Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIORSERTIFIKAAT*

GRADE/*GRAAD* 12

SEPTEMBER 2023

PHYSICAL SCIENCES P2/ *FISIESE WETENSKAPPE V2* MARKING GUIDELINE/*NASIENRIGLYN*

MARKS: **150**

This marking guideline consists of 19 pages./
Hierdie nasienriglyn bestaan uit 19 bladsye.

QUESTION 1/*VRAAG* 1

1.1 D ✓✓ (2)

1.2 B ✓✓ (2)

1.3 A✓✓ (2)



1.4 D ✓✓ (2)

1.5 B ✓✓ (2)

1.6 C ✓✓ (2)

1.7 D ✓✓ (2)

1.8 A ✓✓ (2)

1.9 D ✓✓ (2)

1.10 B ✓✓ (2)

[20]



Copyright reserved/*Kopiereg voorbehou*

QUESTION 2/*VRAAG 2*

2.1.1 D ✓ (1)

2.1.2 F ✓ (1)

2.1.3 B ✓ (1)

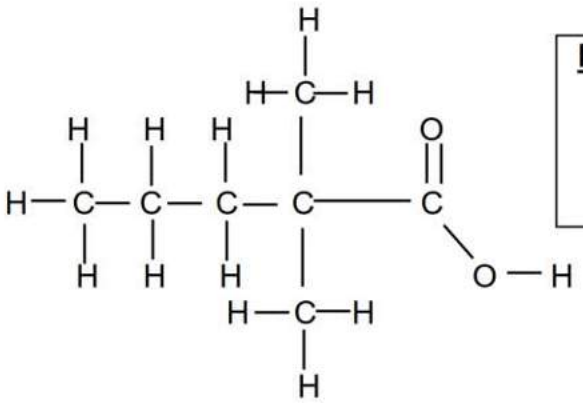
2.2 UNSATURATED ✓

It is an organic compound that <u>contains double/triple/multiple bonds</u>. ✓

ONVERSADIG

Dit is 'n organiese verbinding wat <u>dubbel/drievoudige/meervoudige bindings bevat</u>. (2)

2.3.1



<u>Marking criteria/*Nasienkriteria*</u>
- Functional group correct ✓
  Funksionele groep korrek
- Whole structure correct ✓
  Hele struktuur korrek

(2)

2.3.2 <u>hept-3-yne ✓ ✓ / 3-heptyne</u>

<u>*hept-3-yn / 3-heptyn*</u>

Marking criteria/ *Nasienkriteria*
- Parent name and suffix correct (heptyne)✓
  Stam naam en agtervoegsel korrek (heptyn)
- Everything correct e.g. hyphens and numbering ✓
  Alles korrek bv koppeltekens en nommering

(2)

2.4 Tertiary. ✓

The carbon that is bonded to the hydroxyl group (-OH) is bonded to three other carbons. ✓

OR

The carbon of the functional group is bonded to three other carbons.

Tersiêre

Die koolstof wat verbind is aan die hidroksielgroep (-OH) is verbind aan drie ander koolstowwe.

OF

Die koolstof van die funksionele groep is aan drie ander koolstowwe verbind. (2)

Copyright reserved/*Kopiereg voorbehou*

2.5 Butan-2-ol / 2-butanol ✓✓ ***NOTE/LET WEL:*** Butan-1-ol / 1-butanol (1/2) (2)

2.6.1 Compounds with the same molecular formula ✓ but different functional groups ✓/belong to different homologous series.

Verbindings met dieselfde molekulêre formule, maar verskillende funksionele groepe / behoort aan verskillende homoloë reeks. (2)

2.6.2 CH_3COCH_3 ✓✓ **OR/*OF*** CH_3CCH_3 (with O above C) (2)

[17]

QUESTION 3/*VRAAG* 3

3.1

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 woord/frase

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

Die temperatuur waarby die dampdruk van 'n vloeistof gelyk is aan die atmosferiese druk. (2)

3.2.1 Molecular size ✓ / Surface area / Chain length / London forces
Molekulêre grootte / Oppervlakte / kettinglengte / Londonkragte (1)

