GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

VOORBEREIDENDE EKSAMEN

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MARKING GUIDELINES
NASIENRIGLYNE

10842

PHYSICAL SCIENCES: CHEMISTRY
FISIESE WETENSKAPPE: CHEMIE

(PAPER/*VRAESTEL* 2)

15 pages/*bladsye*

QUESTION/*VRAAG* 1

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

[20]

QUESTION/*VRAAG* 2

2.1 Compounds with one or more multiple bonds between C atoms in the hydrocarbon chain. (2 or 0)
Verbindings met een of meer meervoudige bindings tussen C-atome in die koolwaterstofkettings. (2 of 0)

OR/*OF* A hydrocarbon with two or more bonds between the C-atoms./
'n Koolwaterstof met twee of meer bindings tussen die C-atome.

OR/*OF* Hydrocarbons containing not only single bonds between C atoms.
Koolwaterstowwe wat nie slegs enkelbindings tussen die C-atome bevat nie.

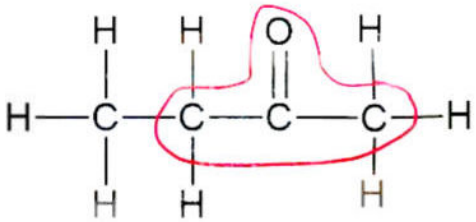
(2)

2.2 Propyl ethanoate/*propieletanoaat*

Marking criteria/*Nasienkriteria*:
- Correct stem, i.e. ethanoate/ *Korrekte stam d.i. ethanoaat* ✓
- Correct prefix propyl/*Korrekte voorvoegsel propiel* ✓

(2)

2.3



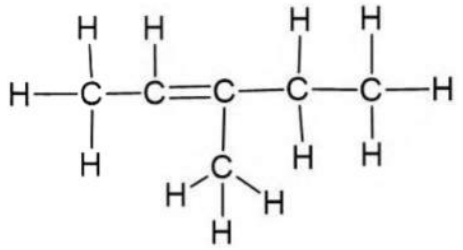
Marking criteria/*Nasienkriteria*:
- Functional group correct. ✓/ *Funksionele groep korrek.*
- Whole structure correct. ✓/*Hele struktuur korrek.*

(2)

✓ ✓

2.4 2-bromobutane/*2-bromobutaan* (first part and second part of name)
(eerste deel en tweede deel van naam) (2)

2.5 3-methylpent-2-ene OR 3-methyl-2-pentene ✓
3-metielpent-2-een OF 3-metiel-2-penteen



✓

(2)

2.6 G ✓ accept/*aanvaar*: CH_3CH_2OH (1)

2.7 The difference is that the carbonyl group/functional group is on different carbon atoms. ✓✓

Die verskil is dat die karbonielgroep/funksionele groep op verskillende koolstofatome is. (2)

2.8 C_nH_{2n} ✓ (1)
[14]

QUESTION/*VRAAG* 3

3.1 Organic molecules with the same molecular formula, but different types of chain. ✓
Organiese molekule met dieselfde molekulêre formule, maar verskillende tipes kettings. (1)

3.2.1 P:
2,2-dimethylpropane OR dimethylpropane ✓
2,2-dimetielpropaan OR dimetielpropaan

Q:
2-methylbutane OR methylbutane ✓
2-metielbutaan OR metielbutaan

(2)

3.2.2

Marking criteria:

- Compare branches of molecules and the surface area ✓
- Compare the intermolecular forces ✓
- Mention the energy required to overcome the intermolecular forces. ✓

Accept if explained in terms of less compact and increased surface area.

Nasienkriteria:

- *Vergelyk vertakking van die molekule en die kontakoppervlakte*
- *Vergelyk die intermolekulêre kragte*
- *Noem die energie wat benodig word om die intermolekulere kragte te oorkom*

Aanvaar indien verduidelik in terme van minder kompak en groter kontakarea.

