Province of the
EASTERN CAPE
EDUCATION

NATIONAL
SENIOR CERTIFICATE/
NASIONALE SENIOR
SERTIFIKAAT

GRADE/*GRAAD* 12

SEPTEMBER 2022

PHYSICAL SCIENCES P2
MARKING GUIDELINE/
FISIESE WETENSKAPPE V2
NASIENRIGLYN

MARKS/ *PUNTE*: 150

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

QUESTION/*VRAAG* 1

1.1	B ✓✓	(2)
1.2	A ✓✓	(2)
1.3	B ✓✓	(2)
1.4	C ✓✓	(2)
1.5	C ✓✓	(2)
1.6	A ✓✓	(2)
1.7	B ✓✓	(2)
1.8	D ✓✓	(2)
1.9	B ✓✓	(2)
1.10	A ✓✓	(2)
		[20]

QUESTION/*VRAAG* 2

2.1 It is a series of organic compounds that can be described by the same general formula. ✓✓ **(2 or 0)**

'n Reeks organiese verbindings wat deur dieselfde algemene formule beskryf kan word. ***(2 of 0)***

OR/*OF*

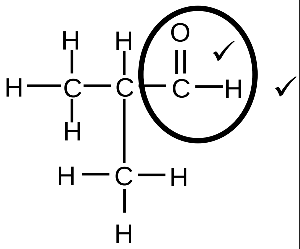
A series/group of organic compounds in which one member differs from the next with -CH_2- group. ✓✓ **(2 or 0)**

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

2.2.1 D ✓ (1)

2.2.2 C_nH_{2n-2} ✓ (1)

2.2.3



Marking criteria/ Nasienkriteria
• Only functional group correct / *Slegs funksionele groep korrek*: Max/ *Maks* ½ • *Whole structure correct/ Hele struktuur korrek: 2/2*

(2)

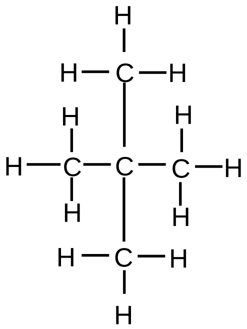
pentanoic acid

2.3 3-ethyl-2-methyl~~hexanoic acid~~ / *3-etiel-2-metielheksanoësuur*

Marking criteria
• Correct stem i.e ~~hexanoic acid~~ pentanoic acid ✓ • All substituents (ethyl and methyl) correctly identified ✓ even if positions swapped • IUPAC name completely correct including numbering, sequence and hyphens ✓
Nasienkriteria
• *Korrekte stam d.i heksanoësuur* • *Alle substituente (etiel en metiel) korrek geïdentifiseer* • *IUPAC-naam heeltemal korrek insluitende nommering, volgorde en koppeltekens*

(3)

2.4.1



Marking criteria/*Nasienkriteria*
• Longest chain contains 3 carbons / *Langste koolstofketting bevat 3 koolstowwe* ✓ around C there must be 4 bonds • Two methyl substituents on C2 / *Twee metielsubstituente op C2* ✓ • Whole structure is correct / *Hele struktuur korrek* ✓

(3)

2.4.2 $C_5H_{12} + 8\ O_2$ ✓→ $6\ H_2O + 5\ CO_2$ ✓ (bal ✓)

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

(3)

[15]

QUESTION/*VRAAG* 3

3.1.1

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.*

a substance

The temperature at which the vapour pressure of (a liquid) equals the atmospheric pressure. ✓✓ can swap atmospheric pressure and vapour pressure / frequency of effective collisses

Die temperatuur waarby die dampdruk van die vloeistof gelyk is aan die atmosferiese druk. (2)

3.1.2 As the number of C atoms increases:

- The surface area/chain length/molecular mass of the alcohols increases ✓
- The strength of London forces/induced dipole forces/dispersion forces increase. ✓

Soos die aantal C-atome toeneem:

