



# 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.***

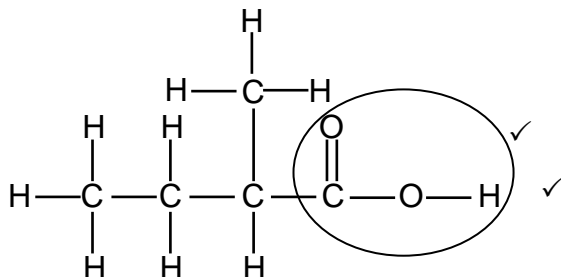
**QUESTION 1/VRAAG 1**

- 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<sub>2</sub>/Koolstofdioksied ✓  
Water/H<sub>2</sub>O ✓ (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:  $\frac{1}{2}$

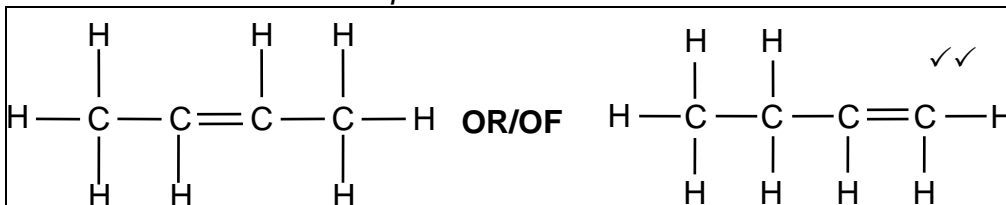
- Molecular formula/Molekulêre formule:  $\frac{0}{2}$

(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)

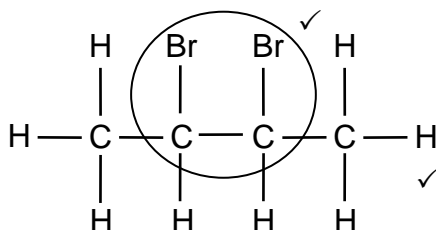
2.5.2

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 ✓

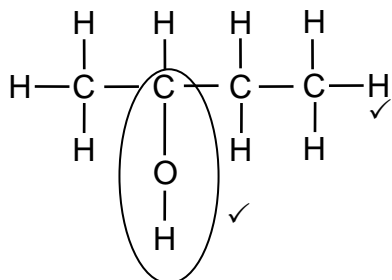
*Onversadig*

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:**

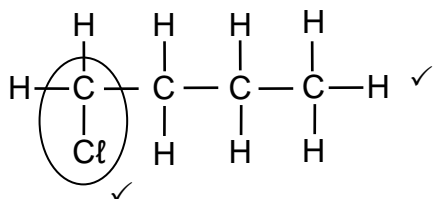
Correct IUPAC name, but one or more of the following errors: omitting hyphens and/or commas; including extra spaces and/or hyphens

*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<sub>2</sub>O OF verdunde NaOH/KOH*
- Mild heat/Matige hitte ✓

4.4.2 Substitution/hydrolysis ✓  
*Substitusie/hidrolise* (1)

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<sub>4</sub>H<sub>9</sub>OH in plaas van C<sub>4</sub>H<sub>10</sub>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<sup>-1</sup>

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

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

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

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

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

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

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

Accept range/aanvaar gebied: 0,004615 – 0,00463 mol·s<sup>-1</sup>

(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)

<b>Accept/Aanvaar:</b> 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  $2 \text{ dm}^3$ . ✓  
*Deel aantal mol by ewewig deur  $2 \text{ dm}^3$ .*
- 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 <sub>2</sub>	I <sub>2</sub>	
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 <sup>-3</sup> ) Ewewigskonsentrasie (mol·dm <sup>-3</sup> )	0,02	$\frac{x - 0,04}{4}$	$\frac{x - 0,04}{4}$	Divide by 2 dm <sup>3</sup> ✓ Deel deur 2 dm <sup>3</sup>

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

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

$$\therefore x = 0,05$$

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

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

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

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.  $\frac{2}{6}$

6.5

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

$$= 50 \checkmark$$

(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

$$\begin{aligned}n_a(\text{initial/aanvanklik}) &= c_a v_a \\ &= (0,1)(25 \times 10^{-3}) \checkmark \\ &= 2,5 \times 10^{-3} \text{ mol}\end{aligned}$$

$$\begin{aligned}n_b(\text{reacted/gereageer}) &= c_b v_b \\ &= (0,1)(30 \times 10^{-3}) \checkmark \\ &= 3 \times 10^{-3} \text{ mol}\end{aligned}$$

