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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD 12*

SEPTEMBER 2026

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

MARKS/*PUNTE*: 150

This marking guideline consists of 16 pages./
Hierdie nasienriglyn bestaan uit 16 bladsye.

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QUESTION/*VRAAG 1*

1.1 B ✓✓ (2)

1.2 A ✓✓ (2)

1.3 D ✓✓ (2)

1.4 B ✓✓ (2)

1.5 C ✓✓ (2)

1.6 A ✓✓ (2)

1.7 B ✓✓ (2)

1.8 B ✓✓ (2)

1.9 C ✓✓ (2)

1.10 D ✓✓ (2)

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QUESTION/*VRAAG 2*

2.1

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 sleutelwoorde/frases in die korrekte konteks weggelaat word:
- 1 punt per word/frase

A bond or an atom or a group of atoms that determine(s) the physical and chemical properties of a group of organic compounds. ✓✓
'n Binding of 'n atoom of 'n groep atome wat die fisiese en chemiese eienskappe van 'n groep organiese verbindings bepaal. (2)

2.2 2.2.1 Haloalkanes / *Haloalkane* ✓ (1)

2.2.2 $C_nH_{2n+1}OH$ / $C_nH_{2n+2}O$ ✓ (1)

2.3.1 2,2-dimethylbutane ✓✓
2,2-dimetielbutaan

Marking criteria/*Nasienkriteria*
- Correct stem – butane
- Whole name correct
- *Stam korrek – butaan*
- *Hele naam korrek*

(2)

2.3 2.3.2 2-bromo-2-chloro-3,3-dimethylpentane ✓✓✓
2-bromo-2-chloro-3,3-dimetielpentaan

Marking criteria/*Nasienkriteria*
- Correct stem – pentane / *Stam korrek – butaan*
- Substituents correctly identified / Substituente korrek geïdentifiseer
- Whole name correct / *Hele naam korrek*

(3)

2.4 2.4.1 Tertiary alcohol ✓
The carbon that contains the functional / hydroxyl group / OH group is bonded to three other carbon atoms / a tertiary carbon atom ✓

Tersiêre alkohol
Die koolstof wat die funksionele / hidroksielgroep / OH-groep bevat, is aan drie ander koolstofatome verbind / is verbind aan 'n tersiêre koolstofatoom (2)

2.4.2 2-methylpropan-2-ol / 2-methyl-2-propanol ✓✓
2-metielpropan-2-ol / 2-metiel-2-propan-2-ol (2)

2.5 $CH_3CH_2CH_2CH_2CH_2COOH$ / $CH_3CH_2CH_2CH_2CH_2CO_2H$ ✓✓ (2)

2.6 $2\ C_6H_{14} + 19\ O_2$ ✓ $\rightarrow 12\ CO_2 + 14\ H_2O$ ✓ (✓ bal)
Reactant, products, balancing
Reaktanse, Produkte, balansering (3)

[18]

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QUESTION/*VRAAG 3*

3.1

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 sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per word/frase*

The temperature at which the vapour pressure of a substance equals the atmospheric pressure ✓✓
Die temperatuur waarby die dampdruk van 'n stof gelyk is aan atmosferiese druk. (2)

3.2 Molar mass / Strength of the London forces / *Molêre massa / Sterkte van die Londonkragte* ✓ (1)

3.3

MARKING CRITERIA/*NASIENKRITERIA*
- State dipole-dipole forces in butanone ✓
- State the hydrogen bonding in butan-1-ol and propanoic acid ✓
- Compare the strength of the hydrogen bonding to dipole-dipole forces ✓
- Compare the strength of the hydrogen bonding in propanoic acid to butan-1-ol ✓
- *Stel van dipool-dipoolkragte in butanoon*
- *Stel die waterstofbinding in butan-1-ol en propanoësuur*
- *Vergelyk die sterkte van die waterstofbinding met dipool-dipoolkragte*
- *Vergelyk die sterkte van die waterstofbinding in propanoësuur met butan-1-ol*

- Butanone has dipole-dipole forces ✓
- Butan-1-ol has 1 site of hydrogen bonding and Propanoic acid has 2 sites of hydrogen bonding ✓
- Dipole-dipole forces are weaker than hydrogen bonding / Hydrogen bonding is stronger than the dipole-dipole forces ✓
- The 2 sites of hydrogen bonding in propanoic acid are stronger than the 1-site of hydrogen bonding in butan-1-ol / The 1 – site for hydrogen bonding in butan-1-ol is weaker than the 2-sites for hydrogen bonding in propanoic acid ✓

