



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:

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

4 ethyl 2,2 dimethylhexane ✓

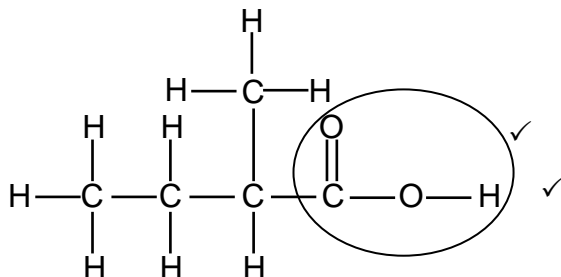
4 etiel 2,2 dimetielheksaan ✓

(2)

2.3 Carbon dioxide/CO₂/Koolstofdioksied ✓
Water/H₂O ✓

(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: $\frac{1}{2}$

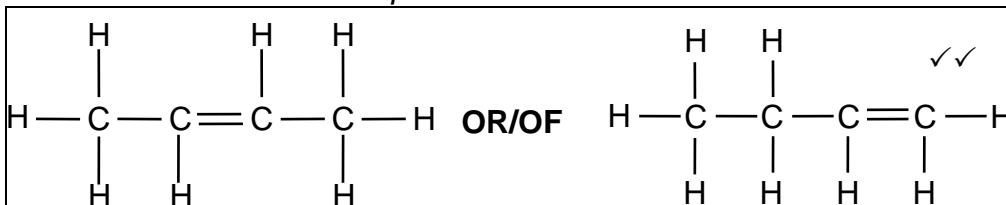
- Molecular formula/Molekulêre formule: $\frac{0}{2}$

(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)

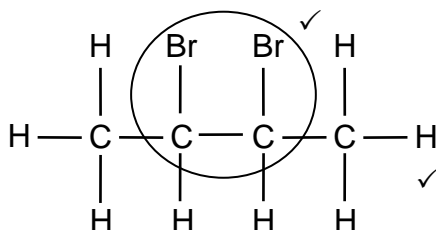
2.5.2

Substitution/halogenation/bromination ✓

Substitusie/halogenering/brominerig

(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)

(4)
[9]

QUESTION 4/VRAAG 4

4.1 Unsaturated ✓

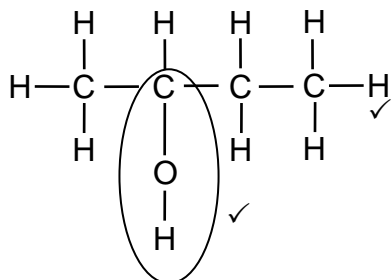
Onversadig

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:

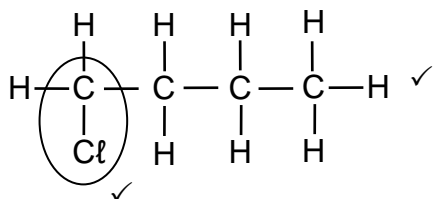
Correct IUPAC name, but one or more of the following errors: omitting hyphens and/or commas; including extra spaces and/or hyphens

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 ✓ (1)
Substitusie/hidrolise

4.4.3 $C_4H_9Cl + NaOH \checkmark \rightarrow C_4H_{10}O + NaCl \checkmark$ bal. ✓

OR/OF

$C_4H_9Cl + H_2O \checkmark \rightarrow C_4H_{10}O + HCl \checkmark$ 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. $\frac{2}{3}$

(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

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

$$= \frac{1,2}{65} \checkmark$$

$$= 0,018 \text{ mol}$$

$$n(\text{HCl reacted/gereageer}) = 2(0,018) \checkmark = 0,037 \text{ mol}$$

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

$$= \frac{0,037 \checkmark}{8 \checkmark} \text{ OR/OF } = \frac{-0,037}{8}$$

$$= 4,63 \times 10^{-3} \text{ mol}\cdot\text{s}^{-1} \text{ OR/OF } - 4,63 \times 10^{-3} \text{ mol}\cdot\text{s}^{-1} \checkmark$$

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: $[\text{H}_2] = [\text{I}_2] = x$ /By ewewig: $[\text{H}_2] = [\text{I}_2]$ ✓
- 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: $2,83 \times 10^{-3} \text{ mol} \cdot \text{dm}^{-3}$ ✓

OPTION 1/OPSIE 1

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

$$K_c = \frac{[H_2][I_2]}{[HI]^2} \checkmark$$

$$\therefore 0,02 \checkmark = \frac{(x)(x)}{\left(\frac{0,04}{2}\right)^2} \checkmark \quad \begin{array}{l} \text{Divide by } 2 \text{ dm}^3 \checkmark \\ \text{Deel deur } 2 \text{ dm}^3 \end{array}$$