- *Die oppervlak-area/kettinglengte/molekulêre massa van die alkohole verhoog.*
- *Die sterkte van die Londonkragte/geïnduseerde dipoolkragte/ verspreidingskragte verhoog*

OR/*OF*

As the number of C atoms decreases:

- The surface area/chain length/molecular mass of the alcohols decreases ✓
- The strength of London forces/induced dipole forces/dispersion forces decrease. ✓

Soos die aantal C-atome afneem:

- *Die oppervlak-area/kettinglengte/molekulêre massa van die alkohole verlaag.*
- *Die sterkte van die Londonkragte/geïnduseerde dipoolkragte/ verspreidingskragte verswak* (2)

3.1.3

Marking criteria
- Identify the intermolecular forces in both compounds. ✓✓
- Compare the strength of the intermolecular forces. ✓

Nasienkriteria
- *Die intermolekulêre kragte korrek geïdentifiseer in beide verbindings*
- *Vergelyk die sterkte van die intermolekulêre kragte*

- Alcohols have both (London forces) and hydrogen bonds ✓
- Ketones have both (London forces) and dipole-dipole forces ✓
- Hydrogen bonds in the alcohols are stronger than the dipole-dipole forces in ketones ✓

- *Alkohole het beide (Londonkragte) en waterstofbindings*
- *Ketone het beide (Londonkragte) en dipool-dipool kragte*
- *Waterstofbindings in die alkohole is sterker as die dipool-dipoolkragte in ketone*

OR/*OF*

- Alcohols have both (London forces) and hydrogen bonds ✓
- Ketones have both (London forces) and dipole-dipole forces ✓
- the dipole-dipole forces in Ketones are weaker than the hydrogen bonds in the alcohols ✓

- *Alkohole het beide (Londonkragte) en waterstofbindings*
- *Ketone het beide (Londonkragte) en dipool-dippol kragte*
- *Die dipool-dipoolkragte in ketone is swakker as die waterstofbindings in die alkohole* (3)

3.1.4 To have one independent variable✓ **OR** To have a fair test
*Om slegs een onafhanklike veranderlike te het **OF** Om 'n regverdige toets te hê* (1)

3.1.5 Ketone ✓

Lower boiling point / *Laer kookpunt* ✓ (2)

3.2.1 Propanoic acid / *Propanoësuur* ✓ (1)

3.2.2

Marking criteria
- Identify the intermolecular forces correctly in both compounds. ✓
- Compare the strength of the intermolecular forces. ✓
- Compare the energy required to overcome the intermolecular forces. ✓

Nasienkriteria
- *Die intermolekulêre kragte is korrek in beide verbindings geïdentifiseer*
- *Vergelyk die sterkte van die intermolekulêre kragte.*
- *Vergelyk die energie wat benodig word om die intermolekulêre kragte te oorkom.*

No negative marking.

- Both have hydrogen bonds ✓
- ~~Propan-1-ol has ONE site for hydrogen bonds~~
- ~~Propanoic acid has TWO sites for hydrogen bonds~~ } ~~✓~~
- The intermolecular forces of propanoic acid are stronger than that of propan-1-ol ✓
- More energy is needed to overcome the intermolecular forces of propanoic acid. ✓

- *Beide het waterstofbindings*
- *Propan-1-ol het EEN plek vir waterstofbindings*
- *Propanoësuur het TWEE plekke vir waterstofbindings*
- *Die intermolekulêrekragte in propanoësuur is sterker as dié in propan-1-ol*
- *Meer energie word benodig om die intermolekulêre kragte te oorkom in propanoësuur*

OR/OF

- Both have hydrogen bonds. ✓
- ~~Propan-1-ol has ONE site for hydrogen bonds~~
- ~~Propanoic acid has two sites for hydrogen bonds~~ } ~~✓~~
- The intermolecular forces of propan-1-ol are weaker than that of propanoic acid ✓
- Less energy is needed to overcome the intermolecular forces of propan-1-ol. ✓

