education

Department of Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION
VOORBEREIDENDE EKSAMEN

GRADE/GRAAD 12

PHYSICAL SCIENCES: CHEMISTRY (P2)
FISIESE WETENSKAPPE: CHEMIE (V2)

SEPTEMBER 2018

MARKS/*PUNTE*: 150

MEMORANDUM

This memorandum consists of 15 pages.
Hierdie memorandum bestaan uit 15 bladsye.

QUESTION 1/*VRAAG 1*

1.1 C ✓✓ (2)

1.2 A ✓✓ (2)

1.3 D ✓✓ (2)

1.4 D ✓✓ (2)

1.5 A ✓✓ (2)

1.6 C ✓✓ (2)

1.7 D ✓✓ (2)

1.8 B ✓✓ (2)

1.9 B ✓✓ (2)

1.10 D ✓✓ (2)
[20]

QUESTION 2/*VRAAG 2*

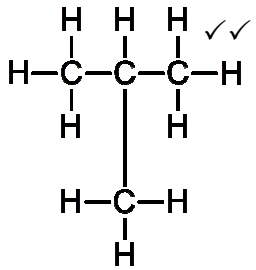
2.1.1 A ✓ (1)

2.1.2 ANY TWO/*ENIGE TWEE* ✓
B
C
D (1)

2.2

2.2.1 Compounds with the same molecular formula ✓but different types of chains. ✓
Verbindings met dieselfde molekulêre formule, maar verskillende soort kettings. (2)

2.2.2



✓✓

IF/*INDIEN:*
- H atom omitted/*H-atoom uitgelaat*: - 1
- Condensed structure/*Gekondenseerde struktuur*: -1

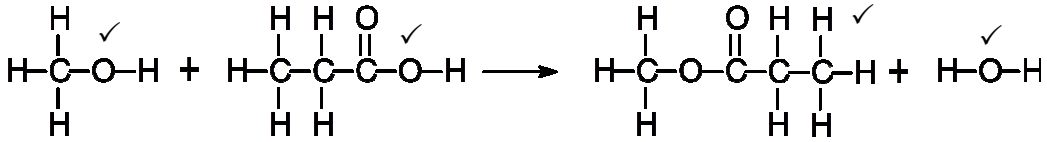
(2)

2.3 H_2 ✓ (1)

2.4

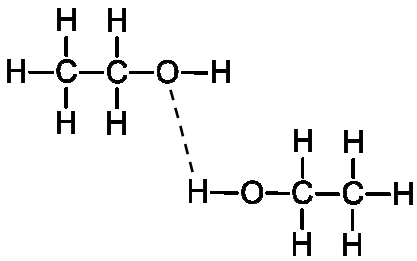
2.4.1 Butanal/*Butanaal* ✓ (1)

2.4.2 3-methyl✓but-1-yne ✓/3-methyl-1-butyne
3-*metielbut-1-yn/3-metiel-1-butyn* (2)

2.5 

Marking guidelines/*Nasienriglyne*
- Ignore/*Ignoreer* ⇌
- Accept H_2O if condensed./*Aanvaar H_2O as gekondenseerd.*
- Any additional reactants and/or products/*Enige addisionele reaktanse en/of produkte:* Max./*Maks*. 3/4
- Accept coefficients that are multiples.
  Aanvaar koëffisiënte wat veelvoude is.
- Incorrect balancing/*Verkeerde balansering*: Max./*Maks*. 3/4
- Condensed formulae/*Gekondenseerde formules*: Max./*Maks. 3/4*
  Molecular formulae/*Molekulêre formules:* Max./*Maks.* 1/4

(4)

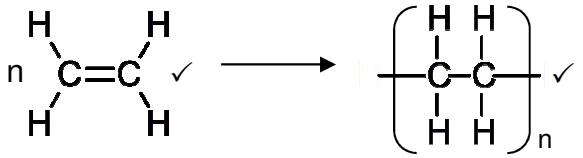
2.6 

Marking criteria/*Nasienriglyne*:
- At least one structural formula of ethanol as shown. ✓
  Ten minste een struktuurformule van etanol soos aangetoon.
- Dotted line drawn from O-atom of one molecule to H-atom bonded to an O-atom in the second molecule (H-atom should be between two O-atoms). ✓
  Stippellyn getrek vanaf O-atoom op een molekuul na 'n H-atoom gebind aan 'n O-atoom in die tweede molekuul (H-atoom moet tussen twee O-atome wees).

