoons Mn^{2+} + 4H_2O$	+ 1,51
$C\ell_2(g) + 2e^- \rightleftharpoons 2C\ell^-$	+ 1,36
$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightleftharpoons 2Cr^{3+} + 7H_2O$	+ 1,33
$O_2(g) + 4H^+ + 4e^- \rightleftharpoons 2H_2O$	+ 1,23
$MnO_2 + 4H^+ + 2e^- \rightleftharpoons Mn^{2+} + 2H_2O$	+ 1,23
$Pt^{2+} + 2e^- \rightleftharpoons Pt$	+ 1,20
$Br_2(\ell) + 2e^- \rightleftharpoons 2Br^-$	+ 1,07
$NO_3^- + 4H^+ + 3e^- \rightleftharpoons NO(g) + 2H_2O$	+ 0,96
$Hg^{2+} + 2e^- \rightleftharpoons Hg(\ell)$	+ 0,85
$Ag^+ + e^- \rightleftharpoons Ag$	+ 0,80
$NO_3^- + 2H^+ + e^- \rightleftharpoons NO_2(g) + H_2O$	+ 0,80
$Fe^{3+} + e^- \rightleftharpoons Fe^{2+}$	+ 0,77
$O_2(g) + 2H^+ + 2e^- \rightleftharpoons H_2O_2$	+ 0,68
$I_2 + 2e^- \rightleftharpoons 2I^-$	+ 0,54
$Cu^+ + e^- \rightleftharpoons Cu$	+ 0,52
$SO_2 + 4H^+ + 4e^- \rightleftharpoons S + 2H_2O$	+ 0,45
$2H_2O + O_2 + 4e^- \rightleftharpoons 4OH^-$	+ 0,40
$Cu^{2+} + 2e^- \rightleftharpoons Cu$	+ 0,34
$SO_4^{2-} + 4H^+ + 2e^- \rightleftharpoons SO_2(g) + 2H_2O$	+ 0,17
$Cu^{2+} + e^- \rightleftharpoons Cu^+$	+ 0,16
$Sn^{4+} + 2e^- \rightleftharpoons Sn^{2+}$	+ 0,15
$S + 2H^+ + 2e^- \rightleftharpoons H_2S(g)$	+ 0,14
$2H^+ + 2e^- \rightleftharpoons H_2(g)$	**0,00**
$Fe^{3+} + 3e^- \rightleftharpoons Fe$	– 0,06
$Pb^{2+} + 2e^- \rightleftharpoons Pb$	– 0,13
$Sn^{2+} + 2e^- \rightleftharpoons Sn$	– 0,14
$Ni^{2+} + 2e^- \rightleftharpoons Ni$	– 0,27
$Co^{2+} + 2e^- \rightleftharpoons Co$	– 0,28
$Cd^{2+} + 2e^- \rightleftharpoons Cd$	– 0,40
$Cr^{3+} + e^- \rightleftharpoons Cr^{2+}$	– 0,41
$Fe^{2+} + 2e^- \rightleftharpoons Fe$	– 0,44
$Cr^{3+} + 3e^- \rightleftharpoons Cr$	– 0,74
$Zn^{2+} + 2e^- \rightleftharpoons Zn$	– 0,76
$2H_2O + 2e^- \rightleftharpoons H_2(g) + 2OH^-$	– 0,83
$Cr^{2+} + 2e^- \rightleftharpoons Cr$	– 0,91
$Mn^{2+} + 2e^- \rightleftharpoons Mn$	– 1,18
$A\ell^{3+} + 3e^- \rightleftharpoons A\ell$	– 1,66
$Mg^{2+} + 2e^- \rightleftharpoons Mg$	– 2,36
$Na^+ + e^- \rightleftharpoons Na$	– 2,71
$Ca^{2+} + 2e^- \rightleftharpoons Ca$	– 2,87
$Sr^{2+} + 2e^- \rightleftharpoons Sr$	– 2,89
$Ba^{2+} + 2e^- \rightleftharpoons Ba$	– 2,90
$Cs^+ + e^- \rightleftharpoons Cs$	- 2,92
$K^+ + e^- \rightleftharpoons K$	– 2,93
$Li^+ + e^- \rightleftharpoons Li$	– 3,05

Increasing strength of oxidising agents/Toenemende sterkte van oksideermiddels ↑

Increasing strength of reducing agents/Toenemende sterkte van reduseermiddels ↓

TABLE 4B: STANDARD REDUCTION POTENTIALS
TABEL 4B: STANDAARD-REDUKSIEPOTENSIALE

Increasing strength of oxidising agents/*Toenemende sterkte van oksideermiddels* ↓