- *Beide het waterstofbindings*
- *Propan-1-ol het EEN plek vir waterstofbindings*
- *Propanoësuur het TWEE plekke vir waterstofbindings*
- *Die intermolekulêrekragte in propan-1-ol is swakker as dié in propanoësuur.*
- *Minder energie word benodig om die intermolekulêre kragte te oorkom in propan-1-ol.* (3)

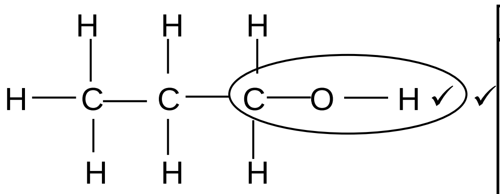
[14]

QUESTION/*VRAAG* 4

4.1.1 Esterification / condensation / *Esterifikasie / konsensasie* ✓ (1)

4.1.2 (Mild) heat / *(Matige) hitte* ✓ (1)

4.1.3



Marking criteria/ *Nasienkriteria*
• Only functional group correct *Slegs funksionele groep korrek*: Max/*Maks* ½   • *Whole structure correct/ Hele struktuur korrek: 2/2*

(2)

4.1.4 Propyl ✓ethanoate ✓ / *Propiel etanoaat* (2)

4.1.5 Pentanoic acid / ~~*Propanoësuur*~~ ✓✓ Pentanoesuur / frequency of effective collisions decreases (2)

4.1.6 Substitution reaction / *Substitusie-reaksie* ✓ (1)

4.1.7 H_2O ✓ (1)

4.1.8 $CH_3CH_2CH_2C\ell$ ✓✓

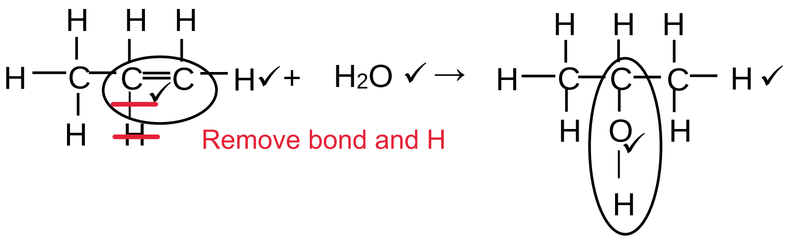
Marking criteria/ *Nasienkriteria*
• Only functional group correct / *Slegs funksionele groep korrek*: Max/*Maks* ½   • *Whole structure correct / Hele struktuur korrek: 2/2*

(2)

4.2.1 (Concentrated / *Gekonsentreerde*) H_2SO_4 ✓✓ (2)

4.2.2 $\underline{H_2O \text{ in excess}}$ ✓ / catalyst/ (Add small amount of $HC\ell/H_3PO_4$) (1)

4.2.3



Marking criteria/ *Nasienkriteria*   **(Organic molecules / *Organiese molekules*)**
• Only functional group correct / *Slegs funksionele groep korrek*: Max/*Maks* ½   • *Whole structure correct/ Hele struktuur korrek: 2/2*

(5)
[20]

QUESTION/*VRAAG 5*

5.1

<u>Marking criteria/ *Nasienkriteria*</u>
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*

<u>ANY ONE</u>

- <u>Change in concentration</u> ✓of reactant / product <u>per (unit) time.</u>✓
- <u>Change in amount/number of moles/volume/mass</u> of products or reactants <u>per (unit) time.</u>
- <u>Amount/number of moles/volume/mass of products formed/reactants used reactants per (unit) time.</u>

<u>ENIGE EEN</u>

- *<u>Verandering in konsentrasie</u> van reaktanse/produkte <u>per (eenheid) tyd</u>*
- *<u>Verandering in hoeveelheid/getal mol/volume/massa</u> van reaktanse of produkte <u>per (eenheid) tyd.</u>*
- *<u>Hoeveelheid/getal mol/volume/massa van produkte gevorm/ reaktanse gebruik per (eenheid) tyd</u>*

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 Concentration / *Konsentrasie* (of/*van* HCℓ) ✓ (1)