- *Butanoon het dipool-dipoolkragte*
- *Butan-1-ol het 1 plek van waterstofbinding en propanoësuur het 2 plekke van waterstofbinding*
- *Dipool-dipoolkragte is swakker as waterstofbinding / Waterstofbinding is sterker as die dipool-dipoolkragte*
- *Die 2 plekke vir waterstofbindings in propanoësuur is sterker as die 1-plek vir waterstofbinding in butan-1-ol / Die 1-plek vir waterstofbinding in butan-1-ol is swakker as die 2-plekke vir waterstofbinding in propanoësuur* (4)

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3.4 3.4.1 2-methylpropan-1-ol / 2-methyl-1-propanol ✓✓
2-metielpropan-1-ol / 2-metiel-1-propanol (2)

3.4.2

MARKING CRITERIA/*NASIENKRITERIA*

- HIGHER THAN ✓
- Compare the surface area / chain length / of butan-1-ol to 2-methylpropan-1-ol ✓
- Relate the strength of the intermolecular / London forces to chain length / surface area correctly ✓
- State the correct relationship between strength of the intermolecular forces to vapour pressure ✓

- *HOËR AS*
- *Vergelyk die oppervlakarea / kettinglengte / van butan-1-ol met 2-metielpropan-1-ol*
- *Stel die sterkte van die intermolekulêre / Londonkragte korrek met kettinglengte / oppervlakarea*
- *Stel die verhouding tussen die sterkte van die intermolekulêre kragte met dampdruk korrek*

HIGHER THAN ✓

- 2-methyl propan-1-ol is branched / has a shorter chain length/ smaller surface area/ than butan-1-ol ✓
- Strength of London forces / intermolecular forces increases with an increase in chain length/ surface area. ✓
- The stronger the intermolecular forces the lower the vapour pressure ✓

OR

- Butan-1-ol is not is branched/ has a longer chain length/ larger surface area than 2-methyl propan-1-ol ✓
- Strength of London forces / intermolecular forces decreases with a decrease in chain length/ surface area. ✓
- The weaker the intermolecular forces the higher the vapour pressure ✓

HOËR AS

- *2-metielpropan-1-ol is vertak/ het 'n korter kettinglengte/ kleiner oppervlakarea/ as butan-1-ol*
- *Sterkte van Londonkragte / intermolekulêrekragte neem toe met 'n toename in kettinglengte / oppervlakarea.*
- *Hoe sterker die intermolekulêrekragte, hoe laer die dampdruk*

OF

- *Butan-1-ol is nie vertak nie/ het 'n langer kettinglengte/ groter oppervlakarea as 2-metielpropan-1-ol*
- *Sterkte van Londonkragte / intermolekulêrekragte neem af met 'n afname in kettinglengte/ oppervlakarea.*
- *Hoe swakker die intermolekulêrekragte, hoe hoër die dampdruk* (4)

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QUESTION/*VRAAG 4*

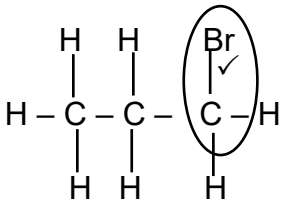
4.1 4.1.1 Addition / Hydrogenation / *Addisie / Hidrogenering / Hidrogansie* ✓ (1)

4.1.2 Platinum / Nickel / Palladium / Pt / Ni/ Pd ✓ (1)

4.2 4.2.1 Heat / UV-light / *Hitte / UV-lig* ✓ (1)

4.2.2 2-bromopropane / *2-bromopropaan* ✓✓ (2)

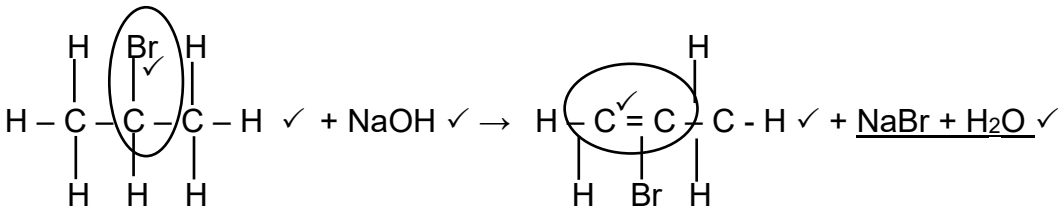
4.2.3



Marking criteria/*Nasienkriteria*
- Br on terminal carbon
- Whole structure is correct
- *Br op terminale koolstof*
- *Hele struktuur korrek*