Increasing strength of reducing agents/*Toenemende sterkte van reduseermiddels* ↑

Half-reactions/*Halfreaksies*	E^{θ} (V)
$Li^+ + e^- \rightleftharpoons Li$	– 3,05
$K^+ + e^- \rightleftharpoons K$	– 2,93
$Cs^+ + e^- \rightleftharpoons Cs$	– 2,92
$Ba^{2+} + 2e^- \rightleftharpoons Ba$	– 2,90
$Sr^{2+} + 2e^- \rightleftharpoons Sr$	– 2,89
$Ca^{2+} + 2e^- \rightleftharpoons Ca$	– 2,87
$Na^+ + e^- \rightleftharpoons Na$	– 2,71
$Mg^{2+} + 2e^- \rightleftharpoons Mg$	– 2,36
$A\ell^{3+} + 3e^- \rightleftharpoons A\ell$	– 1,66
$Mn^{2+} + 2e^- \rightleftharpoons Mn$	– 1,18
$Cr^{2+} + 2e^- \rightleftharpoons Cr$	– 0,91
$2H_2O + 2e^- \rightleftharpoons H_2(g) + 2OH^-$	– 0,83
$Zn^{2+} + 2e^- \rightleftharpoons Zn$	– 0,76
$Cr^{3+} + 3e^- \rightleftharpoons Cr$	– 0,74
$Fe^{2+} + 2e^- \rightleftharpoons Fe$	– 0,44
$Cr^{3+} + e^- \rightleftharpoons Cr^{2+}$	– 0,41
$Cd^{2+} + 2e^- \rightleftharpoons Cd$	– 0,40
$Co^{2+} + 2e^- \rightleftharpoons Co$	– 0,28
$Ni^{2+} + 2e^- \rightleftharpoons Ni$	– 0,27
$Sn^{2+} + 2e^- \rightleftharpoons Sn$	– 0,14
$Pb^{2+} + 2e^- \rightleftharpoons Pb$	– 0,13
$Fe^{3+} + 3e^- \rightleftharpoons Fe$	– 0,06
$2H^+ + 2e^- \rightleftharpoons H_2(g)$	**0,00**
$S + 2H^+ + 2e^- \rightleftharpoons H_2S(g)$	+ 0,14
$Sn^{4+} + 2e^- \rightleftharpoons Sn^{2+}$	+ 0,15
$Cu^{2+} + e^- \rightleftharpoons Cu^+$	+ 0,16
$SO_4^{2-} + 4H^+ + 2e^- \rightleftharpoons SO_2(g) + 2H_2O$	+ 0,17
$Cu^{2+} + 2e^- \rightleftharpoons Cu$	+ 0,34
$2H_2O + O_2 + 4e^- \rightleftharpoons 4OH^-$	+ 0,40
$SO_2 + 4H^+ + 4e^- \rightleftharpoons S + 2H_2O$	+ 0,45
$Cu^+ + e^- \rightleftharpoons Cu$	+ 0,52
$I_2 + 2e^- \rightleftharpoons 2I^-$	+ 0,54
$O_2(g) + 2H^+ + 2e^- \rightleftharpoons H_2O_2$	+ 0,68
$Fe^{3+} + e^- \rightleftharpoons Fe^{2+}$	+ 0,77
$NO_3^- + 2H^+ + e^- \rightleftharpoons NO_2(g) + H_2O$	+ 0,80
$Ag^+ + e^- \rightleftharpoons Ag$	+ 0,80
$Hg^{2+} + 2e^- \rightleftharpoons Hg(\ell)$	+ 0,85
$NO_3^- + 4H^+ + 3e^- \rightleftharpoons NO(g) + 2H_2O$	+ 0,96
$Br_2(\ell) + 2e^- \rightleftharpoons 2Br^-$	+ 1,07
$Pt^{2+} + 2e^- \rightleftharpoons Pt$	+ 1,20
$MnO_2 + 4H^+ + 2e^- \rightleftharpoons Mn^{2+} + 2H_2O$	+ 1,23
$O_2(g) + 4H^+ + 4e^- \rightleftharpoons 2H_2O$	+ 1,23
$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightleftharpoons 2Cr^{3+} + 7H_2O$	+ 1,33
$C\ell_2(g) + 2e^- \rightleftharpoons 2C\ell^-$	+ 1,36
$MnO_4^- + 8H^+ + 5e^- \rightleftharpoons Mn^{2+} + 4H_2O$	+ 1,51
$H_2O_2 + 2H^+ + 2e^- \rightleftharpoons 2H_2O$	+1,77
$Co^{3+} + e^- \rightleftharpoons Co^{2+}$	+ 1,81
$F_2(g) + 2e^- \rightleftharpoons 2F^-$	+ 2,87

education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT
PROVINSIALE ASSESSERING

