Province of the
EASTERN CAPE
EDUCATION

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIORSERTIFIKAAT*

GRADE/*GRAAD* 12

SEPTEMBER 2024

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

MARKS/*PUNTE*: 150

This marking guideline consists of 22 pages./
Hierdie nasienriglyn bestaan uit 22 bladsye.

GENERAL GUIDELINES/*ALGEMENE RIGLYNE*

1. CALCULATIONS/*BEREKENINGE*

1.1 **Marks will be awarded for**: correct formula, correct substitution, correct answer with unit.
Punte sal toegeken word vir: *korrekte formule, korrekte substitusie, korrekte antwoord met eenheid.*

1.2 **No marks** will be awarded if an **incorrect or inappropriate formula is used**, even though there are many relevant symbols and applicable substitutions.
Geen punte *sal toegeken word waar 'n* ***verkeerde of ontoepaslike formule gebruik*** *word nie, selfs al is daar relevante simbole en relevante substitusies.*

1.3 When an error is made during **substitution into a correct formula**, a mark will be awarded for the correct formula and for the correct substitutions, but **no further marks** will be given.
Wanneer 'n fout gedurende ***substitusie in 'n korrekte formule*** *begaan word, sal 'n punt vir die korrekte formule en vir korrekte substitusies toegeken word, maar* ***geen verdere punte*** *sal toegeken word nie.*

1.4 If **no formula** is given, but **all substitutions are correct**, a candidate will **forfeit one mark.**
Indien ***geen formule*** *gegee is nie, maar* ***al die substitusies is korrek****,* ***verloor*** *die kandidaat* ***een punt****.*

1.5 **No penalisation** if **zero substitutions are omitted** in calculations where **correct formula**/**principle** is correctly given.
Geen penalisering *indien* ***nulwaardes nie getoon*** *word nie in berekeninge waar die* ***formule/beginsel korrek gegee is nie****.*

1.6 Mathematical manipulations and change of subject of appropriate formulae carry no marks, but if a candidate starts off with the correct formula and then changes the subject of the formula incorrectly, marks will be awarded for the formula and correct substitutions. The mark for the incorrect numerical answer is forfeited.
Wiskundige manipulasies en verandering van die onderwerp van toepaslike formules tel geen punte nie, maar indien 'n kandidaat met die korrekte formule begin en dan die onderwerp van die formule verkeerd verander, sal die punte vir die formule en korrekte substitusies toegeken word. Die punt vir die verkeerde numeriese antwoord word verbeur.

1.7 Marks are only awarded for a formula if a **calculation has been attempted**, i.e. substitutions have been made or a numerical answer given.
Punte word slegs vir 'n formule toegeken indien ***'n poging tot berekening aangewend*** *is, d.w.s. substitusies is gedoen of 'n numeriese antwoord is gegee.*

1.8 Marks can only be allocated for substitutions when values are substituted into formulae and not when listed before a calculation starts.
Punte kan slegs toegeken word vir substitusies wanneer waardes in formules ingestel word en nie vir waardes wat voor 'n berekening gelys is nie.

1.9 All calculations, when not specified in the question, must be done to a minimum of two decimal places.
Alle berekenings, wanneer nie in die vraag gespesifiseer word nie, moet tot 'n minimum van twee desimale plekke gedoen word.

1.10 If a final answer to a calculation is correct, full marks will not automatically be awarded. Markers will always ensure that the correct/appropriate formula is used and that workings, including substitutions, are correct.
Indien 'n finale antwoord van 'n berekening korrek is, sal volpunte nie outomaties toegeken word nie. Nasieners sal altyd verseker dat die korrekte/toepaslike formule gebruik word en dat bewerkings, insluitende substitusies korrek is.

1.11 Questions where a series of calculations have to be made (e.g. a circuit diagram question) do not necessarily always have to follow the same order. FULL MARKS will be awarded provided it is a valid solution to the problem. However, any calculation that will not bring the candidate closer to the answer than the original data, will not count any marks.
Vrae waar 'n reeks berekeninge gedoen moet word (bv. 'n stroombaan-diagramvraag) hoef nie noodwendig dieselfde volgorde te hê nie. VOLPUNTE sal toegeken word op voorwaarde dat dit 'n geldige oplossing vir die probleem is. Enige berekening wat egter nie die kandidaat nader aan die antwoord as die oorspronklike data bring nie, sal geen punte tel nie.

