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 2015/FEBRUARIE/MAART 2015

MEMORANDUM

MARKS/*PUNTE*: 150

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

QUESTION 1/*VRAAG 1*

1.1 A ✓✓ (2)

1.2 D ✓✓ (2)

1.3 A ✓✓ (2)

1.4 D ✓✓ (2)

1.5 B ✓✓ (2)

1.6 C ✓✓ (2)

1.7 B ✓✓ (2)

1.8 C ✓✓ (2)

1.9 D ✓✓ (2)

1.10 B ✓✓ (2)

[20]

QUESTION 2/*VRAAG 2*

2.1.

2.1.1 Carboxyl (group)/*Karboksiel(groep)* ✓ (1)

2.1.2 Ketones/*Ketone* ✓ (1)

2.1.3 Addition/*Addisie* ✓ (1)

2.2

2.2.1 Ethene/*Eteen* ✓ (1)

2.2.2 4-methyl✓ -hexan-3-one ✓
4-metielheksan-3-oon

OR/*OF*
4-methyl✓-3-hexanone ✓
4-metiel-3-heksanoon

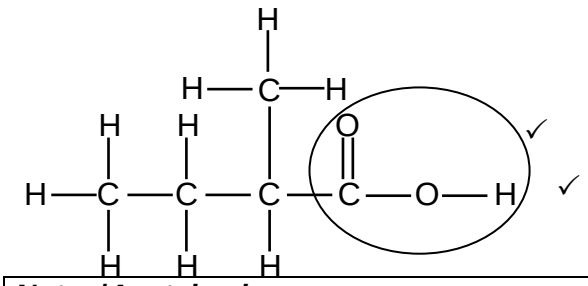
Notes/*Aantekeninge*:
IF/*INDIEN*:
Correct IUPAC name, but one or more of the following errors: omitting hyphens and/or commas; including extra spaces and/or hyphens
Korrekte IUPAC-naam, maar een of meer van die volgende foute: weglating van koppeltekens en/of kommas; insluiting van ekstra spasies en/of koppeltekens
Max./*Maks.* $\frac{1}{2}$
4 methyl hexan 3 one ✓
4 metiel 3 heksanoon ✓ (2)

2.2.3 4-ethyl-2,2-dimethyl✓hexane ✓
4-etiel-2,2-dimetielheksaan

Notes/*Aantekeninge*:
IF/*INDIEN*:
Correct IUPAC name, but one or more of the following errors: omitting hyphens and/or commas; including extra spaces and/or hyphens
Korrekte IUPAC-naam, maar een of meer van die volgende foute: weglating van koppeltekens en/of kommas; insluiting van ekstra spasies en/of koppeltekens
Max./*Maks.* $\frac{1}{2}$
4 ethyl 2,2 dimethylhexane ✓
4 etiel 2,2 dimetielheksaan ✓ (2)

2.3 Carbon dioxide/CO_2/*Koolstofdioksied* ✓
Water/H_2O ✓ (2)

2.4
2.4.1



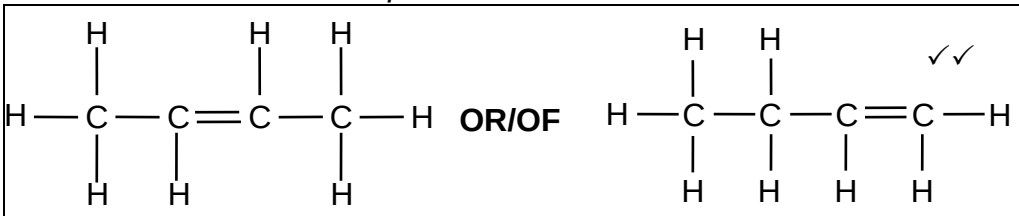
✓ ✓

Notes/*Aantekeninge*
Whole structure correct/*Hele struktuur korrek:* $\frac{2}{2}$
Only functional group correct/*Slegs funksionele groep korrek:* $\frac{1}{2}$

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

(2)

2.4.2 **ANY ONE/*ENIGE EEN*:**
Two marks or zero./*Twee punte of nul.*



✓✓

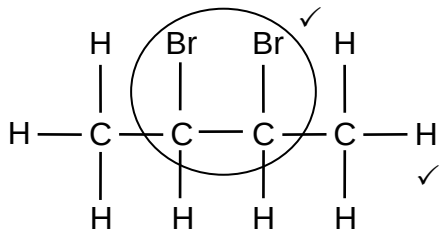
Notes/*Aantekeninge:*
- Condensed or semi-structural formula: Max. $\frac{1}{2}$
  Gekondenseerde of semistruktuurformule: *Maks.* $\frac{1}{2}$
- Molecular formula/*Molekulêre formule*: $\frac{0}{2}$