GRADE/*GRAAD* 12

PHYSICAL SCIENCES: CHEMISTRY (P2)

FISIESE WETENSKAPPE: CHEMIE (V2)

JUNE/*JUNIE* 2024

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 13 pages including the cognitive table.
Hierdie nasienriglyne bestaan uit 13 bladsye insluitend die kognitiewe tabel.

QUESTION 1/*VRAAG 1*

1.1.	C	✓✓	(2)
1.2	B	✓✓	(2)
1.3	D	✓✓	(2)
1.4	C	✓✓	(2)
1.5	D	✓✓	(2)
1.6	D	✓✓	(2)
1.7	D	✓✓	(2)
1.8	D	✓✓	(2)
1.9	B	✓✓	(2)
1.10	A	✓✓	(2)

[20]

QUESTION 2/*VRAAG 2*

2.1.1 A and/*en* B ✓ (1)

2.1.2 D ✓ (1)

2.1.3 F ✓ (1)

2.2.1 Compound that contains carbon and hydrogen atoms only. ✓ ✓
Verbinding wat net uit koolstof en waterstof atome bestaan. **(2 or 0)** (2)

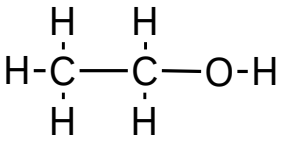
2.2.2 UNSATURATED ✓ Contains double bond ✓ ✓ /multiple bonds
(between the C-atoms in the hydrocarbon chain).
ONVERSADIG Bevat 'n dubbelbinding/meervoudige bindings (tusen C-atome in die koolwaterstof ketting) (3)

2.2.3 2-methylbut-2-ene ✓✓
2-metielbut-2-een (2)

2.3 haloalkanes /alkyl halide/haloalkene✓✓
halo alkaan/alkiel halied/halo alkeen (2)

2.4.1 Ethyl methanoate ✓✓
etielmetanoaat (2)

2.4.2



✓✓ (2)

2.4.3 Methanoic acid ✓
metanoësuur (2)

2.5.1 (Compounds with) the same molecular formula ✓ but different functional groups / different homologous series. ✓
(Verbindings met) dieselfde molekulêre formule maar verskillende funksionele groepe/ verskillende homoloë reeks. (2)

2.5.2 F and/*en* I ✓✓ (2)
[22]

QUESTION 3/*VRAAG 3*

3.1 The pressure exerted by a vapour at equilibrium with its liquid in a closed system. ✓✓
Die druk uitgeoefen deur 'n damp in ewewig met sy vloeistof in 'n geslote sisteem (2)

3.2 3.2.1 Functional group/homologous series ✓ (1)
Funksionele groep/homoloë reeks

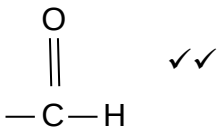
3.2.2 Boiling point/*Kookpunt* ✓ (1)

3.3 Higher than.✓ The van der Waals forces increases✓ with increasing molecular mass✓ or the longer the carbon chain/greater the surface, the greater the intermolecular forces will become.

Groter as. Die Van der Waals-kragte neem toe met toenemende molekulêre massa, of hoe langer die koolstofketting/groter die oppervlak, hoe groter sal die intermolekulêre kragte word. (3)

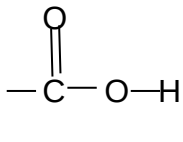
3.4

3.4.1



✓✓ (2)

3.4.2



✓✓ (2)

3.5 Higher than/*Hoër as* ✓

- Butanal (A) has dipole-dipole intermolecular forces whilst Butan-1-ol (B) has Hydrogen bond. ✓
  Butanaal (A) het dipool-dipool intermolekulêre kragte terwyl Butan-1-ol (B) Waterstofbindings het.