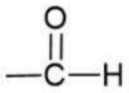
- More branching in P makes the molecule **more compact**, reducing the **surface area** and ✓
- Weaker London forces/induced dipole forces/intermolecular forces in P compared to Q ✓
- Therefore least amount of energy required for P to overcome the intermolecular forces. ✓

- *Meer vertakkings in P maak die molekule meer kompak, en dit verminder die oppervlak*
- *Swakker Londonkragte/geïnduseerde dipoolkragte/intermolekulêre kragte in P in vergelyking met Q*
- *Laer hoeveelheid energie benodig in P om die intermolekulêre kragte te oorkom* (3)

3.3.1 The functional group for ketones, carbonyl, must have a carbon on each side. ✓
OR If there are fewer than three carbon atoms then it is an aldehyde.

Die funksionele groep vir ketone moet 'n koolstofatoom aan elke kant hê.
OF Indien daar minder as drie koolstofatome is, dan is dit 'n aldehied. (1)

3.3.2



✓✓ (2)

3.3.3

Marking criteria:

- Mention the trend of the chain length ✓
- Refer to the London forces that increase ✓
- Compare the energy required to overcome the intermolecular forces. ✓

Nasienkriteria:

- *Stel die tendens van die kettinglengte*
- *Verwys na die Londonkragte wat toeneem*
- *Vergelyk die energie wat benodig word om die intermolekulêre kragte te oorkom.*

- Boiling point increases as the chain length/molar mass/surface area increases. ✓
- All the compounds have dipole-dipole forces, but as the carbon chain increases the melting point increases due to the increase in the strength of the London forces/The increase in chain length increases the strength of intermolecular forces. ✓
- More energy is needed to overcome the intermolecular forces of the longer carbon chain. ✓

- *Die kookpunt neem toe namate die kettinglengte/molêre massa/oppervlakte toeneem.*
- *Al die verbindings het dipool-dipoolkragte, maar soos wat die koolstofketting toeneem, neem die smeltpunt toe as gevolg van die toename in sterkte van die Londonkragte/die toename in kettinglengte verhoog die sterkte van intermolekulêre kragte.*
- *Meer energie word benodig om die intermolekulêre kragte van die langer koolstofketting te oorkom.* (3)

3.3.4 Propanal ✓
Weaker intermolecular forces ✓ therefore less energy ✓ and more particles in the gaseous phase.
OR
The lower boiling point ✓ indicates the weaker intermolecular forces. ✓

Propanaal
Swakker intermolekulêre kragte dus minder energie nodig en meer deeltjies in die gasfase.
OF
Die laer kookpunt dui op swakker intermolekulêre kragte. (3)
[15]

QUESTION/*VRAAG* 4

4.1.1 Esterification OR condensation ✓

Esterifikasie OF kondensasie (1)

4.1.2 Do not have contact with acid – wear protective gloves ✓
Work in a well ventilated room – keep windows open while doing experiment. ✓
Use a waterbath and not an open flame (Alcohol is very flammable)

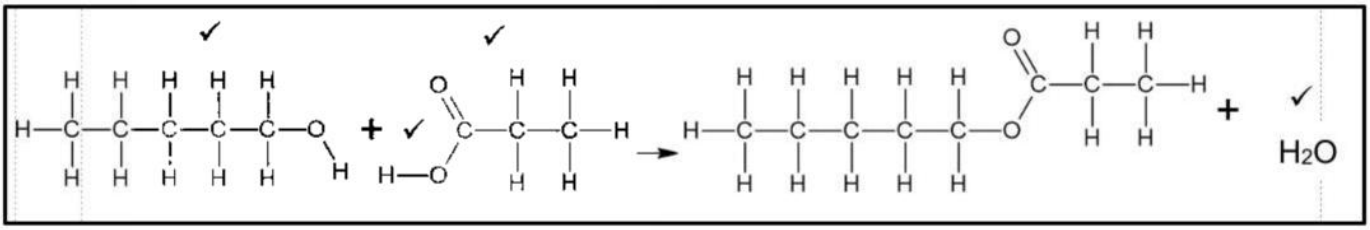
Any two answers/*enige twee antwoorde*

Vermy velkontak met die suur – dra beskermende handskoene
Werk in 'n goed geventileerde kamer – hou die vensters oop terwyl die eksperiment gedoen word.
Gebruik 'n waterbad en nie 'n oop vlam nie (Alkohol is baie vlambaar) (2)