(2)

2.5
2.5.1 E ✓ (1)

2.5.2 Substitution**/**halogenation/bromination ✓
Substitusie/halogenering/brominering (1)

2.5.3



✓ ✓

Notes/*Aantekeninge*
Whole structure correct/*Hele struktuur korrek:* $\frac{2}{2}$
Only functional group correct/*Slegs funksionele groep korrek:* $\frac{1}{2}$

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

(2)
[18]

QUESTION 3/*VRAAG 3*

3.1 C ✓ (1)

3.2

3.2.1 Chain length/molecular size/molecular mass/number of carbon atoms in the chain. ✓
Kettinglengte/molekulêre grootte/molekulêre massa/aantal koolstof-atome in die ketting. (1)

3.2.2 Boiling point ✓
Kookpunt (1)

3.3 London (forces)/induced dipole (forces)/dispersion (forces) ✓
London (kragte)/geïnduseerde dipool (kragte)/dispersie (kragte) (1)

3.4 Higher than ✓
Hoër as (1)

3.5 Lower than/*Laer as* ✓

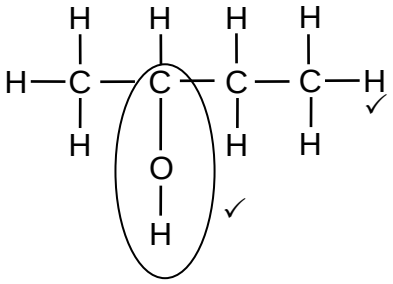
- Both compounds D and E have hydrogen bonding between molecules. ✓
  Beide verbindings D en E het waterstofbinding tussen molekule.
- Compound D has one site for hydrogen bonding whilst compound E has two sites for hydrogen bonding/forms dimers
  OR
  Compound D has less sites for hydrogen bonding/weaker hydrogen bonding than compound E. ✓
  Verbinding D het een punt vir waterstofbinding terwyl verbinding E twee punte het vir waterstofbinding./vorm dimere
  OF
  Verbinding D het minder punte vir waterstofbinding/swakker waterstofbinding as verbinding E.
- More energy needed to overcome intermolecular forces in compound E/less energy needed to overcome intermolecular forces in compound D. ✓
  Meer energie nodig om die intermolekulêre kragte te oorkom in verbinding E/minder energie nodig om die intermolekulêre kragte in verbinding E te oorkom. (4)

[9]

QUESTION 4/*VRAAG 4*

4.1 Unsaturated ✓
Onversadig
Contains a double bond/multiple bond (between C atoms). ✓
Bevat 'n dubbelbinding/meervoudige binding (tussen C-atome). (2)

4.2.1



Notes/*Aantekeninge*
Whole structure correct /*Hele struktuur korrek:* $\frac{2}{2}$
Only functional group correct/*Slegs funksionele groep korrek:* $\frac{1}{2}$

(2)

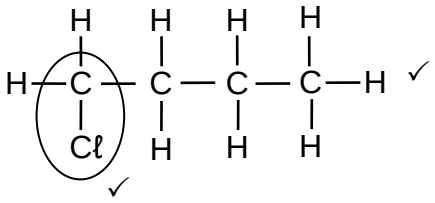
4.2.2 Addition/hydration ✓
Addisie/hidrasie (1)

4.3
4.3.1 2-chlorobutane ✓✓
2-chlorobutaan

Notes/*Aantekeninge*:
IF/*INDIEN*:
Correct IUPAC name, but one or more of the following errors: omitting hyphens and/or commas; including extra spaces and/or hyphens
Korrekte IUPAC-naam, maar een of meer van die volgende foute: weglating van koppeltekens en/of kommas; insluiting van ekstra spasies en/of koppeltekens
Max./*Maks.* $\frac{1}{2}$

(2)

4.3.2



Notes/*Aantekeninge*
Whole structure correct/*Hele struktuur korrek:* $\frac{2}{2}$
Only functional group correct/*Slegs funksionele groep korrek:* $\frac{1}{2}$

(2)

4.4 **NO POSITIVE MARKING FROM QUESTION 4.3.1.**
4.4.1 ***GEEN POSITIEWE NASIEN VANAF VRAAG 4.3.1.***

- H_2O OR dilute NaOH/KOH ✓
  H_2O OF verdunde NaOH/KOH
- Mild heat/*Matige hitte* ✓ (2)

