basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE/*SENIORSERTIFIKAAT*

PHYSICAL SCIENCES P2
FISIESE WETENSKAPPE V2

CHEMISTRY/*CHEMIE*

2015

MEMORANDUM

MARKS/*PUNTE*: 150

This memorandum consists of 14 pages.
Hierdie memorandum bestaan uit 14 bladsye.

QUESTION 1/*VRAAG 1*

1.1 A ✓✓ (2)

1.2 C ✓✓ (2)

1.3 C ✓✓ (2)

1.4 D ✓✓ (2)

1.5 C ✓✓ (2)

1.6 A ✓✓ (2)

1.7 C ✓✓ (2)

1.8 C ✓✓ (2)

1.9 A ✓✓ (2)

1.10 D ✓✓ (2)

[20]

QUESTION 2/*VRAAG 2*

2.1

2.1.1 B ✓ (1)

2.1.2 E ✓ (1)

2.1.3 A ✓ (1)

2.2

2.2.1 4-chloro-2,5-dimethylheptane
4-chloro-2,5-dimetielheptaan/4-chloor-2,5-dimetielheptaan

Marking criteria/*Nasienriglyne:*
- Correct stem i.e. heptane./*Korrekte stam d.i. heptaan.* ✓
- All substituents (chloro and dimethyl) correctly identified./*Alle substituente (chloro/chloor and dimetiel) korrek geïdentifiseer.* ✓
- Substituents correctly numbered, in alphabetical order, hyphens and commas correctly used. ✓
  Substituente korrek genommer, in alfabetiese volgorde, koppeltekens en kommas korrek gebruik.

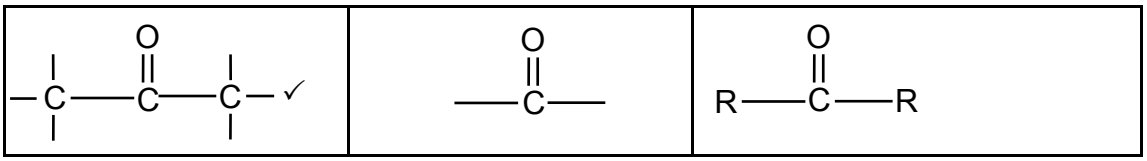
(3)

2.2.2 2-methyl✓propan-1-ol ✓
2-methyl-1-propanol
2-metielpropan-1-ol
2-metiel-1-propanol

IF/*INDIEN*:
2 methylpropan 1 ol / *2 metielpropan 1 ol* ½
IF/*INDIEN*:
2-methylpropanol / *2-metielpropanol* ½

(2)

2.2.3 **ANY ONE/*ENIGE EEN*:**



(1)

2.3

2.3.1 Compounds with the same molecular formula✓ but different positions of the functional groups /side chain/substituents on parent chain. ✓
Verbindings met dieselfde molekulêre formule, maar verskillende posisies van funksionele groepe/syketting/substituente op die hoofketting. (2)

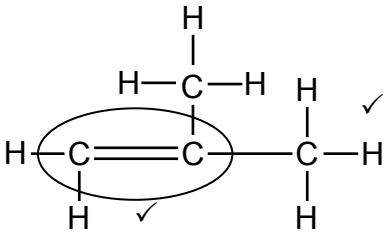
2.3.2 
But-1-ene / *But-1-een*

AND/*EN*


But-2-ene / *But-2-een*

Notes/*Aantekeninge:*
Accept: 1-butene ✓✓ and 2-butene ✓✓
Aanvaar: *1-buteen en 2-buteen*
IF/*INDIEN*:
Butene/*buteen* ¼
But 1 ene/*But 1 een* ✓ & But 2 ene/*But 2 een* ✓ 2/4

(4)

2.3.3 

Marking criteria/*Nasienriglyne:*
- Whole structure correct/*Hele struktuur korrek:* 2/2
- Only functional group correct/*Slegs funksionele groep korrek:* ½

Notes/*Aantekeninge:*
- If two or more functional groups/Indien *twee of meer funksionele groepe:* 0/2
- Condensed or semi-structural formula:
  Gekondenseerde of semistruktuurformule: Max/*Maks* ½
- Molecular formula/*Molekulêre formule*: 0/2