- The strength of intermolecular forces in Butanal (A) is weaker than in Butan-1-ol (B) ✓
  Die sterkte van intermolekulêre kragte in Butanaal (A) is swakker as in Butan-1-ol (B)

- Less energy is needed to overcome the intermolecular forces in Butanal (A) than in Butan-1-ol (B). ✓
  Minder energie is nodig om die intermolekulêre kragte in Butanaal (A) te oorkom as in Butan-1-ol (B)

OR/*OF*

- Butan-1-ol (B) has Hydrogen bond whilst Butanal (A) has dipole-dipole intermolecular forces.
  Butan-1-ol (B) het waterstofbinding terwyl Butanaal (A) dipool-dipool intermolekulêre kragte het.

- The strength of intermolecular forces in Butan-1-ol (B) is stonger than in *Butanal* (A).
  Die intermolekulêre kragte in Butan-1-ol (B) is sterker as Butanaal (A).

- More energy is needed to overcome the intermolecular forces in Butan-1-ol (B) than in Butanal (A)
  Meer energie is nodig om die intermolekulêre kragte in Butan-1-ol (B) te oorkom as in Butanaal (A).

(4)
[15]

QUESTION 4/*VRAAG 4*

4.1

4.1.1 Substitution (Halogenation/Bromination) ✓
Substitusie (Halogenering/Bromering) (1)

4.1.2 Addition(Hydration) ✓
Addisie(Hidrasie) (1)

4.1.3 Elimination(Cracking) ✓
Eliminasie (Kraking) (1)

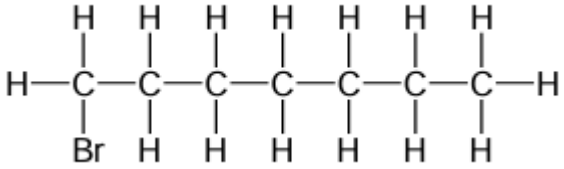
4.2 Heptan-2-ol/2-Heptanol ✓✓ (2)

4.3

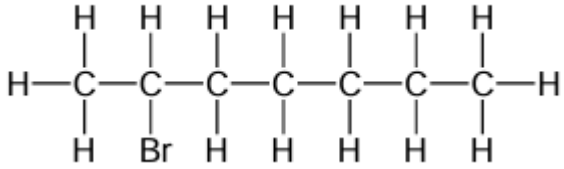
4.3.1 C_7H_{16} ✓✓ (2)

4.3.2 C_3H_6 ✓✓ (2)

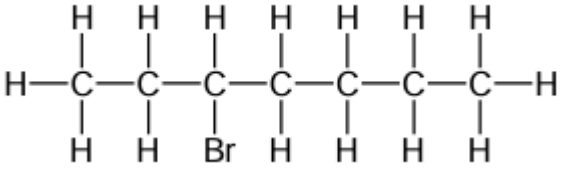
4.4 Any one of the following/*Enige een van die volgende*:



OR/*OF*



OR/OF ✓✓



(2)

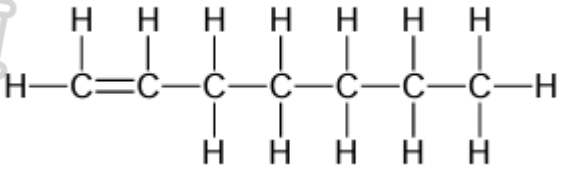
4.5 $\mathbf{2}C_4H_{10} + 13O_2 \rightarrow \mathbf{8}CO_2 + \mathbf{10}H_2O$ (3)

Notes/*Nota's:*
- Reactants /*Reaktante*✓
- Products/*Produkte* ✓
- Balancing/*Balansering* ✓
- Ignore/*ignoreer* ⇌ and phases/*en fases*

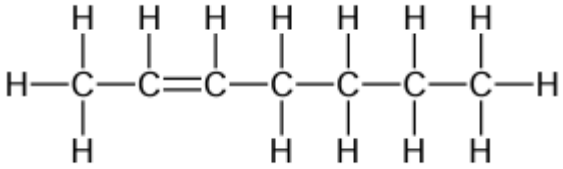
Marking rule/*Nasienreël* 6.3.10

4.6

4.6.1



✓✓ **OR/*OF***



(2)

4.6.2 Concentrated strong base(KOH)/*Gekonsentreerde sterk basis (KOH)* ✓
Strong heat/Sterk verhit ✓ (2)
[18]

QUESTION 5/*VRAAG 5*

5.1.1 **ANY ONE*:***

- Change in concentration ✓of products/reactants per unit time.✓
- Change in amount/number of mole/volume/mass ✓of products/reactants per unit time.✓
- Amount/number of mole/volume/mass of products formed/reactants used✓ per unit time.✓
- Rate of change in concentration/amount of moles/number of moles/volume/mass.✓✓(**2 or 0**)