4.1.3 **Marking criteria/Nasienkriteria:**

- Alcohol with 5 C atoms and OH at **the first** carbon atom /*Alkohol met 5 C atome en OH aan die eerste koolstofatoom* ✓
- functional group of **carboxylic acid** correct/*funksionele groep van* ***karboksielsuur*** *korrek* ✓
- Carboxylic acid with 3 carbons/*Karboksielsuur met 3 koolstowwe* ✓
- water/*water* ✓ accept: structural formula for water *aanvaar: struktuurformule vir water*

(4)



4.1.4 (Concentrated) sulphuric acid/(gekonsentreerde) swawelsuur ✓ (1)

4.2.1 Dehydration/*dehidrasie* ✓ (1)

4.2.2 **Marking criteria/Nasienkriteria:**

- Whole condensed structural formula of alkene correct. ✓
  Hele gekondenseerde struktuurformule van die alkeen korrek.
- Both reactants correct./*Beide reaktanse korrek* ✓
- Whole condensed structural formula of alkane correct
  Hele gekondenseerde struktuurformule vir alkaan korrek ✓

NOTE/*LET WEL:*
Max 2/3 if structural formula used/*Maksimum 2/3 indien struktuurformule gebruik*

$CH_3CHCHCH_2CH_3 + H_2 \rightarrow CH_3CH_2CH_2CH_2CH_3$ (3)

4.2.3 $C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O$

Marking criteria/*Nasienkriteria*:
- Reactants ✓ *Reaktanse* Products ✓ *Produkte* Balancing: ✓ *Balansering*
- Ignore double arrows./*Ignoreer dubbelpyle.*
- Marking rule 6.3.10/*Nasienreël 6.3.10.*

(3)

4.3.1 Tertiary ✓
The carbon atom bonded to the hydroxyl group is bonded to 3 other carbon atoms. ✓

Tersiêre
Die koolstofatoom gebind aan die hidroksielgroep is gebind aan drie ander koolstofatome. (2)

4.3.2 Room temperature/*Kamertemperatuur* ✓ (1)

4.3.3 Substitution/*substitusie* ✓ (1)

4.3.4 Hydrogen chloride/hydrochloric acid ***Waterstof****chloried/soutsuur* ✓ (1)

4.3.5 Dilute strong base (NaOH/KOH/LiOH)
Verdunde sterk basis/(NaOH/KOH/LiOH) ✓

Accept: excess water
Aanvaar: oormaat water (1)
[21]

QUESTION/*VRAAG* 5

5.1 The change in concentration of reactants or products per unit time. ✓✓

Die verandering in die konsentrasie van reaktanse of produkte per eenheid tyd.
(2 or/*of* 0) (2)

5.2 Final answer in range 4,4 to 5,2/*Finale antwoord gebied 4,4 to 5,2*

Accept any TWO sets of co-ordinates from the straight line tangent.
Aanvaar enige TWEE stelle ko-ordinate vanaf die reguitlyn raaklyn.

Rate of change/*Tempo van verandering* $= \frac{\Delta V}{\Delta t}$

$= \frac{440-150}{60-0}$ ✓ ✓

= 4,83 ($cm^3 s^{-1}$) ✓ (3)

5.3

Marking criteria:	***Nasienkriteria:***
(a) Mole calculation of H_2. ✓	(a) *Mol berekening van H_2*
(b) Ratio of H_2 and Mg ✓	(b) *Verhouding H_2 en Mg*
(c) Calculate mass/mole of Magnesium ✓	(c) *Bereken massa/mol van Magnesium*
(d) Calculate % purity ✓	(d) *Bereken % suiwerheid*
(e) Answer ✓	(e) *Antwoord*
(Range 37,6 → 38)	(Gebied 37,6 → 38)