(2)

2.7
2.7.1 Addition polymerisation/*Addisiepolimerisasie* ✓ (1)

2.7.2



Bal. ✓

Marking guidelines/*Nasienriglyne*
- Ignore/*Ignoreer* ⇌
- Any additional reactants and/or products/*Enige addisionele reaktanse en/of produkte:* Max./*Maks.* 2/3
- Incorrect balancing/*Verkeerde balansering*: Max./*Maks.* 2/3
- Condensed formulae/*Gekondenseerde formules*: Max./*Maks.* 2/3
- Molecular formulae/*Molekulêre formules:* 0/3

(3)
[20]

QUESTION 3/*VRAAG 3*

3.1 Haloalkanes/Alkyl halides/*Haloalkane/Alkielhaliede* ✓ (1)

3.2
3.2.1 London forces/dispersion forces/induced dipole forces ✓
Londonkragte/dispersiekragte/geïnduseerde dipoolkragte (1)

3.2.2 **Structure/*Struktuur*:**
Compound **B** has a longer chain length/larger molecular size/molecular structure/molecular mass/surface area than compound **A**. ✓
*Verbinding **B** het 'n langer kettinglengte/groter molekulêre grootte/ molekulêre struktuur/molekulêre massa/oppervlak as verbinding **A**.*
Intermolecular forces/*Intermolekulêre kragte*:
Stronger intermolecular forces/induced dipole forces/London forces/ dispersion forces/Van der Waals forces. ✓
Sterker intermolekulêre kragte/geïnduseerde dipoolkragte/Londonkragte/ dispersiekragte/Van der Waalskragte.
Energy/*Energie*:
More energy needed to overcome/break intermolecular forces. ✓
Meer energie benodig om intermolekulêre kragte te oorkom/breek.

OR/OF

Structure/*Struktuur:*
Compound **A** has a shorter chain length/smaller molecular size/molecular structure/molecular mass/surface area than compound **B**.
*Verbinding **A** het 'n korter kettinglengte/kleiner molekulêre grootte/ molekulêre struktuur/molekulêre massa/oppervlak as verbinding **B**.*
Intermolecular forces/*Intermolekulêre kragte*:
Weaker intermolecular forces/induced dipole forces/London forces/ dispersion forces/Van der Waals forces.
Swakker intermolekulêre kragte/geïnduseerde dipoolkragte/Londonkragte/ dispersiekragte/Van der Waalskragte.
Energy/*Energie*:
Less energy needed to overcome/break intermolecular forces.
Minder energie benodig om intermolekulêre kragte te oorkom/breek. (3)

3.3 Positional (isomers)/*Posisie(-isomere)* ✓ (1)

3.4.1 69 °C ✓ (1)

3.4.2

- **Compare compound D to compound B:**
  Vergelyk verbinding D met verbinding B:
  Compound **D** is more branched/more compact/has a smaller surface area than compound **B**. ✓
  *Verbinding **D** is meer vertak/meer kompak/het 'n kleiner oppervlak as verbinding **B**.*
- **Compare compound D to compound E:**
  Vergelyk verbinding D met verbinding E:
  Compound **D** is less branched/has a longer chain length/larger surface area than compound **E**. ✓
  *Verbinding **D** is minder vertak/het 'n langer kettinglengte/het 'n groter oppervlak as verbinding **E**.*
- Intermolecular forces in compound **D** are weaker than in compound **B** and stronger than in compound **E**. ✓
  *Intermolekulêre kragte in verbinding **D** is swakker as in verbinding **B** en sterker as in verbinding **E**.*
- Less energy is needed to overcome/break intermolecular forces in compound **D** than in compound **B** and more energy is needed to overcome/break intermolecular forces in compound **D** than in compound **E**. ✓
  Minder energie benodig om intermolekulêre kragte in verbinding **D** te oorkom/breek as in verbinding **B** en meer energie benodig om intermolekulêre kragte in verbinding **D** te oorkom/breek as in verbinding **E**. (4)

[11]

QUESTION 4/*VRAAG 4*

4.1
4.1.1 Z ✓ (1)

4.1.2 X ✓ (1)

4.1.3 V ✓ (1)

4.1.4 Y ✓ (1)

4.2
4.2.1 Propan-2-ol/2-propanol ✓ (1)