5.3 Equal to / *Gelyk aan* ✓

The same amount of (the limiting reagent), $Na_2S_2O_3$, is used. ✓
Dieselfde hoeveelheid (van beperkde reagens) $Na_2S_2O_3$ was gebruik. (2)

5.4.1 Experiment 3 / *Eksperiment 3* ✓ (1)

5.4.2 For T_2

- Higher temperature increases kinetic energy of particles ✓
- Greater (More) number of particles have sufficient energy. ✓
- More effective collision per unit time ✓ / frequency of effective collisions increases

Vir T_2

- *Hoër temperatuur verhoog die kinetiese energie van die deeltjies*
- *Groter aantal deeltjies het genoeg energie*
- *Meer effektiewe botsings per eenheidstyd*

OR/*OF*

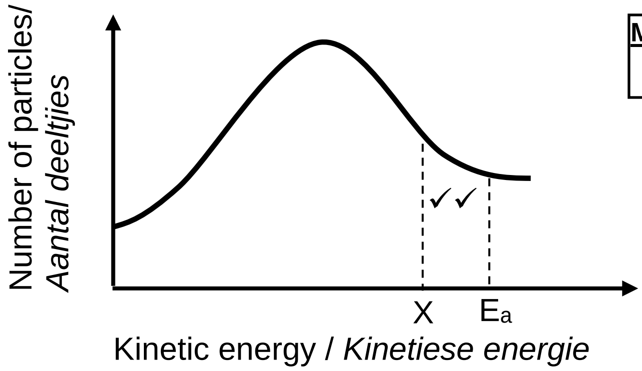
For T_1

- Lower temperature decreases kinetic energy of particles
- Fewer particles have sufficient energy.
- Less effective collision per unit time / frequency of effective collisions decreases

Vir T_1

- *Laer temperatuur verlaag die kinetiese energie van die deeltjies*
- *Minder aantal deeltjies het genoeg energie*
- *Minder effektiewe botsings per eenheidstyd* (3)

5.4.3



Marking criteria/*Nasienkriteria*
• $X < E_a$

(2)

both X and E_a must be there

5.5

Marking criteria

- Formula n = m/M
- Substitution into n = m/M
- **Using** ratio HCℓ: $Na_2S_2O_3$ 2 : 1
- Substitution into rate equation
- Final answer

Nasienkriteria

- *Formule* n = m/M
- *Vervanging in* n = m/M
- ***Gebruik** van verhouding* HCℓ: $Na_2S_2O_3$ 2 : 1
- *Vervanging in tempo vergelyking*
- *Finale antwoord*

$n = \frac{m}{M}$ ✓

$n = \frac{0,7118}{158}$ ✓

n ($Na_2S_2O_3$) = $4,505 \times 10^{-3}$ mol

n (HCℓ) = 2 ($4,505 \times 10^{-3}$) ✓

n (HCℓ) = $9,01 \times 10^{-3}$ mol

rate/ *tempo* = $-\frac{\Delta n}{\Delta t}$ rate/ *tempo* = $-\frac{0 - 9,01 \times 10^{-3}}{34}$ ✓ rate/ *tempo* = $2,65 \times 10^{-4}$ (mol·s^{-1}) ✓	**Accept / *Aanvaar*** rate/ *tempo* = $\frac{\Delta n}{\Delta t}$ rate/*tempo* = $\frac{-9,01 \times 10^{-3}}{34}$ ✓ rate / *tempo* = $-2,65 \times 10^{-4}$ (mol·s^{-1}) ✓

(5)

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

[17]

QUESTION/*VRAAG 6*

6.1.1 (A reaction in which) products can be converted back to its reactants ✓✓ (and vice versa) Accept reaction that has a forward and backward reaction

(Is 'n reaksie waar) produkte terug na reaktanse, en omgekeerd, omgeskakel kan word. **(2 or/ *of* 0)** (2)

