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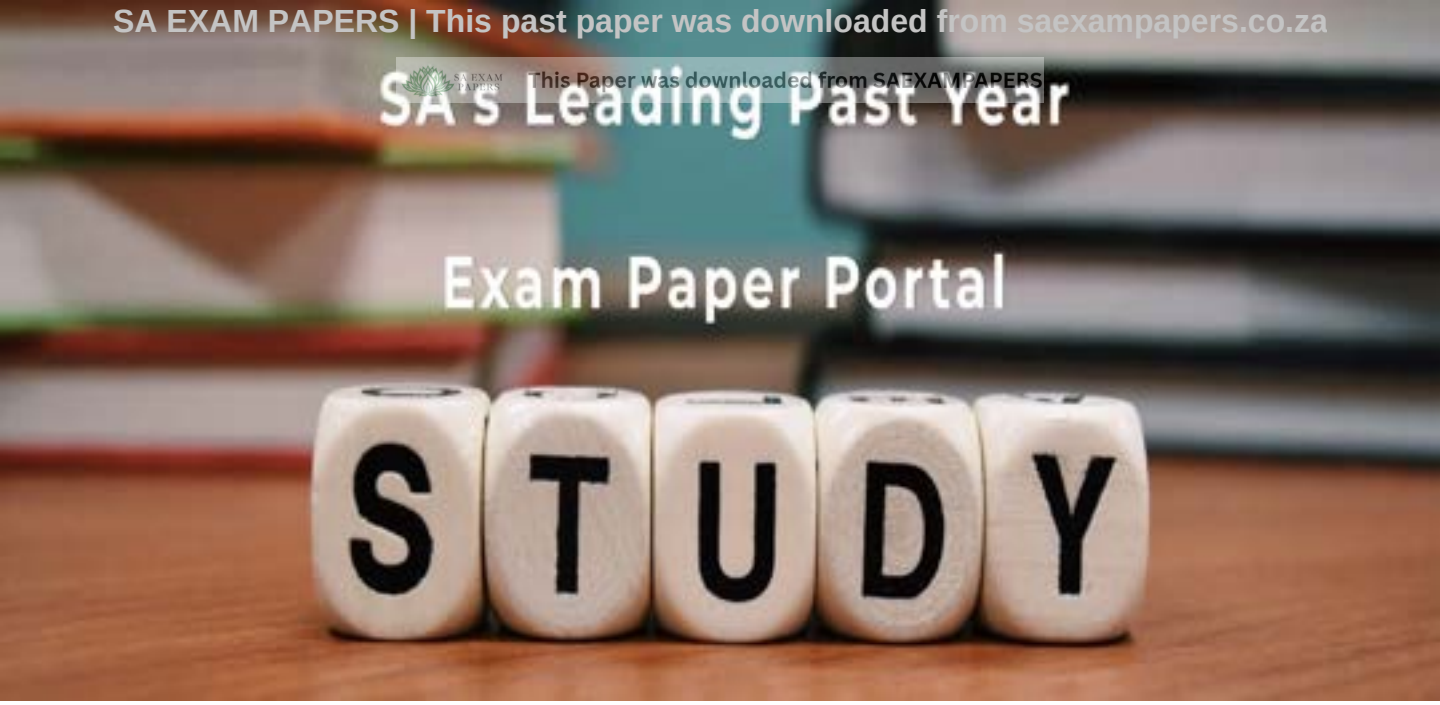

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD 12*

SEPTEMBER 2025

PHYSICAL SCIENCES P2: CHEMISTRY/ *FISIESE WETENSKAPPE V2: CHEMIE* MARKING GUIDELINE / *NASIENRIGLYN*

MARKS/*PUNTE*: 150

This marking guideline consists of 17 pages./
Hierdie nasienriglyn bestaan uit 17 bladsye.