For/*Vir* H_2: $n = \frac{V}{V_m}$

$= \frac{0,4}{25,4}$ ✓**(a)**

$= 0,0157$ mol

Ratio H_2:Mg

1 : 1 ✓ **(b)**

0,0157 : 0,0157

Mass of Mg = nM

= 0,0157(24) ✓ **(c)**

= 0,3768 g

% purity = $\frac{\text{actual mass/ } werklike\ massa}{\text{theoretical mass/ } teoretiese\ massa} \times 100$

$= \frac{0,3678}{1} \times 100$ ✓ **(d)**

= 37,795% ✓ **(e)** (5)

5.4 The graph will have a steeper gradient ✓ that will reach completion faster ✓ and the same final volume.

Die grafiek sal 'n steiler helling hê wat vinniger voltooi sal word en sal dieselfde finale volume hê. (2)

5.5

- The concentration of the hydrochloric acid is more, thus more particles per unit volume. ✓
- More particles have kinetic energy (Ek) larger or equal to activation energy. Ek ≥ Ea ✓
- More effective collisions per unit time ✓
- Resulting in a higher rate of reaction. ✓

- *Die konsentrasie van die soutsuur verhoog, dus meer deeltjies per eenheid volume.*
- *Meer deeltjies het kinetiese energie (Ek) hoër of gelyk aan die aktiveringsenergie. Ek ≥ Ea*
- *Meer effektiewe botsings per eenheid tyd*
- *Wat dus lei tot 'n hoër reaksietempo.* (4)

[16]

QUESTION/*VRAAG* 6

6.1

Marking criteria/*Nasienkriteria:*
If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark./*Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

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, stel die sisteem 'n nuwe ewewig in deur die reaksie wat die versteuring teenwerk, te bevoordeel. (2)

6.2.1 DECREASES/*VERLAAG* ✓ (1)

6.2.2 The reverse reaction will be favoured ✓ to increase the concentration ✓of the methane (reactants).

Die terugwaartse reaksie sal bevoordeel word om die konsentrasie van die metaan (reaktanse) te verhoog (2)

6.3.1 EXOTHERMIC/*EKSOTERMIES* ✓ (1)

6.3.2
- As the temperature increases, the endothermic reaction is favoured. ✓
- The moles/amount of H_2 present at equilibrium decreases, ✓
- The reverse reaction is favoured, ✓therefore the forward reaction is exothermic.

- *Wanneer die temperatuur verhoog sal die endotermiese reaksie bevoordeel word.*
- *Die mol/hoeveelheid H_2 teenwoordig by ewewig verminder*
- *Die terugwaartse reaksie word bevoordeel dus is die voorwaartse reaksie eksotermies.* (3)

6.3.3

Marking criteria

(a) n_{H2} at equilibrium ✓
(b) Using the mole ratio of $1H_2S:2H_2$. ✓
(c) Using the mole ratio of $1CH_4:4H_2$ ✓
(d) Calculating the equilibrium mole of H_2S ✓
(e) Calculating the equilibrium mole of CH_4 ✓
(f) Divide by volume of 3 dm^3 ✓
(g) Correct Kc expression ✓
(h) Substitute concentration values and K_c ✓
(i) Final answer 0,957 mol ✓

***Nasienkriteria**:*

(a) n_{H2} by ewewig
(b) Gebruik die mol verhouding van $1H_2S:2H_2$.
(c) Gebruik die mol verhouding van $1CH_4:4H_2$
(d) Bereken die ewewig mol van H_2S
(e) Bereken die ewewig mol van CH_4
(f) Deel deur die volume van 3 dm^3
(g) Korrekte Kc uitdrukking
(h) Vervang konsentrasie waardes en K_c
(i) Finale antwoord 0,957 mol

