



**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIORSERTIFIKAAT**

GRADE/GRAAD 12

SEPTEMBER 2023

**PHYSICAL SCIENCES P2/ FISIESE
WETENSKAPPE V2
MARKING GUIDELINE/NASIENRIGLYN**

MARKS: 150

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

QUESTION 1/VRAAG 1

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

QUESTION 2/VRAAG 2

2.1.1 D ✓ (1)

2.1.2 F ✓ (1)

2.1.3 B ✓ (1)

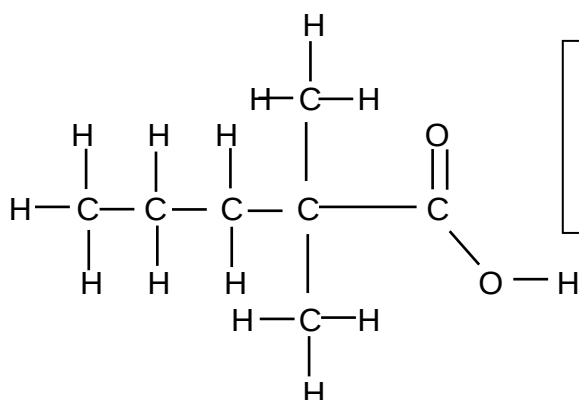
2.2 UNSATURATED ✓

It is an organic compound that contains double/triple/multiple bonds. ✓

ONVERSADIG

Dit is 'n organiese verbinding wat dubbel/drievoudige/meervoudige bindings bevat. (2)

2.3.1

**Marking criteria/Nasienkriteria**

- Functional group correct ✓
Funksionele groep korrek
- Whole structure correct ✓
Hele struktuur korrek

(2)

2.3.2 hept-3-yne ✓ ✓ / 3-heptynehept-3-yn / 3-heptyn**Marking criteria/ Nasienkriteria**

- Parent name and suffix correct (heptyne) ✓
Stam naam en agtervoegsel korrek (heptyn)
- Everything correct e.g. hyphens and numbering ✓
Alles korrek bv koppeltekens en nommering

(2)

2.4 Tertiary. ✓

The carbon that is bonded to the hydroxyl group (-OH) is bonded to three other carbons. ✓

OR

The carbon of the functional group is bonded to three other carbons.

Tersiêre

Die koolstof wat verbind is aan die hidroksielgroep (-OH) is verbind aan drie ander koolstowwe.

OF

Die koolstof van die funksionele groep is aan drie ander koolstowwe verbind. (2)

- 2.5 Butan-2-ol / 2-butanol ✓✓ **NOTE/LET WEL:** Butan-1-ol / 1-butanol (1/2) (2)
- 2.6.1 Compounds with the same molecular formula ✓ but different functional groups ✓/belong to different homologous series.

Verbindings met dieselfde molekulêre formule, maar verskillende funksionele groepe / behoort aan verskillende homoloë reeks. (2)
- 2.6.2 CH_3COCH_3 ✓✓ **OR/OF**
$$\begin{array}{c} \text{O} \\ || \\ \text{CH}_3\text{CCH}_3 \end{array}$$
 (2)
[17]

QUESTION 3/VRAAG 3

- 3.1 **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
- The temperature at which the vapour pressure of a liquid equals the atmospheric pressure ✓✓

Die temperatuur waarby die dampdruk van 'n vloeistof gelyk is aan die atmosferiese druk. (2)
- 3.2.1 Molecular size ✓ / Surface area / Chain length / London forces
Molekulêre grootte / Oppervlakte / kettinglengte / Londonkragte (1)
- 3.2.2 Functional group ✓ / Homologous series
Funksionele groep / Homoloë reeks (1)
- 3.3 London forces / induced dipole forces / dispersion forces ✓
Londonkragte / geïnduseerde dipoolkragte / verspreidingskragte (1)
- 3.4 129°C ✓ (1)