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QUESTION/*VRAAG* 1

1.1	B ✓✓	(2)
1.2	C ✓✓	(2)
1.3	D ✓✓	(2)
1.4	C ✓✓	(2)
1.5	B ✓✓	(2)
1.6	C ✓✓	(2)
1.7	A ✓✓	(2)
1.8	C ✓✓	(2)
1.9	D ✓✓	(2)
1.10	D ✓✓	(2)

[20]

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QUESTION/*VRAAG* 2

2.1 A series of organic compounds that can be described by the same general formula. ✓✓
'n Reeks organiese verbindings wat deur dieselfde algemene formule beskryf kan word.

OR / *OF*

A series of organic compounds in which one member differs from the next with a CH_2 group. ✓✓
'n Reeks organiese verbindings waarin een lid van die volgende met 'n CH_2-groep verskil. (2)

2.2 2.2.1 C ✓ (1)

2.2.2 E ✓ (1)

2.2.3 D and/*en* E ✓✓ (2)

2.3 2.3.1 4-chloro-2-methylhexane ✓✓✓
4-chloro-2-metielheksaan

Marking criteria/*Nasienkriteria*:
- hexane / *heksaan* ✓
- chloro and methyl / *en metiel* ✓
- Whole name correct / *Hele naam korrek* ✓

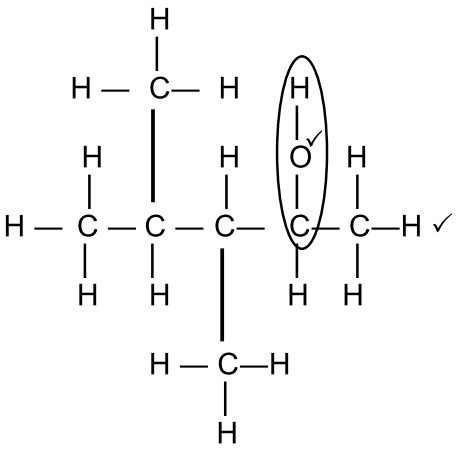
(3)

2.3.2 4-methylpent-2-yne ✓✓
4-metielpent-2-yn
OR / *OF*
4-methyl-2-pentyne ✓✓
4-metiel-2-pentyn

Marking criteria/*Nasienkriteria*:
- Pentyne / *Pentyn* ✓
- Whole name correct / *Hele naam korrek* ✓

(2)

2.4



Marking criteria/*Nasienkriteria*:
- Correct functional group. ✓
- Whole structure correct ✓
- *Korrek functionele groep*
- *Hele struktuur korrek*

(2)

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2.5 2.5.1

Marking criteria/ *Nasienkriteria*
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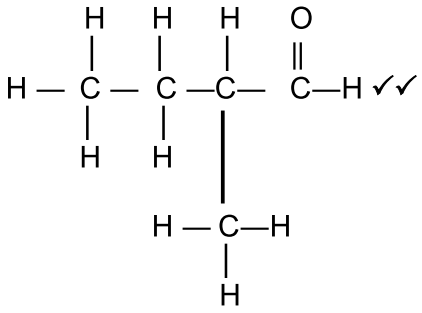
*Indien enige van onderstreepte die sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per woord/frase.*

Compounds with the same molecular formula but different positions of the side chain, substituents or functional group on the parent chain. ✓✓

Verbindings met dieselfde molekulêre formule, maar verskillende posisies van die syketting, substituente of funksionele groepe op die stamketting. (2)

2.5.2



Marking criteria/*Nasienkriteria*:
- Position of the methyl group moved to carbon 2 ✓
- Whole structure correct ✓
- *Posisie van metiel groep verskuif na koolstof 2*
- *Hele struktuur korrek*

NOTE: If position of functional group is changed then 0/2
LET WEL: *As die posisie van die funksionele groep verander dan 0/2*

(2)

2.6 2.6.1

Using oxygen/*gebruik suurstof*	**Using hydrogen/gebruik waterstof**
P (2) + 6(1) = 8(2) ✓	6 x 2 = 12 C_xH_{12} ✓ ∴ C_5H_{12}
P = 5 ✓	P = 5 ✓

