Province of the
EASTERN CAPE
EDUCATION

# NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIORSERTIFIKAAT*

## GRADE/*GRAAD 12*

## JUNE/*JUNIE* 2024

# PHYSICAL SCIENCES: CHEMISTRY P2/ *FISIESE WETENSKAPPE: CHEMIE V2* MARKING GUIDELINE/*NASIENRIGLYN*

**MARKS/*PUNTE*: 150**

This marking guideline consists of 19 pages./
*Hierdie nasienriglyn bestaan uit 19 bladsye.*

## QUESTION 1/*VRAAG 1*

1.1 C ✓✓ (2)

1.2 D ✓✓ (2)

1.3 A ✓✓ (2)

1.4 D ✓✓ (2)

1.5 B ✓✓ (2)

1.6 B ✓✓ (2)

1.7 C ✓✓ (2)

1.8 C ✓✓ (2)

1.9 B ✓✓ (2)

1.10 B ✓✓ (2)

**[20]**

**QUESTION 2/*VRAAG 2***

2.1 A series of organic compounds that can be described by the same general formula ✓✓

*'n Reeks organiese verbindings wat deur dieselfde algemene formule beskryf kan word.*

**OR/*OF***

A series of organic compounds in which one member differs from the next with a $CH_2$ group ✓✓

*'n Reeks organiese verbindings waarin een lid van die volgende verskil met 'n $CH_2$ -groep* (2)

2.2 2.2.1 B ✓ (1)

2.2.2 A ✓ (1)

2.2.3 B ✓ (1)

2.2.4 C ✓ (1)

2.3 Secondary alcohol / *Sekondêre alkohol* ✓
The carbon that contains the hydroxyl group/ -OH is bonded to two carbon atoms. ✓
*Die koolstof wat die hidroksielgroep / -OH bevat is verbind aan twee ander koolstowwe*

**OR/*OF***

The hydroxyl group / -OH is bonded to a secondary carbon.
*Die hidroksielgroep / -OH is verbind aan 'n sekondêre koolstof*

**OR/OF**

The carbon that contains the hydroxyl group */ OH* contains one hydrogen atom
*Die koolstof wat die hidroksielgroep / OH bevat het een waterstof-atoom* (2)

2.4 2.4.1 $C_nH_{2n}$ ✓ (1)

2.4.2 4-methylpent-2-ene ✓✓
*4-metielpen-2-een*
**OR/*OF***
4-methyl-2-pentene ✓✓
*4-metiel-2-penteen*

**Marking criteria/*Nasienkriteria*:**
- Pent-2-ene / 2-pentene✓ *Pent-2-een / 2-penteen*
- Whole name correct ✓ *Hele naam korrek*

(2)

2.4.3 5,5-dimethylhexan-3-ol ✓✓✓
*5,5-dimetielhexan-3-ol*
**OR/*OF***
5,5-dimethyl-3-hexanol ✓✓✓
*5,5-dimetiel-3-hexanol*

**Marking criteria/*Nasienkriteria*:**
- Hexan-3-ol / 3-hexanol ✓
- Dimethyl / *dimetiel* ✓
- Whole name correct / *hele naam korrek* ✓

(3)

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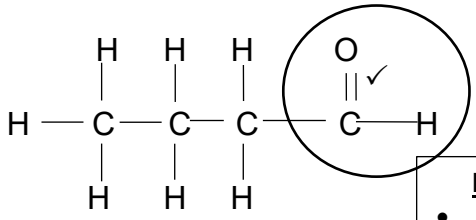
2.5 2.5.1

**Marking criteria/*Nasienkriteria***
If any of the underlined key words/phrases in the **correct context** are omitted: -1 mark per word/phrase.
*Indien enige van die sleutelwoorde/frases in die korrekte konteks weggelaat word: -1 punt per woord/frase.*

Compounds that have the same molecular formula but different functional groups. ✓✓

*Verbindings met dieselfde molekulêre formule maar verskillende funksionele groepe.* (2)

