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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
- $$\begin{array}{ccccc}
 & \text{H} & & \text{H} & & \text{H} & & \\
 & | & & | & & | & & \\
 \text{H} & - \text{C} & - & \text{C} & - & \text{C} & - & \text{H} \\
 & | & & | & & | & & \\
 & \text{H} & & & & \text{H} & & \\
 & & & & & | & & \\
 & & & & & \text{H} - \text{C} - \text{H} & & \\
 & & & & & | & & \\
 & & & & & \text{H} & &
 \end{array}$$

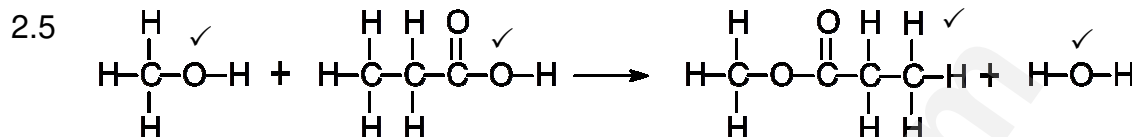
IF/INDIEN:

 - H atom omitted/H-atoom uitgelaat: - 1
 - Condensed structure/Gekondenseerde struktuur: -1
- (2)
- 2.3 H₂ ✓ (1)

2.4

2.4.1 Butanal/Butanaal ✓ (1)

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

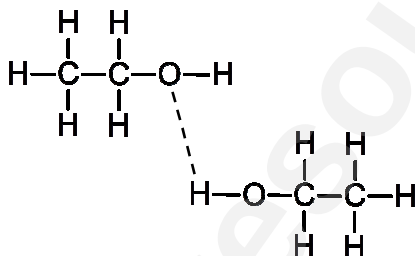


Marking guidelines/Nasienriglyne

- Ignore/Ignoreer ⇌
- Accept H₂O if condensed./Aanvaar H₂O 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:

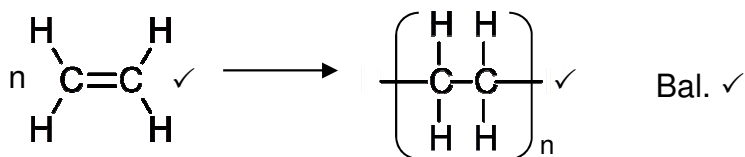
- At least one structural formula of ethanol as shown. ✓
Ten minste een struktuurformule van etanol soos aangetoon.
- Dotted line drawn from O-atom of one molecule to H-atom bonded to an O-atom in the second molecule (H-atom should be between two O-atoms). ✓
Stippellyn getrek vanaf O-atoom op een molekule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

(2)

2.7

2.7.1 Addition polymerisation/Addisiepolimerisasie ✓ (1)

2.7.2



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)

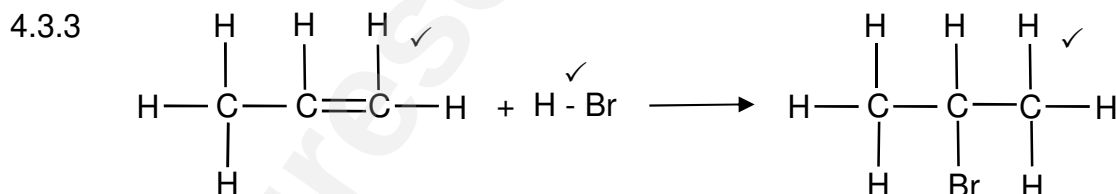
4.2.2 Propane/*propaan* ✓ (1)

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)



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 $\text{Na}_2\text{S}_2\text{O}_3$)/Konsentrasie (van $\text{Na}_2\text{S}_2\text{O}_3$) ✓ (1)

(b) To dilute (the $\text{Na}_2\text{S}_2\text{O}_3$)/Om $\text{Na}_2\text{S}_2\text{O}_3$ te verdun. ✓