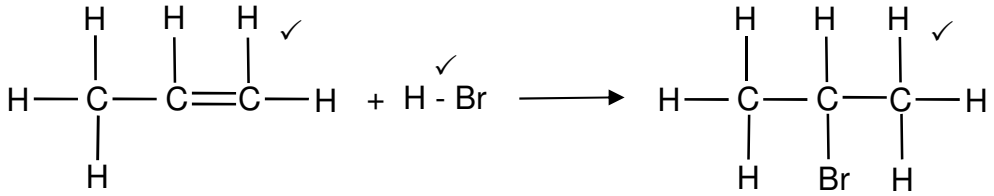
4.2.2 Propane/*propaan* ✓ (1)

4.3
4.3.1 Both reactions take place in the presence of a strong base/NaOH/ KOH/LiOH. ✓
Beide reaksies vind plaas in teenwoordigheid van 'n sterk basis/NaOH/ KOH/LiOH. (1)

4.3.2 Y: concentrated base/ethanolic base & Z: dilute base/base in water/water ✓
Y: gekonsentreerde basis/etanoliese basis & Z: verdunde basis/basis in water/water

Y: heat (strongly)/high temperature & Z: mild heat ✓
Y: verhit (sterk)/hoë temperatuur & Z: matige hitte (2)

4.3.3



Marking guidelines/*Nasienriglyne*
- Ignore/*Ignoreer* ⇌
- Accept HBr if condensed./*Aanvaar HBr as gekondenseerd.*
- Any additional reactants and/or products/*Enige addisionele reaktanse en/of produkte:* Max./*Maks.* 2/3
- Accept coefficients that are multiples. *Aanvaar koëffisiënte wat veelvoude is.*
- Incorrect balancing/*Verkeerde balansering*: Max./*Maks.* 2/3
- Condensed formulae/*Gekondenseerde formules*: Max./*Maks.* 2/3
- Molecular formulae/*Molekulêre formules:* Max./*Maks.* 1/3

(3)
[12]

QUESTION 5/*VRAAG 5*

5.1

5.1.1

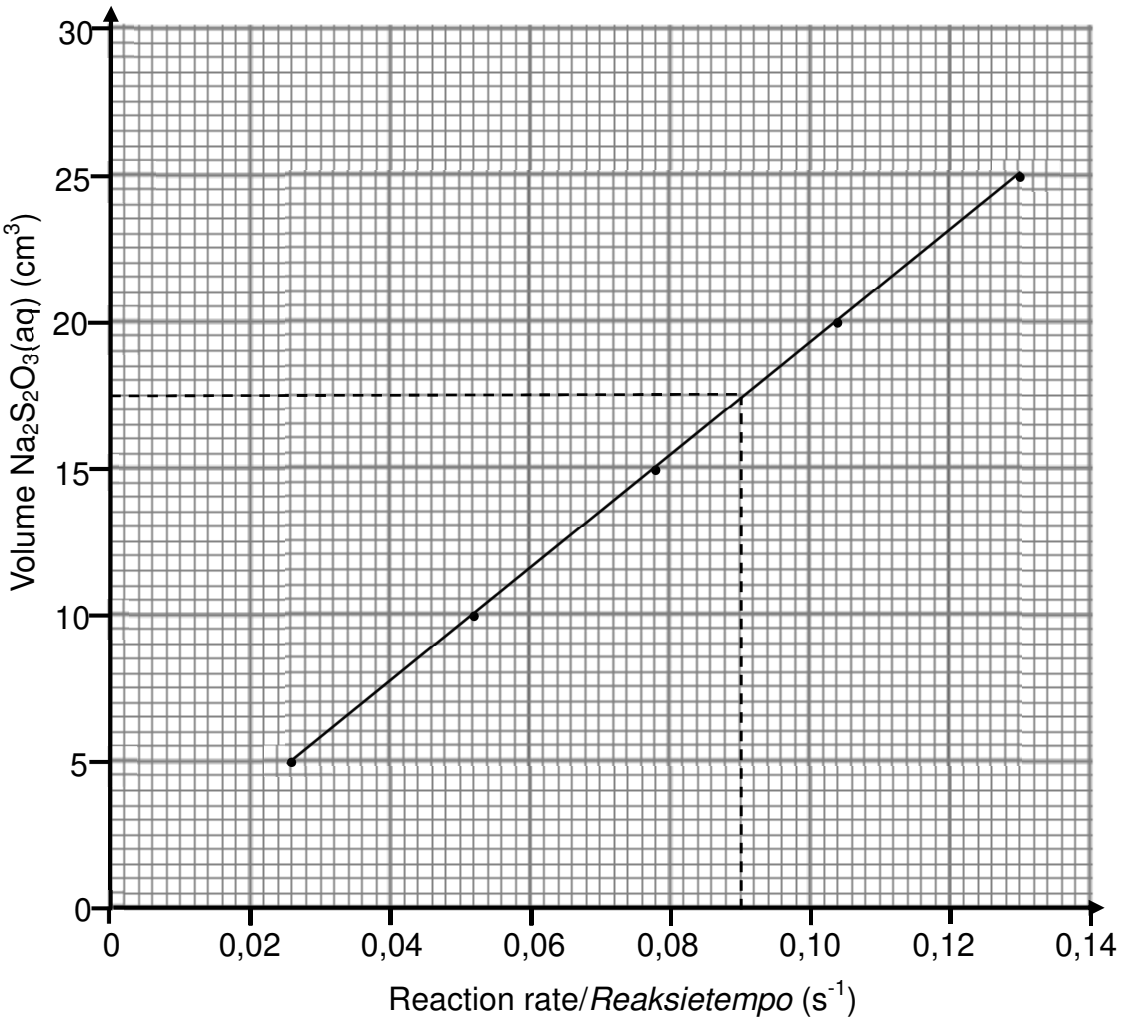
(a) Concentration (of $Na_2S_2O_3$)/*Konsentrasie (van $Na_2S_2O_3$)* ✓ (1)

