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**PREPARATORY EXAMINATION
VOORBEREIDENDE EKSAMEN**

GRADE/GRAAD 12

**PHYSICAL SCIENCES: CHEMISTRY P2
FISIESE WETENSKAPPE: CHEMIE V2**

SEPTEMBER 2019

MARKS/PUNTE: 150

MARKING GUIDELINES/NASIENRIGLYN

**This marking guideline consists of 16 pages.
*Hierdie nasienriglyn bestaan uit 16 bladsye.***

QUESTION 1/VRAAG 1

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

QUESTION 2/VRAAG 2

- 2.1 A series of organic compounds that can be described by the same general formula and functional group. ✓✓
'n Reeks organiese verbindings wat deur dieselfde algemene formule en funksionele groep beskryf kan word.

OR/OF

A series of organic compounds in which one member differs from the next by a CH₂ group. / *'n Reeks organiese verbindings waarin een lid van die volgende met 'n CH₂-groep verskil.*

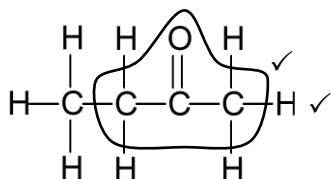
Accept/Aanvaar:

A series of organic compounds that can be described by the same general formula OR functional group. / *'n Reeks organiese verbindings wat deur dieselfde algemene formule OF funksionele groep beskryf kan word.* (2)

2.2

- 2.2.1 Aldehydes/aldehyede ✓ (1)

2.2.2



Marking criteria/Nasienriglyne

- Whole structure correct:
Hele struktuur korrek: 2/2
- Only functional group correct:
Slegs funksionele groep korrek: 1/2

IF/INDIEN:

More than one functional group/Meer as een funksionele groep: 0/2

(2)

2.3

2.3.1 Pent-1-yne/1-pentyne ✓✓
 Pent-1-yn/1-pentyn

IF/INDIEN:

Pentyne/Pentyn

Max./Maks. $\frac{1}{2}$

(2)

2.3.2 2-methyl✓but-1-ene ✓ / 2-metielbut-1-een

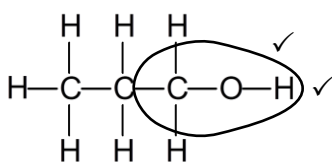
OR/OF

2-methyl-1-butene/2-metiel-1-buteen

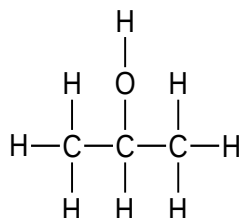
(2)

2.4

2.4.1



OR/OF



Marking criteria/Nasienriglyne

- Whole structure correct:

Hele struktuur korrek: $\frac{2}{2}$

- Only functional group correct:

Slegs funksionele groep korrek: $\frac{1}{2}$

IF/INDIEN:

More than one functional group:

Meer as een funksionele groep: $\frac{0}{2}$

ACCEPT/AANVAAR:

Any correct structural formula for C_3H_8O .

Enige korrekte struktuurformule vir C_3H_8O .

(2)

2.4.2 **POSITIVE MARKING FROM QUESTION 2.4.1.**

POSITIEWE NASIEN VANAF VRAAG 2.4.1.

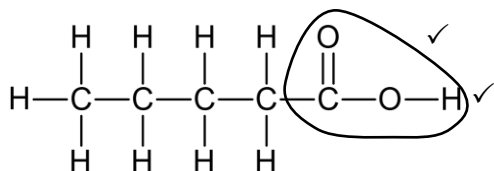
Propan✓-1-ol✓/1-propanol

OR/OF

Propan-2-ol/2-propanol

(2)

2.5



Marking criteria/Nasienriglyne

- Whole structure correct:

Hele struktuur korrek: $\frac{2}{2}$

- Only functional group correct:

Slegs funksionele groep korrek: $\frac{1}{2}$

IF/INDIEN:

More than one functional group/Meer as een funksionele groep: $\frac{0}{2}$

(2)

[15]