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

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

$$\begin{aligned}n_a(\text{left/oorgebly}) &= n_a(\text{initial/aanvanklik}) - n_a(\text{neutralised/geneutraliseer}) \\ &= 2,5 \times 10^{-3} - 1,5 \times 10^{-3} \checkmark \\ &= 1 \times 10^{-3} \text{ mol}\end{aligned}$$

$$\begin{aligned}c_a &= \frac{n}{V} \\ &= \frac{1 \times 10^{-3}}{(25 \times 10^{-3} + 30 \times 10^{-3})} \\ &= 0,018 \text{ mol} \cdot \text{dm}^{-3}\end{aligned}$$

$$\begin{aligned}\text{pH} &= -\log[\text{H}_3\text{O}^+] \checkmark \\ &= -\log(2 \times 0,018) \checkmark \\ &= 1,44 \checkmark\end{aligned}$$

(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)

<p>8.5 <b>Option 1/Opsie 1</b> <math>E_{cell}^{\theta} = E_{reduction}^{\theta} - E_{oxidation}^{\theta}</math> ✓ <math>= +0,80</math> ✓ <math>- 0,34</math> ✓ <math>= +0,46</math> V ✓</p> <p><b>Option 2/Opsie 2</b> ✓ <math>\begin{cases} Cu \rightarrow Cu^{2+} + 2e^{-} &amp; E^{\circ} = - 0,34 \text{ ✓} \\ Ag^{+} + e^{-} \rightarrow Ag &amp; E^{\circ} = +0,80 \text{ ✓} \\ &amp; E^{\circ} = 0,46 \text{ V } \checkmark \end{cases}</math></p>	<p><b>Notes/Aantekeninge</b> Accept any other correct formula from the data sheet. <i>Aanvaar enige ander korrekte formule vanaf gegewensblad.</i></p> <p>Any other formula using unconventional abbreviations, e.g. <math>E_{cell}^{\theta} = E_{OA}^{\theta} - E_{RA}^{\theta}</math> followed by correct substitutions: <math>\frac{3}{4}</math> <i>Enige ander formule wat onkonvensionele afkortings gebruik bv. <math>E_{sel}^{\theta} = E_{OM}^{\theta} - E_{RM}^{\theta}</math> gevolg deur korrekte vervangings: <math>\frac{3}{4}</math></i> (4)</p>
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8.6  $Cu + 2Ag^{+}(aq) \checkmark \rightarrow Cu^{2+}(aq) + 2Ag(s) \checkmark$  Balancing ✓

<b>Notes/Aantekeninge</b>		
• Reactants ✓ <i>Reaktanse ✓</i>	• Products ✓ <i>Produkke ✓</i>	• Balancing ✓ <i>Balansering ✓</i>
• 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.

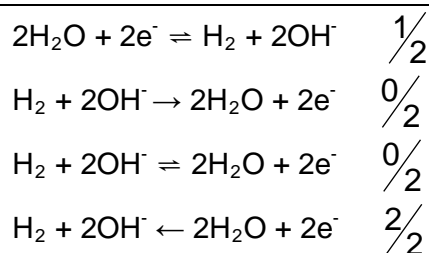
**OR/OF**

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/ $\text{Cl}_2$  ✓  
Chloorgas/ $\text{Cl}_2$

(1)

- 9.3  $\text{H}_2\text{O}$  is a stronger oxidising agent ✓ (than  $\text{Na}^+$ ) and will be reduced ✓ (to  $\text{H}_2$ ).  
 $\text{H}_2\text{O}$  is 'n sterker oksideermiddel (as  $\text{Na}^+$ ) en sal gereduseer word (na  $\text{H}_2$ ).

**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/ $\text{H}_2\text{O}$  will be reduced to  $\text{H}_2$ ./ $\text{Na}^+$  will not be reduced to Na. ✓

Daarom word water/ $\text{H}_2\text{O}$  na  $\text{H}_2$  gereduseer./ $\text{Na}^+$  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**