3.5

Marking criteria/Nasienkriteria

- Compare the molecular size of 2-methylbutan-1-ol to butan-1-ol ✓
- Relate the molecular size to London forces/induced dipole forces/dispersion forces. ✓
- Compare the chain length of 2-methylbutan-1-ol to pentan-1-ol ✓
- Relate the chain length to London forces/induced dipole forces/dispersion forces ✓
- *Vergelyk die molekulêre grootte van 2-metielbutan-1-ol aan butan-1-ol*
- *Verwys die molekulêre grootte na die Londonkragte/ geïnduseerde dipoolkragte / verspreidingkragte*
- *Vergelyk die kettinglengte van 2-metielbutan-1-ol met pentan-1-ol*
- *Verwys die kettinglengte na die Londonkragte / geïnduseer dipoolkragte / verspreidingkragte*
- 2-methylbutan-1-ol has a larger molar mass/molecular size than butan-1-ol ✓
- London forces/induced dipole forces/dispersion forces of 2-methylbutan-1-ol is stronger than that of butan-1-ol ✓
- The boiling point will be higher than that of butan-1-ol
- 2-methyl butan-1-ol has a shorter chain length than pentan-1-ol ✓
- London forces of 2-methyl butan-1-ol is weaker than that of pentan-1-ol ✓
- The boiling point will be lower than that of pentan-1-ol
- *2-metielbutan-1-ol het 'n groter molekulêre massa/molekulêre grootte as butan-1-ol*
- *Londonkragte/geïnduseerde dipoolkragte/verspreidings van 2-metielbutan-1-ol is sterker as dié van butan-1-ol*
- *Die kookpunt is hoër as dié van butan-1-ol*
- *2-metielbutan-1-ol het 'n korter kettinglengte as pentan-1-ol*
- *Londonkragte van 2-metielbutan-1-ol is swakker as dié van pentan-1-ol*
- *Die kookpunt sal laer wees as dié van pentan-1-ol*

(4)

OR /OF

- Butan-1-ol has a smaller molar mass/molecular size than 2-methylbutan-1-ol
- London forces/induced dipole forces/dispersion forces of butan-1-ol is weaker than that of 2-methylbutan-1-ol
- The boiling point will be higher than that of butan-1-ol
- Pentan-1-ol has a larger chainlength than 2-methyl butan-1-ol
- London forces/induced dipole forces/dispersion forces of pentan-1-ol is stronger than that of 2-methyl butan-1-ol
- The boiling point will be lower than that of pentan-1-ol
- *Butan-1-ol het 'n kleiner molekulêre massa/molekulêre grootte as 2-metielbutan-1-ol*
- *Londonkragte/geïnduseerde dipoolkragte/verspreidings van butan-1-ol is swakker as dié van 2-metielbutan-1-ol*
- *Die kookpunt is hoër as dié van butan-1-ol*
- *Pentan-1-ol het 'n langer kettinglengte as 2-metielbutan-1-ol*
- *Londonkragte van pentan-1-ol is sterker as dié van 2-metielbutan-1-ol*
- *Die kookpunt sal laer wees as dié van pentan-1-ol*

3.6.1

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)

3.6.2

Q ✓

(1)

3.6.3

Marking criteria/Nasienkriteria

- Propan-1-ol has hydrogen bonds ✓ (and London forces/induced dipole forces/dispersion forces)
- Propanal has dipole-dipole forces ✓ (and London/induced dipole forces/dispersion forces)
- Compare the strength of the hydrogen bonds to dipole-dipole forces ✓
- Relate strength of intermolecular forces to vapour pressure ✓
- *Propan-1-ol het waterstofbindings (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Propanal het dipool-dipoolkragte (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Vergelyk die sterkte van die waterstofbindings met die dipool-dipoolkragte*
- *Verwys die sterkte van die intermolekulêre kragte met die dampdruk*

- Propan-1-ol has hydrogen bonds ✓ (and London forces/induced dipole forces/dispersion forces)
- Propanal has dipole-dipole forces (and London forces/induced dipole forces/dispersion forces) ✓
- Hydrogen bonds are stronger than the dipole-dipole forces ✓
- Stronger intermolecular forces result in lower vapour pressure ✓
- *Propan-1-ol het waterstofbindings (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Propanal het dipool-dipoolkragte (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Waterstofbindings is sterker as dipool-dipoolkragte*
- *Sterker intermolekulêre kragte het laer dampdruk*