QUESTION 3/VRAAG 3

- 3.1 The temperature at which the vapour pressure of a substance equals atmospheric pressure. / Die temperatuur waar die dampdruk van 'n stof gelyk is aan atmosferiese druk. ✓✓ (2)

3.2

Criteria for conclusion/Riglyne vir gevolgtrekking	
Dependent and independent variable correctly identified. <i>Afhanklike en onafhanklike veranderlikes korrek identifiseer.</i>	✓
Relationship between the independent and dependent variables correctly stated. / Verwantskap tussen <i>afhanklike en onafhanklike veranderlikes</i> korrek gestel.	✓

Examples/Voorbeelde:

- Boiling point increases with decrease in branching.
Kookpunt neem toe met afname in vertakking.
- Boiling point increases with increase in surface area.
Kookpunt neem toe met toename in oppervlakte.
- Boiling point is proportional to chain length.
Kookpunt is eweredig aan kettinglengte. (2)

- 3.3 C ✓ (1)

- 3.4 Chain (isomers)/Ketting(isomere) ✓

- They have the same molecular formula, but different (types of) chains. ✓
Hulle het dieselfde molekulêre formule, maar verskillende (soorte) kettings. (2)

- 3.5
- Compound **C**/pentane/alkanes has London/dispersion/induced dipole forces./Verbinding **C**/pentaan/alkane het London-/dispersie-/geïnduseerde dipoolkragte. ✓
 - 1-chloropentane/haloalkanes has dipole-dipole forces (in addition to London/dispersion/induced dipole forces)./1-chloropentaan/haloalkane het dipool-dipoolkragte (tesame met London-/dispersie-/geïnduseerde dipoolkragte). ✓
 - Dipole-dipole forces are stronger than London/dispersion/ induced dipole forces./Dipool-dipoolkragte is sterker as London-/dispersie-/geïnduseerde dipoolkragte. ✓

OR/OF

London/dispersion/ induced dipole forces are weaker than dipole-dipole forces./London-/dispersie-/geïnduseerde dipoolkragte is swakker as dipool-dipoolkragte.

- More energy needed to overcome intermolecular forces in 1-chloropentane than in compound **C**./Meer energie word benodig om intermolekulêre kragte in 1-chloropentaan te oorkom/breek as in verbinding C. ✓

OR/OF

Less energy needed to overcome intermolecular forces in compound **C** than in 1-chloropentane./Minder energie word benodig om intermolekulêre kragte in verbinding C as in 1-chloropentaan te oorkom/breek. (4)

- 3.6 $C_5H_{12} + 8O_2 \rightarrow 6H_2O + 5CO_2$ ✓ bal. ✓

Marking criteria/Nasienriglyne:

- Products ✓ Balancing ✓
Produkte Balansering
- Ignore phases./Ignoreer fases.
- Ignore double arrows./Ignoreer dubbelpyle.
- Marking rule 6.3.10/Nasienreël 6.3.10.

(2)
[13]

QUESTION 4/VRAAG 4



4.2

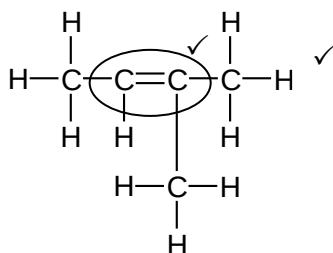


4.2.2

- Use concentrated strong base/NaOH/KOH/LiOH **OR** ethanolic/alcoholic strong base/NaOH/KOH/LiOH ✓
Gebruik gekonsentreerde sterk basis/NaOH/KOH/LiOH OF etanoliese/alkoholiese sterk basis/NaOH/KOH/LiOH
- Heat (strongly)/high temperature ✓
Verhit (sterk)/hoë temperatuur (2)

4.2.3 Elimination/dehydrohalogenation/dehydrobromination ✓
Eliminasie/dehidrohalogenasie/dehidrohalogenering/dehidrobrominasie (1)

4.2.4



Marking criteria/Nasienriglyne

- Whole structure correct:
Hele struktuur korrek: 2/2
- Only functional group correct:
Slegs funksionele groep korrek: 1/2

