Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD 12*

SEPTEMBER 2020

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

MARKS / *PUNTE*: **150**

This marking guideline consists of 21 pages.
Hierdie nasienriglyn bestaan uit 21 bladsye

GUIDELINES FOR MARKING/*RIGLYNE VIR NASIEN*

This section provides guidelines for the way in which marks will be allocated. The broad principles must be adhered to in the marking of Physical Sciences tests and examinations.

Hierdie afdeling verskaf riglyne vir die manier waarop punte toegeken sal word. Die breë beginsels moet tydens die nasien van Fisiese Wetenskappe toetse en eksamens gevolg word.

1.1 MARK ALLOCATION/*PUNTETOEKENNING*

1.1.1 **Definitions/*Definisies*:** Two marks will be awarded for a correct definition. No marks will be awarded for an incorrect or partially correct definition.
Twee punte sal vir 'n korrekte definisie toegeken word. Geen punte sal vir 'n verkeerde of gedeeltelik korrekte definisie toegeken word nie.

1.1.2 **Calculations/*Berekeninge*:**

- 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.*
- No marks will be awarded if an incorrect or inappropriate formula is used, even though there may be 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.*

1.1.3 **Explanations and interpretations/*Verduidelikings en interpretasie*:**
Allocation of marks to questions requiring interpretation or explanation e.g. AS 1.4, 2.2, 2.3, 3.1, 3.2 and 3.3, will differ and may include the use of rubrics, checklists, memoranda, etc. In all such answers emphasis must be placed on scientific concepts relating to the question.
Toekenning van punte by vrae wat interpretasie of verduideliking vereis bv. AS 1.4, 2.2, 2.3, 3.1, 3.2 en 3.3, sal verskil en mag die gebruik van rubrieke, kontrolelyste, memoranda, ens. insluit. By al hierdie antwoorde moet die wetenskaplike konsepte, met betrekking tot die vraag, beklemtoon word.

1.2 FORMULAE AND SUBSTITUTIONS/*FORMULES EN SUBSTITUSIES*

1.2.1 Mathematical manipulations and change of subjects of appropriate formulae carry no marks, but if a candidate starts with the correct formula and then changes the subject of the formula incorrectly, marks will be awarded for the formula and the correct substitutions. The mark for the incorrect numerical answer is forfeited.
Wiskundige manipulering en verandering van die voorwerp van toepaslike formules dra geen punte nie, maar as 'n kandidaat begin met die korrekte formule en dan die voorwerp van die formule verkeerd uitwerk, sal punte vir die formule en korrekte substitusie toegeken word.

1.2.2 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 substitusie toegeken word, maar **geen verdere punte** sal toegeken word nie.*

1.2.3 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 sal slegs toegeken word vir 'n formule as 'n **poging aangewend is** om 'n berekening te doen d.w.s. substitusie is gedoen of 'n numerieke antwoord is verskaf.*

1.2.4 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 is en nie vir waardes wat voor 'n berekening gelys is nie.

1.2.5 All calculations, when not specified in the question, must be done to two decimal places.
Alle berekenings, wanneer nie in die vraag gespesifiseer word nie, moet tot twee desimale plekke gedoen word.

1.3 **UNITS/*EENHEDE***

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

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

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

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

1.3.4 SI units must be used except in certain cases, e.g. $V \cdot m^{-1}$ instead of $N \cdot C^{-1}$, and $cm \cdot s^{-1}$ or $km \cdot h^{-1}$ instead of $m \cdot s^{-1}$ where the question warrants this. (This instruction only applies to Paper 1).
SI-eenhede moet gebruik word behalwe in sekere gevalle, bv. $V \cdot m^{-1}$ in plaas van of $N \cdot C^{-1}$, en $cm \cdot s^{-1}$ of $km \cdot h^{-1}$ in plaas van $m \cdot s^{-1}$ waar die vraag dit verlang. (Hierdie instruksie geld slegs vir Vraestel 1).

1.4 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:

1.4.1 **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 or 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 sub questions.
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 aan die daaropvolgende subvraag toegeken.*

1.4.2 **A multi-step question in a subquestion**: If the candidate has to calculate, for example, current in the 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 byvoorbeeld, die aantal mol verkeerd bereken in 'n eerste stap as gevolg van 'n substitusiefout, verloor die kandidaat die punt vir die substitusie sowel as die finale antwoord.*

1.4.3 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 tot 'n berekening korrek is, sal volpunte nie outomaties toegeken word nie. Nasieners sal altyd verseker dat die korrekte toepaslike formule gebruik is en dat bewerkings, insluitende substitusies, korrek is.

1.4.4 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 stroombaandiagram-vraag) hoef dieselfde volgorde nie noodwendig gevolg te word nie. VOLPUNTE sal toegeken word mits dit 'n geldige oplossing tot die probleem is. Maar, enige berekening wat nie die kandidaat nader aan die antwoord bring as die oorspronklike data nie, sal egter geen punte nie tel nie.