OR / OF

- Propan-1-ol has Hydrogen bonds ✓ (and London forces/induced dipole forces/dispersion forces)
- Propanal has dipole-dipole forces ✓ (and London/induced dipole forces/dispersion forces)
- Dipole-dipole forces are weaker than the hydrogen bonds ✓
- Weaker intermolecular forces result in higher vapour pressure ✓
- *Propan-1-ol het waterstofbindings (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Propanal het dipool-dipoolkragte (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Dipool-dipoolkragte is swakker as waterstofbindings*
- *Swakker intermolekulêre kragte het hoër dampdruk*

(4)
[17]

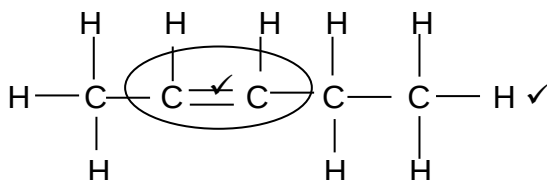
QUESTION 4/VRAAG 4

4.1.1 Hydrolysis / *Hidrolise* ✓ (1)

4.1.2 Pentan-2-ol / 2-pentanol ✓✓ (2)

4.1.3 Concentrated strong base ✓ **OR** concentrated NaOH **OR** concentrated KOH **OR** concentrated LiOH
Gekonsentreerde sterk basis **OF** gekonsentreerde NaOH **OF** gekonsentreerde KOH
OF gekonsentreerde LiOH (1)

4.1.4



Marking criteria/Nasienkriteria

- Functional group correct ✓
Funksionele groep korrek
- Whole structure correct ✓
Hele struktuur korrek

(2)

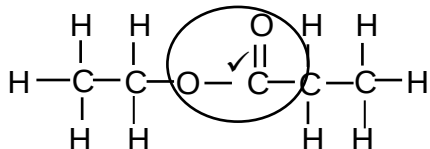
4.1.5 Sulphuric acid / *Swawelsuur* ✓ (1)

4.1.6 Dehydration / *Dehidrasie* / *Dehidratering* ✓ (1)

4.2.1 Esterification / Condensation / *Esterifikasie* / *Verestering* ✓ (1)

4.2.2 Alcohols are flammable ✓ / prevent fire
Alkohole is vlambaar / om 'n vuur te voorkom (1)

4.2.3



Marking criteria/Nasienkriteria

- Functional group correct ✓
Funksionele groep korrek
- Whole structure correct ✓
Hele struktuur korrek

ethyl ✓ propanoate ✓ / *etiel-propanoaat*

(4)
[14]

QUESTION 5/VRAAG 5

5.1

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

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 Stopwatch ✓/Timer/ Measuring cylinder
Stophorlosie / Tydhouer / Meetsilinder (1)

5.3 Reaction is exothermic / reaction releases heat ✓
Reaksie is eksotermies / reaksie gee hitte af (1)

5.4 SHORTER / KORTER ✓ (1)

5.5 For Exp. 2

- Higher concentration results in more particles colliding with correct orientation ✓
- The number of effective collision per unit time increases / frequency of the effective collisions increases ✓

Vir Eksp. 2

- Hoër konsentrasie beteken meer deeltjies bots met die korrekte oriëntasie
- Die aantal effektiewe botsings per eenheid tyd neem toe/ frekwensie van die effektiewe botsings neem toe.

OR / OF

For Exp. 1

- Low concentration results in fewer particles colliding with correct orientation ✓
- The number of effective collision per unit time decreases / frequency of effective collisions decreases ✓

Vir Eksp. 1

- Lae konsentrasie beteken minder deeltjies bots met die korrekte oriëntasie
- Die aantal effektiewe botsings per eenheid tyd neem af / frekwensie van die effektiewe botsings neem af.