3.2.2 Functional group ✓/ Homologous series
Funksionele groep / Homoloë reeks (1)

3.3 London forces / induced dipole forces / dispersion forces ✓
Londonkragte / geïnduseerde dipoolkragte / verspreidingskragte (1)

3.4 129 °C ✓ (1)

3.5

Marking criteria/*Nasienkriteria*

- Compare the molecular size of 2-methylbutan-1-ol to butan-1-ol ✓
- Relate the molecular size to London forces/induced dipole forces/dispersion forces. ✓

- Compare the chain length of 2-methylbutan-1-ol to pentan-1-ol ✓
- Relate the chain length to London forces/induced dipole forces/dispersion forces ✓

- *Vergelyk die molekulêre grootte van 2-metielbutan-1-ol aan butan-1-ol*
- *Verwys die molekulêre grootte na die Londonkragte/ geïnduseerde dipoolkragte / verspreidingkragte*

- *Vergelyk die kettinglengte van 2-metielbutan-1-ol met pentan-1-ol*
- *Verwys die kettinglengte na die Londonkragte / geïnduseer dipoolkragte / verspreidingkragte*

- 2-methylbutan-1-ol has a larger molar mass/molecular size than butan-1-ol ✓
- London forces/induced dipole forces/dispersion forces of 2-methylbutan-1-ol is stronger than that butan-1ol ✓
- The boiling point will higher than that of butan-1-ol

- 2-methyl butan-1-ol has a shorter chain length than pentan-1-ol✓
- London forces of 2-methyl butan-1-ol is weaker than that of pentan-1-ol ✓
- The boiling point will be lower than that of pentan-1-ol

- *2-metielbutan-1-ol het 'n groter molekulêre massa/molekulêre grootte as butan-1-ol*
- *Londonkragte/geïnduseerde dipoolkragte/verspreidings van 2-metielbutan-1-ol is sterker as dié van butan-1-ol*
- *Die kookpunt is hoër as dié van butan-1-ol*

- *2-metielbutan-1-ol het 'n korter kettinglengte as pentan-1-ol*
- *Londonkragte van 2-metielbutan-1-ol is swakker as dié van pentan-1-ol*
- *Die kookpunt sal laer wees as dié van pentan-1-ol* (4)

Copyright reserved/*Kopiereg voorbehou*

OR /*OF*

- Butan-1-ol has a smaller molar mass/molecular size than 2-methylbutan-1-ol
- London forces/induced dipole forces/dispersion forces of butan-1-ol is weaker than that 2-methylbutan-1-ol
- The boiling point will higher than that of butan-1-ol

- Pentan-1-ol has a larger chainlength than 2-methyl butan-1-ol
- London forces/induced dipole forces/dispersion forces of pentan-1-ol is stronger than that of 2-methyl butan-1-ol
- The boiling point will be lower than that of pentan-1-ol

- *Butan-1-ol het 'n kleiner molekulêre massa/molekulêre grootte as 2-metielbutan-1-ol*
- *Londonkragte/geïnduseerde dipoolkragte/verspreidings van butan-1-ol is swakker as dié van 2-metielbutan-1-ol*
- *Die kookpunt is hoër as dié van butan-1-ol*

- *Pentan-1-ol het 'n langer kettinglengte as 2-metielbutan-1-ol*
- *Londonkragte van pentan-1-ol is sterker as dié van 2-metielbutan-1-ol*
- *Die kookpunt sal laer wees as dié van pentan-1-ol*

3.6.1

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 woord/frase*

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

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

3.6.2 **Q** ✓ (1)

3.6.3 **Marking criteria/*Nasienkriteria***

- Propan-1-ol has hydrogen bonds ✓(and London forces/induced dipole forces/dispersion forces
- Propanal has dipole-dipole forces ✓(and London/induced dipole forces/dispersion forces
- Compare the strength of the hydrogen bonds to dipole-dipole forces ✓
- Relate strength of intermolecular forces to vapour pressure ✓

- *Propan-1-ol het waterstofbindings (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Propanal het dipool-dipoolkragte (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Vergelyk die sterkte van die waterstofbindings met die dipool-dipoolkragte*
- *Verwys die sterkte van die intermolekulêrekragte met die dampdruk*