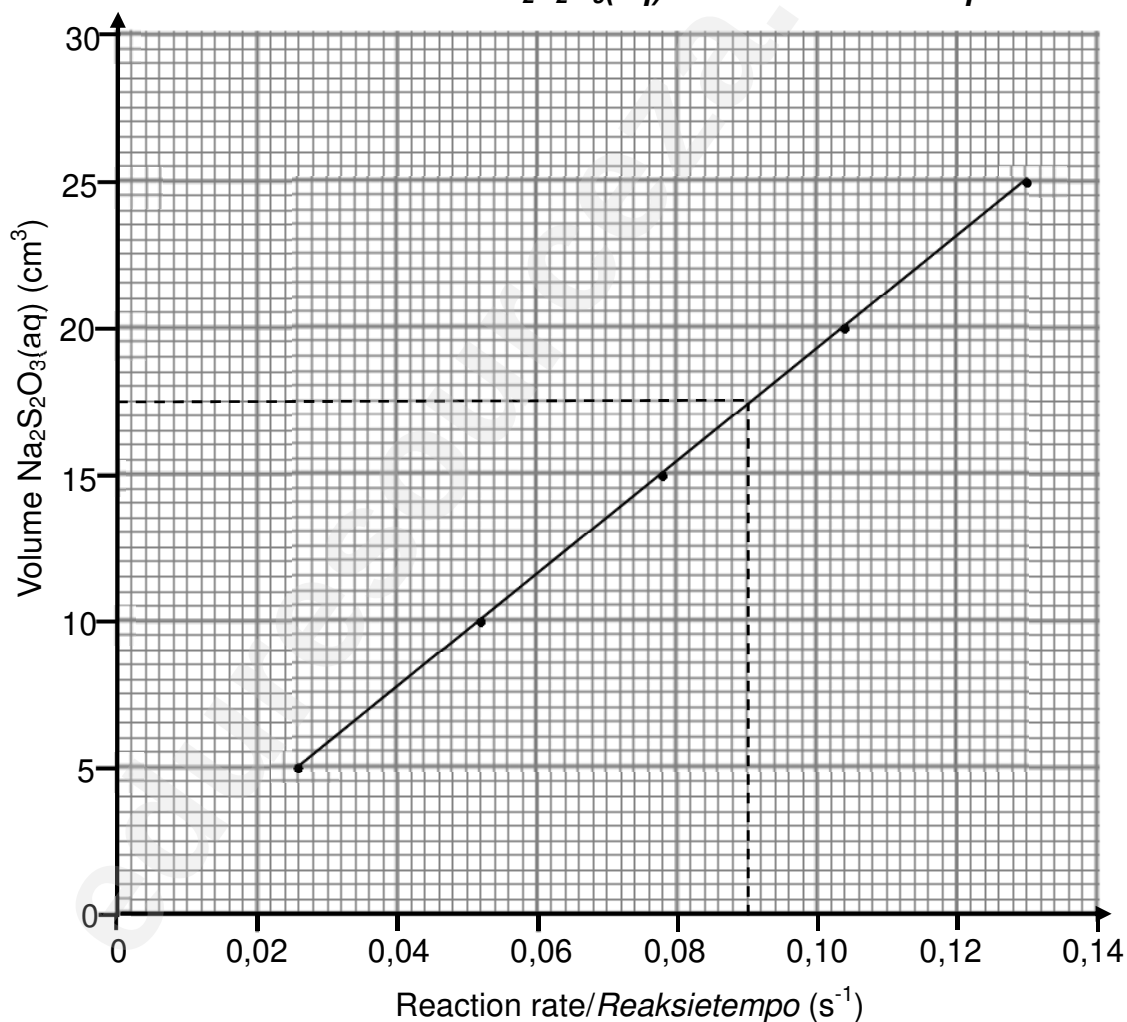
OR/OF

Decrease concentration (of $\text{Na}_2\text{S}_2\text{O}_3$.)
 Verminder konsentrasie (van $\text{Na}_2\text{S}_2\text{O}_3$.)

(1)

5.1.2

Graph of volume of $\text{Na}_2\text{S}_2\text{O}_3(\text{aq})$ versus reaction rate
 Grafiek van volume $\text{Na}_2\text{S}_2\text{O}_3(\text{aq})$ 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 $\frac{1}{\text{reaction time}} / \frac{1}{\text{reaksietyd}} = \frac{1}{11} = 0,09 \text{ (s}^{-1}\text{)} \checkmark$

On graph: Dotted line starting from 0,09 s on x axis drawn to y axis as shown on graph. $\checkmark$

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: 17,5 cm³ $\checkmark$
 (Accept/Aanvaar: 17 – 18 cm³)

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 $\checkmark$



OPTION 1/OPSIE 1

In experiment 1/In eksperiment 1:

- More (Na₂S₂O₃) particles per unit volume. $\checkmark$
Meer (Na₂S₂O₃)-deeltjies per eenheidsvolume.
- More effective collisions per unit time. $\checkmark$
Meer effektiewe botsings per eenheidstyd.