2.5.2



**Marking criteria/*Nasienkriteria***
- Functional group / *funksionele groep* ✓ 1/2
- Whole structure correct / *Hele struktuur korrek ✓2/2*

(2)

2.6 2.6.1 Esterification / Condensation / *Esterifikasie / Kondensasie* ✓ (1)

2.6.2

| Mol C | : Mol H | : Mol O |
|---|---|---|
| $\frac{58,82}{12}$ ✓ | : $\frac{9,81}{1}$ ✓ | : $\frac{31,37}{16}$ ✓ |
| 4,90 | : 9,81 | : 1,96 |
| 2,5 | : 5 | : 1 |
| 5 | : 10 | : 2 ✓ |

**Marking criteria/*Nasienkriteria***
- % C divide by M (C/) *% C gedeel deur M (C)*
- % H divide by M (H)/ *% H gedeel deur M(H)*
- % O divide by M (O)/ *% O gedeel deur M (O)*
- Simplest mole ratio/ *Eenvoudigste molverhouding*
- Molecular formula/ *Molekulêre formule*

Empirical formula / Empiriese formule: $C_5H_{10}O_2$

Molecular Formula / Molekulêre formule: $C_5H_{10}O_2$ ✓ (5)

2.6.3 $M\ (C_xH_yO_2) = 74\ g \cdot mol^{-1}$

$12n + 2n + 2(16) = 74$ ✓

$n = 3$ ✓

Propanoic acid/Propanoësuur ✓✓ (4)

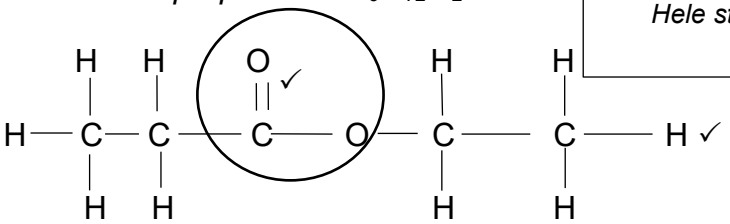
2.6.4 **Marking criteria/*Nasienkriteria***

- Determining the molar mass of alcohol **P** / *Bepaal die molekulêre massa van alkohol **P*** ✓
- Identifying alcohol **P** / *Identifiseer alkohol **P*** ✓
- Name of ester / *Naam van ester* ✓✓
- Structural formula of the ester/ *Struktuurformule van die ester* ✓✓

Propanoic acid + alcohol **P** → ester + $H_2O$
*Propanoësuur* + *alkohol **P***→ ester + $H_2O$
M (Alcohol / *Alkohol* P) = 102 + 18 – 74 = 46 g·mol$^{-1}$ ✓
Alcohol / *Alkohol* P = Ethanol / *etanol* ✓

**Marking criteria/*Nasienkriteria***
- Functional group / *funksionele groep* ✓ 1/2
- Whole structure correct / *Hele struktuur korrek* ✓2/2

Ester = ethyl ✓ propanoate ✓
*Ester = etielpropanoaat* $C_6H_{12}O_2$




(6)
**[34]**

## QUESTION 3/*VRAAG 3*

**Marking criteria/ *Nasienkriteria***
If any of the underlined key words/phrases in the **correct context** are omitted: - 1 mark per word/phrase.
*Indien enige van die sleutelwoorde frases in die **korrekte konteks** weggelaat word: -1 punt per woord/frase.*

3.1 Boiling point is the temperature at which the vapour pressure of a liquid / substance equal the atmospheric pressure ✓✓

*Kookpunt is die temperatuur waarby die dampdruk van 'n vloeistof/stof gelyk aan die atmosferiese druk is.* (2)

3.2 Alcohols are flammable / *Alkohole is vlambaar* ✓ (1)

3.3 140 (˚C) ✓ (1)

3.4 YES. ✓ Compounds have the same molecular mass/ compounds are Isomers / only one independent variable. ✓
*JA. Verbindings het dieselfde molekulêre massa/ verbindings is isomere / slegs een onafhanklike veranderlike.* (2)

3.5 2-methylbutan-1-ol ✓✓ *2-metielbutan-1-ol*
**OR/*OF***
2-methyl-1-butanol ✓✓ *2-metiel-1-butanol*