6.1.2 Turns more pink / *Raak meer pienk* ✓ (1)

6.1.3 Turns more blue / *Raak meer blou* ✓ (1)

6.1.4 Exothermic / *Eksotermies* ✓ (1)

6.1.5
No negative marking
- Increase in temperature shifted the equilibrium position left ✓/Reverse reaction is favoured / frequency of effective collisions increases
- Increase in temperature favours the endothermic reaction ✓

- *Toename in temperatuur verskuif die ewewigsposisie na links/ Terugwaartse reaksie word bevoordeel.*
- *Toename in temperatuur bevoordeel 'n endotermiese reaksie.* (2)

6.2

OPTION 1: MOLE CALCULATIONS
OPSIE 1: MOL BEREKENINGE

Marking criteria:

a. Substitution into formula $n = \frac{N}{N_A}$ ✓
b. Using ratio $N_2O_4 : NO_2 = 1 : 2$ ✓
c. $n(NO_2)$ equilibrium = $n_{initial} + \Delta n$ ✓
d. $n(N_2O_4)$ equilibrium = n initial - Δn ✓
e. Divide **equilibrium** amounts of N_2O_4 and NO_2 by 4 dm^3 ✓
f. Correct K_C expression (formulae in square brackets) ✓
g. Substitution into equilibrium concentration into K_C expression ✓
h. Final answer ✓

Nasienkriteria:

a. *Vervanging in formule* $n = \frac{N}{N_A}$
b. ***Gebruik** verhouding* $N_2O_4 : NO_2 = 1 : 2$ ✓
c. $n(NO_2)$ ewewig = $n_{initial} + \Delta n$ ✓
*d. Deel **ewewig**hoeveelhede van N_2O_4 en NO_2 deur 4 dm^3*
e. Korrekte K_c-uitdrukking (formules met vierkanthakies)
f. Vervanging in ewewigskonsentrasies in K_c-uitdrukking
g. *Finale antwoord*

$n = \frac{N}{N_A}$

$n = \frac{3,01 \times 10^{23}}{6,02 \times 10^{23}}$ ✓ (a)

n = 0,5 mol

	N_2O_4 (g)	2 NO_2 (g)	
Initial quantity (mol) *Aanvangshoeveelheid (mol)*	0,5	-	
Change (mol) *Verandering (mol)*	0,4	0,8	✓ (b) ratio
Equilibrium (mol) *Ewewig (mol)*	0,1 ✓ (d)	0,8	✓ (c)
Concentration ($mol{\cdot}dm^{-3}$) *Konsentrasie ($mol{\cdot}dm^{-3}$)*	0,025	0,2	✓ (e)

$K_c = \frac{[NO_2]^2}{[N_2O_4]}$ ✓ (f)	No K_c expression, correct substitution / *Geen K_c-uitdrukking, korrekte, korrekte substitusie.* Max / *Maks 7/8*
$K_c = \frac{(0,2)^2}{(0,025)}$ ✓ (g)	Wrong K_c expression/*Verkeerde K_c – uitdrukking.* Max. *Maks. 5/8*
K_c = 1,6 ✓ (h)	

OPTION 2: CONCENTRATION CALCULATIONS/
***OPSIE 2:* KONSENTRASIEBEREKENINGE**

Marking criteria

a. Substitution into formula $n = \frac{N}{N_A}$ ✓
b. Using ratio N_2O_4: NO_2 = 1 : 2 ✓
c. c(NO_2) equilibrium = $c_{initial}$ + Δc ✓
d. c(N_2O_4) equilibrium = c initial – Δc ✓
e. Divide n initial and Δn of N_2O_4 by 4 dm^3 ✓
f. Correct K_C expression (formulae in square brackets) ✓
g. Substitution into equilibrium concentration into K_C expression ✓
h. Final answer ✓

Nasienkriteria:

a. *Vervanging in formule* $n = \frac{N}{N_A}$
b. ***Gebruik*** *verhouding N_2O_4 : NO_2 1 : 2*
c. Ewewig c(NO_2) = *begin c* + Δc
d. *Ewewig c (N_2O_4) = begin c* – Δc
e. Deel ***aanvangs en verandering*** *hoeveelhede van N_2O_4 en NO_2 deur 4 dm^3*
f. Korrekte K_c-uitdrukking (formules met vierkanthakies)
g. Vervanging in ewewigskonsentrasies in K_c-uitdrukking
h. Finale antwoord