Copyright reserved/*Kopiereg voorbehou*

- Propan-1-ol has hydrogen bonds ✓(and London forces/induced dipole forces/dispersion forces)
- Propanal has dipole-dipole forces (and London forces/induced dipole forces/dispersion forces) ✓
- Hydrogen bonds are stronger than the dipole-dipole forces ✓
- Stronger intermolecular forces result in lower vapour pressure ✓

- *Propan-1-ol het waterstofbindings (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Propanal het dipool-dipoolkragte (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Waterstofbindings is sterker as dipool-dipoolkragte*
- *Sterker intermolekulêrekragte het laer dampdruk*

OR / *OF*

- Propan-1-ol has Hydrogen bonds ✓ (and London forces/induced dipole forces/dispersion forces)
- Propanal has dipole-dipole forces ✓(and London/induced dipole forces/dispersion forces)
- Dipole-dipole forces are weaker than the hydrogen bonds✓
- Weaker intermolecular forces result in higher vapour pressure ✓

- *Propan-1-ol het waterstofbindings (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Propanal het dipool-dipoolkragte (en Londonkragte/geïnduseerde dipoolkragte/verspreidingskragte)*
- *Dipool-dipoolkragte is swakker as waterstofbindings*
- *Swakker intermolekulêrekragte het hoër dampdruk*

(4)
[17]

Copyright reserved/*Kopiereg voorbehou*

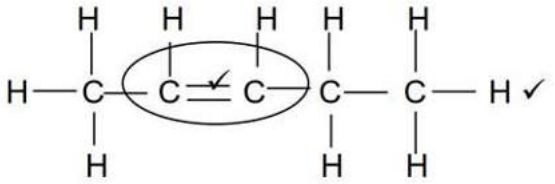
QUESTION 4/*VRAAG 4*

4.1.1 Hydrolysis / *Hidrolise* ✓ (1)

4.1.2 Pentan-2-ol / 2-pentanol ✓✓ (2)

4.1.3 Concentrated strong base✓ **OR** concentrated NaOH **OR** concentrated KOH **OR** concentrated LiOH
Gekonsentreerde sterk basis ***OF*** *gekonsentreerde NaOH* ***OF*** *gekonsentreerde KOH* ***OF*** *gekonsentreerde LiOH* (1)

4.1.4



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

(2)

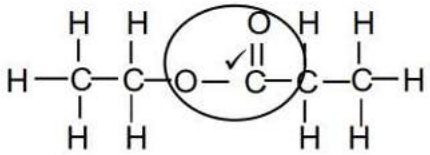
4.1.5 Sulphuric acid / *Swawelsuur* ✓ (1)

4.1.6 Dehydration / *Dehidrasie* / *Dehidratering* ✓ (1)

4.2.1 Esterification / Condensation / *Esterifikasie / Verestering* ✓ (1)

4.2.2 Alcohols are flammable✓ /prevent fire
Alkohole is vlambaar / om 'n vuur te voorkom (1)

4.2.3



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

ethyl ✓propanoate ✓ / *etiel-propanoaat* (4)
[14]

QUESTION 5/*VRAAG 5*

5.1

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 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 reaktanse of produkte 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 mol/volume/massa ✓✓ ***(2 of 0)*** (2)

5.2 Stopwatch ✓/Timer/ Measuring cylinder
Stophorlosie / Tydhouer / Meetsilinder (1)

5.3 Reaction is exothermic / reaction releases heat ✓
Reaksie is eksotermies / reaksie gee hitte af (1)

5.4 SHORTER / *KORTER* ✓ (1)

5.5 For Exp. **2**

- Higher concentration results in more particles colliding with correct orientation ✓
- The number of effective collision per unit time increases / frequency of the effective collisions increases ✓

Vir Eksp. ***2***

- *Hoër konsentrasie beteken meer deeltjies bots met die korrekte orientasie*
- *Die aantal effektiewe botsings per eenheid tyd neem toe/ frekwensie van die effektiewe botsings neem toe.*