	$2\ H_2S(g)$	$+\ CH_4(g)$	$\rightleftharpoons CS_2(\ell)$	$+\ 4\ H_2(g)$
Initial/ *Aanvanklik*	x	0,2		
Change/ *Verandering*	0,15 x 2 ✓(b) = –0,3	0,6/4 = –0,15✓(c)		+0,6
Equilibrium/ *Ewewig*	x – 0,3✓(d)	0,2 – 0,15 = 0,05✓(e)		0,6 ✓(a)
Concentration/ *Konsentrasie*	$\frac{x-0,3}{3}$ ✓(f)	$\frac{0,05}{3}$		$\frac{0,6}{3}$

$K_C = \frac{[H_2]^4}{[H_2S]^2[CH_4]}$ ✓(g)

$2 = \frac{(\frac{0,6}{3})^4}{(\frac{x-0,3}{3})^2(\frac{0,05}{3})^2}$ ✓(h)

Wrong Kc expression max 6/9
No Kc expression, correct substitution max 8/9

Verkeerde Kc uitdrukking maks 6/9
Geen Kc uitdrukking, korrekte substitusie maks 8/9

$x = 0,957$✓(i)

(9)
[18]

QUESTION/*VRAAG 7*

7.1 Weak base/*Swak basis.* ✓

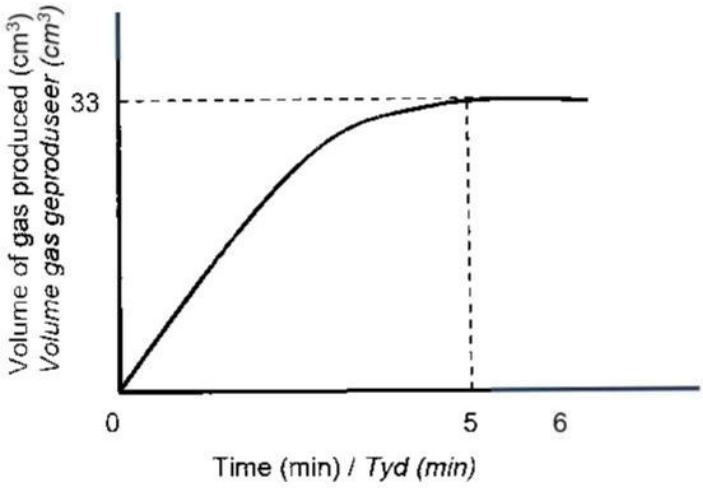
A weak base and a strong acid will give a red orange colour./*'n Swak basis en 'n sterk suur sal 'n rooi oranje kleur gee.* ✓
OR/*OF*
A weak base undgoes incomplete dissociation in water to form a low concentration of hydroxide (OH^-) ions.
'n Swak basis sal onvolledig dissosieer in water om 'n lae konsentrasie hidroksied (OH^-) ione te vorm. (2)

7.2 Below 7 ✓ because hydrolysis took place✓
Onder 7, want hidrolisie vind plaas.

OR/*OF*

The salt formed from a strong acid reacting with a weak base./*Die sout vorm as a sterk suur reageer met 'n swak basis.* (2)

7.3.1



Marking criteria:
- Values of 33 cm^3 and 5 or 6 min showing the completion of the reaction. ✓
- Label and unit – for both axes ✓
- Correct shape ✓✓
- Axes switched – 0/4

Nasienkriteria:
- *Waardes van 33 cm^3 en 5 of 6 min wys die voltooiing van die reaksie.*
- *Byskrif en eenheid – beide asse*
- *Korrekte vorm*
- *Asse omgeruil – 0/4*

(4)

7.3.2 After 5 mins the graph remains parallel (flattens out) to the X axis ✓
The volume of the gas produced remains constant ✓
The reaction has stopped ✓
The limiting reactant is used up
The gradient is zero

Na 5 min is die grafiek parallel (raak plat) met die x-as
Die volume van die gas wat geproduseer is bly konstant
Die reaksie het gestop
Die beperkende reaktans is opgebruik
Die gradiënt is nul