2. UNITS/*EENHEDE*

2.1 Candidates will only be penalised once for the repeated use of an incorrect unit **within a question**.
*Kandidate sal slegs een keer gepenaliseer word vir die herhaaldelike gebruik van 'n verkeerde eenheid **in 'n vraag**.*

2.2 Units are only required in the final answer to a calculation.
Eenhede word slegs in die finale antwoord op 'n vraag verlang.

2.3 Marks are only awarded for an answer, and not for a unit *per se*. Candidates will therefore forfeit the mark allocated for the answer in each of the following situations:

- Correct answer + wrong unit
- Wrong answer + correct unit
- Correct answer + no unit

Punte sal slegs vir 'n antwoord en nie vir 'n eenheid per se toegeken word nie. Kandidate sal die punt vir die antwoord in die volgende gevalle verbeur:

- *Korrekte antwoord + verkeerde eenheid*
- *Verkeerde antwoord + korrekte eenheid*
- *Korrekte antwoord + geen eenheid*

2.4 SI units must be used except in certain cases, e.g. $V \cdot m^{-1}$ instead of $N \cdot C^{-1}$, and $cm \bullet s^{-1}$ or $km \bullet h^{-1}$ instead of $m \bullet s^{-1}$ where the question warrants this.
SI-eenhede moet gebruik word, behalwe in sekere gevalle, bv. $V \bullet m^{-1}$ in plaas van $N \bullet C^{-1}$, en $cm \bullet s^{-1}$ of $km \bullet h^{-1}$ in plaas van $m \bullet s^{-1}$ waar die vraag dit regverdig.

3. GENERAL/*ALGEMEEN*

3.1 If one answer or calculation is required, but two are given by the candidate, only the first one will be marked, irrespective of which one is correct. If two answers are required, only the first two will be marked, etc.
Indien een antwoord of berekening verlang word, maar twee word deur die kandidaat gegee, sal slegs die eerste een nagesien word, ongeag watter een korrek is. Indien twee antwoorde verlang word, sal slegs die eerste twee nagesien word, ens.

3.2 For marking purposes, alternative symbols (s, u, t, etc.) will also be accepted.
Vir nasiendoeleindes sal alternatiewe simbole (s, u, t, ens.) ook aanvaar word.

3.3 Separate compound units with a multiplication dot, not a full stop, for example, $m•s^{-1}$.
For marking purposes, $m•s^{-1}$ and m/s will also be accepted.
Skei saamgestelde eenhede met 'n vermenigvuldigingspunt en nie met 'n punt nie, byvoorbeeld $m•s^{-1}$. Vir nasiendoeleindes sal $m•s^{-1}$ en m/s ook aanvaar word.

4. POSITIVE MARKING/*POSITIEWE NASIEN*

Positive marking regarding calculations will be followed in the following cases:
Positiewe nasien met betrekking tot berekeninge sal in die volgende gevalle geld:

4.1 **Subquestion to subquestion:** When a certain variable is calculated in one subquestion (e.g. 3.1) and needs to be substituted in another (3.2 of 3.3), e.g. if the answer for 3.1 is incorrect and is substituted correctly in 3.2 or 3.3, **full marks** are to be awarded for the subsequent subquestions.
***Subvraag na subvraag**: Wanneer 'n sekere veranderlike in een subvraag (bv. 3.1) bereken word en dan in 'n ander vervang moet word (3.2 of 3.3), bv. indien die antwoord vir 3.1 verkeerd is en word korrek in 3.2 of 3.3 vervang, word **volpunte** vir die daaropvolgende subvraag toegeken.*

4.2 **A multistep question in a subquestion**: If the candidate has to calculate, for example, current in die first step and gets it wrong due to a substitution error, the mark for the substitution and the final answer will be forfeited.
*'n **Vraag met veelvuldige stappe in 'n subvraag**: Indien 'n kandidaat bv. die stroom verkeerd bereken in 'n eerste stap as gevolg van 'n substitusiefout, verloor die kandidaat die punt vir die substitusie sowel as die finale antwoord.*