ENIGE EEN:

- *Verandering in konsentrasie van produkte/reaktanse per eenheid tyd.*
- *Verandering in hoeveelheid/getal mol/volume/massa van produkte/reaktanse per eenheid tyd.*
- *Hoeveelheid/getal mol/volume/massa van produkte gevorm/reaktanse gebruik per eenheid tyd.*
- *Tempo van verandering in konsentrasie/hoeveelheid/getal mol//volume/massa* (**2 of 0**)

NOTE
Give the mark for per unit time only if in correct context of reaction rate
NOTA
Gee die punt vir per eenheid tyd slegs indien dit in die korrekte konteks vir reaksietempo gebruik is (2)

5.1.2 Experiment 1/*Eksperiment 1* ✓

- Highest temperature/*Hoogste temperatuur* ✓
- Largest surface area/ *Grootste reaksieoppervlak*✓ (3)

5.2

5.2.1 Temperature/Surface area/State of division. ✓
Temperatuur/Reaksieoppervlak/Toestand van verdeedheid (1)

5.2.2 Equal to/*Gelyk aan* ✓
Number/amount of mol/mass of Mg used is the same. ✓
Hoeveelheid mol/massa Mg is dieselfde (2)

5.3 More than ONE independent variable/*Meer as EEN onafhanklike veranderlike*✓ (1)

5.4 n(HCℓ) initial/*aanvanklik* = c.V ✓

= 2 x 80/1 000 ✓

= 0,16 mol

n(Mg)reacting/*reageer* = m/M

= 0.24/24 ✓

= 0.01 mol

n(HCℓ)reacting/*reageer* = 2 x 0.01 ✓

= 0.02 mol

n (HCℓ)remaining/*oorbly* = 0.16 – 0.02 ✓

= 0.14 mol

m(HCℓ)remaining/*oorbly* = nM

= 0.14 x 36,5 ✓

= 5,11 g ✓ (7)

5.5 5.5.1 Number/Fraction of molecules/particles/*aantal deeltjies* ✓ (1)

5.5.2 P ✓ (1)

5.5.3 Increase in temperature/*Toename in temperatuur*

- Increases (average) kinetic energy of particles. ✓/*Verhoog die (gemiddelde) kinetiese energie van deeltjies*
- More particles have enough/sufficient (kinetic) energy to react./EK ≥ EA ✓/*Meer deeltjies het genoeg (kinetiese) energie om te reageer*
- More effective collisions per unit time/second. ✓ OR Rate/Frequency of effective collisions increases./*Meer effektiewe botsings per eenheidstyd OF Reaksietempo van effektiewe botsings verhoog*
- Increases reaction rate ✓/*Toename in reaksietempo* (4)

[22]

QUESTION 6/*VRAAG* 6

6.1 The minimum energy required ✓ for a chemical reaction to start. ✓
Minimum hoeveelheid energie benodig om 'n reaksie te begin/aktiveer. (2)

6.2 Endothermic, ✓because energy is absorbed/E_k of reactants > E_k of products ✓✓
Endotermies, want energie word geabsorbeer/E_k van reaktante > E_k van produkte (3)

6.3 6.3.1 RP = Δ H/Heat of reaction/Enthalpy ✓
RP = Δ H/Reaksie warmte/Entalpie (1)

6.3.2 QP = Activation energy/*Aktiveringsenergie* ✓ (1)

6.4 ΔH reaction/*reaksie* = H products/*produkte* – H reactants/*reaktante* ✓

- 216,7 = H products/*produkte* – 400 ✓ H reactants/*reaktante*

(X) = 183,3 ✓ ($kJ \cdot mol^{-1}$) (3)

6.5 DECREASES/*AFNEEM* ✓ (1)
[11]

QUESTION 7/*VRAAG 7*

7.1 The rate of forward reaction equals to the rate of reverse reaction. ✓✓
Die tempo van die voorwaartse reaksie is dieselfde as die tempo van die terugwaartse reaksie. (2)