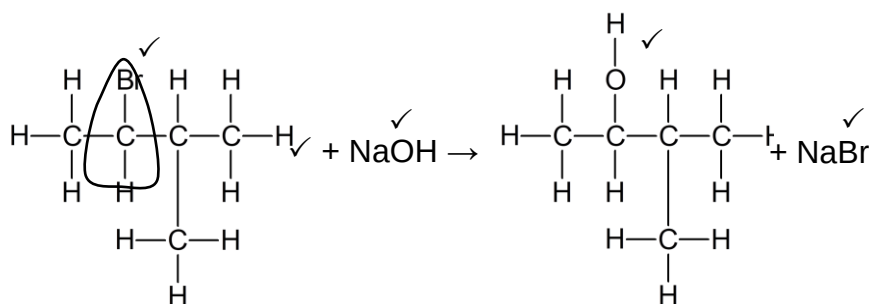
IF/INDIEN:

More than one functional group/Meer as een funksionele groep: 0/2 (2)

4.3

4.3.1 Hydrolysis/hidrolise ✓ (1)

4.3.2



Marking guidelines/Nasienriglyne

- Ignore/Ignoreer ⇌
- Accept coefficients that are multiples.
Aanvaar koëffisiënte wat veelvoude is.
- Any additional reactants and/or products/Enige addisionele reaktanse of produkte:
Max./Maks. 4/5
- Incorrect balancing/Verkeerde balansering: Max./Maks. 4/5
- Condensed formulae/Gekondenseerde formules: Max./Maks. 4/5
- Molecular formulae/Molekulêre formules: Max./Maks. 2/5

(5)

4.4

4.4.1 Dehydration/elimination ✓

Dehidrasie/dehidratering/eliminasi (1)

4.4.2 2-methylbut-2-ene ✓ /methylbut-2-ene/2-metielbut-2-een/metielbut-2-een

OR/OF

2-methyl-2-butene/methyl-2-butene/2-metiel-2-buteen/metiel-2-buteen (2)

[16]

QUESTION 5/VRAAG 5

5.1 **ONLY ANY ONE/ENIGE EEN:**

- Change in concentration/amount/number of moles/volume/mass of reactants/products ✓ per (unit) time. ✓
Verandering in konsentrasie/hoeveelheid/aantal mol/volume/massa van reaktanse/produkte per (eenheids)volume.
- Rate of change in concentration. ✓✓
Tempo van verandering in konsentrasie.
- Concentration/amount/number of moles/volume/mass of reactants used/products formed ✓ per (unit) time. ✓
Konsentrasie/hoeveelheid/aantal mol/volume/massa van reaktanse gebruik/produkte gevorm per (eenheids)volume.

NOTE/LET WEL:

Award mark for 'per unit time' only in correct context.
Ken punt vir 'per tydeenheid' slegs toe in korrekte konteks.

5.2 0 and/en 1 (minute/minuut) ✓

(2)
(1)

$$\begin{aligned}
 5.3 \quad n(\text{H}_2) &= \frac{V}{V_m} \\
 &= \frac{0,75}{24} \checkmark \\
 &= 0,031 \text{ mol} \\
 \text{rate/} &= \frac{\Delta n}{\Delta t} \\
 \text{tempo} &= \frac{0,031 - 0}{2 - 0} \checkmark \\
 &= 0,016 \text{ (mol} \cdot \text{min}^{-1}) \checkmark
 \end{aligned}$$

ACCEPT/AANVAAR: 0,015 to/tot 0,02 mol·min⁻¹) (4)

5.4 0 (dm³·min⁻¹) ✓

(1)

5.5 No more gas is formed./The reaction is complete./No reaction takes place/Mg used up./Geen gas word meer gevorm nie./Die reaksie is voltooi./Geen reaksie vind plaas nie/Mg is opgebruik. ✓

(1)

5.6

5.6.1 Larger than/*Groter as* ✓

Larger mass/moles of magnesium (in experiment 1). ✓
Groter massa/aantal mol magnesium (in eksperiment 1).