(2)

2.4

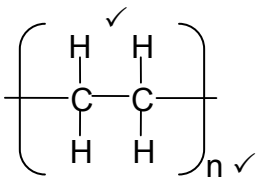
2.4.1 Cracking/elimination ✓
Kraking/eliminasie (1)

2.4.2 Ethene/*Eteen* ✓ (1)

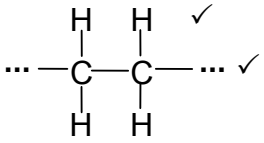
2.4.3 C_4H_{10} ✓ (1)

2.4.4 Polyethene/*Polieteen* ✓

Accept/*Aanvaar*:
Polyethylene/polythene
Poli-eteen/poli-etileen

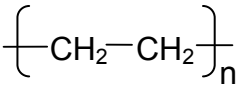


OR/*OF*



Marking guidelines/*Nasienriglyne:*
Ignore if hyphens used/*Ignoreer indien koppeltekens gebruik is.*

Marking guidelines/*Nasienriglyne:*
- Structure shows TWO C atoms with four bonds each and FOUR H atoms./*Struktuur toon TWEE C-atome met vier bindings elk na VIER H-atome.* ✓
- Structure placed in brackets with multiple n. / *Struktuur in hakies geplaas met veelvoud n.* ✓
- **Accept /*Aanvaar:***



(3)
[23]

QUESTION 3/*VRAAG 3*

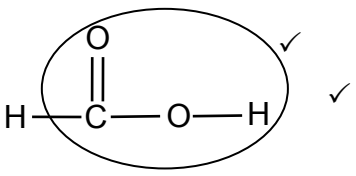
3.1
3.1.1 Hydrolysis/*Hidrolise* ✓ (1)

3.1.2 (Mild) heat /(*Matige) hitte* ✓
Dilute (strong) base/aqueous base ✓
Verdunde (sterk) basis / basis in water. (2)

3.1.3 Ethanol/*Etanol* ✓ (1)

3.2
3.2.1 Esterification/condensation ✓
Esterifikasie/verestering/kondensasie (1)

3.2.2



Notes/*Aantekeninge*
- Functional group/*Funksionele groep* ✓
- Whole structure correct/*Hele struktuur korrek* ✓

(2)

3.2.3 Ethyl✓ methanoate ✓
Etielmetanoaat

Accept / *Aanvaar:*
Ethyl methanoate written as one word /
Etielmetanoaat geskryf as twee woorde.

(2)
[9]

QUESTION 4/*VRAAG 4*

4.1 Saturated/*Versadig* ✓

ANY ONE/*ENIGE EEN*:

- B/It has ONLY single bonds. ✓
  B/Dit het SLEGS enkelbindings.
- B/It has single bonds between C atoms.
  B/Dit het enkelbindings tussen C-atome.
- B/It has no double OR triple bonds OR multiple bonds.
  B/Dit het geen dubbel- OF trippelbindings OF meervoudige bindings nie.
- B/It contains the maximum number of H atoms bonded to C atoms.
  B/Dit bevat die maksimum getal H-atome gebind aan C-atome.
- Each C atom in B is bonded to four other atoms.
  Elke C atoom in B is gebind aan vier ander atome. (2)

4.2

4.2.1 – 42 (°C) ✓ (1)

4.2.2 78 (°C) ✓ (1)

Notes/*Aantekeninge*
Ignore the unit.
Ignoreer die eenheid.

4.3

- Between molecules of C/propane are London forces/dispersion forces/ induced dipole forces. ✓
  Tussen molekule van C/propaan is Londonkragte/ dispersiekragte/ geïnduseerde dipoolkragte.
- Between molecules of E/ethanol are (London forces/dispersion forces/ induced dipole forces and) hydrogen bonds. ✓
  Tussen molekule van E/etanol is (London-kragte/ dispersiekragte / geïnduseerde dipoolkragte en) waterstofbindings.
- Hydrogen bonds/Forces between alcohol molecules are stronger. ✓
  Waterstofbindings/Kragte tussen alkoholmolekule is sterker.