**Marking criteria/*Nasienkriteria***:
- butan-1-ol ✓
- Whole name correct / *hele naam korrek* ✓

(Accept/*Aanvaar*)

3-methylbutan-1-ol ✓✓ *3-metielbutan-1-ol*
**OR/*OF***
3-methyl-1-butanol ✓✓ *3-metiel-1-butanol* (2)

3.6 Alcohol **3** ✓ accept: 2,2-dimethylpropan-1-ol / 2,2-dimethyl-1-propanol
*Alkohol **3*** *aanvaar: 2,2-metielpropan-1-ol/ 2,2-dimetiel-1-propanol* (1)

3.7 **Marking criteria / *Nasienkriteria***
- Chain length decreases from **1** to **3**
  *Kettinglengte neem af vanaf **1** tot **3***
- Decrease in the strength of the London forces/dispersion forces/induced dipole forces from 1–3
  *Afname in die sterkte van die Londonkragte/verspreidingskragte/ Geïnduseerde dipool-dipool kragte vanaf 1–3*
- Relate the strength of London forces/dispersion forces/induced dipole to energy involved
  *Vergelyk the sterkte van die Londonkragte/verspreidingskragte/ Geïnduseerde dipool-dipool kragte na die energie*

From **1** to **3**

- Surface area / chain length decreases / increased in the number of branches ✓
  *Oppervlakte / kettinglengte neem af / toename in die aantal takke*
- Strength of London forces/dispersion forces/induced dipole forces decreases ✓
  *Sterkte van die Londonkragte/verspreidingskragte/geïnduseerde dipool-dipool kragte neem af*
- Less energy is needed to overcome intermolecular forces ✓
  *Minder energie word benodig om die intermolekulêre kragte te oorkom*

**OR/*OF***

**Marking criteria/Nasienkriteria**

- Chain length increases from ***3*** *to* ***1***
  *Kettinglengte neem toe vanaf* ***3*** *na* ***1***
- Increase in the strength of the London forces/dispersion forces/induced dipole forces from 3 to 1
  *Toename in die sterkte van die Londonkragte/Verspreidingskragte / geïnduseerde dipool-dipool kragte vanaf 3 na 1*
- Relate the strength of London forces to energy involved.
  *Vergelyk the sterkte van die Londonkragte/Verspreidingskragte/ geïnduseerde dipool-dipool kragte na die energie*

From **3** to **1** */ Vanaf* ***3*** *tot* ***1***

- Surface area / chain length increases/ decreased in the number of branches ✓
  *Oppervlakte/ kettinglengte neem toe/ afname in die aantal takke*
- Strength of London forces/Dispersion forces/Induced dipole forces increases ✓
  *Sterkte van die Londonkragte/Verspreidingskragte /Geïnduseerde dipool-dipool kragte neem toe*
- More energy needed to overcome intermolecular forces ✓
  *Meer energie word benodig om die intermolekulêre kragte te oorkom* (3)

3.8 3.8.1

**Marking criteria/ *Nasienkriteria***
If any of the underlined key words/phrases in the **correct context** are omitted: - 1 mark per word/phrase.
*Indien enige van die sleutelwoorde/frases in die* ***korrekte konteks*** *weggelaat word: - 1 punt per woord/frase.*

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)

3.8.2 **Marking criteria/*Nasienkriteria***

- Butan-1-ol has hydrogen bonds ✓/
  *Butan-1-ol het waterstofbinding*
- Butanone has dipole-dipole forces ✓ /
  *Butanoon het dipool-dipool kragte* /
- Compare the strength of the hydrogen bonds to dipole-dipole forces ✓/
  *Vergelyk die sterkte van die waterstofbinding met dipool-dipoolkragte /*
- Relate strength intermolecular forces to vapour pressure ✓/
  *Verwys die sterkte van die intermolekulêrekragte met die dampdruk*