OR / *OF*

For Exp. **1**

- Low concentration results in fewer particles colliding with correct orientation ✓
- The number of effective collision per unit time decreases / frequency of effective collisions decreases ✓

Vir Eksp. ***1***

- *Lae konsentrasie beteken minder deeltjies bots met die korrekte orientasie*
- *Die aantal effektiewe botsings per eenheid tyd neem af / frekwensie van die effektiewe botsings neem af.* (2)

5.6.1 Rate/ *Tempo* = $\frac{\Delta c}{\Delta t}$

= $\frac{250\text{-}0}{5{,}28\text{-}0}$ ✓ ✓ Accept / *Aanvaar* $\frac{250}{5{,}28}$

= 0,95✓($cm^3 \cdot min^{-1}$) (3)

5.6.2 **Marking criteria / Nasienkriteria**

- V_{CO_2} remaining / *oorbly* = 150 cm^3
- Substitution into / *Vervanging in* n = V/Vm
- Subst. into / *Vervanging in* n = m/M
- Final answer / *Finale antwoord*

$V(CO_2)$ remaining / *oorbly* = 250 – 100 = 150 cm^3 ✓

n = V/Vm = 150/25 000 ✓

= 6 x 10^{-3} mol

$n(CO_2)$ = m/M

6 x 10^{-3} = m / 44 ✓

m = 0,264 g ✓/0,26 g (4)

5.7.1 **P** ✓ (1)

5.7.2 $C_2H_4O_2$ is a weaker acid ✓(than HCℓ) which will result in a LOWER reaction rate ✓ (for Expt. 3) / Lower gradient/Longer reaction time

$C_2H_4O_2$ is 'n swakker suur (as HCℓ) wat sal lei na 'n LAER reaksietempo (vir Eksp. 3) / laer gradiënt / langer reaksietyd

OR / *OF*

HCℓ is stronger acid ✓(than $C_2H_4O_2$) which will result in a HIGHER reaction rate ✓ for Expt. 1/ Higher gradient/Shorter reaction time

HCℓ is 'n sterker suur (as $C_2H_4O_2$) wat sal lei na 'n HOËR reaksietempo (vir Eksp. 1) / hoër gradiënt / korter reaksietyd (2)

5.7.3 EQUAL TO ✓
Final amount of CO_2 is the same ✓ (in both experiments)

GELYK AAN
Finale hoeveelheid van CO_2 is gelyk (in beide eksperimente) (2)
[19]

Copyright reserved/*Kopiereg voorbehou*

QUESTION 6 / *VRAAG 6*

6.1.1 Reversible reaction ✓ /Products can be converted back to reactants
Omkeerbare reaksie / Produkte kan na reaktanse omgeskakel word

NOTE: Do not accept "Reaction is at equilibrium"
LET WEL: Moenie "Reaksie is by ewewig" aanvaar nie. (1)

6.1.2 (Chemical) Equilibrium / *(Chemiese) Ewewig* ✓ (1)

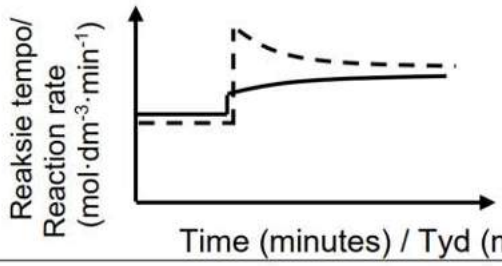
6.1.3 HEATED / *VERHIT* ✓ (1)

6.1.4 ENDOTHERMIC / *ENDOTERMIES* ✓ (1)

6.1.5
- Increase in temperature favoured the forward reaction ✓ / The rate of the forward reaction increased more than the rate of the reverse reaction.
- Increase in temperature favours the endothermic reaction. ✓

- *Toename in temperatuur bevoordeel die voortwaartse reaksie / Die tempo van die voortwaartse reaksie is hoër as die terugwaartse reaksie*
- *'n Toename in temperatuur bevoordeel die endotermiese reaksie* (2)

6.1.6



Marking criteria/ *Nasienkriteria*
- Both rates increase; new equilibrium at a higher rate when P is increased ✓
  Beide tempos neem toe; nuwe ewewig is by 'n hoër tempo wanneer P verhoog
- The increase in reverse reaction is HIGHER than for the forward reaction and eventually there is horizontal section for both ✓
  Die toename in die terugwaartse reaksie is HOËR as die voortwaartse reaksie en daar is horisontale gedeelte by die einde vir beide.