5. NEGATIVE MARKING/*NEGATIEWE NASIEN*

Normally an incorrect answer cannot be correctly motivated if based on a conceptual mistake. If the candidate is therefore required to motivate in QUESTION 3.2 the answer given in QUESTION 3.1, and QUESTION 3.1 is incorrect, no marks can be awarded for QUESTION 3.2. However, if the answer for e.g. QUESTION 3.1 is based on a calculation, the motivation for the incorrect answer could be considered.
'n Verkeerde antwoord, indien dit op 'n konsepsuele fout gebaseer is, kan normaalweg nie korrek gemotiveer word nie. Indien 'n kandidaat gevra word om in VRAAG 3.2 die antwoord op VRAAG 3.1 te motiveer en VRAAG 3.1 is verkeerd, kan geen punte vir VRAAG 3.2 toegeken word nie. Indien die antwoord op bv. VRAAG 3.1 egter op 'n berekening gebaseer is, kan die motivering vir die verkeerde antwoord in VRAAG 3.2 oorweeg word.

QUESTION 1/*VRAAG* 1

1.1 C ✓✓ (2)

1.2 C ✓✓ (2)

1.3 B ✓✓ (2)

1.4 A ✓✓ (2)

1.5 B ✓✓ (2)

1.6 B ✓✓ (2)

1.7 C ✓✓ (2)

1.8 A ✓✓ (2)

1.9 B ✓✓ (2)

1.10 B ✓✓ (2)

[20]

QUESTION 2/*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 woord/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)

2.2.1 E ✓ (1)

2.2.2 A ✓ (1)

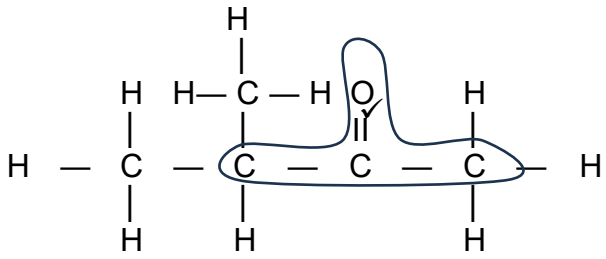
2.2.3 C ✓ (1)

2.3 EQUAL TO ✓

Compound **E** and ethyl methanoate are functional isomers / structural isomers / have the same molecular formula / same number and type of atoms/same number of C, H and O atoms. ✓✓

GELYK AAN
*Verbinding **E** en etiel metanoaat is funksionele isomere / strukturele isomere/ het dieselfde molekulêre formule/dieselfde aantal en tipe atome / dieselfde aantal van C, H en O atome.* (3)

2.4.1



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

(2)

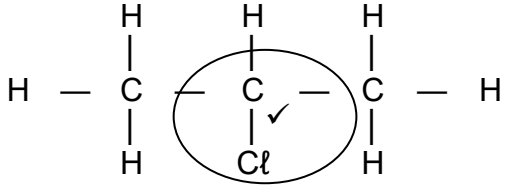
2.4.2 Propanoic acid/*Propanoësuur* ✓✓ (2)

2.4.3 4-methylhex-2-yne / 4-methyl-2-hexyne
4-metielheks-2-yn / 4-metiel-2-heksyn

Marking criteria/*Nasienkriteria*
- Hexyne / *heksyn* ✓
- Methyl / *metiel* ✓
- Whole name correct / *Volle naam korrek* ✓

(3)

2.5



Marking criteria/*Nasienkriteria*
- Functional group on 2nd carbon ✓/ *Funksionele groep op 2de koolstof*
- Whole structure correct ✓/ *Hele struktuur korrek*

(2)

2.6 $C_7H_{12} + 10\ O_2$ ✓→ $7\ CO_2 + 6\ H_2O$ ✓ Bal. ✓

NOTES / *NOTA*
- Reactant/*reaktanse* ✓ Products/*Produkte* ✓ Balancing/*Balansering* ✓

(3)
[20]

QUESTION 3/*VRAAG* 3

3.1.1 **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 temperature at which the vapour pressure of a substance / liquid equals the atmospheric pressure ✓✓/
Die temperatuur waarteen die dampdruk van 'n stof / vloeistof gelyk aan die atmosferiese druk is (2)

3.1.2 All are primary alcohols/*Almal is primêre alkohole* ✓ (1)

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

3.1.4 Pentan-1-ol/1-*pentanol* ✓✓ (2)

3.2.1 Compound **C/**propanoic acid ✓
*Verbinding **C**/propanoësuur* (1)

3.2.2 **Marking criteria/*Nasienkriteria***
- Type of intermolecular forces in compound A ✓
- Compound B and C have hydrogen bonds ✓
- Compare the number of sites for hydrogen bonding in B and C ✓
- Compare the strength of intermolecular forces ✓
- Compare energy required to overcome the intermolecular forces ✓