(2)

2.6.2 $CH_3CH_2CH_2CH_2CH_3$ ✓✓ (2)

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QUESTION/*VRAAG* 3

Marking criteria/ *Nasienkriteria*
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- 1 mark per word/phrase.
*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per woord/frase.*

3.1 The pressure exerted by a vapour at equilibrium with its liquid in a closed system. ✓✓

Die druk wat deur damp uitgeoefen word by ewewig met sy vloeistof in 'n geslote sisteem. (2)

3.2 LIQUID ✓

The boiling points of the substances are above room temperature. ✓

OR

The vapour pressure of the substances at 25 °C are below the atmospheric pressure. ✓

VLOEISTOF

Die kookpunt van die stowwe is hoër as kamertemperatuur.

OF

Die dampdruk van die stowwe by 25 °C is laer as die atmosferiese druk. (2)

3.3 DECREASES / *LAER AS*. ✓ (1)

3.4 The longer the chainlength / stronger the intermolecular forces the lower the vapour pressure. ✓✓

Hoe langer die kettinglengte / sterker die intermolekulêrekragte hoe laer die dampdruk. (2)

3.5 3.5.1

Marking criteria/ *Nasienkriteria*
If any of the underlined key words/phrases in the **correct context** are omitted: - 1 mark per word/phrase.
*Indien enige van die onderstrerepte sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per woord/frase.*

The temperature at which the vapour pressure of a substance equals the atmospheric pressure. ✓✓

Die temperatuur waarteen die dampdruk van 'n stof gelyk is aan die atmosferiese duk. (2)

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3.5.2

Marking criteria
- Identify the number of sites of hydrogen bonds in propan-1-ol
- Identify the number of sites of hydrogen bonds in propanoic acid
- Compare the strength of the hydrogen bonds / intermolecular forces
- Relate the strength of intermolecular to energy involved.

Nasienkriteria
- *Identifiseer die aantal waterstofbindings in propan-1-ol*
- *Identifiseer die aantal waterstofbindings in propanoësuur*
- *Vergelyk die sterkte van die waterstofbindings / intermolekulêrekragte*
- *Vergelyk die energie van die intermolekulêrekragte*

- One site of hydrogen bonds in propan-1-ol/A ✓
- Two sites of hydrogen bonds in propanoic acid/B ✓
- Hydrogen bonds / intermolecular forces in propanoic acid/B are stronger than that of propan-1-ol/A ✓
- More energy is needed to overcome the intermolecular forces is propanoic acid/B ✓

OR

- One site of hydrogen bonds in propan-1-ol/A ✓
- Two sites of hydrogen bonds in propanoic acid/B ✓
- Hydrogen bonds/ intermolecular forces in propan-1-ol/A is weaker than that of propanoic acid/B ✓
- Less energy is needed to overcome the intermolecular forces is propan-1-ol/A ✓

- *Een plek vir waterstofbindings in propan-1-ol/A*
- *Twee plekke vir waterstofbindins in propanoësuur/B*
- *Waterstofbinding/ intermolekulêrekragte in propanoësuur/B is sterker as dié van propan-1-ol/A*
- *Meer energie word benodig om die intermolekulêrekragte in propanoësuur/B te oorkom*

OF

- *Een plek vir waterstofbindings in propan-1-ol/A*
- *Twee plekke vir waterstofbindins in propanoësuur/B*
- *Waterstofbinding / intermolekulêrekragte in propan-1-ol/A is swakker as dié van propanoësuur/B*
- *Minder energie word benodig om die intermolekulêrekragte in propan-1-ol/A te oorkom*

(4)
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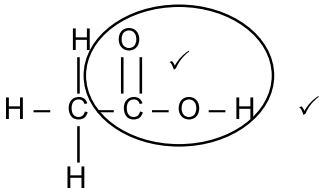
QUESTION/*VRAAG* 4