(2)

4.3



Marking criteria for organic compounds/*Nasienkriteria vir organiese verbindings*
- Functional group correct / *Funksionele groep korrek*
- Whole structure is correct / *Hele struktuur korrek*

Marking criteria for inorganic compounds/*Nasienkriteria vir anorganiese verbindings*
- NaOH ✓, NaBr , H_2O ✓

(6)

4.4 4.4.1 Esterification / Condensation / *Verestering / Esterifikasie* ✓ (1)

4.4.2 Smell / *Reuk* ✓ (1)

4.4.3 $12n + 2n + 32 = 88$ ✓
$n = 4$
Ethyl ✓ethanoate ✓ *etieletanoaat* (3)

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QUESTION/*VRAAG 5*

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 sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per word/frase*

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

ENIGE EEN
- *Verandering in konsentrasie van reaktante of produkte per (eenheid) tyd.*
- *Verandering in hoeveelheid/aantal mol/volume/massa van reaktante of produkte per (eenheid) tyd.*
- *Verandering in hoeveelheid/aantal mol/volume/massa van produkte wat gevorm word of reaktante wat per (eenheid) tyd gebruik word.*

OR/*OF*

The rate of changes in concentration/amount of moles/mumber of moles/volume/mass of reactants or products. ✓✓ **(2 or 0)**
Die tempo van veranderinge in konsentrasie/hoeveelheid mol/aantal mol/volume/massa van reaktante of produkte. ***(2 of 0)*** (2)

5.2 5.2.1 Concentration/*Konsentrasie* ✓ (1)

5.2.2 Reaction rate/*Reaksietempo* ✓ (1)

5.3 EQUAL TO/*GELYK AAN* ✓ (1)

5.4
- Larger exposed surface area of (Na_2CO_3) particles in experiment **3** ✓
- More (Na_2CO_3) particles collide with the correct orientation ✓
- More effective collisions per (unit) time. /Frequency of effective collisions increase. ✓

- *Groter blootgestelde oppervlakarea van (Na_2CO_3) deeltjies in eksperiment **3***
- *Meer (Na_2CO_3) deeltjies met die korrekte oriëntasie bots*
- *Meer effektiewe botsings per (eenheid) tyd. /Frekwensie van effektiewe botsings neem toe.* (3)

5.5 5.5.1 (Experiment / *Eksperiment*) **4** ✓ (1)

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5.5.2
- Experiment **4** has a higher temperature. ✓
- Curve **B** has more particles with higher (average) kinetic energy.

- *Eksperiment **4** het 'n hoër temperatuur.*
- *Kurwe **B** het meer deeltjies met hoër (gemiddelde) kinetiese energie.* (2)

5.6

Marking criteria/*Nasienkriteria*

(a) Substitution into/*Vervanging in* n = m / M
(b) Use of mole ratio to determine / *Gebruik van molverhouding om* te bepaal n (HCℓ)
(c) Substitution into/*Vervanging in* c = n / V
(d) Substitution into rate equation/ *Vervanging in reaksietempo vergelyking*
(e) Final answer/*Finale antwoord*

$$n = \frac{m}{M}$$

$$n = \frac{2,3}{106}$$ ✓ (a)

$$n = 0,0217 \text{ mol}$$

$n(HC\ell) = 2\ n(Na_2CO_3) = 2 \times 0,0217$ (b) ✓

$n(HC\ell) = 0,0434$ mol

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

$$c = \frac{0,0434}{0,1}$$ (c) ✓

$c = 0,434\ mol \cdot dm^{-3}$

$$\text{Rate / } \textit{Tempo} = -\frac{\Delta c}{\Delta t}$$

$$\text{Rate / } \textit{Tempo} = -\frac{(-0,434)}{20}$$ (d) ✓

Rate / *Tempo* = $0,0217\ mol \cdot dm^{-3} \cdot s^{-1}$ (e) ✓

Range = $0,02 - 0,022\ mol \cdot dm^{-3} \cdot s^{-1}$ (5)

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QUESTION/*VRAAG 6*

6.1

Marking criteria/ Nasienriglyne
If any of the underlined key words/phrases in the **correct context** are omitted: - 1 mark per word/phrase
*Indien enige van die 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 the disturbance. ✓✓

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

6.2 6.2.1 STAYS ORANGE / *BLY ORANJE* ✓ (1)