- *Tipe intermolekulêrekragte in verbinding A*
- *Verbinding B en C het waterstofbinding*
- *Vergelyk die aantal punte vir waterstofbinding in B en C*
- *Vergelyk die sterktes in die intermolekulêrekragte*
- *Vergelyk die energie wat benodig is om die intermolekulêrekragte te oorkom*

- Compound A/butanone has dipole-dipole forces ✓ (and London forces / dispersion forces/induced-dipole forces)
- Compound B/butan-1-ol and C/propanoic acid has hydrogen bonds ✓(and London forces/dispersion forces/induced-dipole forces)
- Compound B/butan-1-ol has one site for hydrogen bonding and C/propanoic acid has two sites for hydrogen bonding ✓
- Strength of the intermolecular forces increases from compound A / butanone to compound B / butan-1-ol to compound C / propanoic acid ✓
- More energy is needed to overcome the intermolecular forces in compound C / propanoic acid than compounds A/ butanone and B/butan-1-ol ✓

- *Verbinding A/butanoon het dipool-dipoolkragte (en Londonkragte / verspreidingskragte/geïnduseerde dipoolkragte)*
- *Verbinding B/butan-1-ol en C/propanoësuur het waterstofbinding (en Londonkragte/verspreidingskragte/ geïnduseerde dipoolkragte)*
- *Verbinding B/butan-1-ol het een plek vir waterstofbinding en C/propanoësuur het twee plekke vir waterstofbinding*
- *Die sterkte van die intermolekulêre kragte neem toe van verbinding A/ butanoon na verbinding B/butan-1-ol na verbinding C/propanoësuur*
- *Meer energie word benodig om die intermolekulêre kragte te oorkom in verbindin C/propanoësuur as verbinding A/butanoon en B/butan-1-ol* (5)

[12]

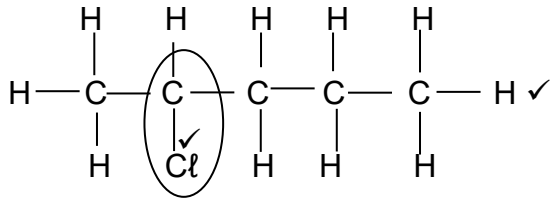
QUESTION 4/*VRAAG 4*

4.1.1 UNSATURATED ✓ It contains a double bond between its carbon-carbon atoms in the hydrocarbon chain. ✓
ONVERSADIG. Dit bevat 'n dubbelbinding tussen die koolstof-koolstofatome in die koolwaterstofketting. (2)

4.1.2 Substitution/Hydrolysis of a haloalkane ✓
Substitusie/Hidrolise van haloalkane (1)

4.1.3 Elimination/dehydrohalogenation of haloalkanes ✓/
Eliminasie/dehidrohalogenering/dehidrohalogenasie van haloalkane (1)

4.1.4



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

(2)

4.1.4 Pentan-2-ol/2-pentanol ✓✓ (2)

4.1.6 Dilute strong base/NaOH ✓ and mild heat ✓/
Verdunde sterkbasis/NaOH en matige hitte (2)

4.1.7 Positional isomers ✓✓/
Posisionele isomere (2)

4.2

Marking criteria/*Nasienkriteria*

Reaction 1:
Dehydration reaction and correct chemicals. ✓
Reactants with correct condensed structural formula✓
Products with correct condensed structural formula ✓
Reaksie 1:
Dehidrasie reaksie met korrekte chemikalieë
Reaktanse met korrekte gekondenseerdestruktuur formule
Produkte met korrekte gekondenseerdestruktuur formule

Reaction 2:
Addition reaction and correct chemicals used. ✓
Reactants with correct condensed structural formula✓
Products with correct condensed structural formula ✓
Reaksie 2:
Addisie reaksie met korrekte chemikalieë
Reaktanse met korrekte gekondenseerdestruktuur formule
Produkte met korrekte gekondenseerdestruktuur formule

Reaction 1 / *Reaksie 1*

$CH_3CH_2CH_2CH_2OH$✓ $\xrightarrow[\text{Heat / } \textit{Hitte}]{\text{Conc } H_2SO_4}$ $CH_3CH_2CHCH_2 + H_2O$✓ ✓(correct reaction / *korrekte reaksie*)