OPTION 2/OPSIE 2

In experiment 5/In eksperiment 5:

- Less (Na₂S₂O₃) particles per unit volume.
Minder (Na₂S₂O₃)-deeltjies per eenheidsvolume.
- Less effective collisions per unit time
Minder effektiewe botsings per eenheidstyd.

(3)

5.2

5.2.1 The minimum energy needed for a reaction to take place. $\checkmark\checkmark$
 Die minimum energie benodig vir 'n reaksie om plaas te vind. (2)

5.2.2 (a) - 20 kJ.mol⁻¹ $\checkmark$ (1)

(b) 185 kJ.mol⁻¹ $\checkmark$ (1)

5.2.3 Reverse (reaction)/Terugwaartse (reaksie) $\checkmark$ (1)

[16]

QUESTION 6/VRAAG 6

6.1 Reversible reaction/Omkeerbare reaksie ✓

(1)

6.2

Marking criteria/Nasienriglyne:

- Use $M(\text{NH}_4\text{Cl}) = 53,5 \text{ g} \cdot \text{mol}^{-1}$ to calculate $n(\text{NH}_4\text{Cl})$ ✓
Gebruik $M(\text{NH}_4\text{Cl}) = 53,5 \text{ g} \cdot \text{mol}^{-1}$ om $n(\text{NH}_4\text{Cl})$ te bereken.
- $m(\text{NH}_4\text{Cl})_{\text{used/gebruik}} = m(\text{NH}_4\text{Cl})_{\text{initial/begin}} - m(\text{NH}_4\text{Cl})_{\text{equil/ewe}}$ ✓
OR/OF
 $n(\text{NH}_4\text{Cl})_{\text{used/gebruik}} = n(\text{NH}_4\text{Cl})_{\text{initial/begin}} - n(\text{NH}_4\text{Cl})_{\text{equil/ewe}}$
- **USING** ratio/**GEBRUIK** verhouding: $\text{NH}_4\text{Cl} : \text{NH}_3 : \text{HCl} = 1 : 1 : 1$ ✓
- $n(\text{NH}_3)_{\text{equil/ewe}} = n(\text{NH}_3)_{\text{form/gevorm}}$ & $n(\text{HCl})_{\text{equil/ewe}} = n(\text{HCl})_{\text{form/gevorm}}$ ✓
- Divide/Deel $n(\text{NH}_3)_{\text{equil/ewe}}$ & $n(\text{HCl})_{\text{equil/ewe}}$ by/deur $0,5 \text{ dm}^3$ ✓
- 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: $0,009,447 \times 10^{-3}$ to/tot $0,01$

OPTION 1/OPSIE 1

	$\text{NH}_4\text{Cl(s)}$	$\text{NH}_3(\text{g})$	HCl(g)	
Initial quantity (mol) <i>Aanvanklike hoeveelheid (mol)</i>	$\frac{10,7}{53,5} = 0,2$	0	0	
Change (mol) <i>Verandering (mol)</i>	0,05 ✓	0,05	0,05	Ratio/ verhouding ✓
Quantity at equilibrium (mol) <i>Hoeveelheid by ewewig (mol)</i>	$\frac{8,1}{53,5} = 0,15$	0,05	0,05	✓
Equilibrium concentration <i>Ewewigskonsentrasie</i> ($\text{mol} \cdot \text{dm}^{-3}$)	-	0,1	0,1	Divide by/Deel deur 0,5 ✓

$$K_c = [\text{NH}_3][\text{HCl}] \checkmark$$

$$= (0,1)(0,1) \checkmark$$

$$= 0,01 \checkmark$$

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: $[\text{NH}_4\text{Cl}] = 1$ in $K_c = \frac{[\text{NH}_3][\text{HCl}]}{[\text{NH}_4\text{Cl}]}$