OR/OF

Smaller mass/moles of magnesium (in experiment 2).
Kleiner massa/aantal mol magnesium (in eksperiment 2).

(2)

5.6.2 Higher than/*Hoër as* ✓

- Higher concentration of HCl/more HCl particles per unit volume (in experiment 1)./*Hoër HCl-konsentrasie/meer HCl-deeltjies per eenheid volume (in eksperiment 1).* ✓
- More particles (per volume) with correct orientation/more contact points
Meer deeltjies (per volume) met korrekte oriëntasie/meer kontakpunte. ✓
- More effective collisions per unit time./Higher frequency of effective collisions./*Meer effektiewe botsings per eenheid tyd./Hoër frekwensie van effektiewe botsings.* ✓

OR/OF

- Lower concentration of HCl/more HCl particles per unit volume (in experiment 2)./*Laer HCl-konsentrasie/minder HCl-deeltjies per eenheid volume (in eksperiment 2).*
- Less particles (per volume) with correct orientation/less contact points
Minder deeltjies (per volume) met korrekte oriëntasie/minder kontakpunte.
- Less effective collisions per unit time./Lower frequency of effective collisions./*Minder effektiewe botsings per eenheid tyd./Laer frekwensie van effektiewe botsings.*

(4)

[15]

QUESTION 6/VRAAG 6

- 6.1 A reaction where products can be converted back to reactants. ✓✓
'n Reaksie waarin produkte terug na reaktanse omgeskakel kan word.

OR/OF

A reaction in which the forward and reverse reactions can take place simultaneously./'n Reaksie waarin die voorwaartse en terugwaartse reaksies gelyktydig kan plaasvind. (2)

- 6.2 1 (minute/minuut) ✓ (1)

- 6.3
6.3.1 2 ✓ (1)

- 6.3.2 1 ✓ (1)

- 6.3.3 2 ✓ (1)

- 6.4 **POSITIVE MARKING FROM QUESTION 6.3.**
POSITIEWE NASIEN VANAF VRAAG 6.3.

Marking criteria/Nasienriglyne:

- Substitute/Vervang 3 mol in $c = \frac{n}{V}$ ✓
- Substitute/Vervang 2,5 mol in $c = \frac{n}{V}$ ✓
- Substitute/Vervang 1 mol in $c = \frac{n}{V}$ ✓
- Substitute $V = 4 \text{ dm}^3$ in the above THREE formulae. ✓
Vervang $V = 4 \text{ dm}^3$ in die bostaande DRIE formules.
- K_c expression/ K_c -uitdrukking ✓
- Substitution of concentrations into K_c expression ✓
Vervanging van konsentrasies in K_c -uitdrukking.
- Final answer/Finale antwoord: 0,18 ✓

OPTION/OPSIE 1

$$\left. \begin{aligned} [A] &= \frac{3}{4} \checkmark = 0,75 \text{ mol} \cdot \text{dm}^{-3} \\ [B] &= \frac{2,5}{4} \checkmark = 0,625 \text{ mol} \cdot \text{dm}^{-3} \\ [C] &= \frac{1}{4} \checkmark = 0,25 \text{ mol} \cdot \text{dm}^{-3} \end{aligned} \right\} \text{Divide by/Deel deur } 4 \text{ dm}^3 \checkmark$$

$$K_c = \frac{[C]^2}{[A]^2[B]} \checkmark$$

$$\begin{aligned} &= \frac{(0,25)^2}{(0,75)^2(0,625)} \checkmark \\ &= 0,18 \checkmark \end{aligned}$$

No K_c expression, correct substitution/Geen K_c -uitdrukking, korrekte substitusie: Max./Maks. $\frac{6}{7}$

Wrong K_c expression/Verkeerde K_c -uitdrukking: Max./Maks. $\frac{4}{7}$

OPTION/OPSIE 2

	A	B	C
Initial quantity/Aanvanklike hoeveelheid (mol)	4	3	0
Change/Verandering (mol)	1	0,5	1
Quantity at equilibrium/Hoeveelheid by ewewig (mol)	3 ✓	2,5 ✓	1 ✓
Equilibrium concentration/Ewewigskonsentrasie (mol·dm ⁻³)	$\frac{3}{4}$	$\frac{2,5}{4}$	$\frac{1}{4}$