NOTE: *Do not penalise if axes are not labelled.*
LET WEL: *Moenie penaliseer as asse nie benoem is nie.* (2)

6.2 MOLE CALCULATIONS / *MOL BEREKENINGE*

a. Correct K_C expression (formula in square brackets) ✓
b. Substitution of equilibrium concentration of CO_2 into K_C expression ✓
c. Determining the $n_{equilibrium}$ CO ✓
d. Determining the n CO $_{reacted}$
e. Correct mol ratio for CO:C ✓
f. Determining the initial mol of C✓
g. Correct substitution into percentage formula ✓
h. Final answer ✓

a. Korrekte K_c-uitdrukking (Formule formule tussen vierkanthakies)
b. Vervanging van ewewigkonsentrasie van CO_2 in K_C – uitdrukking
c. Bepaal die n_{ewewig} CO
d. Bepaal n CO $_{reageer}$
e. Korrekte molverhouding vir CO : C
f. Bepaal die aanvanklike mol van C
g. Korrekte vervanging in persentasie formule
h. Finale antwoord

$$K_c = \frac{[CO]^2}{[CO_2]} \checkmark \text{ (a)}$$

$$0,05 = \frac{[CO]^2}{0,05} \text{ (b)} \checkmark$$

$$[CO] = 0,05 \text{ mol.dm}^{-3}$$

- No K_c expression, correct substitution / *Geen K_c-uitdrukking, korrekte, korrekte substitusie.* Max. / *Maks. 7/8*
- Wrong K_c expression / *Verkeerde K_c-uitdrukking.* Max. *Maks. 5/8*

	C (s)	CO_2 (g)	2 CO (g)
Initial mol /Aanvangs-hoeveelheid (mol)	0,45 ✓(f)		0
Change/ *Verandering* in mol	0, 05✓(e)		0,1✓ (d)
Equilibrium/ *Ewewig* mol	0,40		0,1✓ (c)
Concentration/ *Konsentrasie* (mol·dm^{-3})	-		0,05

% C reacted = $\Delta n/n_{initial}$ x 100

= 0,05/0,45 x 100 ✓ (g)

= 11,11%✓ (h)

(8)
[16]

Copyright reserved/*Kopiereg voorbehou*

QUESTION 7/*VRAAG 7*

7.1.1 An acid is a proton (H^+-ion) donor ✓✓
'n Suur is 'n proton (H^+-ioon*) skenker* (2)

7.1.2 $HC_2O_4^-$ ✓ (1)

7.1.3 Weak acid / *Swaksuur* ✓ (1)

7.1.4 The acid did not fully/completely ionise ✓✓ (in water). **OR** ionised incompletely.
Die suur ioniseer nie volledig (in water) nie ***OF*** *Suur ioniseer onvolledig* (2)

7.2.1 **Marking criteria/*Nasienkriteria***

- n = cV
- Subst. into / *Vervanging in* n = cV
- Final answer / *Finale antwoord*

n (CH_3COOH) = cV ✓
= 0,1 x 25 x 10^{-3} ✓
= 2,5 x 10^{-3} mol ✓ (3)

7.2.2

Marking criteria/*Nasienkriteria*	**Marking criteria/*Nasienkriteria***
• Formula pH = - log [H_3O^+] ✓ • pH value substituted into formula ✓ • Substitution in K_w formula ✓ • Final answer ✓ • *Formule pH = - log [H_3O^+]* • *pH waarde vervang in formule* • *Vervang in K_w formule* • *Finale antwoord*	• Formula pOH + pH = 14 ✓ • pH value substituted into formula ✓ • Substitution in pOH formula ✓ • Final answer ✓ • *Formule pOH + pH = 14* • *pH waarde vervang in formule* • *Vervang van pOH waarde in formule* • *Finale antwoord*