4.1 4.1.1 Esterification/Condensation/*Esterifikasie/Versteuring* ✓ (1)

4.1.2 

✓ ✓

Marking criteria/*Nasienkriteria*
- Correct functional group ✓
  Funksionele groep korrek
- Whole structure correct ✓
  Hele struktuur korrek

(2)

4.2 4.2.1 H_2SO_4 / Sulphuric acid / *Swawelsuur* ✓ (1)

4.2.2 But-1-ene/ 1-Butene/ *But-1-een /1-Buteen* ✓✓ (2)

4.3 4.3.1 Hydrohalogenation/*Hidrohalogenering* ✓ (1)

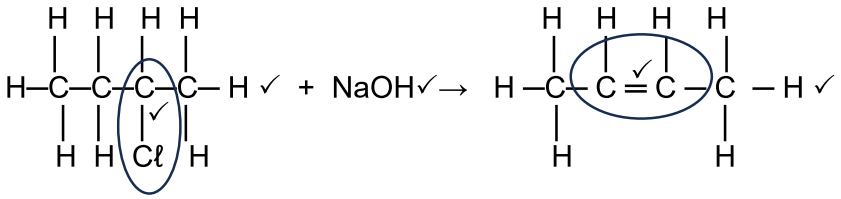
4.3.2 Secondary Halolalkane ✓

The halogen/Cℓ is bonded to a secondary carbon. /The halogen/Cℓ is bonded to a carbon that is bonded to two other carbon atoms. /The halogen/Cℓ is bonded to a carbon that contains one hydrogen atom. ✓

Sekondêre haloalkaan

Die halogeen/Cℓ is aan 'n sekondêre koolstof verbind. /Die halogeen/ Cℓ is verbind aan 'n koolstof wat verbind is aan twee ander koolstofatome./ Die halogeen/ Cℓ is verbind aan 'n koolstof wat een waterstof atoom bevat. (2)

4.4 4.4.1 Elimination/dehydrohalogenation/
Eliminasie/dehidrohalogenering ✓ (1)

4.4.2 

✓ ✓ ✓ ✓ ✓

Marking criteria for organic compounds/
Nasienkriteria vir organiese verbindings
- Correct functional group ✓
  Funksionele groep korrek
- Whole structure correct ✓
  Hele struktuur korrek

Inorganic reagent / Anorganiese reagense
- NaOH, ✓ NaBr and H_2O ✓

(6)
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QUESTION/*VRAAG* 5

5.1 **Marking criteria/ *Nasienkriteria***
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- 1 mark per word/phrase.
*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per woord/frase.*

ANY ONE
Change in concentration ✓ of reactant or product per (unit) time. ✓
Change in amount/ number of moles/ volume/ mass of products or reactants per (unit) time. ✓✓
Change in amount/ number of moles/ volume/ mass of products formed or reactants used reactants per (unit) time. ✓✓

ENIGE EEN
Verandering in konsentrasie van reaktanse of produkte per (eenheid) tyd.
Verandering in hoeveelheid/ getal mol/ volume /massa van produkte of reaktanse per (eenheid) tyd.
Verandering in hoeveelheid/ getal mol/ volume/ massa van produkte gevorm/ reaktanse gebruik per (eenheid) tyd.