Any three/ *enige drie* (3)

7.3.3 $n_{(CO2)} = \frac{V}{V_M}$

$= \frac{\frac{33}{1000}}{25}$ ✓

$= 0{,}00132\text{mol}$

ratio of/*vervanging van* $MgCO_3 : CO_2$

1 : 1

$m_{(MgCO3)} = n \times M$

$= \underline{0{,}00132 \; x \; 84}$ ✓

$= 0{,}11\text{g}$ ✓

(3)

7.3.4 **POSITIVE MARKING FROM QUESTION 7.3.3 (0,00132 mol)/*POSITIEWE NASIEN VANAF VRAAG 7.3.3 (0,00132 mol)***

Marking criteria:
(a) Use a mole ratio ✓
(b) Use the formule $c = \frac{n}{V}$ with a volume of 0,03 dm^3✓
(c) Ratio of $HNO_3 : H_3O^+$✓
(d) Calculate exess number of mole or concentration ✓✓
(e) pH formula✓
(f) Final answer 0,385 ✓ (Range: 0,37 – 0,4)

Nasienkriteria:
(a) Gebruik die mol verhouding
(b) Gebruik die formule $c = \frac{n}{V}$ met 'n volume van 0,03 dm^3
(c) Verhouding $HNO_3 : H_3O^+$
(d) Bereken die oormaat aantal mol of die konsentrasie
(e) pH formule
(f) Finale antwoord 0,385 (Gebied: 0,37 – 0,4)

OPTION/*OPSIE* 1

ratio of/*verhouding van* $MgCO_3 : HNO_3$

1 : 2✓(a)

0,00132: 2(0,00132)

n_{HNO3} used/*gebruik* = 0,00264mol

n_{HNO3} initial/*aanvanklik*

= c x V

= 0,5 x 0,03 ✓(b)

= 0,015 mol

n_{HNO3} excess/*oormaat* = n_{HNO3} initial/*aanvanklik* – n_{HNO3} used/*gebruik*

= 0,015 – 0,00264 ✓✓(d)

= 0,01236 mol

$c_{HNO3} = \frac{n}{V}$

$= \frac{0,01236}{0,03}$

= 0,412 mol.dm^{-3}

ratio of/*verhouding van* $HNO_3 : H_3O^+$

1 : 1 ✓(c)

$[H_3O^+]$= 0,412 mol.dm^{-3}

OPTION/*OPSIE* 2

n_{CO2} = 0,00132 mol

ratio of/*verhouding van* $HNO_3 : CO_2$

2 : 1 ✓(a)

n_{HNO3} used/*gebruik* = 0,00264mol

$c_{HNO3} = \frac{n}{V}$

$= \frac{0,0264}{0,03}$ ✓(b)

= 0,088 mol.dm^{-3}

ratio of/*verhouding van* $HNO_3 : H_3O^+$

1 : 1 ✓(c)

$[H_3O^+]_{used/gebruik}$= 0,088 mol.dm^{-3}

$[H_3O^+]_{excess/oormaat}$ =$[H_3O^+]$initial/*aanvanklik* – $[H_3O^+]$ used/*gebruik*

= 05 – 0,088 ✓✓(d)

= 0,0412 mol.dm^{-3}

pH = –log$[H_3O^+]$ ✓(e)

= –log(0,412)

= 0,385✓(f) (7)

[21]

QUESTION/*VRAAG* 8

8.1 Anode/*Anode*✓
It is the negative electrode./*Dis die negatiewe elektrode.* ✓ (2)

8.2 $Cu^{2+} + 2e^- \rightarrow Cu$ ✓✓ (2)