(b) To dilute (the $Na_2S_2O_3$)/*Om $Na_2S_2O_3$ te verdun.* ✓

OR/*OF*

Decrease concentration (of $Na_2S_2O_3$.)
Verminder konsentrasie (van $Na_2S_2O_3$.) (1)

5.1.2 **Graph of volume of $Na_2S_2O_3$(aq) versus reaction rate**
Grafiek van volume $Na_2S_2O_3$(aq) teenoor reaksietempo



Marking criteria/*Nasienriglyne*	
Any three points plotted correctly./*Enige drie punte korrek gestip.*	✓
All the points plotted correctly./ *Alle punte korrek gestip.*	✓
Best-fit line drawn./*Beste paslyn getrek*.	✓

(3)

5.1.3 $\frac{1}{\textit{reaction}\ \text{time}} / \frac{1}{\textit{reaksietyd}} = \frac{1}{11} = 0{,}09\ (s^{-1})$ ✓

On graph: Dotted line starting from 0,09 s on x axis drawn to y axis as shown on graph. ✓
Op grafiek: Stippellyn geteken vanaf 0,09 s op x-as na y-as soos getoon op grafiek.

Reading on y axis/*Lesing op y-as*: <u>17,5 cm^3</u> ✓
(Accept/*Aanvaar*: 17 – 18 cm^3)

Note/***Let wel*****:** Award mark for answer only if 0,09 s used and dotted lines shown on graph./*Ken punt vir antwoord slegs toe indien 0,09 s gebruik is en stippellyn op grafiek aangetoon is*. (3)

5.1.4 Higher than/*Hoër as* ✓

-

<u>OPTION 1/*OPSIE 1*</u>
In <u>experiment 1/*In eksperiment 1*</u>:

- <u>More ($Na_2S_2O_3$) particles per unit volume.</u> ✓
  <u>*Meer ($Na_2S_2O_3$)-deeltjies per eenheidsvolume.*</u>
- <u>More effective collisions per unit time.</u> ✓
  <u>*Meer effektiewe botsings per eenheidstyd.*</u>

<u>OPTION 2/*OPSIE 2*</u>
In <u>experiment 5/*In eksperiment 5*</u>:

- <u>Less ($Na_2S_2O_3$) particles per unit volume.</u>
  <u>*Minder ($Na_2S_2O_3$)-deeltjies per eenheidsvolume.*</u>
- <u>Less effective collisions per unit time</u> .
  <u>*Minder effektiewe botsings per eenheidstyd.*</u> (3)

5.2

5.2.1 The <u>minimum energy needed</u> for a <u>reaction to take place</u>. ✓✓
Die <u>minimum energie benodig</u> vir 'n <u>reaksie om plaas te vind</u>. (2)

5.2.2 (a) - 20 $kJ \cdot mol^{-1}$ ✓ (1)

(b) 185 $kJ \cdot mol^{-1}$ ✓ (1)