OPTION 1 / *OPSIE 1*	**OPTION 2 / *OPSIE 2***
$pH = - \log [H_3O^+]$ ✓	$pOH + pH = 14$ ✓
12 ✓ $= - \log [H_3O^+]$	$pOH + 12$ ✓ $= 14$
$[H_3O^+] = 1 \times 10^{-12}$ mol·dm^{-3}	$pOH = 2$
$K_w = [OH^-][H_3O^+] = 1 \times 10^{-14}$	$pOH = - \log [OH^-]$
$[OH^-][H_3O^+] = 1 \times 10^{-14}$	$2 = - \log [OH^-]$ ✓
$[OH^-](1 \times 10^{-12}) = 1 \times 10^{-14}$ ✓	$[OH^-] = 0,01$ mol·dm^{-3} ✓
$[OH^-] = 0,01$ mol·dm^{-3} ✓	

(4)

7.2.3 **Positive marking from / *Positiewe nasien vanaf* 7.2.1 and/ *en* 7.2.2**
Marking criteria / *Nasienkriteria*

- **Using** ratio Acid : Base 1 : 1
- Subst. of base values into $n_{NaOH\ excess} = cV$
- Addition of n remaining and n initial (NaOH)
- Subst. into c = n/V
- Multiplication of c_{dilute} by 10
- Final answer

- ***Gebruik*** *verhouding Suu r: Basis* = 1 : 1
- *Vervanging van basis waarde in* $n_{NaOH\ oormaat} = cV$
- *Addisie van n oorbly en n aanvanklik (NaOH)*
- *Vervanging in c = n / V*
- *Vermenigvulding van* c_{verdun} *met 10*
- *Finale antwoord*

n (NaOH) $_{reacting/\ reageer}$ = 2,5 x 10^{-3} mol ✓ ***From/Vanaf 7.2.1***

n (NaOH) $_{in\ excess/\ oormaat}$ = cV

n (NaOH) $_{excess/\ oormaat}$ = (0,01)(60 x 10^{-3}) ✓

n (NaOH) $_{excess/\ oormaat}$ = 6 x 10^{-4} mol

$n\ (NaOH)_{total/\ totaal}$ = 2,5 x 10^{-3} + 6 x 10^{-4} ✓

n (NaOH) = 3,1 x 10^{-3} mol

(6)

Copyright reserved/*Kopiereg voorbehou*

$c_{dilute/verdun} = \frac{n}{V}$

$c_{dilute/verdun} = \frac{3,1 \times 10^{-3}}{35 \times 10^{-3}}$ ✓

$c_{dilute/verdun} = 0,08857 \text{ mol} \cdot \text{dm}^{-3}$

$c_{concentrated /}$ $= 0,08857 \times 10$ ✓

gekonsentreerd $= 0,8857 \text{ mol} \cdot \text{dm}^{-3}$ ✓/$0,89 \text{ mol} \cdot \text{dm}^{-3}$

[19]

Copyright reserved/*Kopiereg voorbehou*

QUESTION 8/*VRAAG 8*

8.1 Chemical energy is converted into electrical energy ✓✓
Chemiese energie word na elektriese energie omgeskakel. (2)

8.2.1 $Fe^{2+} \rightarrow Fe^{3+} + e^-$ ✓✓ (2)

Marking criteria / *Nasienkriteria*
- $Fe^{3+} + e^- \leftarrow Fe^{2+}$ 2/2
- $Fe^{2+} \rightleftharpoons Fe^{3+} + e^-$ ½
- $Fe^{3+} + e^- \rightarrow Fe^{2+}$ 0/2
- $Fe^{3+} + e^- \rightleftharpoons Fe^{2+}$ 0/2

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

- If a charge of an ion is omitted
  As lading weggelaat is op 'n ioon.
  e.g. / *bv.* $Fe^2 \rightarrow Fe^3 + e^-$ Max. / *Maks.* ½

8.2.2 Ag | Ag^+✓ | | ✓ Fe^{3+},Fe^{2+}✓| Pt ✓ (3)

Marking criteria/*Nasienkriteria*
- Ag | Ag^+ ✓
- Fe^{3+},Fe^{2+} | Pt ✓
- | | ✓

8.2.3 Concentration: 1 mol·dm^{-3} ✓ and temperature: 25 ˚C ✓ / 298 K
Konsentrasie: 1 mol·dm^{-3} en temperatuur: 25 ˚C / 298 K (2)