Reaction 2 / *Reaksie 2*

$CH_3CH_2CHCH_2 + H_2$✓ $\xrightarrow[\text{Heat/ } \textit{Hitte}]{\text{Pt}}$ $CH_3CH_2CH_2CH_3$✓ ✓(correct reaction / *korrekte reaksie*) (6)

[18]

QUESTION 5/*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 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

Marking criteria for investigative question/*Nasienkriteria vir ondersoekende vraag*
The independent and dependent variables are stated ✓/ *Die onafhanklike en afhanklike veranderlike is gestel*
Ask a question about the relationship between the independent and dependent variables ✓/ *'n Vraag rondom die verwantskap tussen onafhanklike en afhanklike veranderlike*

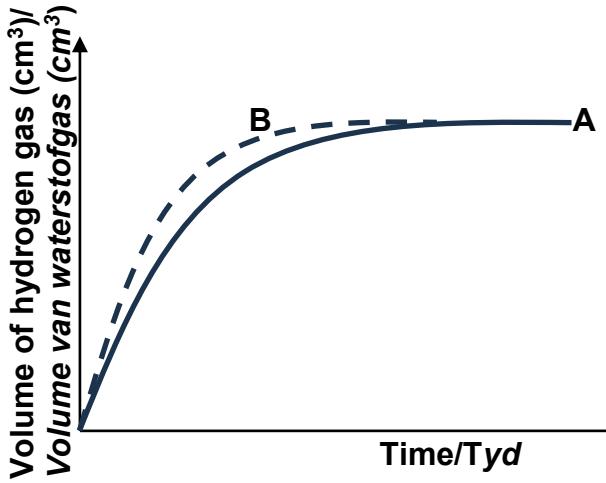
What is the effect of the increase / decrease / change of concentration on the reaction rate? ✓✓/
Wat is die effek van 'n toename / afname / verandering in konsentrasie op die reaksietempo?

OR / *OF*

What is the relationship between the concentration and reaction rate? ✓✓
Wat is die verwantskap tussen konsentrasie en reaksietempo? (2)

5.3.1 HIGHER THAN/HOËR AS ✓ (1)

5.3.2



Marking criteria / *Nasienkriteria*
- Gradient B of is higher than A ✓/ *Gradiënt van B is hoër as A*
- Final volume of curve A and B is the same and is horizontal / *Finale volume van kurwe A en B is dieselfde en is horisontaal.* ✓

NOTE: A or B must be indicated Ignore the labels of the axes./
LET WEL: A of B moet aangedui word.
Ignoreer die benoeming van die asse.

(2)

5.4 **Marking criteria**

(a) Subst. into rate equation✓

(b) Subst. 486,62 and 25 000 into in n = $\frac{V}{Vm}$ ✓

(c) Use of mol ratio n (Zn) : n (H_2) ✓

(d) Subst. 0,02 and 65 into m = nM✓

(e) Final answer✓

Nasienkriteria

(a) Vervanging in reaksietempo vergelyking

(b) Vervang 486,62 en 25 000 in n = $\frac{V}{Vm}$

(c) Gebruik van die mol verhouding n (Zn) : n (H_2)

(d) Vervang 0,02 en 65 in m = nM

(e) Finale antwoord

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

8,39 = $\frac{V - 0}{58}$ (a)✓

$V = 486,62\ cm^3$

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

n = $\frac{486,62}{24\ 000}$ (b)✓

$n(H_2) = 0,020$ mol

n (Zn) = n (H_2) = 0,020 (c) ✓

m (Zn) = nM

m (Zn) = (0,020)(65) (d) ✓

m (Zn) = 1,30 g (e)✓ (5)

5.5 INCREASES / *VERHOOG* ✓ (1)

5.6
- At higher temperature the average kinetic energy of the particles is higher ✓
- More particles have enough/sufficient kinetic energy or more particles have kinetic energy equal or higher than the activation energy ✓
- More effective collisions per unit time / Higher frequency of effective collisions ✓

- *By hoër temperatuur is die gemiddelde kinetiese energie van die deeltjies hoër*
- *Meer deeltjies het genoeg kinetiese energie of meer deeltjies het kinetiese energie gelyk of hoër as die aktiveringsenergie*.
- *Meer effektiewe botsings per eenheidstyd/ Frekwensie van die effektiewe botsings neem toe*. (3)

[16]