- Butan-1-ol has hydrogen bonds (and London forces) ✓/
  *Butan-1-ol het waterstofbinding (en Londonkragte)*
- Butanone has dipole-dipole forces (and London forces) ✓/
  *Butanoon het dipool-dipoolkragte (en Londonkragte*)
- Hydrogen bonds is stronger than the dipole-dipole forces ✓/
  *Waterstofbinding is sterkter as die dipool-dipoolkragte*
- Stronger intermolecular forces result in lower vapour pressure ✓/
  *Sterker intermolekulêrekragte lei tot laer dampdruk*

**OR/*OF***

- Butan-1-ol has for hydrogen bonds (and London forces) ✓/
  *Butan-1-ol het waterstofbinding (en Londonkragte)*
- Butanone has dipole-dipole forces (and London forces) ✓/
  *Butanoon het dipool-dipoolkragte (en Londonkragte*)
- Dipole-dipole forces weaker than the hydrogen bonds ✓/
  *Dipool-dipoolkragte is swakker as die waterstofbinding*
- Weaker intermolecular forces result in higher vapour pressure ✓/
  *Swakker intermolekulêrekragte sal tot 'n hoër dampdruk lei* (4)

3.8.3 INCREASE / *TOENEEM* ✓ (1)

**[19]**

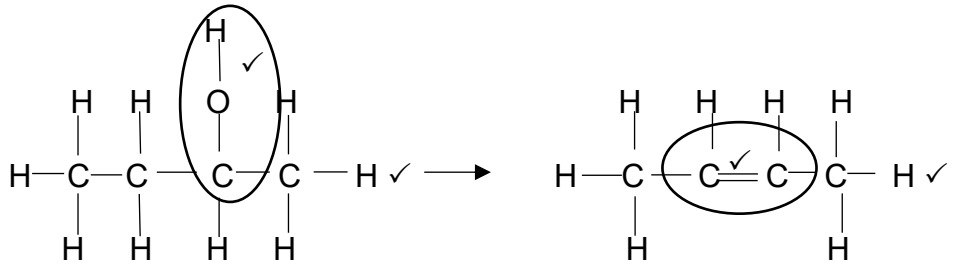
**QUESTION 4/*VRAAG 4***

4.1 4.1.1 Dehydration / *Dihidratering / dihidrasie* ✓ (1)

4.1.2 Sulphuric acid / *swawelsuur* / $H_2SO_4$ ✓ (1)

4.1.3

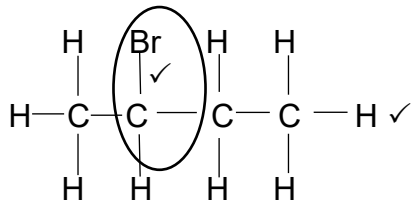
**Marking criteria/*Nasienkriteria*:**
**Organic compounds only/ *Slegs vir organiese verbinding***
- Functional group/ *funksionele groep* ✓ 1/2
- Whole structure correct / *Hele struktuur korrek* ✓ (2/2)
  *Hele struktuur korrek* ✓ *2/2*



\+ $H_2O$ (4)

4.1.4 Addition / hydrohalogenation / *Addisie / hidrohalogenering/ hidrohalogenasie* ✓ (1)

4.1.5 2-bromobutane ✓✓/
*2-bromobutaan*



**Marking criteria/ *Nasienkriteria***
**Name of compound / *Naam van verbinding***
- Butane / *butaan* ✓ 1/2
- Whole name correct ✓ *2/2*
  *hele naam korrek*

**Structure /**
- Functional group ✓ 1/2
  *funksionele groep*
- Whole structure correct ✓/*Hele struktuur korrek 2/2*

(4)

4.1.6 Mild heat ✓ and dilute strong base /LiOH/KOH/NaOH ✓/
*Matige hitte en verdunde sterk basis /LiOH/KOH/NaOH* (2)

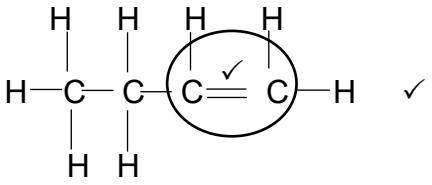
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4.2 4.2.1 Breaking down of long chain hydrocarbon molecules into more useful shorter chains ✓✓ **(2 or 0)** */*
*Die proses waarin langer kettingkoolwaterstof-molekule afgebreek word in korter, meer bruikbare, molekule* ***(2 of 0)*** (2)