OR/*OF*

More energy is needed to overcome hydrogen bonds/forces between alcohol molecules than London forces/dispersion forces/induced dipole forces.
Meer energie word benodig om waterstofbindings/kragte tussen alkoholmolekule te oorkom as London-kragte/dispersiekragte/ geïnduseerde dipoolkragte.

OR/*OF*

Between molecules of C/propane are weak London forces/dispersion forces/induced dipole forces. ✓
Between molecules of E/ethanol molecules are strong hydrogen bonds ✓✓
Tussen propaanmolekule is swak London-kragte/dispersiekragte/ geïnduseerde dipoolkragte en tussen etanolmolekule is sterk waterstofbindings .

OR/*OF*

More energy is needed to overcome hydrogen bonds between ethanol molecules than the London forces/dispersion forces/induced dipole forces between propane molecules.
Meer energie word benodig om waterstofbindings tussen etanolmolekule te oorkom as om London-kragte/dispersiekragte/ geïnduseerde dipoolkragte tussen propaanmolekule te oorkom. (3)

4.4 Decrease/*Verminder* ✓

From A to D:

- Chain length/molecular mass/molecular size/surface area increases. ✓
- Strength of intermolecular forces/ London forces/dispersion forces/induced dipole forces increases. ✓
- More energy needed to overcome/break the intermolecular forces. ✓

Van A tot D:

- *Kettinglengte/molekulêre massa/molekuulgrootte/reaksieoppervlak neem toe.*
- *Sterkte van intermolekulêre kragte/ London-kragte/dispersiekragte/ geïnduseerde dipoolkragte vermeerder.*
- *Meer energie nodig om intermolekulêre kragte te oorkom/breek.*

OR/*OF*

From D to A:

- Chain length/molecular mass/molecular size/surface area decreases . ✓
- Strength of intermolecular forces/London forces/dispersion forces/induced dipole forces decreases.✓
- Less energy needed to overcome intermolecular forces. ✓

Van D tot A:

- *Kettinglengte/molekulêre massa/molekuul se grootte/reaksieoppervlak neem af.*
- *Sterkte van intermolekulêre kragte/* London forces/dispersion forces/induced dipole forces *verminder.*
- *Minder energie nodig om intermolekulêre kragte te oorkom.* (4)

4.5 Higher than/*Hoër as* ✓ (1)

[12]

QUESTION 5/*VRAAG 5*

5.1 Exothermic /*Eksotermies* ✓

$\Delta H < 0$ / Energy is released. / Energie word vrygestel.✓ (2)

5.2

OPTION 1/*OPSIE 1*

5.2.1 $n(HC\ell) = cV$

$= (1,5)$ ✓ (30×10^{-3}) ✓

$= 0,045$ mol

$$\text{ave rate / } gem.tempo = -\frac{\Delta n}{\Delta t}$$

$$= -\frac{(0-0,045)}{(60-0)}\checkmark$$

$$= 7,5 \times 10^{-4}\ (\text{mol}\cdot\text{s}^{-1})\checkmark$$

Notes/*Aantekeninge*

Accept /*Aanvaar:*

- $-7,5 \times 10^{-4}$ mol·s^{-1}
- Rate / *Tempo* $= \frac{\Delta n}{\Delta t}$

$$= \frac{0,045-0}{60-0}$$

$= 7,5 \times 10^{-4}$ (mol·s^{-1})

OPTION 2/*OPSIE*

$$\text{average / gem. tempo} = -\frac{\Delta c}{\Delta t}$$

$$= -\frac{(0-1,5)}{(60-0)}\checkmark$$

$$= 0,025\ \text{mol}\cdot\text{dm}^{-3}\cdot\text{s}^{-1}$$

$\therefore$ average rate = $(0,025)(30 \times 10^{-3})$ ✓✓

$= 7,5 \times 10^{-4}$ (mol·s^{-1}) ✓

Notes/*Aantekeninge*

Accept/*Aanvaar:*

- $-7,5 \times 10^{-4}$ mol·s^{-1}
- Rate / *Tempo* $= \frac{\Delta c}{\Delta t}$

$$= \frac{1,5-0}{60-0}$$

$$= 0,025\ \text{mol}\cdot\text{dm}^{-3}\cdot\text{s}^{-1}$$

average rate=$(0,025)(30 \times 10^{-3})$

$= 7,5 \times 10^{-4}$ (mol·s^{-1}) (5)