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:

$$\Delta n(\text{NH}_4\text{Cl}) = 10,7 - 8,1 \checkmark = 2,6 \text{ g}$$

$$\Delta n(\text{NH}_4\text{Cl}) = \frac{2,6}{53,5} \checkmark = 0,05 \text{ mol}$$

$$\left. \begin{array}{l} \Delta n(\text{NH}_3) = \Delta n(\text{NH}_4\text{Cl}) = 0,05 \text{ mol} \\ \Delta n(\text{HCl}) = \Delta n(\text{NH}_4\text{Cl}) = 0,05 \text{ mol} \end{array} \right\} \checkmark$$

$$\left. \begin{array}{l} n(\text{NH}_3)_{\text{equi/ewe}} = n(\text{NH}_3)_{\text{initial/begin}} + \Delta n(\text{NH}_3) = 0,05 \text{ mol} \\ n(\text{HCl})_{\text{equi/ewe}} = \Delta n(\text{HCl})_{\text{initial/begin}} + \Delta n(\text{HCl}) = 0,05 \text{ mol} \end{array} \right\} \checkmark$$

$$\left. \begin{array}{l} [\text{NH}_3]_{\text{equi/ewe}} = \frac{0,05}{0,5} \checkmark = 0,1 \text{ mol} \\ [\text{HCl}]_{\text{equi/ewe}} = \frac{0,05}{0,5} \checkmark = 0,1 \text{ mol} \end{array} \right\} \checkmark \text{ Divide by/Deel deur } 0,5$$

$$\begin{aligned} K_c &= [\text{NH}_3][\text{HCl}] \checkmark \\ &= (0,1)(0,1) \checkmark \\ &= 0,01 \checkmark \end{aligned}$$

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: $[\text{NH}_4\text{Cl}] = 1$ in $K_c = \frac{[\text{NH}_3][\text{HCl}]}{[\text{NH}_4\text{Cl}]}$

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 $\checkmark$



- Increase in temperature increases concentration of products/favours forward reaction. $\checkmark$

Toename in temperatuur verhoog die konsentrasie van die produkte/bevoordeel die voorwaartse reaksie.

- Increase in temperature favours the endothermic reaction. $\checkmark$

Toename in temperatuur bevoordeel die endotermiese reaksie.

(3)

6.4

6.4.1 Remains the same/Bly dieselfde $\checkmark$

(1)

6.4.2 Increases/Verhoog $\checkmark$

(1)

6.4.3 Remains the same/Bly dieselfde $\checkmark$

(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: $\text{pH} = -\log [\text{H}_3\text{O}^+]$ OR/OF $c = \frac{n}{v}$ ✓
- Substitute/Vervang $\text{pH} = 2$. ✓
- Use mol ratio/Gebruik molverhouding: $n(\text{H}_3\text{PO}_4) : n(\text{H}_3\text{O}^+) = 1:3$ ✓
- Substitute/Vervang $[\text{H}_3\text{PO}_4]$ & $0,5 \text{ dm}^3$ in $n = cV$. ✓
- Final answer/Finale antwoord: $1,67 \times 10^{-3} \text{ mol}$ / $1,665 \times 10^{-3} \text{ mol}$ ✓

$\text{pH} = -\log [\text{H}_3\text{O}^+]$
 $\therefore 2 \checkmark = -\log [\text{H}_3\text{O}^+]$
 $\therefore [\text{H}_3\text{O}^+] = 0,01 \text{ mol} \cdot \text{dm}^{-3}$
 $[\text{H}_3\text{PO}_4] = \frac{1}{3} [\text{H}_3\text{O}^+]$
 $= \frac{1}{3} \times 0,01 \checkmark$
 $= 3,33 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3}$
 $n(\text{H}_3\text{PO}_4)_{\text{ini/aanv}} = cV$
 $= (3,33 \times 10^{-3})(500 \times 10^{-3}) \checkmark$
 $= 1,67 \times 10^{-3} \text{ mol} \checkmark$