6.2.2 BECOMES YELLOW / WORD GEEL ✓ (1)

6.2.3
- As the pH increases the concentration of H_3O^+ / H^+ decreases ✓
- According to Le Chaterlier's principle the reverse reaction will be favoured / the equilibrium will shift towards the left / the system will counter this change by increasing the concentration of H_3O^+ / H^+ ✓

- *Soos die pH styg, neem die konsentrasie van H_3O^+ / H^+ af*
- *Volgens Le Chaterlier se beginsel sal die terugwaartse reaksie bevoordeel word / die ewewig sal na links verskuif / die stelsel sal hierdie verandering teenwerk deur die konsentrasie van H_3O^+ / H^+ te verhoog* (2)

6.3 6.3.1

	a P (g)	**b Q(g)**	⇌	**c R (g)**	**d R (g)**
RATIO	a	b		c	D
$\mathbf{n_i}$	5	5		-	-
Δn	**4**	**2**		**6**	**2** ✓
$\mathbf{n_e}$	1	3		6	2

a = 2 b = 1 c = 3 d = 1 ✓

Marking criteria/*Nasienkriteria*
- Calculate Δ n for a, b, c, d
- Final answer
- *Bereken Δn vir a, b, c, d*
- *Final antwoord*

(2)

6.3.2 Exothermic ✓
- Amount of **Q** increased ✓
- The reverse reaction was favoured/equilibrium position shifted towards the left. ✓
- An increase in temperature favours the endothermic reaction. ✓

Eksotermies
- *Hoeveelheid van **Q** het toegeneem*
- *Die terugwaartse reaksie is bevoordeel/ewewigsposisie het na links verskuif.*
- *'n Toename in temperatuur bevoordeel die endotermiese reaksie.* (4)

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6.3.3 **POSITIVE MARKING FROM QUESTION 6.3.1**
OPTION 1: MOLE OPTION

(a) Calculating the change in mole of Q
(b) Use the ratio to calculate the change in mole of P, R and S
(c) Calculating the equilibrium mole of P, R and S
(d) Calculating the equilibrium concentration of P, R and S
(e) Correct Kc expression with square brackets
(f) Substitution of equilibrium concentrations into Kc expression.
(g) Final answer

POSITIEWE NASIEN VANAF VRAAG 6.3.1
OPSIE 1: MOL-OPSIE

(a) Bereken die verandering in mol Q
(b) Gebruik die verhouding om die verandering in mol van P, R en S te bereken
(c) Bereken die ewewigsmol van P, R en S
(d) Bereken die ewewigsmol van P, R en S
(e) Korrekte Kc-uitdrukking met vierkantige hakies
(f) Vervanging van ewewigskonsentrasies in Kc-uitdrukking.
(g) Finale antwoord

	2 P (g)	Q (g)	⇌	3 R (g)	S (g)
Initial amount (mol) *Aanvangshoeveelheid (mol)*	1	3		6	2
Change (mol) Verandering (mol)	2	1 (a) ✓		3	1 (b) ✓
Equilibrium amount (mol) *Hoeveelheid by ewewig (mol)*	3	4		3	1 (c) ✓
Equilibrium concentration ($mol \cdot dm^{-3}$) Ewewigskonsentrasie ($mol \cdot dm^{-3}$)	= 3 / 2 = 1,5	= 4 / 2 = 2		= 3 / 2 = 1,5	= 1 / 2 (d) ✓ = 0,5

$$Kc = \frac{[R]^3[S]}{[P]^2[Q]} \text{ (e) } ✓$$

$$Kc = \frac{(1,5)^3(0,5)}{(1,5)^2(2)} \text{ (f) } ✓$$

Kc = 0,375 (g) ✓

NOTE/*LET WEL*:

No K_C expression, correct substitution/
Geen Kc-uitdrukking, korrekte substitusie:
Max./*Maks.* 6/7

Wrong K_C expression /*Verkeerde Kc-uitdrukking:* Max./*Maks.* 4/7

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OPTION 2: CONCENTRATION

(a) Calculating the initial concentration of P, Q, R, S and equilibrium concentration of Q.
(b) Determine the change in concentration of Q
(c) Use the ratio to calculate the change in conc of P, R and S
(d) Calculating the equilibrium concentration of P, R and S
(e) Correct Kc expression with square brackets
(f) Substitution of equilibrium concentrations into Kc expression
(g) Final answer