(2)

5.6.1

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

$$= \frac{250-0}{5,28-0} \checkmark$$

$$\text{Accept / Aanvaar} \quad \frac{250}{5,28}$$

$$= 0,95 \checkmark (\text{cm}^3 \cdot \text{min}^{-1})$$

(3)

5.6.2

Marking criteria / Nasienkriteria

- V_{CO_2} remaining / oorbly = 150 cm^3
- Substitution into / Vervanging in $n = V/V_m$
- Subst. into / Vervanging in $n = m/M$
- Final answer / Finale antwoord

$$V(\text{CO}_2) \text{ remaining / oorbly} = 250 - 100 = 150 \text{ cm}^3 \checkmark$$

$$n = V/V_m = 150/25\,000 \checkmark$$

$$= 6 \times 10^{-3} \text{ mol}$$

$$n(\text{CO}_2) = m/M$$

$$6 \times 10^{-3} = m / 44 \checkmark$$

$$m = 0,264 \text{ g} \checkmark / 0,26 \text{ g}$$

(4)

5.7.1 P ✓ (1)

5.7.2 C₂H₄O₂ is a weaker acid ✓ (than HCl) which will result in a LOWER reaction rate ✓ (for Expt. 3) / Lower gradient/Longer reaction time

C₂H₄O₂ is 'n swakker suur (as HCl) wat sal lei na 'n LAER reaksietempo (vir Eksp. 3) / laer gradiënt / langer reaksietyd

OR / OF

HCl is stronger acid ✓ (than C₂H₄O₂) which will result in a HIGHER reaction rate ✓ for Expt. 1/ Higher gradient/Shorter reaction time

HCl is 'n sterker suur (as C₂H₄O₂) wat sal lei na 'n HOËR reaksietempo (vir Eksp. 1) / hoër gradiënt / korter reaksietyd (2)

5.7.3 EQUAL TO ✓
Final amount of CO₂ is the same ✓ (in both experiments)

GELYK AAN
Finale hoeveelheid van CO₂ is gelyk (in beide eksperimente) (2)
[19]

QUESTION 6 / VRAAG 6

- 6.1.1 Reversible reaction ✓ / Products can be converted back to reactants
Omkeerbare reaksie / Produkte kan na reaktanse omgeskakel word

NOTE: Do not accept "Reaction is at equilibrium"

LET WEL: Moenie "Reaksie is by ewewig" aanvaar nie.

(1)

- 6.1.2 (Chemical) Equilibrium / (Chemiese) Ewewig ✓

(1)

- 6.1.3 HEATED / VERHIT ✓

(1)

- 6.1.4 ENDOTHERMIC / ENDOTERMIES ✓

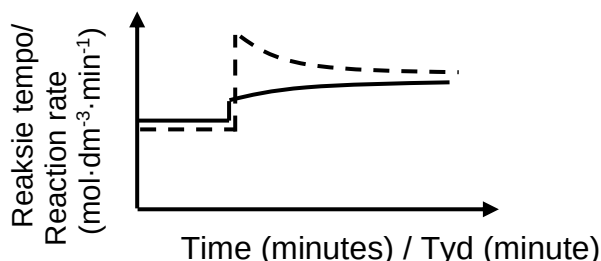
(1)

- 6.1.5 • Increase in temperature favoured the forward reaction ✓ / The rate of the forward reaction increased more than the rate of the reverse reaction.
 • Increase in temperature favours the endothermic reaction. ✓

- *Toename in temperatuur bevoordeel die voortwaartse reaksie / Die tempo van die voortwaartse reaksie is hoër as die terugwaartse reaksie*
 • *'n Toename in temperatuur bevoordeel die endotermiese reaksie*

(2)

6.1.6

**Marking criterial Nasienkriteria**

- Both rates increase; new equilibrium at a higher rate when P is increased ✓
Beide tempos neem toe; nuwe ewewig is by 'n hoër tempo wanneer P verhoog
- The increase in reverse reaction is HIGHER than for the forward reaction and eventually there is horizontal section for both ✓
Die toename in die terugwaartse reaksie is HOËR as die voortwaartse reaksie en daar is horisontale gedeelte by die einde vir beide.

NOTE: Do not penalise if axes are not labelled.

LET WEL: Moenie penaliseer as asse nie benoem is nie.