✓(b)

✓ (e)

$n = \frac{N}{N_A}$

$n = \frac{3{,}01 \times 10^{23}}{6{,}02 \times 10^{23}}$ ✓ (a)

n = 0,5 mol

	N_2O_4 (g)	2 NO_2 (g)
Initial concentration ($mol \cdot dm^{-3}$) *Aanvangs konsentrasie* ($mol \cdot dm^{-3}$)	0,125	-
Change in concentration ($mol \cdot dm^{-3}$) *Verandering in konsentrasie* ($mol \cdot dm^{-3}$)	0,1 ✓ (d)	0,2
Equilibrium concentration ($mol \cdot dm^{-3}$) *Ewewig konsentrasie* ($mol \cdot dm^{-3}$)	0,025✓ (c)	0,2

$K_c = \frac{[NO_2]^2}{[N_2O_4]}$ ✓ (f)

$K_c = \frac{(0{,}2)^2}{(0{,}025)}$ ✓ (g)

$K_c = 1{,}6$ ✓ (h) (8)

No K_c expression, correct substitution / *Geen K_c-uitdrukking, korrekte substitusie.* Max / *Maks 7/8*
Wrong K_c expression / *Verkeerde K_c -uitdrukking.* Max. *Maks. 5/8*

[15]

QUESTION/*VRAAG 7*

7.1.1 An acid is a proton (H^+ ion) donor / *'n Suur is 'n proton (H^+-ioon) skenker* ✓✓ (2)

7.1.2 HCℓ and/*en* $C\ell^-$ ✓✓ **OR/*OF*** H_3O^+ and/*en* H_2O ✓✓ (2)

7.1.3 Solution **I.** ✓

- HCℓ is a stronger acid than CH_3COOH / HCℓ has a higher K_a ✓ (than CH_3COOH)
- HCℓ will produce a higher concentration of H_3O^+ ✓ (than CH_3COOH)

OR

- CH_3COOH is a weaker acid than HCℓ / CH_3COOH has a lower K_a (than HCℓ)
- CH_3COOH will produce a lower concentration of H_3O^+ (than HCℓ)

Oplossing ***I.***

- *HCℓ is 'n sterker suur as CH_3COOH / HCℓ het 'n hoër K_a-waarde as CH_3COOH*
- *HCℓ sal 'n hoër konsentrasie van H_3O^+ produseer as CH_3COOH*

OF

- *CH_3COOH is 'n swakker suur as HCℓ / CH_3COOH het 'n laer K_a-waarde as HCℓ*
- *CH_3COOH sal 'n laer konsentrasie H_3O^+ produseer as HCℓ* (3)

7.2.1

n = cV ✓
 = 1 x10 / 1 000 ✓
 = 0,01 mol ✓ (3)

7.2.2

Marking criteria	**Marking criteria**
• Formula $pH = -\log[H_3O^+]$ ✓ • pH value substituted into formula ✓ • Substitution in K_w formula✓ • Substitution into n = cV✓ • Final answer✓ ***Nasienkriteria*** • *Formule* $pH = -\log[H_3O^+]$ • *pH-waarde vervang in formule* • *Vervanging in* K_w *formule* • *Vervanging in n = cV* • *Finale antwoord*	• Formula pOH + pH = 14 ✓ • pH value substituted into formula ✓ • Substitution in pOH formula✓ • Substitution into n = cV✓ • Final answer✓ ***Nasienkriteria*** • *Formule pOH + pH = 14* • *pH-waarde vervang in formule* • *Vervanging in pOH formule* • *Vervanging in n = cV* • *Finale antwoord*