4.4.2 Substitution/hydrolysis ✓
Substitusie/hidrolise (1)

4.4.3 $C_4H_9C\ell + NaOH$ ✓ $\rightarrow C_4H_{10}O + NaC\ell$ ✓ bal. ✓

OR/*OF*
$C_4H_9C\ell + H_2O$ ✓ $\rightarrow C_4H_{10}O + HC\ell$ ✓ bal. ✓

Notes/*Aantekeninge*

- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse ✓ *Produkte* ✓ *Balansering* ✓
- Do not penalise if C_4H_9OH instead of $C_4H_{10}O$./*Moenie penaliseer indien C_4H_9OH in plaas van $C_4H_{10}O$*
- Ignore/*Ignoreer* ⇌
- Marking rule 6.3.10/*Nasienreël 6.3.10*
- Condensed structural formulae or structural formulae:
  Gekondenseerde struktuurformules of struktuurformules: Max./*Maks.* $^2/_3$

(3)
[15]

QUESTION 5/*VRAAG 5*

5.1 Exothermic/*Eksotermies* ✓
Temperature increases during reaction./$T_i < T_f$ ✓
Temperatuur verhoog tydens die reaksie./$T_i < T_f$ (2)

5.2 Larger surface area in experiment 2. ✓
Groter reaksieoppervlakte in eksperiment 2.
OR/*OF*
Smaller surface area in experiment 1. ✓
Kleiner reaksieoppervlakte in eksperiment 1. (1)

5.3 More than one independent variable. ✓
Meer as een onafhanklike veranderlike.
OR/*OF*
Different concentrations and state of division. ✓
Verskillende konsentrasies en toestand van verdeeldheid. (1)

5.4 Faster than ✓
Vinniger as
A catalyst was used in experiment 5. ✓
'n Katalisator is gebruik in eksperiment 5.

- A catalyst provides an alternative pathway of lower activation energy. ✓
  'n Katalisator voorsien 'n alternatiewe pad van laer aktiveringsenergie.
- More molecules have sufficient/enough kinetic energy.
  Meer molekule het voldoende/genoeg kinetiese energie. ✓
  OR/*OF*
  More molecules have kinetic energy equal to or greater than the activation energy.
  Meer molekule het kinetiese energie gelyk aan of groter as die aktiveringsenergie.
- More effective collisions per unit time./Rate or frequency of effective collisions increases. ✓
  Meer effektiewe botsings per eenheidstyd./Tempo of frekwensie van effektiewe botsings neem toe. ✓ (5)

5.5

Marking criteria/*Nasienriglyne*:

- Formula/*Formule*: $n = \frac{n}{M}$
- Substitute/*Vervang* 65
- Use ratio/*Gebruik verhouding* 1 : 2
- Substitute mole acid in rate equation/*Vervang mol suur in tempovergelyking*
- Substitute time in rate equation/*Vervang tyd in tempovergelyking*
- Final answer/*Finale antwoord*: 0,004615 – 0,00463 mol·s^{-1}

$n(Zn) = \frac{n}{M}$ ✓

$= \frac{1,2}{65}$ ✓

$= 0,018$ mol

n(HCℓ reacted/*gereageer*) = 2(0,018) ✓ = 0,037 mol

$\text{rate/tempo} = \frac{\Delta n}{\Delta t}$

$= \frac{0,037}{8}$ ✓ **OR/*OF*** $= \frac{-0,037}{8}$

$= 4,63 \times 10^{-3}$ mol·s^{-1} **OR/*OF*** $- 4,63 \times 10^{-3}$ mol·s^{-1} ✓

Accept range/*aanvaar gebied*: 0,004615 – 0,00463 mol·s^{-1} (6)
[15]

QUESTION 6/VRAAG 6

6.1 A reaction is reversible when products can be converted back to reactants. ✓
'n Reaksie is omkeerbaar wanneer die produkte terug verander kan word na reaktanse. (1)