4.2.2 Minimize the UV light present / No substitution reaction can occur in the saturated hydrocarbon ✓/
*Verminder die teenwoordige UV-lig / Geen substitusiereaksie kan in die versadigde koolwaterstof plaasvind nie* (1)

4.2.3 $C_4H_2$. ✓ It readily reacts with bromine (without the presence of UV-light) ✓
*$C_4H_2$. Dit reageer geredelik met broom (sonder die teenwoordigheid van UV-lig)* (2)

4.2.4




✓

**Marking criteria/*Nasienkriteria***
- Functional group ✓ ½
  *Funksionele groep*
- Whole structure correct/ ✓ *2/2*
  *Hele struktuur korrek*

(2)

4.2.5 $2\ C_4H_{10} + 13\ O_2$ ✓ → $8\ CO_2 + 8\ H_2O$ ✓ (✓ bal.)

**Marking criteria / *Nasienkriteria***
- Reactants / *Reaktanse* 1/3
- Products / *Produkte* *2/3*
- Balancing */ Balansering* *3/3*

(3)
**[23]**

**QUESTION 5/*VRAAG 5***

5.1

**Marking criteria/ *Nasienkriteria***
If any of the underlined key words/phrases in the **correct context** are omitted: - 1 mark per word/phrase. /
*Indien enige van die sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per woord/frase*

**ANY ONE**
Change in concentration ✓ of reactant or product per (unit) time. ✓

Change in amount/number of moles/volume/mass ✓of products or reactants per (unit) time. ✓

Change in amount/number of moles/volume/mass ✓ of products formed or reactants used reactants per (unit) time. ✓

***ENIGE EEN***
*Verandering in konsentrasie van reaktanse of produkte per (eenheid) tyd.*

*Verandering in hoeveelheid/getal mol/volume/massa van reaktanse of produkte per (eenheid) tyd.*

*Verandering in hoeveelheid/getal mol/volume/massa van produkte gevorm / reaktanse gebruik per (eenheid) tyd.*

**OR/*OF***

The rate of change in concentration/amount of moles/number of moles / volume / mass. ✓✓ **(2 or 0)**

*Die tempo van verandering in konsentrasie / hoeveelheid mol / getal mol / volume / massa. **(2 of 0)*** (2)

5.2 Temperature / *Temperatuur* ✓ (1)

5.3 5.3.1 Experiment / *Eksperiment* **2** ✓ (1)

5.3.2 **OPTION 1 / *OPSIE 1***

- In experiment 2 more particles are exposed / larger surface area ✓
- More particles will collide with the correct orientation ✓
- More effective collisions per unit time / Frequency of the effective collisions increases ✓

- *In eksperiment 2 word meer deeltjies blootgestel / groter oppervlakte*
- *Meer deeltjies sal met die korrekte oriëntasie bots*
- *Meer effektiewe botsings per tydseenheid / Frekwensie van die effektiewe botsings neem toe*

**OR/*OF***

**OPTION 2 / *OPSIE 2***

- In experiment 3 less particles are exposed / smaller surface area ✓
- Less particles will collide with the correct orientation ✓
- Less effective collisions per unit time / Frequency of the effective collisions decreases ✓

- *In eksperiment 3 word minder deeltjies blootgestel / kleiner oppervlakte*
- *Minder deeltjies sal met die korrekte oriëntasie bots*
- *Minder effektiewe botsings per tydseenheid / Frekwensie van die effektiewe botsings neem af* (3)

