basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE/*GRAAD* 12

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

FEBRUARY/MARCH/*FEBRUARIE/MAART* 2013

MEMORANDUM

MARKS/*PUNTE*: 150

This memorandum consists of 16 pages.
Hierdie memorandum bestaan uit 16 bladsye.

SECTION A/*AFDELING A*

QUESTION 1/*VRAAG 1*

1.1 Alcohols/Alkanols ✓
Alkohole/*Alkanole* ✓ (1)

1.2 Cracking/Elimination ✓
Kraking/*Eliminasie* ✓ (1)

1.3 (Reaction) rate/Rate (of reaction)✓
(Reaksie-)tempo/Tempo (van reaksie)✓ (1)

1.4 Electrolysis/*Elektrolise* ✓ (1)

1.5 Haber (process)/*Haber(-proses)* ✓ (1)
[5]

QUESTION 2/*VRAAG 2*

2.1 D ✓✓ (2)

2.2 B ✓✓ (2)

2.3 A ✓✓ (2)

2.4 A ✓✓ (2)

2.5 C ✓✓ (2)

2.6 C ✓✓ (2)

2.7 D ✓✓ (2)

2.8 B ✓✓ (2)

2.9 D ✓✓ (2)

2.10 C ✓✓ (2)
[20]

TOTAL SECTION/*TOTAAL AFDELING* A: 25

SECTION B/*AFDELING B*

QUESTION 3/*VRAAG 3*

3.1

3.1.1 E ✓ (1)

3.1.2 A ✓ (1)

3.1.3 A ✓ (1)

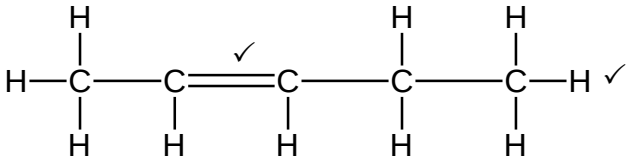
3.1.4 F ✓ (1)

3.1.5 A ✓ **OR/*OF*** D (1)

3.1.6 C ✓ (1)

3.2

3.2.1



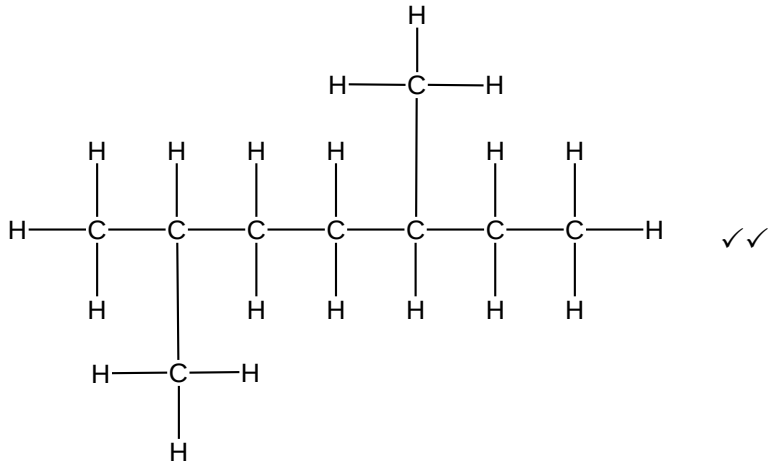
Notes/*Aantekeninge*
Functional group: ✓
Whole structure correct: ✓

Funksionele groep: ✓
Hele struktuur korrek: ✓

Notes/*Aantekeninge*:
- Condensed or semistructural formula: $\frac{1}{2}$
  Gekondenseerde of semistruktuurformule: $\frac{1}{2}$
- Molecular formula/*Molekulêre formule*: $\frac{0}{2}$

(2)

3.2.2



✓✓

Notes/*Aantekeninge*:
- Condensed or semistructural formula:/*Gekondenseerde of semistruktuurformule*: $\frac{1}{2}$
- All bonds shown, one or more H atoms omitted: Max. $\frac{1}{2}$
  Alle bindings aangetoon, een of meer H-atome uitgelaat: Maks. $\frac{1}{2}$
- Wrong number of bonds e.g. C atoms not forming 4 bonds: $\frac{0}{2}$
  Verkeerde aantal bindings bv. C-atome vorm nie 4 bindings nie: $\frac{0}{2}$