6.2 No change ✓
Geen verandering (1)

6.3

6.3.1 Temperature decreases ✓
Temperatuur verlaag (1)

Accept/*Aanvaar*:
Temperature changes
Temperatuur verander

6.3.2 Decrease in temperature decreases the rate of both forward and reverse reactions. ✓
Verlaging in temperatuur verlaag die tempo van beide die voorwaartse en terugwaartse reaksies.
Decrease in temperature favours the exothermic reaction. ✓
Verlaging in temperatuur bevoordeel die eksotermiese reaksie.
The rate of the reverse (exothermic) reaction is faster or the reverse reaction is favoured./The rate of the forward (endothermic) reaction is slower. ✓
Die tempo van die terugwaartse (eksotermiese) reaksie is vinniger of die terugwaartse reaksie word bevoordeel./Die tempo van die voorwaartse (endotermiese) reaksie is stadiger. (3)

6.4

Mark criteria/*Nasienriglyne:*

- Correct K_c expression (formulae in square brackets).✓
  Korrekte K_c uitdrukking (formules in vierkanthakies).
- *Divide equilibrium moles by 2 dm*^{3}. ✓
  Deel aantal mol by ewewig deur 2 dm^3.
- At equilibrium: $[H_2] = [I_2] = x$/By ewewig: $[H_2] = [I_2]$ ✓
- *Substitution of concentrations into* K_c expression. ✓
  Vervanging van konsentrasies in K_c-uitdrukking.
- *Substitution of* K_c value. ✓
  Vervanging van K_c-waarde.
- Final answer/*Finale antwoord*: $2,83 \times 10^{-3}$ mol·dm^{-3} ✓

OPTION 1/*OPSIE 1*

At equilibrium/*by ewewig*: $[H_2] = [I_2]$ ✓

$K_c = \frac{[H_2][I_2]}{[HI]^2}$ ✓

$\therefore 0,02$ ✓ $= \frac{(x)(x)}{\left(\frac{0,04}{2}\right)^2}$ ✓ Divide by 2 dm^3 ✓
Deel deur 2 dm^3

$\therefore x = [H_2] = 2,83 \times 10^{-3}$ mol·dm^{-3} ✓ (0,0028 mol·dm^{-3})

No K_c expression, correct substitution: *Geen K_c-uitdrukking, korrekte substitusie:*	Max./*Maks.* 5/6
Wrong K_c expression/*Verkeerde K_c-uitdrukking*:	Max./*Maks.* 2/6

OPTION 2/*OPSIE 2*

	HI	H_2	I_2	
Initial quantity (mol) *Aanvangshoeveelheid (mol)*	x	0	0	
Change (mol) *Verandering (mol)*	x - 0,04	$\frac{x-0,04}{2}$	$\frac{x-0,04}{2}$	ratio ✓ *verhouding*
Quantity at equilibrium (mol)/ *Hoeveelheid by ewewig (mol)*	0,04	$\frac{x-0,04}{2}$	$\frac{x-0,04}{2}$	
Equilibrium concentration (mol·dm^{-3}) *Ewewigskonsentrasie (mol·dm^{-3})*	0,02	$\frac{x-0,04}{4}$	$\frac{x-0,04}{4}$	Divide by 2 dm^3 ✓ *Deel deur* 2 dm^3

$K_c = \frac{[H_2][I_2]}{[HI]^2}$ ✓

$\therefore 0,02$ ✓ $= \frac{(\frac{x-0,04}{4})(\frac{x-0,04}{4})}{(0,02)^2}$ ✓

$\therefore x = 0,05$

No K_C expression, correct substitution/*Geen K_c-uitdrukking*, *korrekte substitusie*: Max./*Maks.* 5/6
Wrong K_C expression/*Verkeerde K_c-uitdrukking*: Max./M*aks.* 2/6

$[H_2] = \frac{x-0,04}{2}$

$= \frac{0,05-0,04}{2}$

$= 2,83 \times 10^{-3}$ mol·dm^{-3} ✓ (6)

6.5 $K_c = \frac{1}{0,02}$

$= 50$ ✓ (1)

6.6 Increases ✓
Vermeerder (1)

[14]

QUESTION 7/*VRAAG 7*

7.1

7.1.1 An acid is a proton (H^+ ion) donor. ✓✓
'n Suur is 'n proton (H^+ ioon) -donor/-skenker. (2)

7.1.2 It ionises to form 2 protons/2 moles of $H^{\pm}$ ions.
Dit ioniseer om 2 protone/2 mol $H^{\pm}$-ione te vorm.
OR/*OF*
It donates 2 H^+ ions per H_2SO_4 molecule. ✓
Dit skenk 2 H^+ ione per H_2SO_4 -molekuul. (1)