÷ 4 dm³ ✓

$$K_c = \frac{[C]^2}{[A]^2[B]}$$

$$= \frac{(0,25)^2}{(0,75)^2(0,625)}$$

$$= 0,18 \checkmark$$

No K_c expression, correct substitution/Geen K_c-uitdrukking, korrekte substitusie: Max./Maks. $\frac{6}{7}$

Wrong K_c expression/Verkeerde K_c-uitdrukking: Max./Maks. $\frac{4}{7}$

USING CONCENTRATION/GEBRUIK VAN KONSENTRASIE

OPTION/OPSIE 3

	A	B	C
Initial concentration/Aanvanklike konsentrasie (mol·dm ⁻³)	$\frac{4}{4} = 1$	$\frac{3}{4} = 0,75$	0
Change/Verandering (mol·dm ⁻³)	$\frac{1}{4} = 0,25$	$\frac{0,5}{4} = 0,125$	$\frac{1}{4} = 0,25$
Equilibrium concentration/Ewewigskonsentrasie (mol·dm ⁻³)	$\frac{3}{4} = 0,75$	$\frac{2,5}{4} = 0,625$	$\frac{1}{4} = 0,25$

÷ 4 dm³ ✓

$$K_c = \frac{[C]^2}{[A]^2[B]}$$

$$= \frac{(0,25)^2}{(0,75)^2(0,625)}$$

$$= 0,18 \checkmark$$

No K_c expression, correct substitution/Geen K_c-uitdrukking, korrekte substitusie: Max./Maks. $\frac{6}{7}$

Wrong K_c expression/Verkeerde K_c-uitdrukking: Max./Maks. $\frac{4}{7}$

(7)

6.5 Increase in n(A) or [A]/Addition of A(g) ✓

Verhoging in n(A) of [A]/Byvoeging van A(g)

- According to Le Chatelier's principle, the system will react to decrease/oppose the increase in n(A) or [A]/Volgens Le Chatelier se beginsel sal die sisteem reageer om die verhoging in n(A) of [A] te verminder/teen te werk. ✓
- The forward reaction is favoured. ✓
Die voorwaartse reaksie is bevoordeel.

OR/OF

n(A) or [A] and n(B) or [B] decrease and n(C) or [C] increases.
n(A) of [A] en n(B) of [B] verminder en n(C) of [C] vermeerder.

(3)

[16]

QUESTION 7/VRAAG 7

7.1 The reaction of a salt with water./Die reaksie van 'n sout met water. ✓✓

OR/OF

The reaction of ions with water to produce hydroxide ions/a base or hydronium ions/an acid.

Die reaksie van ione met water om hidroksiedione/'n basis of hidroniumione/'n suur te vorm.

(2)

7.2 $\text{HCO}_3^- (\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{H}_2\text{CO}_3(\text{aq}) + \text{OH}^- (\text{aq})$ ✓

Due to the formation of OH^- ions the solution is basic. ✓

Weens die vorming van OH^- -ione is die oplossing basies.

(3)

7.3

Marking criteria/Nasienriglyne:

- Formula/Formule: $c = \frac{n}{V}$ ✓
- Substitution of/Vervanging van $0,1 \times 4 \times 10^{-3} / 0,1 \times 16,5 \times 10^{-3}$ ✓
- Substitute/Vervang $V = 41,5 \times 10^{-3}$ ✓ ($25 + 12,5 + 4 = 41,5 \text{ cm}^3$)
- Use/Gebruik $[\text{H}_3\text{O}^+] : [\text{H}_2\text{SO}_4]$ **OR/OF** $n(\text{H}_3\text{O}^+) : n(\text{H}_2\text{SO}_4) = 2 : 1$ ✓
- Formula/Formule: $\text{pH} = -\log [\text{H}_3\text{O}^+]$ ✓
- Substitute/Vervang $[\text{H}^+]$ ✓
- Final answer/Finale antwoord: 1,71 ✓ (Range/Gebied: 1,7 to/tot 1,71)