5.4 5.4.1

| **Marking criteria /** | ***Nasienkriteria*** |
|---|---|
| • Subst. Into the rate equation<br>• Subst. into n = m/M<br>• Using the mol ratio $CO_2$ : $MgCO_3$<br>• Formula m = nM<br>• Subst. into m = nM<br>• Final answer | • *Vervang in die tempo vergelyking*<br>• *Vervang in n = m/M*<br>• *Gebruik die mol verhouding $CO_2$ : $MgCO_3$*<br>• *Formule m = n/M*<br>• *Vervanging in m = n/M*<br>• *Finale antwoord* |

$$\text{Rate/ } \textit{Tempo} = \frac{\Delta m}{\Delta t}$$

$$0,25 = \frac{m - 0}{10,44} \checkmark$$

$$m = 2,61 \text{ g}$$

$$n = \frac{M}{m}$$

$$n = \frac{2,61}{44} \checkmark$$

$$n = 0,0593 \text{ mol}$$

$n (CO_2) = n (MgCO_3) = 0,0593$ mol ✓

$m = nM$ ✓

$m = (0,0593)(84)$ ✓

$m = 4,9812$ g ✓ (6)

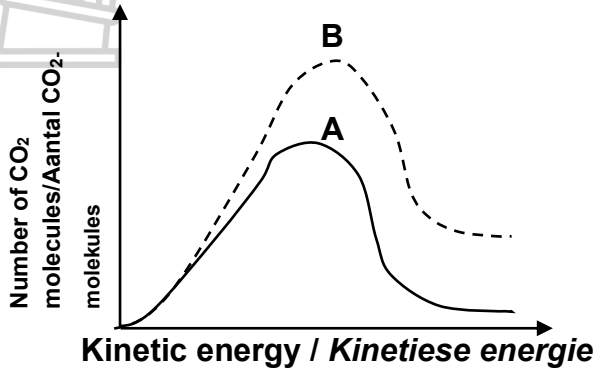
5.4.2

$$n = \frac{V}{V_m} \checkmark$$

$$0{,}0593 = \frac{1{,}47}{V_m} \checkmark$$

$$V_m = 24{,}79\ dm^3 \checkmark$$ (3)

5.5




**Marking criteria / *Nasienkriteria***

- Shape of **B** starting at the origin ✓
  *Vorm van **B** begin by oorsprong*
- Curve of **B** is higher / *Kurwe **B** is hoër* ✓

**NOTE: A or B must be indicated**
**Ignore the labels of the axes.**
***LET WEL: A of B moet aangedui word.***
***Ignoreer die benoeming van die asse.***

(2)
**[18]**

## QUESTION 6/*VRAAG 6*

6.1 6.1.1 **Marking criteria/ *Nasienkriteria***
If any of the underlined key words/phrases in the **correct context** are omitted: - 1 mark per word/phrase.
*Indien enige van die sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per woord/frase*

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

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

6.1.2 EQUAL TO / *GELYK AAN* ✓
Chemical equilibrium is reached / *Chemiese ewewig word bereik* ✓ (2)

6.1.3 Y ✓
2 mol of $SO_2$ will react for every 1 mol of $O_2$ ✓/
*2 mol van $SO_2$ sal reageer met elke 1 mol van $O_2$*

**OR/*OF***

The rate at which $SO_2$ is consumed is twice that of $O_2$./
*Die tempo waarteen $SO_2$ verbruik word is twee keer as dié van $O_2$*

**OR/*OF***

0,925 mol of $SO_2$ reacted with 0,46 mol of $O_2$ ✓/
*0,925 mol van $SO_2$ reageer met 0,46 mol $O_2$* (2)

6.1.4 NEGATIVE / *NEGATIEF* ✓ (1)

6.1.5
- The amount/concentration of $SO_3$ increased / $SO_2$ and $O_2$ decreased ✓
- (According to Le Chatelier's principle) A decrease in temperature favours the exothermic reaction. ✓
- The forward reaction was favoured / The equilibrium position shifted towards the right ✓

- *Die hoeveelheid/konsentrasie van $SO_3$ neem toe / $SO_2$ en $O_2$ verlaag*
- *(Volgens Le Chatelier se beginsel) 'n Afname in temperatuur bevoordeel die eksotermiese reaksie*
- *Die voorwaartse reaksie word bevoordeel / Die ewewigsposisie verskuif na regs* (3)