OPSIE 2: KONSENTRASIE

(a) Bereken die aanvanklike konsentrasie van P, Q, R, S en ewewig konsentrasie van Q
(b) Bepaal die verandering in konsentrasie Q
(c) Gebruik die verhouding om die verandering in konsentrasie van P, R en S te bereken
(d) Bereken die ewewigskonsentrasie van P, R en S
(e) Korrekte Kc-uitdrukking met vierkantige hakies
(f) Vervanging van ewewigskonsentrasies in Kc-uitdrukking
(g) Finale antwoord

	2 P (g)	Q (g)	⇌	3 R (g)	S (g)
Initial concentration *Aanvangskonsentrasie*	1 / 2 = 0,5	3 / 2 = 1,5		6 / 2 = 3	2 /2 (a) ✓ = 1
Change in concentration *Verandering in konsentrasie*	1	0,5 (b) ✓		1,5	0,5 (c) ✓
Equilibrium concentration ($mol \cdot dm^{-3}$) *Ewewigskonsentrasie* ($mol \cdot dm^{-3}$)	1,5	= 2		1,5	0,5 (d) ✓

$$Kc = \frac{[R]^3[S]}{[P]^2[Q]} \text{ (e) ✓}$$

$$Kc = \frac{(1,5)^3(0,5)}{(1,5)^2(2)} \text{ (f) ✓}$$

Kc = 0,375 (g) ✓

NOTE/*LET WEL*:

No K_C expression, correct substitution/*Geen Kc-uitdrukking, korrekte substitusie:* Max./*Maks.* 6/7

Wrong K_C expression /*Verkeerde Kc-uitdrukking:* Max./*Maks*. 4/7

(7)
[19]

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QUESTION/*VRAAG 7*

7.1 7.1.1 An acid is a proton donor / *'n Suur is 'n protonskenker* ✓ (1)

7.1.2 HSO_4^- ✓
It has the larger K_a value / *Dit het die groter K_a-waarde* ✓ (2)

7.1.3 HCO_3^- and / *en* CO_3^{2-} ✓✓ **OR/*OF*** H_3O^+ and / *en* H_2O ✓✓ (2)

7.2 $C_2O_4^{2-}$ (aq) + H_2O (ℓ) ✓ →$HC_2O_4^-$ (aq) + OH^- ✓

Alkaline / *Alkalies* ✓ (3)

7.3 7.3.1 n = cV ✓
n = (0,45)(0,09) ✓
n = 0,0405 mol ✓ (3)

7.3.2 **POSITIVE MARKING FROM QUESTION 7.3.1 / *POSITIEWE NASIEN VANAF VRAAG 7.3.1***
Marking criteria / *Nasienkriteria*

(a) Substitution in pH formula / *Vervanging in pH-formule*
(b) Use of mol ratio / *Gebruik van molverhouding* [HBr] : [H_3O^+]
(c) Calculate n (HBr) excess / *Bereken n (HBr) oormaat*
(d) Calculating n (HBr) reacting / *Bereken n (HBr) wat reageer*
(e) Use the mol ratio / *Gebruik van molverhouding* HBr reacting/*reageer*: $M(OH)_2$
(f) Substituting into / *Vervanging in* n = m/M
(g) Calculating Molar mass for / *Bereken die molêre massa vir* $M(OH)_2$
(h) Identifying (name or formula)/*Identifisering (naam of formule)* M

pH = - log [H_3O^+]
1,04 = - log [H_3O^+] (a) ✓
[H_3O^+] = $10^{-1,04}$
[H_3O^+] = 0,0912 mol·dm^{-3}

[H_3O^+]: [HBr]
1 : 1
0,0912: [HBr] (b) ✓

EXCESS / *OORMAAT*
n(HBr) = cV
n(HBr) = (0,0912) (0,09) (c) ✓
n(HBr) = 0,0082 mol

n(used/ *gebruik*) = n(total/ *totaal*) – n(excess / *oormaat*)
n(used/ *gebruik*) = 0,0405 – 0,0082 (d) ✓
n(used/ *gebruik*) = 0,0323 mol

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$n(M(OH)_2) = ½ (0,0323)$ (e) ✓ $= 0,01615$ mol

$$n = \frac{m}{M}$$

$$0,0615 = \frac{1,6}{M}$$ (f) ✓

$M = 99,071\ g{\cdot}mol^{-1}$

$99,071 = M + (16 \times 2) + (1 \times 2)$ (g) ✓

$M = 65,071\ g{\cdot}mol^{-1}$

M = Zinc / *Sink* / Zn (h) ✓ (8)

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QUESTION/*VRAAG 8*

8.1 8.1.1 Reduction is a gain of electrons / *Reduksie is 'n wins van elektrone* ✓✓ (2)

8.1.2 Ni is a stronger reducing agent ✓than Cu ✓ and it will reduce Cu^{2+} to Cu ✓

OR

Cu is a weaker reducing agent ✓ than Ni. ✓ and therefore, Ni will be oxidised to Ni^{2+} ✓

Ni is 'n sterker reduseermiddel as Cu en dit sal Cu^{2+} na Cu reduseer.