OPTION/OPSIE 1

$$\begin{aligned} n_{\text{a(excess/oormaat)}} &= cV \checkmark \\ &= (0,1)(4 \times 10^{-3}) \checkmark \\ &= 4 \times 10^{-4} \text{ mol} \\ c_{\text{a(excess/oormaat)}} &= \frac{n}{V} \checkmark \\ &= \frac{4 \times 10^{-4}}{41,5 \times 10^{-3}} \checkmark \\ &= 9,639 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3} \\ c(\text{H}_3\text{O}^+) &= 2c(\text{H}_2\text{SO}_4) \checkmark \\ &= 2(9,639 \times 10^{-3}) \checkmark \\ &= 0,0193 \text{ mol} \cdot \text{dm}^{-3} \\ \text{pH} &= \log[\text{H}_3\text{O}^+] \checkmark \\ &= -\log(0,0193) \checkmark \\ &= 1,71 \checkmark \end{aligned}$$

OPTION/OPSIE 2

$$\begin{aligned} n_{\text{a(ex/or)}} &= cV \checkmark \\ &= (0,1)(4 \times 10^{-3}) \checkmark \\ &= 4 \times 10^{-4} \text{ mol} \\ n(\text{H}_3\text{O}^+) &= 2n(\text{H}_2\text{SO}_4) \checkmark \\ &= 2(4 \times 10^{-4}) \checkmark \\ &= 8 \times 10^{-4} \text{ mol} \\ c_{\text{(H}_3\text{O}^+)} &= \frac{n}{V} \checkmark \\ &= \frac{8 \times 10^{-4}}{41,5 \times 10^{-3}} \checkmark \\ &= 0,0193 \text{ mol} \cdot \text{dm}^{-3} \\ \text{pH} &= \log[\text{H}_3\text{O}^+] \checkmark \\ &= -\log(0,0193) \checkmark \\ &= 1,71 \checkmark \end{aligned}$$

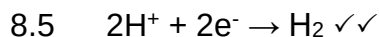
OPTION/OPSIE 3

$$\begin{aligned}
 n_a(\text{tot}) &= cV \checkmark \\
 &= 0,1 \times 16,5 \times 10^{-3} \checkmark \\
 &= 1,65 \times 10^{-3} \text{ mol} \\
 n_b &= cV \\
 &= 0,1 \times 0,025 \\
 &= 2,5 \times 10^{-3} \text{ mol} \\
 n_a(\text{rea}) &= \frac{1}{2}n_b \\
 &= \frac{1}{2} \times 2,5 \times 10^{-3} \\
 &= 1,25 \times 10^{-3} \text{ mol} \\
 n_a(\text{ex/oorm.}) &= n_a(\text{tot}) - n_a(\text{rea}) \\
 &= 1,65 \times 10^{-3} - 1,25 \times 10^{-3} \\
 &= 4 \times 10^{-4} \text{ mol} \\
 c_a(\text{excess}) &= \frac{n}{V} \\
 &= \frac{4 \times 10^{-4}}{41,5 \times 10^{-3}} \checkmark \\
 &= 9,639 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3} \\
 c(\text{H}_3\text{O}^+) &= 2c(\text{H}_2\text{SO}_4) \\
 &= 2(9,639 \times 10^{-3}) \checkmark \\
 &= 0,0193 \text{ mol} \cdot \text{dm}^{-3} \\
 \text{pH} &= \log[\text{H}_3\text{O}^+] \checkmark \\
 &= -\log(0,0193) \checkmark \\
 &= 1,71 \checkmark
 \end{aligned}$$

(7)
[12]