OR/*OF*

The rate of change in concentration/amount of moles/number of moles/volume /mass. ✓✓ **(2 or 0)**
Die tempo van verandering in konsentrasie/hoeveelheid mol/getal mo/volume/ massa. ***(2 of 0)*** (2)

5.2 Volume of carbon dioxide (CO_2) gas produced remains constant/No CO_2 gas bubbles produced ✓
Volume koolstof dioksied (CO_2) wat geproduseer word bly konstant/Geen CO_2 gasborrels word geproduseer. (1)

5.3 5.3.1 Reaction rate / *Reaksietempo*

$$= \frac{\Delta V}{\Delta t}$$

$$= \frac{147 - 0 \checkmark}{50 \checkmark}$$

$$= 2{,}94 \text{ (cm·s}^{-1}\text{)} \checkmark$$ (3)

5.3.2 **Marking criteria/ *Nasienkriteria***
(a) Substitution into/ *Vervanging in* n = V/ Vm
(b) Use of mole ratio/ *Gebruik van mol verhouding* $CaCO_3 : CO_2$
(c) Substitution into/ *Vervanging in* m = nM
(d) Substitution into *percentage purity equation*/ *Vervanging in persentasie suiwerheid vergelyking*
(e) Final answer/ *Finale Antwoord*

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

$= \frac{147}{24\ 000}$ (a) ✓

$n = 6{,}125 \times 10^{-3}$ mol

$n(CaCO_3) = n(CO_2) = 6{,}125 \times 10^{-3}$ mol (b) ✓

$m = nM$

$m(CaCO_3) = (6{,}125 \times 10^{-3})(100)$ (c) ✓

$m(CaCO_3) = 0{,}6125$ g

% purity/ *suiwerheid* $= \frac{0{,}6125}{2{,}5} \times 100$ (d) ✓

% purity/ *suiwerheid* = 24,5 % (e) ✓

(5)

5.4 5.4.1 INCREASES / *TOENEEM* ✓ (1)

5.4.2
- Powdered $CaCO_3$ will increase the surface area/contact area/ increases the state of division of $CaCO_3$. ✓
- More particles will collide with the correct orientation. ✓
- More effective collisions per unit time / Frequency of the effective collisions increase ✓

- *Gepoeierde $CaCO_3$ sal die oppervlakte/kontakarea vergroot/vergroot die toestand van verdeling van $CaCO_3$.*
- *Meer deeltjies sal met die korrekte oriëntasie bots*
- *Meer effektiewe botsings per eenheidstyd/ Frekwensie van die effektiewe botsings neem toe* (3)

5.5 5.5.1 Particles with sufficient kinetic energy for effective collisions. ✓
Deeltjies met genoeg kinetiese energie vir effektiewe botsings. (1)

5.5.2 INCREASE/ TOENEEM ✓

An increase in temperature increases the average kinetic energy of the particles. ✓
'n Toename in temperatuur verhoog die gemiddelde kinetiese energie van die deeltjies. (2)

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QUESTION/*VRAAG 6*

6.1

Marking criteria/ *Nasienkriteria*
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- 1 mark per word/phrase.
*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per word/frase.*

When the equilibrium in a closed system is disturbed, the system will re-instate a new equilibrium by favouring the reaction that will oppose/cancel the disturbance. ✓✓

Wanneer die ewewig in 'n geslote sisteem versteur word, sal die sisteem 'n nuwe ewewig herstel deur die reaksie wat die versteuring sal teenwerk/ kanselleer, te bevoordeel. (2)

6.2 6.2.1 Blue/*Blou* ✓ (1)

6.2.2 Green/*Groen* ✓ (1)

6.3
- The addition of saturated sodium chloride solution increases the concentration of the chloride ions ($C\ell^-$). ✓
- According to Le Chatelier's principle the system will respond by consuming the $Cu(H_2O)_6^{2+}$ and $C\ell^-$ ✓
- The forward reaction will be favoured / the equilibrium position shifts towards right ✓

- *Die byvoeging van versadigde natriumchloriedoplossing verhoog die konsentrasie van die chloriedione ($C\ell^-$).*
- *Volgens Le Chatelier se beginsel sal die sisteem reageer deur die $Cu(H_2O)_6^{2+}$ en $C\ell^-$ op te gebruik*
- *Die voortwaartse reaksie word bevoordeel/Die ewewigsposisie verskuif na regs* (3)

6.4 6.4.1 INCREASES / *TOENEEM* ✓

- According to Le Chatelier's principle an increase in temperature favours the endothermic reaction. ✓
- The forward reaction is favoured / the equilibrium position shifts towards right. ✓
- More CO_2 is produced.