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

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./Maks. $\frac{2}{6}$

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

$$K_c = \frac{[H_2][I_2]}{[HI]^2} \checkmark$$

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

$$\therefore x = 0,05$$

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./Maks. $\frac{2}{6}$

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

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

$$= 2,83 \times 10^{-3} \text{ mol}\cdot\text{dm}^{-3} \checkmark \quad (6)$$

6.5 $K_c = \frac{1}{0,02}$
 $= 50 \checkmark \quad (1)$

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^+ ions.
Dit ioniseer om 2 protone/2 mol H^+ -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
$$n(NaHCO_3) = \frac{m}{M} \checkmark$$
$$= \frac{27}{84} \checkmark$$
$$= 0,32 \text{ mol} \quad (0,0321485 \text{ mol})$$
$$n(H_2SO_4) = \frac{1}{2}n(NaHCO_3) = \frac{1}{2}(0,32) \checkmark = 0,16 \text{ mol} \quad (0,01607142 \text{ mol})$$
$$c = \frac{n}{V} \checkmark$$
$$6 = \frac{0,16}{V} \checkmark$$
$$\therefore V = 0,03 \text{ dm}^3 \checkmark \quad (30 \text{ cm}^3/0,027 \text{ dm}^3/27 \text{ cm}^3)$$
 (6)

7.3.2 $n_a(\text{initial/aanvanklik}) = n_a(\text{final/finaal})$
 $c_a v_a(\text{initial/aanvanklik}) = c_a v_a(\text{final/finaal})$
 $\therefore (6)v_a = (0,1)(1) \checkmark$
 $\therefore v_a = 0,02 \text{ dm}^3 \checkmark \quad (20 \text{ cm}^3/0,0167 \text{ dm}^3/16,7 \text{ cm}^3)$ (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 $2 \times c_a$ in pH formula/Vervang $2 \times c_a$ in pH-formule
- Final answer/Finale antwoord: 1,44

$$n_a(\text{initial/aanvanklik}) = c_a v_a$$

$$= (0,1)(25 \times 10^{-3}) \checkmark$$

$$= 2,5 \times 10^{-3} \text{ mol}$$

$$n_b(\text{reacted/gereageer}) = c_b v_b$$

$$= (0,1)(30 \times 10^{-3}) \checkmark$$

$$= 3 \times 10^{-3} \text{ mol}$$

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

$$\therefore n_a(\text{neutralised/geneutraliseer}) = \frac{1}{2}n_b = \frac{1}{2}(3 \times 10^{-3}) \checkmark = 1,5 \times 10^{-3} \text{ mol}$$

$$n_a(\text{left/oorgebly}) = n_a(\text{initial/aanvanklik}) - n_a(\text{neutralised/geneutraliseer})$$

$$= 2,5 \times 10^{-3} - 1,5 \times 10^{-3} \checkmark$$

$$= 1 \times 10^{-3} \text{ mol}$$

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

$$= \frac{1 \times 10^{-3}}{(25 \times 10^{-3} + 30 \times 10^{-3})}$$

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

$$\text{pH} = -\log[\text{H}_3\text{O}^+] \checkmark$$

$$= -\log(2 \times 0,018) \checkmark$$

$$= 1,44 \checkmark$$

(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

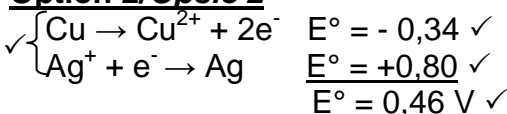
Option 1/Opsie 1

$$E_{cell}^{\theta} = E_{reduction}^{\theta} - E_{oxidation}^{\theta} \checkmark$$

$$= +0,80 \checkmark - 0,34 \checkmark$$

$$= +0,46 \text{ V} \checkmark$$

Option 2/Opsie 2



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. $E_{cell}^{\theta} = E_{OA}^{\theta} - E_{RA}^{\theta}$

followed by correct substitutions: $\frac{3}{4}$

Enige ander formule wat onkonvensionele afkortings gebruik bv. $E_{sel}^{\theta} = E_{OM}^{\theta} - E_{RM}^{\theta}$

gevolg deur korrekte vervangings: $\frac{3}{4}$

(4)

8.6 $Cu + 2Ag^+(aq) \checkmark \rightarrow Cu^{2+}(aq) + 2Ag(s) \checkmark$ 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 Oplissing 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.

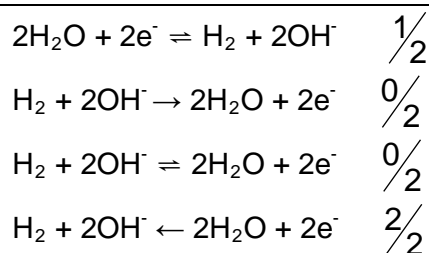
OR/OF

A solution/melt that consists of ions.
'n Oplissing/gesmelte stof wat ione bevat.

(2)

9.2

- 9.2.1 $2\text{H}_2\text{O} + 2\text{e}^- \rightarrow \text{H}_2 + 2\text{OH}^-$ ✓✓



(2)

- 9.2.2 Chlorine gas/ Cl_2 ✓
Chloorgas/ Cl_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 $\text{H}_2(\text{g})$ has a more positive reduction potential (-0,83 V) than the half-reaction that produces Na (-2,71 V). ✓

Die halfreaksie wat $\text{H}_2(\text{g})$ 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*/ N_2O_5 ✓
Vanadiumpentoksied/Vanadium(V) oksied/ N_2O_5 (1)

10.2.2 $H_2S_2O_7(l) + H_2O(l) \rightarrow 2H_2SO_4(l)$ ✓ 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*: $\frac{25}{100} \times 50 = 12,5 \text{ kg}$ }
 Mass of fertiliser in Q/*Massa kunsmis in Q*: $\frac{20}{100} \times 50 = 10 \text{ kg}$ } ✓

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

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

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