(2)

3.3

3.3.1 Carbonyl (group)/*Karboniel(groep)* ✓ (1)

3.3.2 2-methyl✓propan-1-ol ✓
2-metiel✓propan-1-ol ✓

OR/*OF*

2-methyl✓-1-propanol ✓
2-metiel✓-1-propanol ✓ (2)

Notes/*Aantekeninge:*
IF/*INDIEN*:
2 methyl 1 propanol/*2 metiel* 1 *propanol* ✓ ½
2 methylpropan 1 ol/*2 metielpropan* 1 *ol* ✓ ½

[13]

QUESTION 4/*VRAAG 4*

4.1

4.1.1 Gas ✓ (1)

4.1.2 Lower than ✓
Isomers of A:
More branching/Molecules more compact./Smaller surface area (over which the intermolecular forces act.) ✓
Weaker/less intermolecular forces. ✓
Less energy needed to overcome intermolecular forces. ✓

Laer as ✓
Isomere van A:
Meer vertak/Molekule meer kompak./Kleiner oppervlakte (waaroor intermolekulêre kragte werk.) ✓
Swakker/minder intermolekulêre kragte. ✓
Minder energie benodig om intermolekulêre kragte te oorkom. ✓

OR/*OF*

Lower than ✓
A is less branched./has less compact molecules./has larger surface area (over which intermolecular forces act). ✓
Stronger/more intermolecular forces. ✓
More energy needed to overcome intermolecular forces. ✓

Laer as ✓
***A en B** is minder vertak./het minder kompakte molekule./ het groter oppervlakte (waaroor intermolekulêre kragte werk).* ✓
Sterker/meer intermolekulêre kragte. ✓
Meer energie benodig om intermolekulêre kragte te oorkom. ✓ (4)

4.1.3 $2C_4H_{10} + 13O_2$ ✓→ $8CO_2 + 10H_2O$ ✓ bal. ✓

Notes/*Aantekeninge*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse ✓ *Produkte* ✓ *Balansering* ✓
- Ignore/*Ignoreer* ⇌
- Marking rule 3.9/*Nasienreël 3.9*

(3)

4.1.4 Compound B contains a carbonyl group/O atom (bonded to C atom) ✓
and is a polar (molecule)/dipole. ✓

Verbinding B bevat 'n *karbonielgroep/O-atoom (gebind aan* 'n C-atoom) ✓
en is 'n polêre (molekuul)/dipool. ✓ (2)

4.2

4.2.1 Compound D: Two sites for hydrogen bonding/forms dimers ✓
Compound C: One site for hydrogen bonding ✓

Verbinding D: Twee punte vir waterstofbindings/vorm dimere ✓
Verbinding C: Een punt vir waterstofbinding ✓

Both compounds have hydrogen bonding (between molecules). ✓
Compound D has two sites for/stronger/more hydrogen bonding./ ✓
Beide verbindings het waterstofbindings (tussen molecule).
Verbinding D het twee punte vir/sterker/meer waterstofbinding. (2)

4.2.2 (Compound/*Verbinding*) C ✓
Lowest boiling point/*Laagste kookpunt* ✓ (2)

[14]

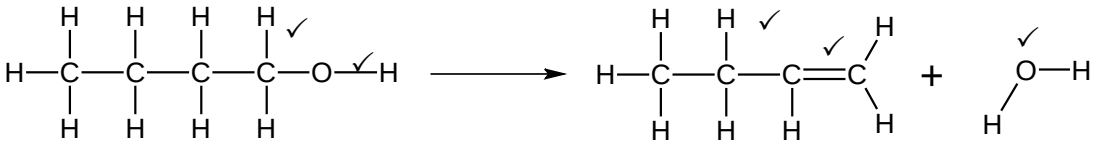
QUESTION 5/*VRAAG 5*

5.1 Primary/*Primêr* ✓ (1)

5.2

5.2.1 Elimination/dehydration ✓
Eliminasie/dehidrering/dehidrasie ✓ (1)

5.2.2



Functional group/*Funksionele groep:* ✓
Whole structure correct/*Hele struktuur korrek:* ✓

Notes/*Aantekeninge:*
- Accept -OH as condensed in structural formula.
  Aanvaar -OH as gekondenseerd in struktuurformule.
- Accept H_2O as condensed or any shape.
  Aanvaar H_2O as gekondenseerd of enige vorm.