(2)

6.2 MOLE CALCULATIONS / MOL BEREKENINGE

- Correct K_c expression (formula in square brackets) ✓
- Substitution of equilibrium concentration of CO_2 into K_c expression ✓
- Determining the $n_{\text{equilibrium CO}}$ ✓
- Determining the $n_{\text{CO reacted}}$
- Correct mol ratio for $\text{CO}:\text{C}$ ✓
- Determining the initial mol of C ✓
- Correct substitution into percentage formula ✓
- Final answer ✓

- Korrekte K_c -uitdrukking (Formule formule tussen vierkanthakies)
- Vervanging van ewewigkonsentrasie van CO_2 in K_c – uitdrukking
- Bepaal die $n_{\text{ewewig CO}}$
- Bepaal $n_{\text{CO reageer}}$
- Korrekte molverhouding vir $\text{CO} : \text{C}$
- Bepaal die aanvanklike mol van C
- Korrekte vervanging in persentasie formule
- Finale antwoord

$$K_c = \frac{[\text{CO}]^2}{[\text{CO}_2]} \quad \checkmark \text{ (a)}$$

$$0,05 = \frac{[\text{CO}]^2}{0,05} \quad \checkmark \text{ (b)}$$

$$[\text{CO}] = 0,05 \text{ mol} \cdot \text{dm}^{-3}$$

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

	C (s)	CO_2 (g)	2 CO (g)
Initial mol /Aanvangshoeveelheid (mol)	0,45 ✓ (f)		0
Change/ Verandering in mol	0,05 ✓ (e)		0,1 ✓ (d)
Equilibrium/ Ewewig mol	0,40		0,1 ✓ (c)
Concentration/ Konsentrasie ($\text{mol} \cdot \text{dm}^{-3}$)	-		0,05

$$\% \text{ C reacted} = \Delta n / n_{\text{initial}} \times 100$$

$$= 0,05 / 0,45 \times 100 \quad \checkmark \text{ (g)}$$

$$= 11,11\% \quad \checkmark \text{ (h)}$$

(8)
[16]

QUESTION 7/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 $HC_2O_4^-$ ✓ (1)

7.1.3 Weak acid / Swaksuur ✓ (1)

7.1.4 The acid did not fully/completely ionise ✓✓ (in water). **OR** ionised incompletely.
*Die suur ioniseer nie volledig (in water) nie **OF** Suur ioniseer onvolledig* (2)

7.2.1 **Marking criteria/Nasienkriteria**

- $n = cV$
- Subst. into / Vervanging in $n = cV$
- Final answer / Finale antwoord

$$\begin{aligned} n(CH_3COOH) &= cV \checkmark \\ &= 0,1 \times 25 \times 10^{-3} \checkmark \\ &= 2,5 \times 10^{-3} \text{ mol } \checkmark \end{aligned}$$

(3)

7.2.2

<u>Marking criteria/Nasienkriteria</u>	<u>Marking criteria/Nasienkriteria</u>
• Formula $pH = -\log [H_3O^+]$ ✓ • pH value substituted into formula ✓ • Substitution in K_w formula ✓ • Final answer ✓ • <i>Formule $pH = -\log [H_3O^+]$</i> • <i>pH waarde vervang in formule</i> • <i>Vervang in K_w formule</i> • <i>Finale antwoord</i>	• Formula $pOH + pH = 14$ ✓ • pH value substituted into formula ✓ • Substitution in pOH formula ✓ • Final answer ✓ • <i>Formule $pOH + pH = 14$</i> • <i>pH waarde vervang in formule</i> • <i>Vervang van pOH waarde in formule</i> • <i>Finale antwoord</i>

<u>OPTION 1 / OPSIE 1</u>	<u>OPTION 2 / OPSIE 2</u>
$\text{pH} = -\log [\text{H}_3\text{O}^+] \checkmark$	$\text{pOH} + \text{pH} = 14 \checkmark$
$12 \checkmark = -\log [\text{H}_3\text{O}^+]$	$\text{pOH} + 12 \checkmark = 14$
$[\text{H}_3\text{O}^+] = 1 \times 10^{-12} \text{ mol}\cdot\text{dm}^{-3}$	$\text{pOH} = 2$
$K_w = [\text{OH}^-][\text{H}_3\text{O}^+] = 1 \times 10^{-14}$	$\text{pOH} = -\log [\text{OH}^-]$
$[\text{OH}^-][\text{H}_3\text{O}^+] = 1 \times 10^{-14}$	$2 = -\log [\text{OH}^-] \checkmark$
$[\text{OH}^-](1 \times 10^{-12}) = 1 \times 10^{-14} \checkmark$	$[\text{OH}^-] = 0,01 \text{ mol}\cdot\text{dm}^{-3} \checkmark$
$[\text{OH}^-] = 0,01 \text{ mol}\cdot\text{dm}^{-3} \checkmark$	