✓ 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 $M = 58 \text{ g} \cdot \text{mol}^{-1}$ to calculate $n(\text{Mg}(\text{OH})_2)_{\text{reacted}}$ ✓
 Gebruik $M = 58 \text{ g} \cdot \text{mol}^{-1}$ om $n(\text{Mg}(\text{OH})_2)_{\text{gereageer}}$ te bereken.
- Use mol ratio/Gebruik molverhouding: $n(\text{H}_3\text{PO}_4) : n(\text{Mg}(\text{OH})_2) = 2:3$ ✓
- Subtraction/Aftrekking:
 $n(\text{H}_3\text{PO}_4)_{\text{excess/oormaat}} = n(\text{H}_3\text{PO}_4)_{\text{initial/aanvanklik}} - n(\text{H}_3\text{PO}_4)_{\text{react/reageer}}$
- Use $V_a = 14 \times 10^{-3} \text{ dm}^3/14 \text{ cm}^3$. ✓
 Gebruik $V_a = 14 \times 10^{-3} \text{ dm}^3/14 \text{ cm}^3$.
- Use mol ratio/Gebruik molverhouding: $n(\text{H}_3\text{PO}_4) : n(\text{NaOH}) = 1:3$ ✓
- Use $V_b = 25 \times 10^{-3} \text{ dm}^3/25 \text{ cm}^3$ to calculate $[\text{NaOH}]$. ✓
 Gebruik $V_b = 25 \times 10^{-3} \text{ dm}^3/25 \text{ cm}^3$ om $[\text{NaOH}]$ te bereken.
- Final answer/Finale antwoord: $9,58 \times 10^{-5} \text{ mol} \cdot \text{dm}^{-3}$ ✓
 Range/Gebied: $9,66 \times 10^{-4}$ to/tot $9,76 \times 10^{-4} \text{ mol} \cdot \text{dm}^{-3}$

$$\begin{aligned}
 n(\text{Mg}(\text{OH})_2) &= \frac{m}{M} \\
 &= \frac{0,12}{58} \checkmark \\
 &= 2,07 \times 10^{-3} \text{ mol} \\
 n(\text{H}_3\text{PO}_4)_{\text{reacted/reageer}} &= \frac{2}{3}n(\text{Mg}(\text{OH})_2) \\
 &= \frac{2}{3}(2,07 \times 10^{-3}) \checkmark \\
 &= 1,38 \times 10^{-3} \text{ mol} \\
 n(\text{H}_3\text{PO}_4)_{\text{excess/oormaat}} &= 1,67 \times 10^{-3} - 1,38 \times 10^{-3} \checkmark \\
 &= 2,9 \times 10^{-4} \text{ mol} \\
 n(\text{H}_3\text{PO}_4)_{\text{excess/oormaat in } 14 \text{ cm}^3} &= 2,9 \times 10^{-4} \times \frac{14}{500} \checkmark \\
 &= 8,12 \times 10^{-6} \text{ mol} \\
 n(\text{NaOH}) &= 3n(\text{H}_3\text{PO}_4) \\
 &= 3(8,12 \times 10^{-6}) \checkmark \\
 &= 2,44 \times 10^{-5} \text{ mol} \\
 c_b &= \frac{n}{V} \\
 &= \frac{2,44 \times 10^{-5}}{25 \times 10^{-3}} \checkmark \\
 &= 9,76 \times 10^{-4} \text{ mol} \cdot \text{dm}^{-3} \checkmark
 \end{aligned}$$

(7)
 [17]

QUESTION 8/VRAAG 8

8.1 Galvanic/*Galvanies* ✓ (1)

8.2 Ag ✓ (1)

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

Marking guidelines/Nasienriglyne:

- $\text{Zn} \rightleftharpoons \text{Zn}^{2+} + 2\text{e}^-$ $\frac{1}{2}$ $\text{Zn}^{2+} + 2\text{e}^- \rightleftharpoons \text{Zn}$ $\frac{0}{2}$
 $\text{Zn}^{2+} + 2\text{e}^- \leftarrow \text{Zn}$ $\frac{2}{2}$ $\text{Zn}^{2+} + 2\text{e}^- \rightarrow \text{Zn}$ $\frac{0}{2}$
- 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: $\frac{1}{2}$ Example/Voorbeeld: $\text{Zn} \rightarrow \text{Zn}^2 + 2\text{e}^-$ ✓

8.4 Increases/*Verhoog* ✓ (1)

8.5

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

$$= \frac{2,16}{108} \checkmark$$

$$= 0,02 \text{ mol}$$

$$n(\text{Zn}) = \frac{1}{2}n(\text{Ag})$$

$$= \frac{1}{2} \times 0,02 \checkmark$$

$$= 0,01 \text{ mol}$$

$$n(\text{Zn}) = \frac{m}{M}$$

$$0,01 = \frac{m}{65} \checkmark$$

$$m = 0,65 \text{ g} \checkmark$$

8.6
 8.6.1 Pressure/*Druk*: $1,013 \times 10^5 \text{ Pa}$ / $101,3 \text{ kPa}$ / 1 atm ✓ (1)