8.3 $E^\theta_{cell} = E^\theta_{cathode/reduction/oxidising\ agent} - E^\theta_{anode/oxidation/reducing\ agent}$ ✓

$E^\theta_{cell} = (0,80)$ ✓ – (0,77) ✓

$E^\theta_{cell} = 0,03$ V ✓

Marking criteria/*Nasienkriteria*
- Any other formula using unconventional abbreviation , e.g.
  Enige ander formule wat onkonvensionele afkortings gebruik bv.
- $E^\theta_{cell} = E^\theta_{OA} - E^\theta_{RA}$ followed by the correct substitution./ *gevolg deur korrekte vervangings* ¾

(4)

8.4 Decrease / *Afneem* ✓ (1)

8.5 $Cℓ^-$ would form an insoluble salt/precipitate with the Ag^+✓✓ / AgCℓ will precipitate out. The Ag^+ half-cell would no longer be neutral / Circuit would be incomplete / Not enough electrolyte in half cell.

$Cℓ^-$ sal 'n neerslag vorm/presipiteer met Ag^+/ AgCℓ vorm 'n neerslag / Die Ag^+halfsel sal nie meer neutraal wees nie / Stroombaan sal onvoltooïed wees / Nie genoeg elektroliet in die halfsel nie. (2)

[16]

Copyright reserved/*Kopiereg voorbehou*

QUESTION 9/*VRAAG 9*

9.1

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 woord/frase

The chemical process in which electrical energy is converted to chemical energy. ✓✓
Die chemiese proses waarin elektriese energie word na chemiese energie omgeskakel.

OR / *OF*

The use of electrical energy to produce a chemical change. ✓✓
Die gebruik van elektriese energie om chemiese energie te produseer (2)

9.2 ENDOTHERMIC / *ENDOTERMIES* ✓ (1)

9.3 $2\ Cl^- \rightarrow Cl_2(g) + 2e^-$ ✓✓ Ignore phases / *Ignoreer fases* (2)

Marking criteria / *Nasienkriteria*
- $2\ Cl^- \rightleftharpoons Cl_2(g) + 2e^-$ ½
- $Cl_2(g) + 2e^- \leftarrow 2\ Cl^-$ 2/2
- $Cl_2(g) + 2e^- \rightleftharpoons 2\ Cl^-$ 0/2

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

9.4

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

$$n = \frac{0,369}{63,5} \checkmark$$

$$n = 5,811 \times 10^{-3}$$

$$n(e^-) = 2 \times 5,811 \times 10^{-3} \checkmark$$

$$n(e^-) = 0,01162$$

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

$$0,01162 = \frac{N}{6,02 \times 10^{23}} \checkmark$$

$$N = 6,9964 \times 10^{21}$$

$$Q = Nq$$

$$Q = 6,9964 \times 10^{21} \times 1,6 \times 10^{-19} \checkmark$$

$$Q = 1\,119,4310 \text{ C}$$

$$I = \frac{Q}{\Delta t} \checkmark$$

$$I = \frac{1\,119,4310}{27 \times 60} \checkmark$$

$$I = 0,69 \text{ A} \checkmark$$

Marking criteria/*Nasienkriteria*

- Subst. into n = m/M
- Use of mole ratio Cu : e^-
- Subst. into $n = N/N_A$
- Subst. into $n = Q/q_e$
- Formula $Q = I\Delta t$
- Subst. into $Q = I\Delta t$
- Final answer with unit

- *Vervang in n = m/M*
- *Gebruik van mol-verhouding Cu : e^-*
- *Vervang in $n = N/N_A$*
- *Vervang in $n = Q/q_e$*
- *Formule $Q = I\Delta t$*
- *Vervang in $Q = I\Delta t$*
- *Finale antwoord met eenheid*

(7)
[12]

TOTAL/*TOTAAL*: 150

Copyright reserved/*Kopiereg voorbehou*