5.2.3 Reverse (reaction)/*Terugwaartse (reaksie)* ✓ (1)
[16]

QUESTION 6/*VRAAG 6*

6.1 Reversible reaction/*Omkeerbare reaksie* ✓ (1)

6.2

Marking criteria/*Nasienriglyne*:
- Use $M(NH_4C\ell) = 53,5\ g\cdot mol^{-1}$ to calculate $n(NH_4C\ell)$ ✓
  Gebruik $M(NH_4C\ell) = 53,5\ g\cdot mol^{-1}$ om $n(NH_4C\ell)$ te bereken.
- $m(NH_4C\ell)_{used/gebruik} = m(NH_4C\ell)_{initial/begin} - m(NH_4C\ell)_{equil/ewe}$ ✓
  OR/OF
  $n(NH_4C\ell)_{used/gebruik} = n(NH_4C\ell)_{initial/begin} - n(NH_4C\ell)_{equil/ewe}$
- **USING** ratio/***GEBRUIK*** *verhouding*: $NH_4C\ell : NH_3 : HC\ell = 1 : 1 : 1$ ✓
- $n(NH_3)_{equil/ewe} = n(NH_3)_{form/gevorm}$ & $n(HC\ell)_{equil/ewe} = n(HC\ell)_{form/gevorm}$ ✓
- Divide/Deel $n(NH_3)_{equil/ewe}$ & $n(HC\ell)_{equil/ewe}$ by/*deur* 0,5 dm^3 ✓
- Correct K_C expression/*Korrekte K_c-uitdrukking* ✓
- Substitution of concentrations into K_C expression. ✓
  Vervang konsentrasies in K_c-uitdrukking.
- Final answer/Finale antwoord: to/*tot* 0,01 ✓
  Range/*Gebied*: 0,009,447 x 10^{-3} to/*tot* 0,01

OPTION 1/*OPSIE 1*

	$NH_4C\ell(s)$	$NH_3(g)$	$HC\ell(g)$
Initial quantity (mol) *Aanvanklike hoeveelheid (mol)*	$\frac{10,7}{53,5}$ ✓ = 0,2	0	0
Change (mol) *Verandering (mol)*	0,05 ✓	0,05	0,05
Quantity at equilibrium (mol) *Hoeveelheid by ewewig (mol)*	$\frac{8,1}{53,5}$ = 0,15	0,05	0,05
Equilibrium concentration *Ewewigskonsentrasie* ($mol\cdot dm^{-3}$)	-	0,1	0,1

Ratio/ *verhouding* ✓ ✓

Divide by/*Deel deur* 0,5 ✓

$K_c = [NH_3][HC\ell]$ ✓
$= (0,1)(0,1)$ ✓
$= 0,01$ ✓

No K_C expression, correct substitution/*Geen K_c-uitdrukking, korrekte vervanging:* Max./*Maks*. 7/8

Wrong K_C expression/*Verkeerde K_c-uitdrukking:* Max./*Maks*. 5/8

IF/*INDIEN*: $[NH_4C\ell] = 1$ in $K_c = \frac{[NH_3][HC\ell]}{[NH_4C\ell]}$
No mark for K_c expression, but continue marking substitution and answer.
Geen punt vir K_c-uitdrukking, maar sien substitusie en antwoord na.

OPTION 2/*OPSIE 2*:

$\Delta m(NH_4C\ell) = 10,7 - 8,1$ ✓ $= 2,6$ g

$\Delta n(NH_4C\ell) = \frac{2,6}{53,5}$ ✓ $= 0,05$ mol

$\Delta n(NH_3) = \Delta n(NH_4C\ell) = 0,05$ mol
$\Delta n(HC\ell) = \Delta n(NH_4C\ell) = 0,05$ mol } ✓

$n(NH_3)_{equi/ewe} = n(NH_3)_{initial/begin} + \Delta n(NH_3) = 0,05$ mol
$n(HC\ell)_{equi/ewe} = \Delta n(HC\ell)_{initial/begin} + \Delta n(HC\ell) = 0,05$ mol } ✓

$[NH_3]_{equi/ewe} = \frac{0,05}{0,5}$ ✓ $= 0,1$ mol
$[HC\ell]_{equi/ewe} = \frac{0,05}{0,5}$ ✓ $= 0,1$ mol } ✓Divide by/*Deel deur* 0,5

$K_c = [NH_3][HC\ell]$ ✓
$= (0,1)(0,1)$ ✓
$= 0,01$ ✓

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

IF/*INDIEN*: $[NH_4C\ell] = 1$ in $K_c = \frac{[NH_3][HC\ell]}{[NH_4C\ell]}$
No mark for K_c expression, but continue marking substitution and answer.
Geen punt vir K_c-uitdrukking, maar sien substitusie en antwoord na.