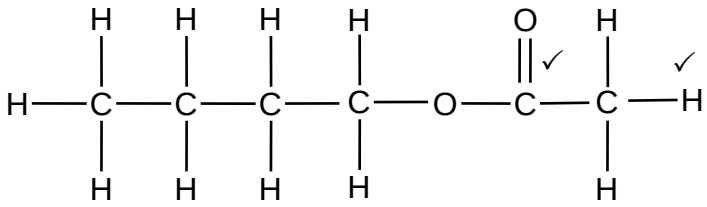
- **Condensed/semistructural formulae** or mixture of both: Max. $\frac{4}{5}$
  G*ekondenseerde/semistruktuurformules* *of mengsel van beide:* *Maks.* $\frac{4}{5}$
- **Molecular formula** for all structures, e.g. $C_4H_{10}O$: Max. $\frac{1}{5}$
  Molekulêre formules *vir alle strukture, bv.* $C_4H_{10}O$: *Maks.* $\frac{1}{5}$
- Any additional reactants or products: Max. $\frac{4}{5}$
  Enige addisionele reaktanse of produkte: *Maks.* $\frac{4}{5}$
- Everything correct, **wrong balancing:** Max. $\frac{4}{5}$
  Alles korrek, ***verkeerde balansering:*** *Maks.* $\frac{4}{5}$

(5)

5.3

5.3.1 Esterification/(Acid catalysed) condensation ✓
Verestering/(Suurgekataliseerde) kondensasie/Esterifikasie ✓ (1)

5.3.2



Notes/*Aantekeninge*
Functional group: ✓
Whole structure correct: ✓

Funksionele groep: ✓
Hele struktuur korrek: ✓

(2)

Notes/*Aantekeninge*:
- Condensed or semistructural formula: $\frac{1}{2}$
  Gekondenseerde of semistruktuurformule: $\frac{1}{2}$
- Molecular formula/*Molekulêre formule*: $\frac{0}{2}$

5.4

5.4.1 Substitution ✓
Substitusie ✓ (1)

5.4.2 1-bromo✓butane ✓
1-bromo✓butaan ✓ (2)
[13]

QUESTION 6/*VRAAG 6*

6.1 Conical (flask)/*Koniese (fles)* ✓

OR/*OF*
Erlenmeyer (flask/*fles*) (1)

6.2 Collect gas produced./Measure volume of gas produced. ✓
Vang bereide gas op./Meet volume gas berei. ✓ (1)

6.3

6.3.1 Concentration/*Konsentrasie* ✓ (1)

6.3.2 **ANY ONE/*ENIGE EEN:***
Temperature ✓
Surface area/State of division

Temperatuur ✓
Reaksieoppervlak/Toestand van verdeeldheid (1)

6.4 P ✓
Higher (acid) concentration in experiment 2. ✓
Steeper slope/Greater gradient ✓
Hoër (suur)konsentrasie in eksperiment 2. ✓
Steiler helling/Groter gradiënt. ✓

OR/*OF*
Higher (acid) concentration in experiment 2. ✓
Same volume of gas produced/collected in a shorter time/faster. ✓
Hoër (suur)konsentrasie in eksperiment 2. ✓
Dieselfde volume gas berei/opgevang in *'n korter tyd/vinniger.* ✓ (3)

6.5 Concentration of acid decreases as reaction proceeds. ✓
Konsentrasie van suur verminder soos wat die reaksie verloop. ✓

OR/*OF*
Surface area of Zn decreases.
Reaksieoppervlak van Zn verminder. (1)

6.6

$$n(H_2) = \frac{V}{V_m}$$

$$= \frac{0,24}{24,04} \checkmark \checkmark$$

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

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

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

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

OR/*OF*

1 mole/*mol* H_2 gas = 24,04 dm^3✓
0,01 mol/*mol*✓ H_2 gas = 0,24 dm^3✓

65 g Zn = 1 mole/*mol* ✓
0,65 g ✓ = 0,01 mole/*mol* ✓

Mark Allocation/*Puntetoekenning*

- Substitute volume.
  V*ervang volume.*
- Substitute molar volume.
  Vervang molêre volume.
- $n(H_2) = 0,01$ mol
- $n(Zn) = n(H_2)$
- Substitute/V*ervang* 65 $g \cdot mol^{-1}$.
- Answer/*Antwoord*