(4)

7.2.3 Positive marking from / Positiewe nasien vanaf 7.2.1 and/ en 7.2.2
Marking criteria / Nasienkriteria

- **Using** ratio Acid : Base 1 : 1
- Subst. of base values into $n_{\text{NaOH excess}} = cV$
- Addition of n remaining and n initial (NaOH)
- Subst. into $c = n/V$
- Multiplication of c_{dilute} by 10
- Final answer
- **Gebruik** verhouding Suu r: Basis = 1 : 1
- Vervanging van basis waarde in $n_{\text{NaOH oormaat}} = cV$
- Addisie van n oorbly en n aanvanklik (NaOH)
- Vervanging in $c = n / V$
- Vermenigvuldiging van c_{verduun} met 10
- Finale antwoord

$$n(\text{NaOH})_{\text{reacting/ reageer}} = 2,5 \times 10^{-3} \text{ mol} \checkmark \text{ From/Vanaf 7.2.1}$$

$$n(\text{NaOH})_{\text{in excess/ oormaat}} = cV$$

$$n(\text{NaOH})_{\text{excess/ oormaat}} = (0,01)(60 \times 10^{-3}) \checkmark$$

$$n(\text{NaOH})_{\text{excess/ oormaat}} = 6 \times 10^{-4} \text{ mol}$$

$$n(\text{NaOH})_{\text{total/ totaal}} = 2,5 \times 10^{-3} + 6 \times 10^{-4} \checkmark$$

$$n(\text{NaOH}) = 3,1 \times 10^{-3} \text{ mol}$$

(6)

$$C_{\text{dilute/verdun}} = \frac{n}{V}$$

$$C_{\text{dilute/verdun}} = \frac{3,1 \times 10^{-3}}{35 \times 10^{-3}} \quad \checkmark$$

$$C_{\text{dilute/verdun}} = 0,08857 \text{ mol} \cdot \text{dm}^{-3}$$

$$\begin{aligned} C_{\text{concentrated / gekonsentreerd}} &= 0,08857 \times 10 \quad \checkmark \\ &= 0,8857 \text{ mol} \cdot \text{dm}^{-3} \quad \checkmark / 0,89 \text{ mol} \cdot \text{dm}^{-3} \end{aligned}$$

[19]

QUESTION 8/VRAAG 8

8.1 Chemical energy is converted into electrical energy ✓✓
Chemiese energie word na elektriese energie omgeskakel. (2)

8.2.1 $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$ ✓✓ (2)

Marking criteria / Nasienkriteria

- $\text{Fe}^{3+} + \text{e}^- \leftarrow \text{Fe}^{2+}$ 2/2
- $\text{Fe}^{2+} \rightleftharpoons \text{Fe}^{3+} + \text{e}^-$ 1/2
- $\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$ 0/2
- $\text{Fe}^{3+} + \text{e}^- \rightleftharpoons \text{Fe}^{2+}$ 0/2
- Ignore if the charge omitted on electron
Ignoreer indien lading op elektron weggelaat is
- If a charge of an ion is omitted
As lading weggelaat is op 'n ioon.
e.g. / bv. $\text{Fe}^2 \rightarrow \text{Fe}^3 + \text{e}^-$ Max. / Maks. 1/2

8.2.2 $\text{Ag} | \text{Ag}^+ \checkmark || \checkmark \text{Fe}^{3+}, \text{Fe}^{2+} \checkmark | \text{Pt} \checkmark$ (3)

Marking criteria/Nasienkriteria

- $\text{Ag} | \text{Ag}^+ \checkmark$
- $\text{Fe}^{3+}, \text{Fe}^{2+} | \text{Pt} \checkmark$
- $|| \checkmark$