IF/*INDIEN*

Mass of Mg used to calculate number of moles:/ *Massa van Mg gebruik om aantal mol te bereken:* Max./*Maks.* $\frac{2}{5}$

$$n(HC\ell) = \frac{m}{M} = \frac{5}{24} = 0,21\ \text{mol}$$

$$\text{ave rate / } gem.tempo = -\frac{\Delta n}{\Delta t}$$

$$= -\frac{(0-0,21)}{(60-0)}\checkmark$$

$$= 3,5 \times 10^{-3}\ (\text{mol}\cdot\text{s}^{-1})$$

5.2.2(a) Increases/*Vermeerder* ✓

- The reaction is exothermic, resulting in an increase in temperature. ✓
  Die reaksie is eksotermies wat tot toename in temperatuur lei.
- More molecules have enough/sufficient kinetic energy. ✓
  Meer molekule het genoeg/voldoende kinetiese energie.
- More effective collisions per unit time/second. ✓
  Meer effektiewe botsings per eenheidtyd/sekonde. (4)

5.2.2(b) Decreases/*Verminder* ✓

-

Concentration (of acid) decreases./*Konsentrasie (van suur) verminder.* ✓

OR/*OF*
The surface area of magnesium decreases./ *Die reaksieoppervlak van magnesium verminder.*

OR/*OF*
Reactants are being used up./*Reaktanse word opgebruik.* (2)

5.3 **ANY TWO/*ENIGE TWEE***

- Higher temperature/*Hoër temperatuur* ✓
- Larger surface area/state of division/contact area of Mg/Use magnesium powder ✓
  Groter reaksie-oppervlak/toestand van verdeeldheid/kontakoppervlak van magnesium
- Addition of a catalyst./*Byvoeging van katalisator.* (2)

[15]

QUESTION 6/*VRAAG 6*

6.1 When the equilibrium (in a closed system) is disturbed, the system will re-instate a new equilibrium ✓
by favouring the reaction that will cancel the disturbance. ✓
Wanneer die ewewig (in 'n geslote sisteem) versteur word, sal die sisteem 'n nuwe ewewig instel deur die reaksie wat die versteuring kanselleer te bevoordeel. (2)

6.2
6.2.1 Remains the same/*Bly dieselfde* ✓ (1)

6.2.2 Increases/*Vermeerder* ✓ (1)

6.3

Marking criteria/*Nasienriglyne:*

- K_c expression/*uitdrukking*.
- Substitution of /*Vervanging van* 1,2 x 10^{-4} .
- x volume (5 dm^3)
- Use mole ratio/*Gebruik verhouding*: 1:1
- Substitution/*Vervang* 51 $g \cdot mol^{-1}$
- Final answer/*Finale antwoord*: 2,81 g

OPTION 1/*OPSIE 1*

$K_c = [NH_3][H_2S]$ ✓
$\therefore$ 1,2 x 10^{-4} ✓ $= [NH_3][H_2S]$
$\therefore [NH_3] = [H_2S]$
$= 0{,}011 \text{ mol} \cdot dm^{-3}$

$n(NH_3) = cV$
$= (0{,}011)(5)$ ✓
$= 0{,}06$ mol (0,06 mol)

$n(NH_4HS) = n(NH_3) = 0{,}06$ mol ✓

$m(NH_4HS) = nM$
$= (0{,}06)(51)$ ✓
$= 2{,}81$ g ✓

(Accept answers in the range 2,55 – 2,81 g.)