(8)

6.3 Endothermic/*Endotermies* ✓

- Increase in temperature increases concentration of products/favours forward reaction. ✓
  Toename in temperatuur verhoog die konsentrasie van die produkte/bevoordeel die voorwaartse reaksie.
- Increase in temperature favours the endothermic reaction. ✓
  Toename in temperatuur bevoordeel die endotermiese reaksie. (3)

6.4

6.4.1 Remains the same/*Bly dieselfde* ✓ (1)

6.4.2 Increases/*Verhoog* ✓ (1)

6.4.3 Remains the same/*Bly dieselfde* ✓ (1)

[15]

QUESTION 7/*VRAAG 7*

7.1

7.1.1 A dilute base contains a small amount/number of moles of base in proportion to the volume of water ✓ and a concentrated base contains a large amount/number of moles of base in proportion to the volume of water. ✓
'n Verdunde basis bevat 'n klein hoeveelheid/aantal mol basis in verhouding tot die volume water en 'n gekonsentreerde basis bevat 'n groot hoeveelheid/aantal mol basis in verhouding tot die volume water. (2)

7.1.2 Phosphoric acid (solution)/*Fosforsuur(oplossing)* ✓ (1)

7.1.3 (a) Increases/*Toeneem* ✓ (1)

(b) Increases/*Toeneem* ✓ (1)

7.2

7.2.1

Marking criteria/*Nasienriglyne:*
- Formula/*Formule:* pH = -log $[H_3O^+]$ **OR**/***OF*** $c = \frac{n}{v}$ ✓
- Substitute/*Vervang* pH = 2. ✓
- Use mol ratio/*Gebruik molverhouding:* $n(H_3PO_4) : n(H_3O^+) = 1:3$ ✓
- Substitute/*Vervang* $[H_3PO_4]$ & 0,5 dm^3 in n= cV. ✓
- Final answer/*Finale antwoord:* 1,67 x 10^{-3} mol / 1,665 x 10^{-3} mol ✓

$pH = -\log [H_3O^+]$
$\therefore 2$ ✓ $= -\log [H_3O^+]$
$\therefore [H_3O^+] = 0{,}01\ mol \cdot dm^{-3}$

$[H_3PO_4] = \frac{1}{3}[H_3O^+]$
$= \frac{1}{3} \times 0{,}01$ ✓
$= 3{,}33 \times 10^{-3}\ mol \cdot dm^{-3}$

$n(H_3PO_4)_{ini/aanv} = cV$
$= (3{,}33 \times 10^{-3})(500 \times 10^{-3})$ ✓
$= 1{,}67 \times 10^{-3}$ mol ✓

✓Any one/*Enige een*

(5)

7.2.2 **POSITIVE MARKING FROM QUESTION 7.2.1.**
POSITIEWE NASIEN VANAF VRAAG 7.2.1.

Marking criteria/*Nasienriglyne*:

- Use M = 58 g·mol^{-1} to calculate $n(Mg(OH)_2)_{reacted}$ ✓
  Gebruik M = 58 g·mol^{-1} om $n(Mg(OH)_2)_{gereageer}$ te bereken.
- Use mol ratio/*Gebruik molverhouding:* $n(H_3PO_4) : n(Mg(OH)_2) = 2:3$ ✓
- Subtraction/Aftrekking:
  $n(H_3PO_4)_{excess/oormaat} = n(H_3PO_4)_{initial/aanvanklik} - n(H_3PO_4)_{react/reageer}$
- Use V_a = 14 x 10^{-3} dm^3/14 cm^3. ✓
  Gebruik V_a = 14 x 10^{-3} dm^3/14 cm^3.
- Use mol ratio/*Gebruik molverhouding:* $n(H_3PO_4) : n(NaOH) = 1:3$ ✓
- Use V_b = 25 x 10^{-3} dm^3/25 cm^3 to calculate [NaOH]. ✓
  Gebruik V_b = 25 x 10^{-3} dm^3/25 cm^3 om [NaOH] te bereken.
- Final answer/*Finale antwoord*: 9,58 x 10^{-5} mol·dm^{-3} ✓
  Range/*Gebied*: 9,66 x 10^{-4} to/*tot* 9,76 x 10^{-4} mol·dm^{-3}