Marking criteria/*Nasienkriteria:*
- $Cu^{2+} + 2e^- \rightleftharpoons Cu$ ($^1/_2$) $Cu \leftarrow Cu^{2+} + 2e^-$ ($^2/_2$)
- $Cu + 2e^- \leftarrow Cu^{2+}$ ($^0/_2$) $Cu \rightleftharpoons Cu^{2+} + 2e^-$ ($^0/_2$)
- Ignore if charge omitted on electron./*Ignoreer indien lading weggelaat op elektron.*
- If charge (2+) omitted on Cu^{2+} *Indien lading (2+) weggelaat op* Cu^{2+}
  Example/*Voorbeeld:* $Cu + 2e^- \rightarrow Cu$ Max./*Maks:* $^1/_2$

8.3

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. OA or RA followed by correct substitution. */ Enige ander formule wat onkonvensionele afkortings gebruik, bv. OM en RM gevolg deur korrekte vervangings* ¾

$E^0cell = E^0cathode/katode - E^0anode$ ✓
$2 = +0,34 - x$ ✓
$= -1,66$ (V) ✓

METAL/*METAAL* X is Aluminium ✓ (4)

8.4 Metal X/*Metaal* X ✓ (accept/*aanvaar*: aluminium)

as it undergoes oxidation/loses electrons/is the reducing agent./
aangesien dit oksidasie ondergaan/elektrone verloor/die reduseermiddel is ✓ (2)

8.5 $2Al + 3Cu^{2+} \rightarrow 2Al^{3+} + 3Cu$

$n_{Al} = \frac{m}{M}$
$= \frac{1,6}{27}$ ✓
$= 0,0593$ mol

Molar ratio/*Molverhouding* of Al : Cu^{2+}
2 : 3

$n_{Cu^{2+}} = \frac{0,0593}{2} \times 3$ ✓
$= 0,089$ mol

$m_{(Cu^{2+})} = n \times M$
$= 0,089 \times 63,5$ ✓
$= 5,64\ g$ ✓ (4)

[14]

QUESTION/*VRAAG* 9

9.1 Ag/Silver/*Ag/Silwer*✓ (1)

9.2 $Ag \longrightarrow Ag^+ + e^-$ ✓✓ (2)

Marking criteria/*Nasienkriteria:*

- $Ag^+ + e^- \rightleftharpoons Ag$ $(^1/_2)$ $Ag \leftarrow Ag^+ + e^-$ $(^0/_2)$
- $Ag^+ + e^- \leftarrow Ag$ $(^2/_2)$ $Ag \rightleftharpoons Ag^+ + e^-$ $(^0/_2)$
- Ignore if charge omitted on electron./*Ignoreer indien lading weggelaat op elektron.*
- If charge (+) omitted on Ag^+ *Indien lading (+) weggelaat op* Ag^+
  Example/*Voorbeeld:* $Ag \longrightarrow Ag + e^-$ Max./*Maks:* $^1/_2$

9.3 $n\ Ag = \frac{m}{M}$

$= \frac{0,54}{108}$ ✓

$= 0,005\ mol$

$n = \frac{N}{N_A}$ ✓

$0,005 = \frac{N}{6,02 \times 10^{23}}$ ✓

$= 3,01 \times 10^{21}$ electrons/*elektrone* ✓ (4)

9.4 For every silver atom that goes in the solution there is one silver atom that forms on the key. ✓✓
Vir elke silwer atoom wat in die oplossing gaan is een silwer atoom wat vorm op die sleutel
OR/*OF*
The rate of oxidation is equal to the rate of reduction.
Die tempo van oksidasie is gelyk aan die tempo van reduksie (2)

9.5 DC source/*GS bron*✓
So that the ions flow in the same direction./*Sodat die ione in dieselfde rigting vloei* ✓
OR/*OF*
So that the cations move from the anode to the cathode./*Sodat die katione van die anode na die katode beweeg.*
OR/*OF*
So that the electron flow/current is in the same direction all the time/*Sodat die elektrone/stroom die heeltyd in dieselfde rigting vloei*
OR/*OF*
To ensure that reduction occurs at the cathode (key) only./*Om te verseker dat die reduksie slegs by die katode (sleutel) plaasvind.* (2)

[11]

TOTAL/*TOTAAL*: 150