QUESTION 8/VRAAG 8

- 8.1 Galvanic/voltaic (cell) ✓
Galvaniese/voltaïese (sel) (1)
- 8.2 Pressure/Druk: 1 atmosphere/atmosfeer (atm)/101,3 kPa/1,013 x 10⁵ Pa ✓
Temperature/Temperatuur: 25 °C / 298 K ✓
Concentration/Konsentrasie: 1 mol·dm⁻³ ✓ (3)
- 8.3 Platinum is inert/does not react with the H⁺ ions/acid./Platinum is onreaktief/regaeer nie met H⁺-ione/suur nie ✓
Platinum is a conductor (of electricity)./Platinum is 'n geleier (van elektrisiteit). ✓ (2)
- 8.4 Incomplete circuit/No salt bridge. ✓
Onvoltooide stroombaan/Geen soutbrug nie. (1)



Marking guidelines/Nasienriglyne:

- $2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2$ $\frac{1}{2}$ $\text{H}_2 \rightleftharpoons 2\text{H}^+ + 2\text{e}^-$ $\frac{0}{2}$
 $\text{H}_2 \leftarrow 2\text{H}^+ + 2\text{e}^-$ $\frac{2}{2}$ $\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$ $\frac{0}{2}$
- Ignore if charge omitted on electron./Ignoreer indien lading op elektron weggelaat is.
- If charge (+) omitted on H^+ /Indien lading (+) weggelaat op H^+ : Max. $\frac{1}{2}$
Example/Voorbeeld: $2\text{H} + 2\text{e}^- \rightarrow \text{H}_2$ ✓

(2)

8.6

8.6.1 Phase boundary/interphase/phase separator ✓

Faseskeiding/interfase

(1)

8.6.2

<u>OPTION 1/OPSIE 1:</u> $E_{\text{cell/sep}}^{\theta} = E_{\text{cathode/katode}}^{\theta} - E_{\text{anode}}^{\theta}$ ✓ $1,42 \checkmark = -0,24 \checkmark - E_{\text{J/J}^{2+}}^{\theta}$ $E_{\text{J/J}^{2+}}^{\theta} = -1,66 \text{ (V)}$ ✓ J = Aluminium/Al ✓	<u>Notes/Aantekeninge</u> • Accept any other correct formula from the data sheet./Aanvaar enige ander korrekte formule vanaf gegewensblad. • Any other formula using unconventional abbreviations, e.g. $E^{\circ}_{\text{cell}} = E^{\circ}_{\text{OA}} - E^{\circ}_{\text{RA}}$ followed by correct substitutions:/Enige ander formule wat onkonvensionele afkortings gebruik bv. $E^{\circ}_{\text{sel}} = E^{\circ}_{\text{OM}} - E^{\circ}_{\text{RM}}$ gevolg deur
<u>OPTION/OPSIE 2:</u> $\left. \begin{array}{l} \text{J} \rightarrow \text{J}^{2+} + 2\text{e}^- \\ \text{D}^{2+} + 2\text{e}^- \rightarrow \text{D} \end{array} \right\} \checkmark$ $E^{\circ} = -1,66 \text{ (V)}$ ✓ $E^{\circ} = -0,24 \text{ (V)}$ ✓ $E_{\text{cell}}^{\circ} = 1,42 \text{ (V)}$ ✓ J = Aluminium/Al ✓	

(5)

8.6.3 Exothermic/Eksotermies ✓

(1)

8.7 The cell reaction has reached equilibrium./Reactants used up. ✓

Die selreaksie het ewewig bereik./Reaktanse is opgebruik.

(1)

[17]

QUESTION 9/VRAAG 9

9.1

- 9.1.1 Solution/liquid/(dissolved) substance that conducts electricity ✓ through the movement of ions. ✓
'n Oplossing/vloeistof/(opgeloste) stof wat elektrisiteit gelei deur die beweging van ione.

ORIOF

A substance of which the aqueous solution contains ions.
'n Stof waarvan die oplossing in water ione bevat.

ORIOF

A substance that dissolves in water to give a solution that conducts electricity./*'n Stof wat in water oplos om 'n oplossing te vorm wat elektrisiteit gelei.* (2)

- 9.1.2 The process in which electrical energy is converted to chemical energy. ✓✓
Die proses waarin elektriese energie omgeskakel word na chemiese energie.