$$n(Mg(OH)_2) = \frac{m}{M}$$
$$= \frac{0,12}{58} \checkmark$$
$$= 2,07 \times 10^{-3} \text{ mol}$$

$$n(H_3PO_4)_{reacted/reageer} = \tfrac{2}{3}n(Mg(OH)_2)$$
$$= \tfrac{2}{3}(2,07 \times 10^{-3}) \checkmark$$
$$= 1,38 \times 10^{-3} \text{ mol}$$

$$n(H_3PO_4)_{excess/oormaat} = 1,67 \times 10^{-3} - 1,38 \times 10^{-3} \checkmark$$
$$= 2,9 \times 10^{-4} \text{ mol}$$

$$n(H_3PO_4)_{excess/oormaat \text{ in } 14 \text{ cm}^3} = 2,9 \times 10^{-4} \times \frac{14}{500} \checkmark$$
$$= 8,12 \times 10^{-6} \text{ mol}$$

$$n(NaOH) = 3n(H_3PO_4)$$
$$= 3(8,12 \times 10^{-6}) \checkmark$$
$$= 2,44 \times 10^{-5} \text{ mol}$$

$$c_b = \frac{n}{V}$$
$$= \frac{2,44 \times 10^{-5}}{25 \times 10^{-3}} \checkmark$$
$$= 9,76 \times 10^{-4} \text{ mol·dm}^{-3} \checkmark$$

(7)
[17]

QUESTION 8/*VRAAG 8*

8.1 Galvanic/*Galvanies* ✓ (1)

8.2 Ag ✓ (1)

8.3 $Zn \rightarrow Zn^{2+} + 2e^-$ ✓✓

Marking guidelines/*Nasienriglyne*:
- $Zn \rightleftharpoons Zn^{2+} + 2e^-$ $^1/_2$ $Zn^{2+} + 2e^- \rightleftharpoons Zn$ $^0/_2$
  $Zn^{2+} + 2e^- \leftarrow Zn$ $^2/_2$ $Zn^{2+} + 2e^- \rightarrow Zn$ $^0/_2$
- Ignore if charge omitted on electron./*Ignoreer indien lading op elektron weggelaat word.*
- If charge (+) omitted on Cu^{2+}/*Indien lading (+) weggelaat op* Zn^{2+}*:*
  Max./*Maks:* $^1/_2$ Example/*Voorbeeld:* $Zn \rightarrow Zn^2 + 2e^-$ ✓

(2)

8.4 Increases/*Verhoog* ✓ (1)

8.5

$$n = \frac{m}{M}$$
$$= \frac{2,16}{108} \checkmark$$
$$= 0,02 \text{ mol}$$

$n(Zn) = ½n(Ag)$
$= ½ \times 0,02$ ✓
$= 0,01$ mol

$$n(Zn) = \frac{m}{M}$$
$$0,01 = \frac{m}{65} \checkmark$$
$$m = 0,65 \text{ g} \checkmark$$

(4)

8.6

8.6.1 Pressure/*Druk*: $1,013 \times 10^5$ Pa/101,3 kPa/1 atm ✓ (1)

8.6.2 $\underline{Zn(s) \mid Zn^{2+}(aq)\ (1\ mol{\cdot}dm^{-3})}$ ✓ || ✓ $\underline{H^+(aq)\ (1\ mol{\cdot}dm^{-3}) \mid H_2\ (g) \mid Pt(s)}$ ✓

OR/*OF*
$\underline{Zn(s) \mid Zn^{2+}(aq)}$ ✓ || ✓ $\underline{H^+(aq) \mid H_2\ (g) \mid Pt(s)}$ ✓

OR/*OF*
$\underline{Zn \mid Zn^{2+}}$ ✓ || ✓ $\underline{H^+ \mid H_2 \mid Pt}$ ✓ (3)