No K_C expression, correct substitution /*Geen K_c- uitdrukking, korrekte substitusie:*
Max./*Maks.* $\frac{5}{6}$

Wrong K_C expression/*Verkeerde K_c-uitdrukking*: Max./M*aks.* $\frac{4}{6}$

OPTION 2/*OPSIE 2*

	NH_4HS	NH_3	H_2S
Initial quantity (mol) *Aanvangshoeveelheid (mol)*		0	0
Change (mol) *Verandering (mol)*	x	x	x
Quantity at equilibrium (mol)/ *Hoeveelheid by ewewig (mol)*	-	x	x
Equilibrium concentration ($mol \cdot dm^{-3}$) *Ewewigskonsentrasie ($mol \cdot dm^{-3}$*	-	$\frac{x}{5}$	$\frac{x}{5}$

Divide by 5 ✓

$K_c = [NH_3][H_2S]$ ✓
$\therefore$ 1,2 x 10^{-4} ✓ $= (\frac{x}{5})(\frac{x}{5})$
$\therefore$ x = 0,0547 mol

$m(NH_4HS) = nM$
$= (0{,}0547)$ ✓ (51) ✓
$= 2{,}79$ g ✓

No K_C expression, correct substitution /*Geen K_c- uitdrukking, korrekte substitusie:*
Max./*Maks.* $\frac{5}{6}$

Wrong K_C expression /*Verkeerde K_c-uitdrukking*: Max./M*aks.* $\frac{4}{6}$

(6)

6.4 Decreases/*Verminder* ✓

- (When pressure is increased) the reaction that leads to the smaller amount of gas is favoured. ✓
  (Wanneer die druk verhoog word,) word die reaksie wat tot die kleiner hoeveelheid gas lei, bevoordeel.
- The reverse reaction is favoured. ✓
  Die terugwaartse reaksie word bevoordeel.

OR/*OF*

Decreases/*Verminder*

- When pressure is increased by decreasing the volume of the container, the concentration of both $NH_3(g)$ and $H_2S(g)$ increase and the reaction that reduces these concentrations is favoured.
  Wanneer die druk verhoog word deur die volume van die houer te verklein, verhoog die konsentrasie van beide die $NH_3(g)$ en $H_2S(g)$ en die reaksie wat hierdie konsentrasies verminder word bevoordeel.
- The reverse reaction is favoured.
  Die terugwaartse reaksie word bevoordeel. (3)

[13]

QUESTION 7/*VRAAG 7*

7.1

7.1.1 Diprotic/*Diproties* ✓ (1)

7.1.2 H_2O ✓
$(COO)_2^{2-}$ ✓ (2)

7.1.3 $HC_2O_4^-/H(COO)_2^-$ ✓
It acts as base (in reaction I) and as acid (in reaction II). ✓
Dit reageer as basis (in reaksie I) en as suur (in reaksie II). (2)

7.2 Ionises/dissociates incompletely/partially. ✓
Ioniseer/dissosieer onvolledig/gedeeltelik. (1)

7.3

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***	**Marking guidelines:** ***Nasienriglyne:***
$c = \frac{m}{MV}$ ✓ $\therefore 0,2 = \frac{m}{0,25\checkmark \times 90\checkmark}$ $\therefore m = 4,5\ g$ ✓	$c = \frac{n}{V}$ ✓ $0,2 = \frac{n}{0,25\checkmark}$ $n = 0,05\ mol$ $n = \frac{m}{M}$ $0,05 = \frac{m}{90}\checkmark$ $m = 4,5\ g$ ✓	• Any formula of/*Enige formule van:* $c = \frac{m}{MV}$ / $c = \frac{n}{V}$ / $n = \frac{m}{M}$ • Substitution of/*Substitusie van* V as 0,25 dm^3. • Substitution of/*Substitusie van* 90 $g \cdot mol^{-1}$. • Final answer/*Finale antwoord:* 4,5 g

(4)

7.4

7.4.1

OPTION 1/*OPSIE 1*	**Marking guidelines/*Nasienriglyne:***
$\frac{c_a \times V_a}{c_a \times V_b} = \frac{n_a}{n_b}$ ✓ $\frac{0,2 \times 25}{c_b \times 36} = \frac{1}{2}$ ✓ ✓ ✓ $c_b = 0,28 \text{ mol} \cdot \text{dm}^{-3}$ ✓	• Formula/*Formule* • Substitution of 0,2 x 25. *Substitusie van* 0,2 x 25. • Use V_b = 36 cm^3. Gebruik V_b = 36 cm^3. • Use mol ratio 1:2. *Gebruik molverhouding 1:2.* • Final answer/*Finale antwoord:* 0,28 mol·dm^{-3}