7.2

7.2.1 Amphiprotic (substance)/Ampholyte ✓
Amfiprotiese (stof)/Amfoliet (1)

7.2.2 H_2CO_3 (aq) ✓ (1)

7.3

7.3.1 $n(NaHCO_3) = \frac{m}{M}$ ✓

$= \frac{27}{84}$ ✓

= 0,32 mol (0,0321485 mol)

$n(H_2SO_4)$ = ½n($NaHCO_3$) = ½(0,32) ✓ = 0,16 mol (0,01607142 mol)

$c = \frac{n}{V}$ ✓

$6 = \frac{0,16}{V}$ ✓

$\therefore V =$ 0,03 dm^3 ✓ (30 cm^3/0,027 dm^3/27 cm^3) (6)

7.3.2 n_a(initial/*aanvanklik*) = n_a(final/*finaal)*
c_av_a(initial/*aanvanklik*) = c_av_a(final/*finaal*)
$\therefore$ (6)v_a = (0,1)(1) ✓
$\therefore$ v_a = 0,02 dm^3 ✓ (20 cm^3/0,0167 dm^3/16,7 cm^3) (2)

7.3.3 Shows end point (of titration)./Shows when neutralisation occurs. ✓
Toon die eindpunt (van titrasie) aan./Toon aan wanneer neutralisasie plaasvind. (1)

7.3.4

Marking criteria/*Nasienriglyne*:

- Substitute initial [acid] and volume/*Vervang* aanvanklike [suur] en volume
- Substitute initial [base] and volume/*Vervang* aanvanklike [basis] en volume
- Use ratio/*Gebruik verhouding* 1 : 2
- Initial mole acid – mole acid reacted/*Aanvanklike mol suur – mol suur gereageer*
- Substitute volume acid + volume base/*Vervang volume suur + volume basis*
- pH formula/*pH-formule*
- Substitute 2 x c_a in pH formula/Vervang 2 x c_a in pH-formule
- Final answer/*Finale antwoord*: 1,44

n_a(initial/*aanvanklik*) = $c_a v_a$
= (0,1)(25 x 10^{-3}) ✓
= 2,5 x 10^{-3} mol

n_b(reacted/*gereageer)* = $c_b v_b$
= (0,1)(30 x 10^{-3}) ✓
= 3 x 10^{-3} mol

$$\frac{n_a}{n_b} = \frac{1}{2}$$

∴ n_a(neutralised/*geneutraliseer*) = ½n_b = ½(3 x 10^{-3}) ✓= 1,5 x 10^{-3} mol

n_a(left/*oorgebly*) = n_a(initial/*aanvanklik*) - n_a(neutralised/*geneutraliseer*)
= 2,5 x 10^{-3} - 1,5 x 10^{-3} ✓
= 1 x 10^{-3} mol

$$c_a = \frac{n}{V}$$

$$= \frac{1\times10^{-3}}{(25\times10^{-3} + 30\times10^{-3})}$$ ✓

$$= 0{,}018 \text{ mol}\cdot\text{dm}^{-3}$$

pH = -log[H_3O^+] ✓
= -log(2 x 0,018) ✓
= 1,44 ✓ (8)

[22]

QUESTION 8/*VRAAG 8*

8.1 A substance that is being reduced. ✓✓
'n Stof wat gereduseer word.
OR/*OF*
A substance that gains/accepts electrons. ✓✓
'n Stof wat elektrone wen/bykry.
OR/*OF*
A substance whose oxidation number decreases. ✓✓
'n Stof waarvan die oksidasiegetal afneem. (2)

8.2 Ag^+ is a stronger oxidising ✓ agent than Cu^{2+} ✓ and will oxidise Cu ✓ to (blue) Cu^{2+} ions. ✓
Ag^+ is 'n sterker oksideermiddel as Cu^{2+} en sal Cu oksideer na (blou) Cu^{2+}-ione.
OR/*OF*
Cu^{2+} is a weaker oxidising ✓agent than Ag^+ ✓ and Cu will be oxidised ✓ to Cu^{2+} ions✓
Cu^{2+} *is 'n swakker oksideermiddel as* Ag^+ *en sal geoksideer word tot* Cu^{2+}-ione. (4)