- *Volgens Le Chatelier se beginsel 'n toename in temperatuur bevoordeel die endotermiese reaksie.*
- *Die voortwaartse reaksie word bevoordeel/ die ewewigsposisie verskuif regs.*
- *Meer CO_2 word geproduseer.* (3)

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6.4.2 **OPTION 1 / *OPSIE 1***

Marking criteria:

(a) Correct Kc expression ✓
(b) Substitution into correct Kc expression ✓
(c) Calculation of moles of CO_2 by substitution into n = cV ✓
(d) The use of molar ratio to calculate reacted moles of $CaCO_3$ ✓
(e) Calculating the mol of $CaCO_3$ that is unreacted ✓
(f) Substituting molar mass and unreacted moles of $CaCO_3$ in m = nM ✓
(g) Final answer ✓

Nasienkriteria:

(a) Korrekte Kc-uitdrukking
(b) Vervanging in korrekte Kc-uitdrukking
(c) Bereken die mol van CO_2 deur in n = cV te vervang
(d) Die gebruik van mol verhouding om die aantal mol te bereken van $CaCO_3$ wat reageer het
(e) Bereken die aantal onreageerde mol van $CaCO_3$
(f) Vervanging van molêre massa en onreageerde mole van $CaCO_3$ in m = nM
(g) Finale antwoord ✓

K_c	=	$[CO_2]$ (a) ✓
$[CO_2]$	=	0,0385 mol·dm^{-3} (b) ✓
$n(CO_2)$	=	cV
	=	0,0385 x 2 (c) ✓
	=	0,077 mol
$n(CO_2)$	=	$n(CaCO_3)$
$n(CaCO_3)$	=	0,077mol $CaCO_3$ reacted/reageer (d) ✓
n(unreacted / onreageerde $CaCO_3$)	=	n(Initial) – n(reacted/reageer)
	=	0,24 – 0,077 ✓ (e)
	=	0,163 mol
$m_{(unreacted/onreageerde)}$	=	nM
	=	0,163 x 100 ✓ (f)
	=	16,3 g ✓ (g)

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OPTION 2 / *OPSIE 2*

Marking criteria:

(a) Correct mol ratio
(b) Divide the equilibrium mol of CO_2 by 2
(c) Correct Kc expression ✓
(d) Substitution into correct Kc expression ✓
(e) Calculating the mol of $CaCO_3$ that is unreacted ✓
(f) Substituting molar mass and unreacted moles of $CaCO_3$ in m = nM ✓
(g) Final answer ✓

Nasienkriteria:

(a) Korrekte mol verhouding
(b) Deel ewewigs mol van CO_2 deur 2
(c) Korrekte Kc-uitdrukking
(d) Vervanging in korrekte Kc-uitdrukking
(e) Bereken die aantal onreageerde mol van $CaCO_3$
(f) Vervanging van molêre massa en onreageerde mole van $CaCO_3$ in m = nM
(g) Finale antwoord ✓

	$CaCO_3$ (s)	CaO (s)	CO_2 (g)
Initial mol *Aanvangsmol*	0,24		
Change in mol *Verandering in mol*	- x		+x ✓ (a)
Equilibrium mol *Ewewigsmol*	0,24 - x		x
Concentration			$\frac{x}{2}$ ✓ (b)

K_c = [CO] ✓ (c)

0,038 = $\frac{x}{2}$ ✓ (d)

x = 0,077

n_e = *0,24 – 0,077* ✓ (e)

n_e = *0,163 mol*

m ($CaCO_3$) = nM

m($CaCO_3$) = (0,163)(100) ✓ (f)

($CaCO_3$) = 16,3 g ✓ (g) (7)