1.4.5 If one answer or calculation is required, but two 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.

1.4.6 Normally, if based on a conceptual mistake, an incorrect answer cannot be correctly motivated. If the candidate is therefore required to motivate in question 3.2 the answer given to question 3.1, and 3.1 is incorrect, no marks can be awarded for question 3.2. However, if the answer for e.g. 3.1 is based on a calculation, the motivation for the incorrect answer for 3.2 could be considered.
Normaalweg, as dit gebaseer is op 'n konsepfout, kan 'n verkeerde antwoord nie korrek gemotiveer word nie. As die kandidaat derhalwe met 'n vraag in 3.2 gevra word om die antwoord in vraag 3.1 te motiveer, en 3.1 is verkeerd, sal geen punte vir vraag 3.2 toegeken word nie. As die antwoord in bv. 3.1 egter gebaseer is op 'n berekening, kan die motivering vir die verkeerde antwoord oorweeg word.

1.4.7 If instructions regarding method of answering are not followed, e.g. the candidate does a calculation when the instruction was to ***solve by construction and measurement*****,** a candidate may forfeit all the marks for the specific question.
Indien instruksies aangaande metode van beantwoording nie gevolg word nie, bv. die kandidaat doen 'n berekening wanneer die instruksie ***los op deur konstruksie en meting*** *was, mag die kandidaat al die punte vir die spesifieke vraag verbeur.*

1.4.8 For an **error of principle, no marks** are awarded (Rule 1) e.g. If the potential difference is 200 V and resistance is 25 Ω, calculate the current.
Vir 'n ***verkeerde beginsel,*** *sal* ***geen punte*** *toegeken word nie (Reël 1) bv. As die potensiaalverskil 200 V en die weerstand 25 Ω is, bereken die stroom*.

CORRECT *KORREK*	ANSWER (1) *ANTW. (1)*	POSSIBLE *MOONTLIK*	ANSWER (2) *ANTW. (2)*	POSSIBLE *MOONTLIK*
$I = \frac{V}{R}$ ✓ $= \frac{200}{25}$ ✓ $= 8A$ ✓	$R = \frac{V}{I}$ ✓ $= \frac{200}{25}$ ***x*** $= 8A$ ***x***	$R = \frac{V}{I}$ ***x*** $= \frac{200}{25}$ $= 8A$	$R = \frac{V}{I}$ ✓ $I = \frac{R}{V}$ ***x*** $= \frac{25}{200}$ $= 0{,}125\ A$ ***x***	$I = \frac{V}{R}$ ✓ $= 8A$ ✓

1.5 GENERAL PRINCIPLES OF MARKING IN CHEMISTRY/ *ALGEMENE BEGINSELS BY DIE NASIEN van CHEMIE*

The following are a number of guidelines that specifically apply to Paper 2.
Die volgende is 'n aantal riglyne wat spesifiek op Vraestel 2 van toepassing is.

1.5.1 When a chemical **FORMULA** is asked, and the **NAME** is given as answer, only one of the two marks will be awarded. The same rule applies when the **NAME** is asked and the **FORMULA** is given.
*Wanneer 'n chemiese **FORMULE** gevra word en die **NAAM** word as antwoord gegee, sal slegs een van die twee punte toegeken word. Dieselfde reël geld wanneer die **NAAM** gevra word en die **FORMULE** gegee word.*

1.5.2 When redox half-reactions are to be written, the correct arrow should be used. If the equation

$$H_2S \rightarrow S + 2H^+ + 2e^- \ (^2/_2)$$

is the correct answer, the following marks will be given:
Wanneer redokshalfreaksies geskryf moet word, moet die korrekte pyltjie gebruik word. Indien die bostaande vergelyking die korrekte antwoord is, sal die volgende punte toegeken word:

$H_2S \leftrightharpoons S + 2H^+ + 2e^- \ (^1/_2)$
$H_2S \leftarrow S + 2H^+ + 2e^- \ (^0/_2)$
$S + 2H^+ + 2e^- \leftarrow H_2S \ (^2/_2)$
$S + 2H^+ + 2e^- \leftrightharpoons H_2S \ (^0/_2)$

1.5.3 When candidates are required to give an explanation involving the relative strength of oxidising and reducing agents, the following is unacceptable:

- Stating the position of a substance on Table 4 only (e.g. Cu is above Mg).
- Using relative reactivity only (e.g. Mg is more reactive than Cu).
- The correct answer would for instance be: Mg is a stronger reducing agent than Cu, and therefore Mg will be able to reduce Cu^{2+} ions to Cu. The answer can also be given in terms of the relative strength as electron acceptors and donors.