OPTION 1 / *OPSIE 1*	**OPTION 2 / *OPSIE 2***
$pH = -\log[H_3O^+]$ ✓ 13 ✓ $= -\log[H_3O^+]$ $[H_3O^+] = 1 \times 10^{-13}\ mol \cdot dm^{-3}$ $K_w = [OH^-][H_3O^+] = 1 \times 10^{-14}$ $[OH^-][H_3O^+] = 1 \times 10^{-14}$ $[OH^-](1 \times 10^{-13}) = 1 \times 10^{-14}$ ✓ $[OH^-] = 0,1\ mol \cdot dm^{-3}$ $[NaOH] = 0,1\ mol \cdot dm^{-3}$	pOH + pH = 14 ✓ pOH + 13 ✓ = 14 pOH = 1 $pOH = -\log[OH^-]$ $1 = -\log[OH^-]$ ✓ $[OH^-] = 0,1\ mol \cdot dm^{-3}$ $[NaOH] = 0,1\ mol \cdot dm^{-3}$
$c = \frac{n}{V}$ **OR/*OF*** $0,1 = \frac{0,01}{V}$ ✓ (From 7.2.1 / *Vanaf 7.2.1*) V = 0,1✓(dm³)✓	$c_1V_1 = c_2V_2$ $(1)(10) = (0,1)V_2$ ✓ $V_2 = 100\ cm^3$ V = 0,1✓(dm³) ✓

(5)

7.2.3

Marking criteria	**Marking criteria /**
• Formula n = cV✓ • Substitution of acid values into n = cV **AND** ✓ **Using** ratio Acid : Base = 1 : 2 • Substitution of V and c into n = cV for V base reacting ✓ • Subtracting $V_{remaining} = V_{initial} - V_{reacting}$ ✓ • Final answer ✓ ***Nasienkriteria*** • *Formule n = cV* • *Vervanging van suur waardes in formule n = cV* ***EN*** ***Gebruik** verhouding Suur : Basis* = 1 : 2 • *Vervanging van V en c in n = cV vir V basis wat reageer* • *Aftrekking* $V_{oorbly} = V_{aanvangs} - V_{reageer}$ • *Finale antwoord*	• Formula $\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$ ✓ • Substitution LHS $\frac{c_aV_a}{c_bV_b}$ ✓ • Substitution RHS $\frac{n_a}{n_b}$ ✓ • Subtracting $V_{remaining} = V_{initial} - V_{reacting}$ ✓ • Final answer ✓ ***Nasienkriteria*** • *Formule* $\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$ • *Vervang LK* $\frac{c_aV_a}{c_bV_b}$ • *Vervang RK* $\frac{n_a}{n_b}$ • *Aftrekking* $V_{oorbly} = V_{aanvangs} - V_{reageer}$ • *Finale antwoord*
OPTION 1/*OPSIE 1*	**OPTION 2/OPSIE 2**
n acid reacting = cV✓ = 0,09 x 15/1 000 = 1,35 x 10^{-3} mol ✓ n base reacting= 2 x 1,35 x 10^{-3} mol = 2,7 x 10^{-3} mol n = cV 2,7 x 10^{-3} = 0,1 $V_{base\ reacting}$ /*basis reageer*✓ 0,027 dm³ = $V_{base\ reacting}$/ *basis reageer*	$\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$ ✓ $\frac{(0,09)(15)}{(0,1)V_b}$ ✓ $= \frac{1}{2}$ ✓ V_b = 27 cm³ V_b = 0,027 dm³

both arrows pointing to 0,027

$V_{remaining/oorbly}$ = 0,1 – 0,027 ✓
= 0,073 dm³ ✓

(5)
[20]

QUESTION/*VRAAG* 8

8.1 Loss of electrons / *Verlies aan elektrone* ✓✓ **(2 or/*of* 0)** (2)

8.2.1 1 mol·dm^{-3} ✓ (1)