QUESTION 6/*VRAAG 6*

6.1.1

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 onderstreepte sleutelwoorde/frases in die korrekte konteks weggelaat word: - 1 punt per woord/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)

6.1.2 Forward (reaction). ✓ The equilibrium concentration of B is higher than A. ✓
Voortwaartse (reaksie). Die ewewig konsentrasie B is hoër as A. (2)

6.1.3 INCREASES/*TOENEEM* ✓ (1)

6.1.4 NO EFFECT/*GEEN EFFEK* ✓ (1)

6.1.5 EXOTHERMIC/*EKSOTERMIES* ✓ (1)

6.1.6
- The concentration of A increased / [B] decreased ✓
- (According to Le Chatelier's principle) an increase in temperature favours the endothermic reaction. ✓
- The reverse reaction was favoured / The equilibrium position shifted towards the left ✓

- *Die konsentrasie van A verhoog / [B] verlaag*
- *(Volgens Le Chatelier se beginsel) 'n Toename in temperatuur bevoordeel die endotermiese reaksie.*
- *Die terugwaartse reaksie word bevoordeel / Die ewewigsposisie verskuif na links*. (3)

6.2 **OPTION 1: CONCENTRATION: Marking criteria**

a) Correct Kc expression with square brackets✓
b) Substitution of 6,34 x 10^{-4} into correct kc expression ✓
c) Correct substitution of [Br_2] into correct kc expression✓
d) Use of the correct ratio [Br_2] : [Br] ✓
e) Determine initial [Br_2] ✓
f) Substitution into c = n/V✓
g) Final answer✓

OPSIE 1: KONSENTRASIE: Nasienkriteria

a) Korrekte Kc uitdrukking met vierkanthakkies
b) Vervanging van 6,34 x 10^{-4} in korrekte Kc-uitdrukking
c) Korrekte vervanging van [Br_2] in korrekte Kc-uitdrukking
d) Korrekte gebruik van verhouding [Br_2] : [Br]
e) Bepaal die aanvangs [Br_2]
f) Vervaning in c = n/V
g) Finale antwoord

$K_c = \frac{[Br]^2}{[Br_2]}$ (a) ✓

$6,34 \times 10^{-4}$(b) ✓ $= \frac{[Br]^2}{(2,074)}$ (c) ✓

- No K_c expression, correct substitution / *Geen K_c-uitdrukking, korrekte substitusie.* Max. *Maks 6/7*
- Wrong K_c expression /

[Br] = 0,03626 mol·dm^{-3}

	Br_2	2 Br
Initial concentration/ *Aanvangskonsentrasie*	2,09213 ✓ (e)	-
Change in concentration/ *Verandering in konsentrasie*	-0,01813	0,03626 ✓ (d)
Equilibrium concentration/ *Ewewigskonsentrasie*	2,074	0,03626

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

$V = \frac{1,05}{2,09213}$ (f) ✓

V = 0,50 dm^3 (g) ✓

OPTION 2: MOLE CALCULATION: Marking criteria

(a) Correct Kc expression with square brackets✓
(b) Substitution of 6,34 x 10^{-4} into correct Kc expression ✓
(c) Correct substitution of [Br] and [Br_2] into correct Kc expression ✓
(d) Determine change in mol Br ✓
(e) Use of the correct ratio [Br_2] : [Br] ✓
(f) Substitution into $n_e = n_i - \Delta n$ for Br_2✓
(g) Final answer✓

OPSIE 2: MOL BEREKENINGE: Nasienkriteria

(a) Korrekte Kc uitdrukking met vierkanthakkies
(b) Vervanging van 6,34 x 10^{-4} in korrekte Kc-uitdrukking
(c) Korrekte vervanging van [Br_2] en [Br] in korrekte Kc-uitdrukking
(d) Bepaal die verandering in mol Br
(e) Korrekte gebruik van verhouding Br_2 : Br
(f) Vervanging in $n_e = n_i - \Delta n$ for Br_2
(g) Finale antwoord

- No K_c expression, correct substitution / *Geen K_c-uitdrukking, korrekte, korrekte substitusie.* Max. / *Maks. 6/7*
- Wrong K_c expression / *Verkeerde K_c-uitdrukking.* Max./*Maks. 3/7*