8.2.3 Concentration: $1 \text{ mol} \cdot \text{dm}^{-3}$ ✓ and temperature: 25°C ✓ / 298 K
Konsentrasie: $1 \text{ mol} \cdot \text{dm}^{-3}$ en temperatuur: 25°C / 298 K (2)

8.3 $E^\theta_{\text{cell}} = E^\theta_{\text{cathode/reduction/oxidising agent}} - E^\theta_{\text{anode/oxidation/reducing agent}}$ ✓

$$E^\theta_{\text{cell}} = (0,80) \checkmark - (0,77) \checkmark$$

$$E^\theta_{\text{cell}} = 0,03 \text{ V} \checkmark$$

Marking criteria/Nasienkriteria

- Any other formula using unconventional abbreviation, e.g.
Enige ander formule wat onkonvensionele afkortings gebruik bv.
- $E^\theta_{\text{cell}} = E^\theta_{\text{OA}} - E^\theta_{\text{RA}}$ followed by the correct substitution./ gevolg deur korrekte vervangings 3/4

8.4 Decrease / Afneem ✓ (1)

8.5 Cl^- would form an insoluble salt/precipitate with the Ag^+ ✓✓ / AgCl will precipitate out. The Ag^+ half-cell would no longer be neutral / Circuit would be incomplete / Not enough electrolyte in half cell.

Cl^- sal 'n neerslag vorm/presipiteer met Ag^+ / AgCl vorm 'n neerslag / Die Ag^+ halfsel sal nie meer neutraal wees nie / Stroombaan sal onvoltooïed wees / Nie genoeg elektroliet in die halfsel nie.

(2)
[16]

QUESTION 9/VRAAG 9

9.1

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

The chemical process in which electrical energy is converted to chemical energy. ✓✓

Die chemiese proses waarin elektriese energie word na chemiese energie omgeskakel.

OR / OF

The use of electrical energy to produce a chemical change. ✓✓

Die gebruik van elektriese energie om chemiese energie te produseer (2)

9.2

ENDOTHERMIC / ENDOTERMIES ✓

(1)

9.3

$2 \text{Cl}^- \rightarrow \text{Cl}_2(\text{g}) + 2\text{e}^-$ ✓✓

Ignore phases / Ignoreer fases

(2)

Marking criteria / Nasienkriteria

- $2 \text{Cl}^- \rightleftharpoons \text{Cl}_2(\text{g}) + 2\text{e}^-$ ½
- $\text{Cl}_2(\text{g}) + 2\text{e}^- \leftarrow 2 \text{Cl}^-$ 2/2
- $\text{Cl}_2(\text{g}) + 2\text{e}^- \rightleftharpoons 2 \text{Cl}^-$ 0/2

Ignore if the charge omitted on electron /

Ignoreer as lading op elektron weggelaat is

9.4

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

$$n = \frac{0,369}{63,5} \checkmark$$

$$n = 5,811 \times 10^{-3}$$

$$n(e^-) = 2 \times 5,811 \times 10^{-3} \checkmark$$

$$n(e^-) = 0,01162$$

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

$$0,01162 = \frac{N}{6,02 \times 10^{23}} \checkmark$$

$$N = 6,9964 \times 10^{21}$$

$$Q = Nq$$

$$Q = 6,9964 \times 10^{21} \times 1,6 \times 10^{-19} \checkmark$$

$$Q = 1\,119,4310 \text{ C}$$

$$I = \frac{Q}{\Delta t} \checkmark$$

$$I = \frac{1\,119,4310}{27 \times 60} \checkmark$$

$$I = 0,69 \text{ A} \checkmark$$

Marking criteria/Nasienkriteria

- Subst. into $n = m/M$
- Use of mole ratio Cu : e^-
- Subst. into $n = N/N_A$
- Subst. into $n = Q/q_e$
- Formula $Q = I\Delta t$
- Subst. into $Q = I\Delta t$
- Final answer with unit

- *Vervang in $n = m/M$*
- *Gebruik van mol-verhouding Cu : e^-*
- *Vervang in $n = N/N_A$*
- *Vervang in $n = Q/q_e$*
- *Formule $Q = I\Delta t$*
- *Vervang in $Q = I\Delta t$*
- *Finale antwoord met eenheid*

(7)
[12]**TOTAL/TOTAAL: 150**