8.6.3

OPTION 1/*OPSIE 1*:	**Notes/Aantekeninge**
$E^{\theta}_{cell} = E^{\theta}_{reduction} - E^{\theta}_{oxidation}$ ✓ $E^{\theta}_{sel} = E^{\theta}_{reduksie} - E^{\theta}_{oksidasie}$ = 0 ✓ - (-0,76) ✓ = 0,76 V ✓	• Accept any other correct formula from the data sheet./*Aanvaar enige ander korrekte formule vanaf gegewensblad*. • Any other formula using unconventional abbreviations, e.g. $E°_{cell} = E°_{OA} - E°_{RA}$ followed by correct substitutions:/*Enige ander formule wat onkonvensionele afkortings gebruik bv.* $E°_{sel} = E°_{OM} - E°_{RM}$ *gevolg deur korrekte vervangings*: 3/4
Option 2: $2H^+ + 2e^- \rightarrow H_2$ $Zn \rightarrow Zn^{2+} + 2e^-$ ✓	$E° = 0,00$ (V) ✓ $E° = 0,76$ (V) ✓ $E^{0}_{cell} = 0,76$ V ✓

(4)
[17]

QUESTION 9/*VRAAG 9*

9.1 The process in which electrical energy is converted to chemical energy. ✓✓
Die proses waarin elektriese energie omgeskakel word na chemiese energie.
OR/*OF*
The use of electrical energy to produce a chemical change.
Die gebruik van elektriese energie om 'n chemiese verandering te weeg te bring. (2)

9.2 Oxidation/*Oksidasie* ✓ (1)

9.3 A substance that loses electrons/donates electrons. ✓✓
'n Stof wat elektrone verloor/skenk. (2)

9.4 Cℓ⁻/chloride (ion)/*Chloried(ioon)* ✓
Accept/Aanvaar: NaCℓ/sodium chloride/*natriumchloried.* (1)

9.5 $2H_2O(\ell) + 2e^- \rightarrow H_2(g) + 2OH^-(aq)$ ✓✓

Marking guidelines/*Nasienriglyne*:
- $2H_2O + 2e^- \rightleftharpoons H_2 + 2OH^-$ ½ $Zn^{2+} + 2e^- \rightleftharpoons Zn$ 0/2
  $H_2 + 2OH^- \leftarrow 2H_2O + 2e^-$ 2/2 $H_2 + 2OH^- \rightarrow 2H_2O + 2e^-$ 0/2
- Ignore if charge omitted on electron./*Ignoreer indien lading op elektron weggelaat word.*
- If charge (-) omitted on OH^-/*Indien lading (-) weggelaat op* OH^-*:*
  Max./*Maks:* ½ Example/*Voorbeeld:* $2H_2O + 2e^- \rightarrow H_2 + 2OH$

(2)

9.6 Carbon/C/*koolstof*/platinum/Pt ✓ (1)
[9]

QUESTION 10/*VRAAG 10*

10.1

10.1.1 $N_2(g) + 3H_2(g)$ ✓→ $2NH_3(g)$ ✓ ✓ balancing/*balansering*

Marking criteria/*Nasienriglyne:*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse *Produkte* *Balansering*
- Ignore phases./*Ignoreer fases*.
- Ignore double arrows./*Ignoreer dubbelpyle.*
- Marking rule 6.3.10/*Nasienreël 6.3.10.*

(3)

10.1.2 Contact (process)/*Kontak(proses)* ✓ (1)

10.1.3 $H_2SO_4 + 2NH_3$ ✓→ $(NH_4)_2SO_4$ ✓ ✓ balancing/*balansering*

Marking criteria/*Nasienriglyne:*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse *Produkte* *Balansering*
- Ignore phases./*Ignoreer fases*.
- Ignore double arrows./*Ignoreer dubbelpyle.*
- Marking rule 6.3.10/*Nasienreël 6.3.10.*

(3)

10.2

10.2.1 (Fertiliser) **S** ✓ (1)

10.2.2 Higher N ✓ for leaf production. ✓
Hoër N vir blaarproduksie. (2)

10.2.3

OPTION 1/*OPSIE 1*:	**OPTION 2/*OPSIE 2*:**
$m\,(\text{fertiliser}) = \frac{30}{100} \times 2$ ✓ $= 0{,}6\ \text{kg}$ ↓ $m\,(\text{filler}) = 2 - 0{,}6$ ✓ $= 1{,}4\ \text{kg}$ ✓	$\%\ \text{filler} = \frac{100 - 30}{}$ ✓ $= 70\%$ ↓ $m\,(\text{filler}) = \frac{70}{100} \times 2$ ✓ $= 1{,}4\ \text{kg}$ ✓

(3)
[13]

TOTAL/*TOTAAL*: 150