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6.2 6.2.1 **OPTION 1: MOLE CALCULATIONS / *OPSIE 1: MOLBEREKENINGE***

a. Determine the change in mol of NOCℓ / *Bepaal die verandering in mol van NOCℓ*
b. Correct ratio NOCℓ : NO : $C\ell_2$ / *Korrekte verhouding NOCℓ : NO : $C\ell_2$*
c. Determine the equilibrium mol for NOCℓ , NO and $C\ell_2$ / *Bepaal die ewewig mol van NOCℓ , NO en $C\ell_2$*
d. Dividing by/ *Deel deur* 1,5
e. Correct Kc expression with square brackets / *Korrekte Kc uitdrukking met vierkanthakkies*
f. Subst. into the correct Kc expression /*Vervanging in korrekte Kc uitdrukking*
g. Final answer / *Finale antwoord*

$\Delta n$ (NOCℓ) = 2,5 x 28/100 = 0,7 ✓ (a)

| | 2 NOCℓ | 2 NO (g) | $C\ell_2$ (g) | |
|---|---|---|---|---|
| Initial mol *Aanvangsmol* | 2,5 | - | - | |
| Change in mol *Verandering in mol* | 0,7 | 0,7 | 0,35 | (b) ✓ |
| Equilibrium mol *Ewewigsmol* | 1,8 | 0,7 | 0,35 | (c) ✓ |
| Concentration *Konsentrasie* | =1,8 / 1,5 = 1,2 | = 0,7 / 1,5 = 0,47 | =0,35 / 1,5 0,23 | (d) ✓ |

$$K_c = \frac{[NO]^2[C\ell_2]}{[NOC\ell]^2} \quad \text{(e) ✓}$$

$$K_c = \frac{(0,47)^2(0,23)}{(1,2)^2} \quad \text{(f) ✓}$$

$K_c$ = 0,035 ✓ (g)

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**OPTION 2: CONCENTRATION CALCULATIONS / *OPSIE 2: KONSENTRASIE BEREKENINGE***

a. Determine the initial concentration NOCℓ / *Bepaal die aanvanklike konsentrasie van NOCℓ*
b. Determine the change in conc of NOCℓ / *Bepaal die verandering in konsentrasie van NOCℓ*
c. Correct ratio NOCℓ : NO : $C\ell_2$ / *Korrekte verhouding NOCℓ : NO : $C\ell_2$*
d. Determine the equilibrium conc. for NOCℓ , NO and $C\ell_2$ / *Bepaal die ewewigs konsentrasie van NOCℓ , NO en $C\ell_2$*
e. Correct Kc expression with square brackets / *Korrekte Kc uitdrukking met vierkanthakkies*
f. Subst. into the correct Kc expression/ *Vervanging in korrekte Kc uitdrukking*
g. Final answer / *Finale antwoord*

$c_i$ (NOCℓ) = 2,5 ÷ 1,5 = 1,67 ✓ (a)
Δc (NOCℓ) = 1,67 x 28 / 100 = 0,47 ✓ (b)

| | 2 NOCℓ | 2 NO (g) | $C\ell_2$ (g) |
|---|---|---|---|
| Initial concentration *Aanvangskonsentrasie* | 1,67 | - | - |
| Change in concentration *Verandering in konsentrasie* | 0,47 | 0,47 | 0,235 |
| Equilibrium concentration *ewewigskonsentrasie* | 1,2 | 0,47 | 0,235 |

(c) ✓
(d) ✓

$$K_c = \frac{[NO]^2[C\ell_2]}{[NOC\ell]^2}$$ (e) ✓

$$K_c = \frac{(0,47)^2(0,23)}{(1,2)^2}$$ (f) ✓

a. $K_c$ = 0,035 ✓ (g) (7)

6.2.2 REMAINS THE SAME / *BLY DIESELFDE* ✓

Only temperature has an effect on the value of the equilibrium constant. ✓/
*Slegs temperatuur het 'n effek op die waarde van die ewewigskonstante* (2)
**[19]**