$K_c = \frac{[Br]^2}{[Br_2]}$ (a) ✓

6,34 x 10^{-4} (b) ✓ $= \frac{[Br]^2}{(2,074)}$ (c) ✓

[Br] = 0,03626 mol·dm^{-3}

	Br_2	**2 Br**
Initial mol *Aanvangs mol*	1,05	-
Change in mol *Verandering in mol*	-0,01813V✓ (e)	0,03626V ✓ (d)
Equilibrium mol. *Ewewigsmol*	2,074V	0,03626V
Equilibrium conc. *Ewewigskonsentrasie*	2,074	0,03626

$n_e = n_i - \Delta n$

2,074V = 1,05 - 0,01813V ✓ (f)

V = 0,5 dm^3 ✓ (g) (7)

[17]

QUESTION 7/*VRAAG 7*

7.1.1 Strong acids ionise completely in water ✓ to produce a high concentration of the hydronium ions / (H_3O^+) ✓

Sterk sure ioniseer volledig in water om 'n hoë konsentrasie van die hydronium ione / (H_3O^+) te produseer. (2)

7.1.2 It donates two protons/H^+ / *Dit skenk twee protone/H^+* ✓ (1)

7.1.3 H_2O ✓ (1)

7.1.4 HSO_4^- ✓✓ (2)

7.1.5 **Marking criteria/ *Nasienkriteria***

(a) Ratio/*Verhouding* $[H_3O^+] : [H_2SO_4]$ ✓
(b) Formula/*Formule* pH = - log $[H_3O^+]$ ✓
(c) pH value substituted into formula/*vervang van pH-waarde in formule* ✓
(d) Final answer / *Finale antwoord* ✓

$[H_3O^+] = 2(0,1)$ ✓ (a) = 0,2 mol·dm^{-3}

pH = - log$[H_3O^+]$ ✓ (b)

pH = - log (0,2) ✓ (c)

pH = 0,70 ✓ (d) (4)

7.2.1

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$c = \frac{m}{MV}$ ✓	$n = \frac{m}{M}$
$c = \frac{1,2}{(90)(50x10^{-3})}$ ✓	$n = \frac{1,2}{90}$
$c = 0,27$ mol· dm^{-3} ✓	$n = 0,013$ mol· dm^{-3}
	$c = \frac{n}{V}$ ✓
	$c = \frac{0,013}{50x10^{-3}}$ ✓
	$c = 0,26$ mol· dm^{-3} ✓

(3)

7.2.2

Positive marking from/*Positiewe nasien vanaf* 7.2.1
Marking criteria/*Nasienkriteria*

(a) Subst. values of $H_2C_2O_4$ into / *Vervang waardes in* n = cV ✓
(b) **Using** ratio / ***Gebruik*** *verhouding* $H_2C_2O_4$: NaOH 1:2✓
(c) Subst of values of / *Vervang waardes van* NaOH into/ *in* c = n/V✓
(d) Subst into values / *Vervang waardes van* NaOH into/ *in* $c_1V_1 = c_2V_2$
(e) Formula / *Formule* m = cMV✓
(f) Subst into / *Vervang in* m = cMV✓
(g) Final answer / *Finale antwoord* ✓

$n(H_2C_2O_4) = cV$

$= 0,27 \times 25 \times 10^{-3}$ (a) ✓

$= 6,75 \times 10^{-3}$ mol

$n(NaOH) = 2 \times 6,75 \times 10^{-3}$ (b) ✓

$n(NaOH) = 0,0135$ mol

$c(NaOH) = \frac{n}{V}$

$c(NaOH) = \frac{0,0135}{43,8 \times 10^{-3}}$ (c) ✓

$c(NaOH) = 0,308$ mol·dm^{-3}

Positive marking from / *Positiewe nasien vanaf* 7.2.1
Marking criteria/*Nasienkriteria*

(a) Subst. values of/ *Vervang waardes in* n_a / n_b into $\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$ ✓
(b) Subst. values of/ *Vervang waardes in* c_aV_a into $\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$ ✓
(c) Subst. values of/ *Vervang waardes in* V_b into $\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$ ✓
(d) Subst into values/ *Vervang waardes van* NaOH into/ *in* $c_1V_1 = c_2V_2$✓
(e) Formula / *Formule* m = cMV✓
(f) Subst into *Vervang in* m = cMV✓
(g) Final answer/ *Finale antwoord* ✓

$\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$

$\frac{(0,27)(25)\text{ (b)}\checkmark}{c_b(43,8)\text{ (c)}\checkmark} = \frac{1}{2}$ (a) ✓