(6)
[14]

QUESTION 7/*VRAAG 7*

7.1 Exothermic ✓
ΔH is negative./less than zero. ✓

Eksotermies ✓
ΔH is *negatief./kleiner as nul.* ✓

OR/*OF*

Exothermic/*Eksotermies* ✓
Energy is released./*Energie word vrygestel*. ✓ (2)

7.2

7.2.1 Greater than/Greater at t_1 than at t_2. ✓
Larger/Steeper gradients/slopes. ✓

Groter as/Groter by t_1 as t_2.
Groter/steiler gradiënte/hellings.

OR/*OF*

Smaller at t_2 than at t_1. ✓
Smaller/less steep gradients/slopes. ✓

Kleiner by t_2 as by t_1.✓
Kleiner/minder steil gradiënte/hellings. ✓ (2)

7.2.2 Equal to/*Gelyk aan* ✓ (1)

7.2.3 **CALCULATIONS USING NUMBER OF MOLES**
BEREKENINGE WAT AANTAL MOL GEBRUIK

Mark allocation/*Puntetoekenning*

- Initial amount of reactants: n(HCℓ) = 1 mol & $n(O_2)$ = 0,3 mol ✓
  Aanvanklike hoeveelheid reaktanse: n(HCℓ) = 1 mol & $n(O_2)$ = 0,3 mol
- Equilibrium/*Ewewig:* $n(O_2)$ = 0,1 mol ✓
- USING ratio/*GEBRUIK verhouding:* 4 : 1 : 2 : 2 ✓
- Equilibrium: n(HCℓ) = 0,2 mol (initial – change) ✓
  Ewewig: n(HCℓ) = 0,2 mol (*aanvanklik – verandering*)
- Equilibrium: $n(H_2O) = n(C\ell_2)$ = 0,4 mol (initial + change) ✓
  Ewewig: $n(H_2O) = n(C\ell_2)$ = 0,4 mol (*aanvanklik – verandering*)
- Divide by volume/*Gedeel deur volume* (5 dm^3) ✓
- Correct K_c expression (formulae in square brackets) ✓
  Korrekte K_c -uitdrukking (formules tussen vierkanthakies) ✓
- Substitution of concentrations/*Vervanging van konsentrasies* ✓
- Final answer/*Finale antwoord*: 800 ✓

Option 1/*Opsie 1:*

From graph/*Uit grafiek*:
Initially/*Aanvanklik* $n(HC\ell) = 1$ mol & $n(O_2) = 0,3$ mol ✓
At equilibrium/*By ewewig* $n(O_2) = 0,1$ mol ✓

Ratio/*verhouding:* ✓
$n(HC\ell)$ reacted/*gereageer* $= 4n(O_2)$ reacted/*gereageer*
$n(H_2O)$ formed/*gevorm* = $n(C\ell_2)$ formed/*gevorm* $= 2n(O_2)$ reacted/*gereageer*
$= 2(0,2) = 0,4$ mol

At equilibrium/*By ewewig*:
$n(HC\ell) = 0,2$ mol/(initial/*aanvanklik* – change/*verandering*) ✓
$n(H_2O) = n(C\ell_2) = 0,4$ mol (initial/*aanvanklik* + change/*verandering*) ✓

Equilibrium concentration/*Ewewigskonsentrasies:*

$$c(HC\ell) = \frac{n}{V} = \frac{0,2}{5} = 0,04 \text{ mol·dm}^{-3}$$
$$c(O_2) = \frac{n}{V} = \frac{0,1}{5} = 0,02 \text{ mol·dm}^{-3}$$
$$c(H_2O) = \frac{n}{V} = \frac{0,4}{5} = 0,08 \text{ mol·dm}^{-3}$$
$$c(C\ell_2) = \frac{n}{V} = \frac{0,4}{5} = 0,08 \text{ mol·dm}^{-3}$$

} Divide by 5 ✓ *Deel deur 5*

$$K_C = \frac{[H_2O]^2[C\ell_2]^2}{[HC\ell]^4[O_2]} \checkmark \quad \therefore \quad \frac{(0,08)^2(0,08)^2}{(0,04)^4(0,02)} \checkmark = 800 \checkmark$$