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**QUESTION 7/*VRAAG 7***

7.1 7.1.1 Acids produce hydrogen ions ($H^+/H_3O^+$/ hydronium ions) in aqueous solutions. ✓✓/

*'n Suur is 'n stof wat waterstof-ione ($H^+/H_3O^+$/ hydroniumione) vorm wanneer dit in water oplos* (2)

7.1.2 $H_2O$ ✓and / *en* $HSO_4^-$ ✓ (2)

7.1.3 $H_2SO_4 + 2\ KOH$ ✓ → $K_2SO_4 + 2\ H_2O$ ✓ (✓ bal.)

| **Marking criteria/ *Nasienkriteria*** |
|---|
| • Reactants / *Reaktanse* |
| • Products /*Produkte* |
| • Balancing / *Balansering* |

(3)

7.2 7.2.1

| **OPTION 1 / *OPSIE 1*** | **OPTION 2 / *OPSIE 2*** |
|---|---|
| $c = \frac{m}{MV}$ ✓ | $n = \frac{m}{M}$ |
| $c = \frac{3,812}{(40)(100x10^{-3})}$ ✓ | $n = \frac{3,812}{40}$ |
| $c = 0,953\ mol\cdot dm^{-3}$ ✓ | $n = 0,0953\ mol$ |
| | $c = \frac{n}{V}$ ✓ |
| | $c = \frac{0,0953}{100x10^{-3}}$ ✓ |
| | $c = 0,953\ mol\cdot dm^{-3}$ ✓ |

(3)

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7.2.2 **OPTION 1 / *OPSIE 1***

**Marking criteria/ *Nasienkriteria***

- Subst. c and V of NaOH into n = cV / *Vervang van c en V van NaOH in n = Cv*
- Use of **ratio** $CH_3COOH$ : NaOH
- *Gebriuk van **verhouding** $CH_3COOH$ : NaOH*
- Subst. of n and V of $CH_3COOH$ into c = n/V / *Vervang van c en V van $CH_3COOH$ in n = cV*
- Formula / *Formule* m = cMV
- Subst. into / *Vervanging in* m = cMV
- Subst. into percentage formula / *Vervanging in persentasie-formule*
- Final answer / *Finale antwoord*

n (NaOH) = cV

n (NaOH) = $(0,953)(21,8 \times 10^{-3})$ ✓

n (NaOH) = 0,0207754 mol

n ($CH_3COOH$) = n (NaOH) = 0,0207754 mol ✓

$$c = \frac{n}{V}$$

$$c = \frac{0,0207754}{25 \times 10^{-3}} \checkmark$$

$$c = 0,831016 \text{ mol·dm}^{-3}$$

m = cMV ✓

m = $(0,831016)(60)(25 \times 10^{-3})$ ✓

m = 1,2465 g

$$\text{Percentage mass / } \textit{Persentasie massa} = \frac{1,2465}{25} \text{ X } 100\ \% \checkmark$$

Percentage mass / *Persentasie massa* = 4,986 % ✓

**OPTION 2 / *OPSIE 2***

**Marking criteria / *Nasienkriteria***

- Subst. into / *Vervang in* $n_a$ and/ *en* $n_b$ $\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$
- Subst. into / *Vervang in* $V_a$ $\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$
- Subst. into / *Vervang in* $c_b$ and/ *en* $V_b$ $\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$
- Formula /*Formule* m = cMV
- Subst into / *Vervanging in* m = cMV
- Subst into percentage formula / *Vervanging in persentasie formule*
- Final answer / *Finale antwoord*

$$\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$$

$$\frac{c_a(25)\ \checkmark}{(0{,}953)(21{,}8)\ \checkmark} = \frac{1}{1}\ \checkmark$$

$c_a = 0{,}831016\ mol{\cdot}dm^{-3}$

m = cMV ✓

m = (0,831016)(60)(25 x $10^{-3}$) ✓

m = 1,2465 g

Percentage mass / *Persentasie massa* $= \frac{1{,}2465}{25}$ X 100% ✓

Percentage mass / *Persentasie massa* = 4,986% ✓ (7)

**[17]**

**TOTAL/*TOTAAL*: 150**

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