ORIOF

The use of electrical energy to produce a chemical change./Die gebruik van elektrisiteit om 'n chemiese verandering teweeg te bring. (2)

- 9.2 B ✓ & D ✓
 $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$ ✓✓

Marking guidelines/Nasienriglyne:

- $\text{Cu}^{2+} + 2\text{e}^- \rightleftharpoons \text{Cu}$ $\frac{1}{2}$ $\text{Cu} \rightleftharpoons \text{Cu}^{2+} + 2\text{e}^-$ $\frac{0}{2}$
 $\text{Cu} \leftarrow \text{Cu}^{2+} + 2\text{e}^-$ $\frac{2}{2}$ $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$ $\frac{0}{2}$
- Ignore if charge omitted on electron./Ignoreer indien lading op elektron weggelaat is.
- If charge omitted on Cu^{2+} / Indien lading weggelaat op Cu^{2+} : Max. $\frac{1}{2}$
Example/Voorbeeld: $\text{Cu}^2 + 2\text{e}^- \rightarrow \text{Cu}$ ✓

(4)

9.3

- 9.3.1 Cl_2 /chlorine (gas)/chloor(gas) ✓ (1)

- 9.3.2 Cu^{2+} (ions)/copper(II) ions ✓
 Cu^{2+} -(ione)/koper(II)ione (1)

- 9.4 Cu is a stronger reducing agent ✓ than Cl^- (ions) ✓ and Cu will be oxidised ✓ (to Cu^{2+}). / Cu is 'n sterker reduseermiddel as Cl^- (-ione) en Cu sal geoksideer word (na Cu^{2+}).

OR/OF

Cl^- (ions) is a weaker reducing agent ✓ than Cu and Cu will be oxidised (to Cu^{2+}). / Cl^- (-ione) is 'n swakker reduseermiddel as Cu en Cu sal geoksideer word (nao Cu^{2+}).

IF/INDIEN

Explained in terms of relative strength of oxidising agent, award mark ONLY for 'Cu will be oxidised' / Verduidelik in terme van relatiewe sterkte van oksideermiddel, ken punt slegs toe vir 'Cu sal geoksideer word'.

Max./Maks. $\frac{1}{3}$

(3)
[13]

QUESTION 10/VRAAG 10

10.1

- 10.1.1 Fractional distillation of liquid air ✓
Fraksionele distillasie van vloeibare lug (1)

- 10.1.2 Ammonia/Ammoniak ✓ (1)

- 10.1.3 Acid-base/neutralisation reaction ✓
Suur-basis/neutralisasiereaksie (1)

10.2

- 10.2.1 $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$

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)

- 10.2.2 $\text{H}_2\text{S}_2\text{O}_7$ /Oleum/pyrosulphuric acid/fuming sulphuric acid ✓
 $\text{H}_2\text{S}_2\text{O}_7$ /Oleum/piroswawelsuur/rokende swawelsuur (1)

10.3

10.3.1 The mass ratio of nitrogen (N), phosphorus (P) and potassium (K) in a certain fertiliser. ✓

Die massa verhouding van stikstof (N), fosfor (P) en kalium (K) in 'n sekere kunsmis. (1)

10.3.2 Percentage fertiliser in the bag/Persentasie kunsmis in die sak. ✓ (1)

10.3.3

<u>OPTION 1/OPSIE 1:</u>	<u>OPTION 2/OPSIE 2:</u>
$\% K = \frac{6}{13} \checkmark \times 22\% \checkmark$ $= 10,15 \%$ $\downarrow$ $m(K) = \frac{10,15}{100} \times 25 \checkmark$ $= 2,54 \text{ kg } \checkmark$	$m(\text{nutrient/voedingstof}):$ $\frac{22}{100} \checkmark \times 25 \checkmark = 5,5 \text{ kg}$ $\downarrow$ $m(K) = \frac{6}{13} \checkmark \times 5,5$ $= 2,54 \text{ kg } \checkmark$

(4)
[13]

TOTAL/TOTAAL: 150