No K_C expression, correct substitution/*Geen K_c -uitdrukking*, *korrekte substitusie*: Max./*Maks.* $8/9$
Wrong K_C expression/*Verkeerde K_c-uitdrukking*: Max./*Maks.* $6/9$

Option 2/*Opsie 2*

	$HC\ell$	O_2	H_2O	$C\ell_2$
Initial quantity (mol) *Aanvangshoeveelheid (mol)*	1	0,3 ✓	0	0
Change (mol) *Verandering (mol)*	-0,8	-0,2	+ 0,4	+ 0,4
Quantity at equilibrium (mol)/ *Hoeveelheid by ewewig(mol)*	0,2✓	0,1✓	0,4	0,4 ✓
Equilibrium concentration ($mol\cdot dm^{-3}$) *Ewewigskonsentrasie ($mol\cdot dm^{-3}$)*	$\frac{0,2}{5}$ (0,04)	$\frac{0,1}{5}$ (0,02)	$\frac{0,4}{5}$ (0,08)	$\frac{0,4}{5}$ (0,08)

ratio ✓ *verhouding*

Divide by 5✓ *Deel deur 5*

$$K_C = \frac{[H_2O]^2[C\ell_2]^2}{[HC\ell]^4[O_2]} \checkmark \quad \therefore \quad \frac{(0,08)^2(0,08)^2}{(0,04)^4(0,02)} \checkmark = 800 \checkmark$$

No K_C expression, correct substitution/*Geen K_c-uitdrukking, korrekte substitusie:*
Max./*Maks.* $\frac{8}{9}$

Wrong K_C expression/*Verkeerde K_c-uitdrukking*:
Max./*Maks.* $\frac{6}{9}$

CALCULATIONS USING CONCENTRATIONS
BEREKENINGE WAT KONSENTRASIES GEBRUIK

Mark allocation/*Puntetoekenning*

- Initial concentration of reactants/*Aanvanklike konsentrasie van reaktanse*: $c(HC\ell) = 0,2$ ✓ & $c(O_2) = 0,06\ mol\cdot dm^{-3}$ ✓
- Equilibrium/*Ewewig:* $c(O_2) = 0,02\ mol\cdot dm^{-3}$ ✓
- USING ratio/*GEBRUIK verhouding:* 4 : 1 : 2 : 2 ✓
- Equilibrium: $c(HC\ell) = 0,04$ mol (initial – change) ✓
  Ewewig: c(HCℓ) = 0,04 mol (aanvanklik – verandering)
- Equilibrium/*Ewewig*: $c(H_2O) = c(C\ell_2) = 0,08$ mol (initial + change) ✓
  Ewewig: $c(H_2O) = c(C\ell_2) = 0,08$ mol (*aanvanklik* + *verandering*)
- Correct K_c expression (formulae in square brackets). ✓
  Korrekte K_c -uitdrukking (formules tussen vierkanthakies).
- Substitution of concentrations/*Vervanging van konsentrasies.* ✓
- Final answer/*Finale antwoord*: 800 ✓

Option 3/*Opsie 3*

	$HC\ell$	O_2	H_2O	$C\ell_2$
Initial concentration (mol·dm^{-3}) *Aanvangshoeveelheid (mol·dm^{-3})*	$\frac{1}{5}=0,2$	$\frac{3}{5}=0,06$ ✓	0	0
Change (mol·dm^{-3}) *Verandering* (mol·dm^{-3})	-0,16	-0,04	+0,08	+0,08
Equilibrium concentration (mol·dm^{-3}) *Ewewigskonsentrasie (mol·dm^{-3})*	0,04 ✓	0,02✓	0,08	0,08 ✓

Divide by 5 ✓

ratio ✓

$K_C = \frac{[H_2O]^2[C\ell_2]^2}{[HC\ell]^4[O_2]}$ ✓ ∴ $\frac{(0,08)^2(0,08)^2}{(0,04)^4(0,02)}$ ✓ = 800 ✓

No K_C expression, correct substitution/*Geen K_c uitdrukking*, *korrekte substitusie:* Max./*Maks.* $\frac{8}{9}$
Wrong K_C expression/*Verkeerde K_c-uitdrukking*: Max./*Maks.* $\frac{6}{9}$