8.3 Chemical → Electrical ✓
Chemies → Elektries (1)

8.4 A ✓ (1)

8.5

Option 1/*Opsie 1*	**Notes/*Aantekeninge***
$E^\theta_{cell} = E^\theta_{reduction} - E^\theta_{oxidation}$ ✓ = +0,80 ✓ – 0,34 ✓ = +0,46 V ✓	Accept any other correct formula from the data sheet. *Aanvaar enige ander korrekte formule vanaf gegewensblad.*
Option 2/*Opsie 2*	Any other formula using unconventional abbreviations, e.g. $E^\theta_{cell} = E^\theta_{OA} - E^\theta_{RA}$
✓ $Cu \rightarrow Cu^{2+} + 2e^-$ E° = - 0,34 ✓ $Ag^+ + e^- \rightarrow Ag$ E° = +0,80 ✓ E° = 0,46 V ✓	followed by correct substitutions: 3/4 *Enige ander formule wat onkonvensionele afkortings gebruik bv.* $E^\theta_{sel} = E^\theta_{OM} - E^\theta_{RM}$ *gevolg deur korrekte vervangings:* 3/4

(4)

8.6 $Cu + 2Ag^+(aq)$ ✓→ $Cu^{2+}(aq) + 2Ag(s)$ ✓ Balancing ✓

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

(3)

8.7 Remains the same ✓
Bly dieselfde (1)

[16]

QUESTION 9/*VRAAG 9*

9.1 A solution that conducts electricity (through the movement of ions). ✓✓
'n Oplossing wat elektrisiteit gelei (deur die beweging van ione).

OR/*OF*
A substance that conducts electricity through the movement of ions.
'n Stof wat elektrisiteit gelei deur die beweging van ione.

OR/*OF*
A solution/melt that consists of ions.
'n Oplossing/gesmelte stof wat ione bevat. (2)

9.2
9.2.1 $2H_2O + 2e^- \rightarrow H_2 + 2OH^-$ ✓✓

$2H_2O + 2e^- \rightleftharpoons H_2 + 2OH^-$	$1/2$
$H_2 + 2OH^- \rightarrow 2H_2O + 2e^-$	$0/2$
$H_2 + 2OH^- \rightleftharpoons 2H_2O + 2e^-$	$0/2$
$H_2 + 2OH^- \leftarrow 2H_2O + 2e^-$	$2/2$

(2)

9.2.2 Chlorine gas/$C\ell_2$ ✓
Chloorgas/$C\ell_2$ (1)

9.3 H_2O is a stronger oxidising agent ✓ (than Na^+) and will be reduced ✓ (to H_2).
H_2O is 'n sterker oksideermiddel (as Na^+) en sal gereduseer word (na H_2).
OR/*OF*
The half-reaction that produces $H_2(g)$ has a more positive reduction potential (-0,83 V) than the half-reaction that produces Na (-2,71 V). ✓
Die halfreaksie wat $H_2(g)$ vorm, het 'n meer positiewe reduksie potensiaal (-0,83 V) as die halfreaksie wat Na vorm (-2,71 V).
Therefore water/H_2O will be reduced to H_2./Na^+ will not be reduced to Na. ✓
Daarom word water/H_2O na H_2 gereduseer./Na^+ sal nie gereduseer word na Na nie. (2)
[7]

QUESTION 10/*VRAAG 10*

10.1 Contact process/*Kontakproses* ✓ (1)

10.2

10.2.1 Vanadium pentoxide/Vanadium(V) oxide/V_2O_5 ✓
Vanadiumpentoksied/Vanadium(V) oksied/V_2O_5 (1)

10.2.2 $H_2S_2O_7(\ell) + H_2O(\ell)$ ✓ $\rightarrow 2H_2SO_4\,(\ell)$ ✓ Bal✓

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

(3)

10.3

10.3.1 $H_2SO_4 + 2NH_3$ ✓ $\rightarrow (NH_4)_2SO_4$✓ Bal✓

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

(3)

10.3.2 Ammonium sulphate ✓
Ammoniumsulfaat (1)

10.4

10.4.1 Total percentage of fertiliser. ✓
Totale persentasie kunsmis. (1)

10.4.2

Mass of fertiliser in P/*Massa kunsmis in* P: $\frac{25}{100}$ x 50 = 12,5 kg
Mass of fertiliser in Q/*Massa kunsmis in* Q: $\frac{20}{100}$ x 50 = 10 kg ✓

Amount of potassium in P/*Massa kalium in* P: $\frac{3}{10}$ x 12,5 = 3,75 kg ✓

Amount of potassium in Q/*Massa kalium in Q*: $\frac{4}{8}$ x 10 = 5 kg ✓

Fertiliser Q has more potassium per mass than fertiliser P. ✓
Kunsmis Q het meer kalium per massa as kunsmis P. (4)

[14]

TOTAL/*TOTAAL*: 150