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QUESTION/*VRAAG 7*

7.1 7.1.1 Bases produce hydroxide ions (OH^-) in aqueous solution. ✓✓ **(2 or 0)**

Basisse produseer hidroksiedione (OH^-) in waterige oplossing. ***(2 of 0)*** (2)

7.1.2 A ✓ (1)

7.1.3 SO_4^{2-} ✓ (1)

7.2 7.2.1 It ionises incompletely in water ✓ to form low concentration of H_3O^+ ions. ✓

Dit ioniseer onvolledig in water om lae konsentrasie H_3O^+-ione te vorm. (2)

7.2.2 Alkaline salt/Alkaliese sout ✓ (1)

7.2.3 $CH_3COO^- + H_2O \rightarrow CH_3COOH + OH^-$ ✓✓

(reactants / *reaktanse* and / *en* products / *produkte*)

Excess OH^- is produced/*Produseer oormaat OH^-.* ✓ (3)

7.3 7.3.1 Bromothymol blue/*Broomtimol blou* ✓ (1)

7.3.2 **Marking criteria**

(a) Substitution in c_aV_a
(b) Substitution in c_bV_b
(c) Subsitution in n_a/ n_b
(d) Use of mole ratio $H_2SO_4 : H_3O^+$
(e) Formula pH = - log $[H_3O^+]$
(f) Substitution in pH = - log $[H_3O^+]$
(g) Final answer

Nasienkriteria

(a) *Vervanging in* c_aV_a
(b) *Vervanging in* c_bV_b
(c) *Vervanging in* n_a/ n_b
(d) *Gebruik van mol verhouding* $H_2SO_4 : H_3O^+$
(e) *Formule* pH = - log $[H_3O^+]$
(f) *Vervanging in* pH = - log $[H_3O^+]$
(g) *Finale antwoord*

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OPTION 1 / *OPSIE 1*	**OPTION 2 / *OPSIE 2***
$\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$ $\frac{C_a \times 25}{0,2 \times 12,5}$ (a) (b) ✓ ✓ $= \frac{1}{2}$ (c) ✓ $c_a = 0,05$ mol·dm^{-3}	n(NaOH) = cV n(NaOH) = (0,2)(12,5 x 10^{-3}) (a) ✓ n (NaOH) = 2,5 x 10^{-3} mol n (H_2SO_4) = 2 x n (NaOH) n (H_2SO_4) = ½ x (2,5 x 10^{-3}) (b) ✓ n (H_2SO_4) = 1,25 x 10^{-3} mol c = n/V c = 1,25 x 10^{-3} / 25 x 10^{-3} (c) ✓ $c_a = 0,05$ mol·dm^{-3}

$H_2SO_4 + H_2O \rightarrow 2\ H_3O^+ + SO_4^{2-}$

c (H_3O^+) = 2 c (H_2SO_4)

c (H_3O^+) = 2(0,05) (d) ✓

[H_3O^+] = 0,1 mol·dm^{-3}

pH = - log [H_3O^+] (e) ✓
= - log 0,1 (f) ✓
= 1 (g) ✓

(7)

[18]

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QUESTION 8/*VRAAG 8*

8.1 8.1.1 Chemical energy to electrical energy. ✓✓
Chemiese energie na elektriese energie. (2)

8.1.2 Metal **M** ✓
The substance with the lower standard electrode potential is more easily oxidized. / Metal **M** is a stronger reducing agent than silver. ✓
Metal M will be oxidised ✓
*Metaal **M***
*Die stof met die laer standaard elektrodepotensiaal word makliker geoksideer / Metaal **M** is 'n sterker reduseermiddel as silwer.*
Metaal M sal geoksideer word (3)

8.2 8.2.1 $E^{\theta}_{cell} = E^{\theta}_{cathode/reduction/oxidising\ agent} - E^{\theta}_{anode/oxidation/reducing\ agent}$ ✓
$E^{\theta}_{sel} = E^{\theta}_{katode/reduksie/oksidaseermiddel} - E^{\theta}_{anode/oksidasie/reduseermiddel}$