(9)

7.3 (-)
Decreases ✓
Higher temperature favours the endothermic reaction. ✓
The reverse reaction is favoured. ✓
Less products/more reactants. ✓

(-)
Verminder ✓
Hoër temperatuur bevoordeel die endotermiese reaksie. ✓
Die terugwaartse reaksie word bevoordeel. ✓
Minder produkte/meer reaktanse. ✓ (4)

7.4

7.4.1 Decreases/*Verminder* ✓ (1)

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

7.4.3 Decreases/*Verminder* ✓ (1)

[21]

QUESTION 8/*VRAAG 8*

8.1 Pressure/*Druk:* 101,3 kPa (1,013 x 10^5 Pa) ✓
Temperature/*Temperatuur:* 25 °C (298 K) ✓ (2)

8.2 Salt bridge/*Soutbrug* ✓ (1)

8.3 (-) Anode ✓
It/ Mg is a stronger reducing agent ✓ than H_2 ✓
and (Mg) will be oxidised. ✓
Dit/Mg is 'n sterker reduseermiddel ✓as H_2 ✓
en (Mg) sal geoksideer word. ✓

OR/*OF*

(-) Anode ✓
H_2 is a weaker reducing agent ✓ than Mg/ it. ✓
and Mg will be oxidised. ✓
H_2.is 'n swakker reduseermiddel ✓as Mg/dit ✓
en Mg sal geoksideer word. ✓ (4)

8.4 $Mg(s) \mid Mg^{2+}(1\ mol{\cdot}dm^{-3}) \parallel H^+(1\ mol{\cdot}dm^{-3}) \mid H_2(g) \mid Pt(s)$ ✓ ✓ ✓

OR/*OF*

$Mg(s) \mid Mg^{2+}(aq) \parallel H^+(aq) \mid H_2(g) \mid Pt(s)$ ✓ ✓ ✓

OR/*OF*

$Mg \mid Mg^{2+} \parallel H^+ \mid H_2 \mid Pt$ ✓ ✓ ✓

Accept/*Aanvaar*:

$Mg \mid Mg^{2+} \parallel H^+ \mid H_2 , Pt$ (3)

8.5 **Option 1/*Opsie 1***
$E^\theta_{cell} = E^\theta_{cathode} - E^\theta_{anode}$ ✓
2,36 ✓ = 0,00 – (E^θ_{anode}) ✓
E^θ_{anode} = -2,36 V ✓

Option 2/*Opsie 2*

✓ $Mg \rightarrow Mg^{2+} + 2e^-$ E° = +2,36
$2H^+ + 2e^- \rightarrow H_2$ E° = 0,00 ✓
E° = 2,36 V ✓

Mg (red. pot.) = -2,36 V ✓

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. $E°_{cell} = E°_{OA} - E°_{RA}$ followed by correct substitutions: 3/4
Enige ander formule wat onkonvensionele afkortings gebruik bv. $E°_{sel} = E°_{OM} - E°_{RM}$

(4)

8.6 $Mg(s) + 2H^+(aq)$ ✓ $\rightarrow Mg^{2+}(aq) + H_2(g)$ ✓ Bal. ✓

Notes/*Aantekeninge*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse ✓ *Produkte* ✓ *Balansering* ✓
- Ignore if phases are omitted./*Ignoreer indien fases uitgelaat word.*
- Ignore/Ignoreer ⇌
- Marking rule 3.9/*Nasienreël 3.9*
- Marking rule 3.4: One mark is forfeited when the charge of an ion is omitted per equation (not for the charge on an electron).
  Nasienreël 3.4: Een punt word verbeur per vergelyking indien die lading op 'n ioon uitgelaat word (nie vir die lading op 'n elektron nie.)