OPTION 2/*OPSIE 2*	**Marking guidelines/*Nasienriglyne:***
$n((COOH)_2) = cV$ ✓ ✓ $= (0,2)(0,025)$ $= 0,005$ mol $n(NaOH) = \underline{2}(0,005)$ ✓ $= 0,01$ mol $c = \frac{n}{V}$ $= \frac{0,01}{0,036}$ ✓ $= 0,28 \text{ mol} \cdot \text{dm}^{-3}$ ✓	• Any ONE of formulae. *Enige EEN van formules* • Substitution of 0,2 x 0,025. *Substitusie van* 0,2 x 0,025. • Use mol ratio 1:2. *Gebruik molverhouding 1:2.* • Use V_b = 0,036 dm^3. Gebruik V_b = 0,036 dm^3 • Final answer/*Finale antwoord:* 0,28 mol·dm^{-3}

(5)

7.4.2 $(COO)_2^{2-}(aq) + 2H_2O(\ell)$ ✓ ⇌ $(COOH)_2(aq) + 2OH^-(aq)$ ✓ Bal. ✓

Accept/*Aanvaar:*

$(COO)_2^{2-}(aq) + H_2O(\ell) \rightleftharpoons H(COO)_2^-(aq) + OH^-(aq)$

Notes/*Aantekeninge*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse ✓ *Produkte* ✓ *Balansering* ✓
- Ignore/*Ignoreer* → and phases/*en fases*.
- Marking rule 6.3.10/*Nasienreël 6.3.10*

(3)

[18]

QUESTION 8/*VRAAG 8*

8.1 Redox (reaction)/*Redoks(reaksie)* ✓ (1)

8.2 P ✓
Negative electrode/Mg is a stronger reducing agent/is oxidized/release electrons. /Mass of Mg decreases. ✓
Negatiewe elektrode/Mg is 'n sterker reduseermiddel/word geoksideer/stel elektrone vry./ Massa van Mg sal afneem. (2)

8.3

8.3.1 (Temperature/*Temperatuur*:) 25 °C/298 K ✓
(Concentration/*Konsentrasie:*) 1 mol·dm^{-3} ✓ (2)

8.3.2 Mg(s) | Mg^{2+}(aq) ✓|| ✓ Pb^{2+}(aq) | Pb(s) ✓
OR/OF
Mg | Mg^{2+}|| Pb^{2+}| Pb (3)

8.3.3 Pb^{2+} / $Pb(NO_3)_2$ / lead(II) ions / lead(II) nitrate ✓
Pb^{2+}/ $Pb(NO_3)_2$ / lood(II)-ione / lood(II)nitraat (1)

8.4

OPTION 1/*OPSIE 1*	**Notes/*Aantekeninge***
$E^{\theta}_{cell} = E^{\theta}_{reduction} - E^{\theta}_{oxidation}$ ✓ = -0,13 ✓ – (-2,36) ✓ = 2,23 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/*OPSIE 2*

$Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$ ✓ E^{θ} = -0,13 V ✓
$Mg(s) \rightarrow Mg^{2+}(aq) + 2e^-$ E^{θ} = +2,36 V ✓
$Pb^{2+}(aq) + Mg(s) \rightarrow Pb(s) + Mg^{2+}(aq)$ E^{θ} = +2,23 V ✓ (4)

8.5

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

8.5.2 Increases/*Verhoog* ✓ (1)
[15]

QUESTION 9/*VRAAG 9*

9.1 **ANY ONE/*ENIGE EEN*:**

- A substance that forms ions in water / when melted. ✓✓
  'n Stof wat ione in water / wanneer gesmelt vorm.
- A substance whose aqueous solution contains ions.
  'n Stof waarvan die oplossing ione bevat.
- 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)

9.2 Plastic is a non-conductor of electricity / Graphite is a conductor. ✓
Plastiek is 'n nie-geleier van elektrisiteit / Grafiet is 'n geleier. (1)