$1{,}54$ ✓$= (0{,}8) - E^{\theta}_{anode/oxidation/reducing\ agent}$ / $E^{\theta}_{anode/oksidasie/reduseermiddel}$ ✓

$E^{\theta}_{anode/oxidation/reducing\ agent}$ / $E^{\theta}_{anode/oksidasie/reduseermiddel} = 0{,}74$ V ✓

Metal is chromium (Cr) ✓

Metaal is chroom (Cr)

Marking criteria/*Nasienkriteria*
- Any other formula using unconventional abbreviation , e.g. / $E^{\theta}_{cell} = E^{\theta}_{OA} - E^{\theta}_{RA}$ followed by the correct substitution Max ¾
Enige ander formule wat onkonvensionele afkorting gebruik bv. $E^{\theta}_{sel} = E^{\theta}_{OM} - E^{\theta}_{RM}$ *gevolg deur korrekte vervanging Maks ¾*

(5)

8.2.2 $Cr \mid Cr^{3+}$ ✓ $\mid\mid$ ✓ $Ag^{+} \mid Ag$ ✓ (3)

8.3 8.3.1 REMAINS THE SAME/*BLY DIESELFDE* ✓ (1)

8.3.2 INCREASES/*TOENEEM* ✓ (1)
[15]

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QUESTION/*VRAAG 9*

9.1 A substance of which aqueous solutions contains ions ✓✓ **(2 or 0)**
'n Stof waarvan die oplossing in water ione bevat ***(2 of 0)***

OR / *OF*

A substance that dissolves in water to give a solution that conducts electricity. **(2 or 0)** ✓✓
'n Stof wat in water oplos om 'n oplossing te vorm wat elektrisiteit gelei. ***(2 of 0)*** (2)

9.2 ENDOTHERMIC/*ENDOTERMIES* ✓ (1)

9.3 X ✓ (1)

9.4 $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ ✓✓ (2)
Ignore phases/ *Ignoreer fase*

Marking criteria / *Nasienkriteria*
- $Cu(s) \leftarrow Cu^{2+}(aq) + 2e^-$ 2/2
- $Cu^{2+}(aq) + 2e^- \rightleftharpoons Cu(s)$ 1/2
- $Cu(s) \rightleftharpoons Cu^{2+}(aq) + 2e^-$ 0/2
- $Cu^{2+}(aq) + 2e^- \leftarrow Cu(s)$ 0/2

Ignore if the charge omitted on electron/
Ignoreer indien lading weggelaat op elektron

9.5 Silver (Ag) is a weaker reducing agent than copper (Cu) and Zinc (Zn). ✓
Silver (Ag) will not be oxidized.
Silwer (Ag) is 'n swakker reduseermiddel as koper (Cu) en sink (Zn).
Silwer (Ag) word nie geoksideer nie. (1)

9.6 **Marking criteria / *Nasienkriteria***
(a) Substitution in/ *Vervang in* $n = N/N_A$
(b) Use of mole ratio/ *Gerbuik van mol verhouding* $M : e^-$
(c) Formula/ *Formule* $n = m/M$
(d) Substitution into/ *Vervang in* $n = m/M$
(e) Formula/ *Formule* $CaC\ell_2$

$$n = \frac{N}{N_A}$$

$$n = \frac{1{,}806 \times 10^{22}}{6{,}02 \times 10^{23}} \quad \text{(a) ✓}$$

$$n = 0{,}03 \text{ mol}$$

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n (M)= 0,03 x ½ (b) ✓

n (M)= 0,015 mol

$M = \frac{m}{n}$ (c) ✓

$M = \frac{0,6}{0,015}$ (d) ✓

M = 40 g·mol^{-1}

M = $CaC\ell_2$ (e) ✓ (5)

[12]

TOTAL/*TOTAAL:* 150

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