7.2 Higher than/*Hoër as* ✓ (1)

7.3 **Marking criteria/*Nasienkriteria:***

- n($C\ell_2$) equilibrium/*ewewig* = 0,6 mol ✓
- Substitute/*Vervang* m(H_2O) into/*in* n=m/M ✓
- using the correct mole ratio/*gebruik korrekte mol verhouding* ✓
- calculate the quantity (mol) at equilibrium of all three substances ✓
  bereken die hoeveelheid (mol) by ewewig van al drie verbindings
- divide number of moles at equilibrium by 5 ✓
  deel die aantal mol by ewewig deur 5
- Kc expression/*vergelyking* ✓
- Correct substitution of equilibrium concentrations in to Kc expression ✓
  Korrekte vervanging van ewewig konsentrasie in die Kc vergelyking
- Final answer/*Finale antwoord* ✓

OPTION 1 :CALCULATION USING NUMBER OF MOLES
OPSIE 1: BEREKENINGE WAT GETAL MOL GEBRUIK

	$HC\ell$	O_2	H_2O	$C\ell_2$
Ratio/*Verhouding*	4	1	2 ✓	2
Initial quantity/*Aanvanklike hoeveelheid* (mol)	1,5	2	1	0
Change/*Verandering* (mol)	1,2	0,3	0,6	0,6 ✓
Quantity at equilibrium / *Hoeveelheid by ewewig* (mol)	0,3	1,7	1,6 ✓	0.6 ✓
Equilibrium concentration / *Ewewigs konsentrasie* ($mol.dm^{-3}$)	0,06	0,34	0,32	0,12 ✓

$$Kc = \frac{[H_2O]^2 \cdot [C\ell_2]^2}{[HC\ell]^4 \cdot [O_2]} \quad ✓$$

$$Kc = \frac{(0,32)^2 \cdot (0,12)^2}{(0,06)^4 \cdot (0,34)} \quad ✓$$

Kc = 334,64✓

(8)

OPTION 2 :CALCULATION USING CONCENTRATION
OPSIE 2: BEREKENINGE WAT KONSENTRASIE GEBRUIK

	HCℓ	O_2	H_2O	$Cℓ_2$
Ratio/*Verhouding*	4	1	2✓	2
Initial conc./*Aanvanklike konsentrasie* (mol.dm^{-3})	0.30	0.40	0.2	0
Change in conc./*Verandering in konsentrasie* (mol.dm^{-3})	-0.24	-0.06	+0.12✓	+0.12✓
Equilibrium conc./*Ewewigs konsentrasie* (mol.dm^{-3})	0.06	0.34	0.32✓	0.12✓

$$Kc = \frac{[H_2O]^2 \cdot [Cℓ_2]^2}{[HCℓ]^4 \cdot [O_2]} \quad ✓$$

$$Kc = \frac{(0,32)^2 \cdot (0,12)^2}{(0,06)^4 \cdot (0,34)} \quad ✓$$

Kc = 334,64✓

7.4 **Marking criteria/*Nasienkriteria:***
If any one of the underlined key phrases in the correct context is omitted, deduct 1 mark
The underlined phrases must be in the correct context.
Indien enige van die onderstreepte frases in die korrekte konteks uitgelaat is,trek 1 punt af.
Die onderstreepte frases moet in die korrekte konteks wees.

When equilibrium in a closed system is disturbed, the system will re-instate a new equilibrium by favouring the reaction that will oppose/cancel the disturbances✓✓

Wanneer die ewewig in 'n geslote sisteem versteur word, sal die sisteem 'n nuwe ewewig instel deur die reaksie wat die versteuring teenwerk, te bevoordeel. (2)

7.5.1 REMAINS THE SAME/*BLY DIESELFDE* ✓ (1)

7.5.2 Increases/*Verhoog* ✓ (1)

7.6 An increase in pressure favours the reaction that produces a fewer number of moles. ✓The forward reaction is favoured ✓

'n Toename in druk bevoordeel die reaksie wat minder mol produseer. Die voorwaartse reaksie word bevoordeel. (2)

7.7.1 Lower than/*Kleiner as*✓ (1)

7.7.2 When the temperature increases the reverse reaction is favoured ✓ An increase in temperature favours the endothermic reaction. ✓

As die temperatuur verhoog sal die terugwaartse reaksie bevoordeel word. 'n Toename in temperatuur bevoordeel die endotermiese reaksie. (2)
[20]

QUESTION 8/*VRAAG 8*

8.1. A solution of precisely known concentration. ✓✓
'n Oplossing waarvan die konsentrasie presies bekend is (2)

8.2 $C_2H_2O_4$/ $C_2O_4^{2-}$ ✓✓ and/*en* H_2O/ OH^- ✓✓ (4)