9.3

9.3.1 $Ni^{2+}(aq) + 2e^- \rightarrow Ni(s)$ ✓✓

Ignore phases / *Ignoreer fases*

Notes/*Aantekeninge*

$Ni \leftarrow Ni^{2+} + 2e^-$ $(2/2)$	$Ni^{2+} + 2e^- \rightleftharpoons Ni$ $(1/2)$
$Ni \rightleftharpoons Ni^{2+} + 2e^-$ $(0/2)$	$Ni^{2+} + 2e \leftarrow Ni$ $(0/2)$

(2)

9.3.2 (-) Ni / nickel / *nikkel* ✓

Ni is oxidised./*Ni word geoksideer*. ✓
OR/*OF*
Ni loses electrons./*Ni verloor elektrone.*
OR/*OF*
Ni is the anode./*Ni is die anode*.
OR/*OF*
Ni is the positive electrode./*Ni is die positiewe elektrode.*
OR/*OF*
$Ni \rightarrow Ni^{2+}(aq) + 2e^-$ (2)

9.4 (-) Ring ✓

Reduction takes place at the cathode./*Reduksie vind by die katode plaas.* ✓
OR/*OF*
Negative electrode. / Negatiewe elektrode. (2)

9.5 (-) Decreases/*Verminder* ✓

Ni^{2+} ions from the electrolyte will be reduced (to Ni). ✓
Ni^{2+}-ione in die elektroliet word gereduseer (na Ni).
OR/*OF*
Ni^{2+} changes to Ni / Ni^{2+} verander na Ni (2)

[11]

QUESTION 10/*VRAAG 10*

10.1

10.1.1 $2SO_2(g) + O_2(g)$ ✓ $\rightarrow 2SO_3(g)$ ✓ Bal. ✓

Notes/*Aantekeninge*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse ✓ *Produkte* ✓ *Balansering* ✓
- Ignore/*Ignoreer* ⇌and phases/*en fases*.
- Marking rule 6.3.10/*Nasienreël 6.3.10*

(3)

10.1.2 Catalyst/*Katalisator* ✓

OR/*OF*

Increase the reaction rate./*Verhoog die reaksietempo.* (1)

10.2 Exothermic/*Eksotermies* ✓

The temperature increases./*Die temperatuur verhoog*. ✓

OR/*OF*

Before the reaction the temperature was 450 °C and after the reaction it was 600 °C / 518 °C/ 475 °C / 460 °C.
Voor die reaksie was die temperatuur 450 °C en na afloop van die reaksie was dit 600 °C / 518 °C / 475 °C / 460 °C. (2)

10.3
- An exothermic reaction is favoured by a decrease in temperature. ✓
  'n Eksotermiese reaksie word bevoordeel deur 'n verlaging in temperatuur.
- The forward reaction is favoured. ✓
  Die voorwaartse reaksie word bevoordeel.
  Higher yield (of SO_3). / *Hoër opbrengs (SO_3).* ✓

OR/*OF*
- An endothermic reaction is favoured by an increase in temperature. ✓
  Endotermiese reaksie word bevoordeel deur 'n verhoging in temperatuur.
- The reverse reaction is favoured. ✓
  Die terugwaartse reaksie word bevoordeel.
  Lower yield (of SO_3). / *Laer opbrengs (SO_3).* ✓

(3)

10.4

10.4.1 $H_2S_2O_7$ ✓ (1)

10.4.2 A mist will form (which is difficult to collect)./*'n Mis sal vorm (wat moeilik is om te versamel).*

OR/*OF*

The reaction is too exothermic./*Die reaksie is te eksotermies*. ✓ (1)

10.5 $H_2SO_4 + 2NH_3$ ✓$\rightarrow (NH_4)_2SO_4$ ✓ Bal. ✓

Notes/*Aantekeninge*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse ✓ *Produkte* ✓ *Balansering* ✓
- Ignore/*Ignoreer* ⇌
- Marking rule 6.3.10/*Nasienreël 6.3.10*

(3)

[14]

TOTAL/*TOTAAL:* 150