8.2.2 Platinum ✓ (1)

8.2.3 Cu ✓ (1)

8.2.4 $O_2 + 4H^+ + 4e^- \rightarrow 2\,H_2O$ ✓✓

Marking criteria / *Nasienkriteria*

- $O_2 + 4H^+ + 4e^- \rightleftharpoons 2\,H_2O$ ½
- $2\,H_2O \leftarrow O_2 + 4H^+ + 4e^-$ 2/2
- $2\,H_2O \rightleftharpoons O_2 + 4H^+ + 4e^-$ 0/2
- $2\,H_2O \rightarrow O_2 + 4H^+ + 4e^-$ 0/2

- Ignore if the charge omitted on electron / *Ignoreer indien lading op elektron weggelaat is.*

(2)

8.2.5 $2\,Cu + O_2 + 4\,H^+$ ✓ $\rightarrow 2\,Cu^{2+} + 2\,H_2O$ ✓ (✓ bal)

Marking criteria/*Nasienkriteria*

- Reactants/ *Reaktanse*
- Products / *Produkte*
- Balancing / *Balansering*

(3)

8.3.1 $E^{\theta}_{cell} = E^{\theta}_{cathode/reduction/oxidising\ agent} - E^{\theta}_{anode/oxidation/reducing\ agent}$ ✓

$E^{\theta}_{cell} = (1,23)$ ✓ $- (0,34)$ ✓

$E^{\theta}_{cell} = 0,89$ V ✓

Notes/*Aantekeninge*

- Any other formula using unconventional abbreviation , e.g. $E^{o}_{cell} = E^{o}_{OA} - E^{o}_{RA}$ followed by the correct substitution : ¾
- *Enige ander formule wat onkonvensionele afkortings gebruik bv.*
- *$E^{o}_{sel} = E^{o}_{OM} - E^{o}_{RM}$ gevolg met korrekte vervangings: ¾*

(4)

8.3.2 Concentration of the reactants decreases ✓
Rate of the forward reaction decreases ✓

Konsentrasie van reaktanse verlaag
Tempo van voortwaartse reaksie verlaag (2)

8.3.3 Equilibrium / *Ewewig* ✓ (1)
[17]

QUESTION/*VRAAG 9*

9.1.1

Marking criteria/ Nasienriglyne
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*

(It is a cell in which) electrical energy ✓ is converted into chemical energy ✓

(Dit is 'n sel waarin) elektriese energie omgeskakel word na chemiese energie. (2)

9.1.2 $2\ C\ell^- \rightarrow C\ell_2(g) + 2e^-$ ✓✓

Ignore phases / *Ignoreer fases* (2)

Marking criteria / *Nasienkriteria*
• $2\ C\ell^- \rightleftharpoons C\ell_2(g) + 2e^-$ ½ • $C\ell_2(g) + 2e^- \leftarrow 2\ C\ell^-$ 2/2 • $C\ell_2(g) + 2e^- \rightleftharpoons 2\ C\ell^-$ 0/2
Ignore if the charge omitted on electron / *Ignoreer indien lading weggelaat is op elektron*

9.1.3 H_2 / Hydrogen gas / *Waterstofgas* (1)

9.1.4 H_2O is a stronger oxidising agent than Na^+ ✓
H_2O is reduced to H_2 ✓

H_2O is 'n sterker oksideermiddel as Na^+
H_2O word gereduseer na H_2 (2)

9.2.1 Cathode / *Katode* ✓ (1)

9.2.2 $n_{Cu} = ½ \times 6$ ✓
$= 3$ mol

$m_{Cu} = nM = 3 \times 63{,}5$ ✓

$= 190{,}5$ g

$0{,}95$ ✓$m_{\text{IMPURE sample}} = 190{,}5$

$m_{\text{IMPURE sample}} = 200{,}53$ g ✓

Marking criteria
• Use of ratio of electrons to Cu • Subst. into n = m/M • Division by 0,95 • Final answer
Nasienkriteria
• *Gebruik van verhouding van elektrone tot Cu* • *Vervanging in n = m/M* • *Deel deur 0,95* • *Finale antwoord*

(4)
[12]

TOTAL/*TOTAAL*: 150