8.6.2 $\text{Zn(s)} \mid \text{Zn}^{2+}(\text{aq}) (1 \text{ mol} \cdot \text{dm}^{-3}) \checkmark \parallel \checkmark \text{H}^+(\text{aq}) (1 \text{ mol} \cdot \text{dm}^{-3}) \mid \text{H}_2(\text{g}) \mid \text{Pt(s)} \checkmark$

OR/OF

$\text{Zn(s)} \mid \text{Zn}^{2+}(\text{aq}) \checkmark \parallel \checkmark \text{H}^+(\text{aq}) \mid \text{H}_2(\text{g}) \mid \text{Pt(s)} \checkmark$

OR/OF

$\text{Zn} \mid \text{Zn}^{2+} \checkmark \parallel \checkmark \text{H}^+ \mid \text{H}_2 \mid \text{Pt} \checkmark$ (3)

8.6.3

OPTION 1/OPSIE 1: $E_{\text{cell}}^{\theta} = E_{\text{reduction}}^{\theta} - E_{\text{oxidation}}^{\theta} \checkmark$ $E_{\text{sel}}^{\theta} = E_{\text{reduksie}}^{\theta} - E_{\text{oksidasie}}^{\theta}$ $= 0 \checkmark - (-0,76) \checkmark$ $= 0,76 \text{ V} \checkmark$	Notes/Aantekeninge - Accept any other correct formula from the data sheet./Aanvaar enige ander korrekte formule vanaf gegewensblad. - Any other formula using unconventional abbreviations, e.g. $E_{\text{cell}}^{\circ} = E_{\text{OA}}^{\circ} - E_{\text{RA}}^{\circ}$ followed by correct substitutions:/Enige ander formule wat onkonvensionele afkortings gebruik bv. $E_{\text{sel}}^{\circ} = E_{\text{OM}}^{\circ} - E_{\text{RM}}^{\circ}$ gevolg deur korrekte vervangings: 3/4
Option 2: $\left. \begin{array}{l} 2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{H}_2 \\ \text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^{-} \end{array} \right\} \checkmark$ $E^{\circ} = 0,00 \text{ (V)} \checkmark$ $E^{\circ} = 0,76 \text{ (V)} \checkmark$ $\underline{E_{\text{cell}}^{\circ} = 0,76 \text{ V} \checkmark}$	

(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 $2\text{H}_2\text{O}(\ell) + 2\text{e}^{-} \rightarrow \text{H}_2(\text{g}) + 2\text{OH}^{-}(\text{aq})$ ✓✓

Marking guidelines/Nasienriglyne:

- $2\text{H}_2\text{O} + 2\text{e}^{-} \rightleftharpoons \text{H}_2 + 2\text{OH}^{-} \quad \frac{1}{2} \quad \text{Zn}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Zn} \quad \frac{0}{2}$
 $\text{H}_2 + 2\text{OH}^{-} \leftarrow 2\text{H}_2\text{O} + 2\text{e}^{-} \quad \frac{2}{2} \quad \text{H}_2 + 2\text{OH}^{-} \rightarrow 2\text{H}_2\text{O} + 2\text{e}^{-} \quad \frac{0}{2}$
- 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: $\frac{1}{2}$ Example/Voorbeeld: $2\text{H}_2\text{O} + 2\text{e}^{-} \rightarrow \text{H}_2 + 2\text{OH}$

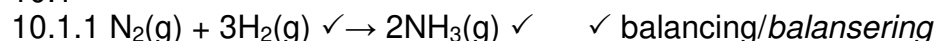
(2)

- 9.6 Carbon/C/koolstof/platinum/Pt ✓ (1)

[9]

QUESTION 10/VRAAG 10

10.1



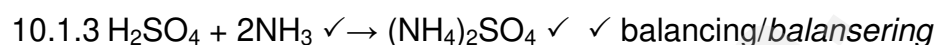
Marking criteria/Nasienriglyne:

- 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)



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:

$$m(\text{fertiliser}) = \frac{30}{100} \times 2 \checkmark$$

$$= 0,6 \text{ kg}$$

$$m(\text{filler}) = 2 - 0,6 \checkmark$$

$$= 1,4 \text{ kg} \checkmark$$

OPTION 2/OPSIE 2:

$$\% \text{ filler} = \frac{100 - 30}{100} \checkmark$$

$$= 70\%$$

$$m(\text{filler}) = \frac{70}{100} \times 2 \checkmark$$

$$= 1,4 \text{ kg} \checkmark$$

(3)

[13]

TOTAL/TOTAAL: 150