OF

Cu is 'n swakker reduseermiddel as Ni en daarom sal Ni na Ni^{2+} geoksideer word. (3)

8.2 8.2.1 Temperature/ *Temperatuur*: 0 °C ✓

OR / *OF*

Concentration of electrolyte/*Konsentrasie van elektroliet*: 1 $mol{\cdot}dm^{-3}$ ✓ (1)

8.2.2 INCREASES/*TONEEM* ✓
Fe is oxidised to/*geoksidder na* Fe^{2+} ✓ (2)

8.2.3 The stronger the reducing agents the higher the initial voltmeter reading. ✓✓
Hoe sterker die reduseermiddels is, hoe hoër die aanvanklike voltmeterlesing. (2)

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8.2.4

$E^{e}_{cell/sel} = E^{\ominus}_{cathode} - E^{\ominus}_{anode}$ ✓ $\underline{2 = 0,34}$ ✓ $- E^{\ominus}_{anode}$ ✓ $E^{\ominus}_{anode} = -1,66$ V ✓ X = Zn ✓	**NOTE/LET WEL:** • Accept any other correct formula from the data sheet. /Aanvaar enige ander korrekte formule vanaf gegewensblad. • Any other formula using unconventional abbreviations, e.g. $E^{e}_{cell} = E^{\ominus}_{OA} - E^{\ominus}_{RA}$ followed by correct substitutions: /Enige ander formule wat gebruik, onkonvensionele bv. $E^{e}_{sel} = E^{\ominus}_{OA} - E^{\ominus}_{RA}$ gevolg deur korrekte max/ *maks* 4/5

(5)

[15]

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QUESTION/*VRAAG 9*

9.1 DC / *GS* ✓

To keep the electrodes from changing polarity ✓
Om seker te maak dat die polariteit van die elektrodes nie verander nie (2)

9.2 **Q** ✓
Decrease in mass / *afname in massa* ✓ (2)

9.3 $Cu^{2+} + 2e^- \rightarrow Cu$ ✓✓

Marking guidelines/Nasienriglyne
- $Cu \rightleftharpoons Cu^{2+} + 2\bar{e}$ (0/2)
- $Cu^{2+} + 2\bar{e} \rightleftharpoons Cu$ (1/2)
- $Cu \leftarrow Cu^{2+} + 2\bar{e}$ (2/2)
- Ignore if charge on electron is omitted / *Ignoreer as lading op elektron weggelaat word*
- If a charge of an ion is omitted / *As 'n lading van 'n ioon weggelaat word* (1/2)
- Marking rule 6.3.10/ Nasienreël 6.3.10 (2)

9.4 REMAINS THE SAME / *BLY DIESELFDE* ✓ (1)

9.5 **Marking criteria / *Nasienkriteria***

(a) Calculate the change in mass / *Bereken die verandering in massa*

(b) Substitute the change in mass (16,12 g) and 63,5 into / *Vervang die verandering in massa (16,12 g) en 63,5 in* n = m /M

(c) Use the mole ratio / *Gebruik die molverhouding* Cu : e^-

(d) Substitute into mole of electron and Avogadro's constant into / *Vervang in mol van elektrone en Avogadro se konstante* in $N = nN_A$

(e) Final answer / *Finale antwoord*

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Δ m(Cu) = 8,32 – 2,2 (a) ✓ = 6,12 g

$$n = \frac{m}{M}$$

$$n = \frac{6,12}{63,5} \text{ (b) ✓}$$

$$n = 0,0964 \text{ mol}$$

$n(e^-) = 0,0964 \times 2$ (c) ✓

$n(e^-) = 0,1928$ mol

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

$$0,1928 = \frac{N}{6,02 \times 10^{23}} \text{ (d) ✓}$$

$N = 1,16 \times 10^{23}$ (e) ✓ (5)

[12]

TOTAL/*TOTAAL:* 150

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