8.3 Weak acid; ✓ it ionises/dissociates incompletely/partially(in water) ✓✓
Swak suur; dit ioniseer/dissosieer nie volledig nie (2)

8.4

8.4.1 HCO_3^- ✓✓ (2)

8.4.2 CO_3^{2-} ✓✓ (2)

8.5.1

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***	**OPTION *3/OPSIE 3***
$n = \frac{m}{M}$ ✓ $= \frac{5,25}{98}$ ✓ ✓ = 0,054 mol✓	98 g ✓ : 1 mol 5,25 ✓ : 0,054 ✓✓	c = m/MV ✓ = 5,25/98x 0,25 ✓ =0,214 ✓ n = c V = 0,214 x 0,25 = 0,054 mol ✓

(4)

8.5.2 C = n/v ✓
C =0,054 /0,25✓

pH = -log[H_3O^+]✓
= -log[1,6 x 10^{-1}] ✓
[H_3O^+] = 0,79 mol·dm^{-3}✓ (5)
[22]

TOTAL/*TOTAAL*: 150

SUBJECT:	PHYSICAL SCIENCES PAPER 2	ASSESSMENT TASK:	2024 JUNE EXAM

QUESTION ANALYSIS GRID

		Cognitive Levels				Topics						Difficulty Levels		
							CHEMICAL CHANGE							
QUESTION	**Mark**	**Remembering (Recall)**	**Understanding (Comprehension)**	**Applying and Analysing**	**Evaluating and Creating (synthesis)**	**Organic molecules (Matter & Materials - 58 marks**	**Rate of reaction & energy change**	**chemical equilibrium**	**acids & bases**	**quantitative aspect of chemical change**	**TOTAL**	**Easy(15%)**	**Moderate (35%)**	**Difficult (40%)**
1.1 Organic Chem	2		2			2					2		2	
1.2 Organic chem	2		2			2					2		2	
1.3 Organic chem	2		2			2					2		2	
Activation energy	2		2				2				2		2	
1.5 Chemical equaton	2		2				2				2		2	
1.6 Rates of reaction	2			2				2			2			2
1.7 Chemical equilibruim	2		2						2		2	2		2
1.8 Acid base	2		2						2		2		2	
1.9 Acids & Bases	2			2					2		2			2
1.10. Acids & Bases	2			2					2		2			2
Ques 1	**20**	**0**	**14**	**6**	**0**	**6**	**4**	**2**	**8**	**0**	**20**	**2**	**12**	**8**
2.1.1 Isomers	2	2				2					2	2		
2.1.2.Alchols	1	1				1					1	1		
2. 1.3 Acids	2		2			2					2		2	
2.2.1. IUPAC	3		3			3					3		2	
2.2.2. Strucural formula	3			3		3					3			3
2.2.3 IUPAC Name	2			2		2					2			2
2.3. Homologous series	1	1				1					1	1		
2.4.1 IUPAC Name.	2		2			2					2		2	
2.4.2 Alcohol	1			1		1					1			1
2.4.3 IUPAC Name	2		2			2					2		2	
2.5.1Functional Isomer	2		2			2					2		2	
2.5.2 Functional Isomers	2		2			2					2		2	
Ques 2	**22**	**4**	**9**	**6**	**0**	**23**	**0**	**0**	**0**	**0**	**19**	**4**	**8**	**6**