(3)
[17]

QUESTION 9/*VRAAG 9*

9.1 Electrolytic/*Elektrolities* ✓ (1)

9.2

9.2.1 A ✓ (1)

9.2.2 B ✓ (1)

9.3

9.3.1 (-) Remains the same ✓
The rate of oxidation of copper at the anode is equal ✓
to the rate of reduction of copper(II) ions at the cathode. ✓

(-) *Bly dieselfde* ✓
Die tempo van oksidasie van koper by die anode is gelyk aan ✓
Die tempo van reduksie van koper(II)-ione by die katode. ✓ (3)

9.3.2 $Cu \rightarrow Cu^{2+} + 2e^-$ ✓✓ (2)

Notes/*Aantekeninge*
$Cu \rightleftharpoons Cu^{2+} + 2e^-$ $(\frac{1}{2})$
$Cu^{2+} + 2e^- \rightarrow Cu$ $(\frac{0}{2})$
$Cu^{2+} + 2e^- \leftarrow Cu$ $(\frac{2}{2})$
$Cu^{2+} + 2e^- \rightleftharpoons Cu$ $(\frac{0}{2})$

9.4

9.4.1 It contains precious metals/valuable/expensive metals. ✓
Dit bevat edelmetale/waardevole/duur metale. ✓ (1)

9.4.2 Consumes large amount of electricity/energy. ✓
Depletes coal resources. **OR** Contributes to global warming. **OR** Habitats destroyed in mining of coal. **OR** Contributes to acid rain. ✓

Verbruik groot hoeveelhede elektrisiteit/energie. ✓
*Put steenkoolbronne uit. **OF** Dra by tot aardverwarming. **OF** Habitatte word vernietig. **OF** Dra by tot suurreën.* ✓

(2)
[11]

QUESTION 10/*VRAAG 10*

10.1 Secondary (cells)/*Sekondêre* (*selle*) ✓ (1)

10.2 $Zn(s) + NiO_2(s) + 2H_2O(\ell)$ ✓ $\rightarrow Zn^{2+}(aq) + Ni(OH)_2(s) + 2OH^-(aq)$✓ bal ✓

Notes/*Aantekeninge:*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse ✓ *Produkte* ✓ *Balansering* ✓
- Ignore if phases are omitted / *Ignoreer indien fases uitgelaat word*
- Ignore/*Ignoreer* ⇌
- Marking rule/*Nasienreël* 3.9 (3)

10.3

10.3.1 The ability (of a cell) to store/deliver charge.✓✓
Die vermoë (van 'n sel) om lading te stoor/lewer. (2)

10.3.2

OPTION 1/*OPSIE 1*

$W = Vq$ ✓
$= (1,65)(1\ 500 \times 10^{-3} \times 3600)$ ✓
$= 8\ 910$ J ✓

OPTION 2/*OPSIE 2*

$q = I\Delta t$

$= (1\ 500 \times 10^{-3})(3\ 600)$ ✓

$\therefore\ q = 5\ 400$ C

$W = Vq$ ✓
$W = (1,65)(5\ 400)$ ✓
$= 8\ 910$ J ✓ (4)

[10]

QUESTION 11/*VRAAG 11*

11.1

11.1.1 Nitrogen/*Stikstof*/N_2 ✓ (1)

11.1.2 Hydrogen/*Waterstof*/H_2 ✓ (1)

11.1.3 Ammonium nitrate/*Ammoniumnitraat*/NH_4NO_3 ✓ (1)

11.2

11.2.1 Contact process/*Kontakproses* ✓ (1)

11.2.2 $2NH_3 + H_2SO_4$ ✓→ $(NH_4)_2SO_4$ ✓ Bal. ✓

Notes/*Aantekeninge:*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse ✓ *Produkte* ✓ *Balansering* ✓
- Ignore/*Ignoreer* ⇌
- Marking rule/*Nasienreël* 3.9

(3)

11.3

11.3.1 Catalytic oxidation of ammonia ✓
Katilitiese oksidasie van ammoniak ✓ (1)

11.3.2 $4NH_3 + 5O_2$ ✓ → $4NO + 6H_2O$ ✓ Balancing/*Balansering* ✓

Notes/*Aantekeninge:*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse ✓ *Produkte* ✓ *Balansering* ✓
- Ignore/*Ignoreer* ⇌
- Marking rule/*Nasienreël* 3.9

(3)

11.3.3 NO_2/Nitrogen dioxide ✓
NO_2/*Stikstofdioksied* ✓

Notes/*Aantekeninge*
Accept: Nitrogen(IV) oxide ✓
Aanvaar: *Stikstof(IV)oksied*

(1)

[12]

TOTAL SECTION B/*TOTAAL AFDELING B:* 125
GRAND TOTAL/*GROOTTOTAAL:* 150