$c_b = 0,308$ mol·dm^{-3}

$c_1V_1 = c_2V_2$

$c_1(25) = (0,308)(100)$ (d) ✓

$c_1 = 1,232$ mol· dm^{-3}

$m = cMV$ (e)✓

$m = (1,232)(40)(2)$ (f)✓

$m = 98,56$ g (g) ✓

(7)
[20]

QUESTION 8/*VRAAG 8*

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

8.2 Provide path for movement of ions / *Bied pad vir beweging van ione/*
Ensures electrical neutrality in the cell / *Om elektriese neutraliteit te verseker.*
(Any one/*Enige een*) ✓ (1)

8.3 $Fe^{3+} + e^- \rightarrow Fe^{2+}$ ✓✓ (2)

Marking criteria/*Nasienkriteria*

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

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

8.4 $E^\theta_{cell} = E^\theta_{cathode/reduction/oxidising\ agent} - E^\theta_{anode/oxidation/reducing\ agent}$ ✓

$E^\theta_{cell} = (0,77)$ ✓ – (- 0,13) ✓

$E^\theta_{cell} = 0,90$ V ✓

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*

(4)

8.5.1 Increases/*Toeneem* ✓ (1)

8.5.2 Remains the same/*Bly dieselfde* ✓ (1)

8.5.3 Increases/*Toeneem* ✓ (1)

8.6 Zn is a stronger reducing agent than Pb. ✓
More energy per unit charge is released for the reaction between Zn and Fe^{3+} / The reaction between Zn and Fe^{3+} is more strongly product-favoured / equilibrium position lies further to the right than Pb and Fe^{3+}. ✓

Zn is 'n sterker reduseermiddel as Pb
Meer energie per eenheid lading word vrygestel vir die reaksie tussen Zn en Fe^{3+}*/Die reaksie tussen Zn en* Fe^{3+} *bevoordeel meer die voortwaartse reaksie/die ewewigsposisie lê meer na regs as Pb en* Fe^{3+}. (2)

[14]

QUESTION 9/*VRAAG 9*

9.1 The chemical process in which electrical energy is converted to chemical energy **(2 or 0)** ✓✓/
Die chemiese proses waar elektriese energie na chemiese energie omgeskakel word. ***(2 of 0)***

OR / *OF*

The use of electrical energy to produce a chemical change **(2 or 0)** ✓✓/
Die gebruik van elektriese energie om chemiese energie te produseer. ***(2 of 0)*** (2)

9.2 Battery ✓ (1)

9.3 Hydrogen gas/*Waterstofgas*/ H_2 ✓ (1)

9.4 $2\ C\ell^-(aq) \rightarrow C\ell_2(g) + 2e^-$ ✓✓ Ignore phases/*Ignoreer fase*

Marking criteria / *Nasienkriteria*

- $2\ C\ell^-(aq) \rightleftharpoons C\ell_2(g) + 2e^-$ $^1/_2$
- $C\ell_2(g) + 2e^- \leftarrow 2\ C\ell^-(aq)$ $^2/_2$
- $C\ell_2(g) + 2e^- \rightleftharpoons 2\ C\ell^-(aq)$ $^0/_2$
- $C\ell_2(g) + 2e^- \rightarrow 2\ C\ell^-(aq)$ $^0/_2$

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

(2)

9.5 Pink/*Pienk* ✓ . OH^- ✓ (2)

9.6.1 Zinc/sink ✓ (1)

9.6 2 **Marking criteria/*Nasienkriteria***

(a) **Using** ratio / ***Gebruik*** *verhouding* Cu: e^- = 1:2✓
(b) Subst. of values of / *Vervang waardes van* Cu into / *in* m = nM✓
(c) Adding the mass of Cu reduced to initial mass / *Die massa van Cu wat gereduseer word by die aanvanklike massa gevoeg*. ✓
(d) Final answer / *Finale antwoord* ✓

n (Cu) = ½ x 1,38 x 10^{-2} (a) ✓

n (Cu) = 6,9 x 10^{-3} mol

m = nM

m = (6,9 x 10^{-3})(63,5) (b) ✓

m = 0,43815 g

m (cathode/*katode*) = 2 + 0,43815 (c) ✓

m (cathode/*katode*) = 2,43815 g (d) ✓ (4)

[13]

TOTAL/*TOTAAL*: 150