3.1 vapour pressuret.	2		2			2					2		2	
3.2.1 Variable	1	1				1					1	1		
3.2.2 Variable	1			1		1					1			1
3.3.1 IMF	2	2				2					2	2		
3.4.1 Structural formula	2	2				2					2	2		
3.4.2 Structural formula	2			2		2					2			2
3.5 IMF	4		4			4					4		4	
Ques 3	**15**	**5**	**6**	**3**	**0**	**14**	**0**	**0**	**0**	**0**	**14**	**5**	**6**	**3**
4.1.1 Type of reaction	1		1			1					1		1	
4.1.2 Type of reaction	1		1			1					1		1	
4.1.3 Type of reaction	1		1			1					1		1	
4.2. IUPAC Name	2			2		2					2			2
4.3.1 Molecular Formula	2		2			2					2		2	
4.3.2 Molecular Formula	2		2			2					2		2	
4.4. Structural Formula	2			2		2					2			2
4.5. Structural Formula	2			2		2					2			2
4.6.1Structural Formula	2			2		2					2			2
4.6.2 Reaction conditions	2	2				2					2		2	
Ques 4	**18**		**7**	**8**	**0**	**17**	**0**	**0**	**0**	**0**	**17**	**0**	**9**	**8**
5.1.1 Rate of reaction	2		2				2			2	2	2		
5.1.2. Factors	3			3			3			3	3			3
5.2.1 Variable	1	1					1			1	1		1	
5..2.2 Reaction rate	2	2					2			2	2		2	
5.3 Reaction rate	1	1					1			1	1		1	
5.4 Calculation of mass	7			7			7			7	7			7
5.5.1 Graph	1		1				1				1		1	
5.5.2 Graph	1		1				1				1		1	
5.5.3 Collision Theory	4			4			4				4		4	
QUES 6	**22**	**4**	**4**	**14**	**0**	**0**	**22**	**0**	**0**	**16**	**22**	**2**	**10**	**10**
6.1 Activation energy	2	2								2	2	2		
6.2 Exothermic reactin	3		3							3	3		3	
6.3..1 Graph	1	1								1	1		1	
6.3.2 Graph	1	1								1	1		1	
6.4 Calculation	3			3						3	3			3
6.5 Catalyst	1			1						1	1		1	
QUES 6	**11**	**4**	**3**	**4**	**0**	**0**	**0**	**0**	**0**	**11**	**11**	**2**	**6**	**3**

7.1 Chemical equilibruim	2		2					1			1		1	
7.2 Equilibruim.	1	1						1			1		1	
7.3 Kc	8			8				8			8			8
7.4 Le Chateliers	2		2					2			2			2
7.5.1 Kc value	1	1						1			1			
7.6 Le Chateliers	1		1				1				1		1	
7.5.2 le Chateliers	2			2			2				2			2
7.7.1 Factors	1	1					1				1		1	
7.7.2 Factors	2			2			2				2		2	
QUES 7	**20**	**2**	**5**	**8**	**0**	**0**	**0**	**13**	**0**	**0**	**19**	**0**	**2**	**10**
8.1 Standard solution	2		2							2	2	2		
8.2 Conjugate pairs	4			4						4	4			4
8.3 Strong acid	3		3							3	3	3		
8.4.1 Ampholyte	2			2						2	2			2
8.4.2 Formula	2		2							2	2	2		
8.5.1 Calculation	4				4					4	4			
8.5.2 Calculation	5				5					5	5			
QUES 8	**22**	**0**	**7**	**6**	**9**	**0**	**0**	**0**	**0**	**22**	**22**	**7**	**0**	**6**
SUMMARY														
QUESTION 1	**20**	**0**	**14**	**6**	**0**	**6**	**4**	**2**	**8**	**0**	**20**	2	12	8
QUESTION 2	**22**	**4**	**9**	**6**	**0**	**23**	**0**	**0**	**0**	**0**	**19**	4	8	6
QUESTION 3	**15**	**5**	**6**	**3**	**0**	**14**	**0**	**0**	**0**	**0**	**14**	5	6	3
QUESTION 4	**18**	**0**	**7**	**8**	**0**	**17**	**0**	**0**	**0**	**0**	**17**	0	9	8
QUESTION 5	**22**	**4**	**4**	**14**	**0**	**0**	**22**	**0**	**0**	**16**	**22**	2	10	10
QUESTION 6	**11**	**4**	**3**	**4**	**0**	**0**	**0**	**0**	**0**	**11**	**11**	2	6	3
QUESTION 7	**20**	**2**	**5**	**8**	**0**	**0**	**0**	**13**	**0**	**0**	**19**	0	2	10
QUESTION 8	**22**	**0**	**7**	**6**	**9**	**0**	**0**	**0**	**0**	**22**	**22**	7	0	6
Total marks	**150**	**19**	**55**	**55**	**9**	**60**	**26**	**15**	**8**	**49**	**158**	**22**	**53**	**54**
Norm marks	**150**	**22,5**	**52,5**	**60**	**15**	**58**	**24**	**17**	**14**	**9**	**150**	**22,5**	**52,5**	**60**
Total %	**100**	**12,7**	**36,7**	**36,7**	**6,0**	**40,0**	**17**	**10,0**	**5,3**	**33**	**105**	**14,7**	**35,3**	**36,0**
Norm %	**100**	**15**	**35,0**	**40**	**10**	**34,7**	**65,3**				**100**	**15,0**	**35,0**	**40**