Wanneer kandidate 'n verduideliking moet gee oor die relatiewe sterkte van oksideer- en reduseermiddels, is die volgende onaanvaarbaar:

- *Meld slegs die posisie van 'n stof op tabel 4 (bv. Cu is bo Mg).*
- *Gebruik slegs relatiewe reaktiwiteit (bv. Mg is meer reaktief as Cu).*
- *Die korrekte antwoord sal byvoorbeeld wees: Mg is 'n sterker reduseermiddel as Cu en derhalwe sal Mg in staat wees om Cu^{2+}-ione na Cu te reduseer. Die antwoord kan ook in terme van die relatiewe sterkte van elektronakseptors of donors gegee word.*

1.5.4 One mark will be forfeited when the charge of an ion is omitted per equation.
Een punt sal verbeur word wanneer die lading van 'n ioon per vergelyking weggelaat is.

1.5.5 The error carrying principle does not apply to chemical equations or half-reactions. For example, if a learner writes the wrong oxidation/reduction half-reaction in the subquestion and carries the answer to another subquestion (balancing of equations or calculations of E^{θ}_{cell}) then the learner is not credited for this substitution.
Die foutdraendebeginsel geld nie vir chemiese vergelykings of halfreaksies nie. Byvoorbeeld, indien 'n leerder die verkeerde oksidasie/reduksie-halfreaksie vir die subvraag skryf en die antwoord na 'n ander subvraag dra (balansering van vergelyking vir of E^{θ}_{sel}) dan word die leerder nie vir die substitusie gekrediteer nie.

1.5.6 When a calculation of the cell potential of a galvanic cell is expected, marks will only be awarded for the formula if one of the formulae indicated on the data sheet (Table 2) is used. The use of any other formula using abbreviations etc. will carry no marks.
Wanneer 'n berekening van die selpotensiaal van 'n gegalvaniseerde sel verlang word, sal punte slegs vir die formule toegeken word as een van die formules op die gegewensblad (Tabel 2) gebruik word. Die gebruik van enige ander formule, die gebruik van afkortings, ens. sal geen punte toegeken word nie.

1.5.7 In the structural formula of an organic molecule all hydrogen atoms must be shown. Marks will be deducted if hydrogen atoms are omitted.
In die struktuurformule van 'n organiese molekuul moet alle waterstofatome getoon word. Punte sal afgetrek word vir die weglating van waterstofatome.

1.5.8 When a structural formula is asked, marks will be deducted if the candidate writes the condensed formula.
Wanneer 'n struktuurformule gevra word, sal punte afgetrek word indien die leerder die verkorte formule skryf.

1.5.9 When an IUPAC name is asked, and the candidate omits the hyphen (e.g. instead of 1-pentene the candidate writes 1 pentene), marks will be forfeited.
Wanneer die IUPAC-naam gevra word en die koppelteken(s) in die naam word uitgelaat (bv. in plaas van 1-penteen skryf 'n kandidaat 1 penteen), sal punte verbeur word.

QUESTION 1/*VRAAG 1*

1.1	D	✓✓	(2)
1.2	C	✓✓	(2)
1.3	A	✓✓	(2)
1.4	A	✓✓	(2)
1.5	C	✓✓	(2)
1.6	B	✓✓	(2)
1.7	B	✓✓	(2)
1.8	D	✓✓	(2)
1.9	D	✓✓	(2)
1.10	B	✓✓	(2)
			[20]

QUESTION 2/*VRAAG 2*

2.1 A series of organic compounds that can be described by the same general formula ✓✓

'n Reeks organiese verbindings wat met dieselfde algemene formule beskryf kan word

OR/*OF*

A series of organic compounds in which members differ by the number of $-CH_2-$ units

'n Reeks organiese verbindings waarin een lid van die volgende met die aantal CH_2-eenhede verskil. (2)

2.2 A compound that contains carbon and hydrogen (atoms) only ✓✓

'n Verbinding wat slegs koolstof en waterstof (atome) bevat **(2 or/*of* 0)** (2)

2.3.1 C_nH_{2n+2} ✓ (1)

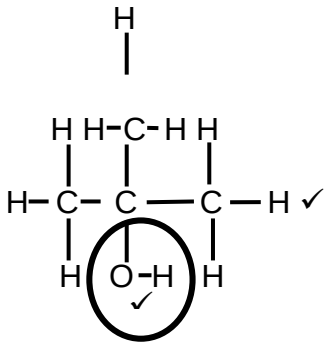
2.3.2 4-ethyl ✓-2,2-dimethyl ✓hexane ✓

4-etiel-2,2-dimetielheksaan (3)

Marking criteria/*Nasienkriteria*
- Hexane/*Heksaan* ✓
- Methyl/*Metiel* and/*en* ethyl *etiel* ✓
- whole name correct/*Hele naam korrek* 3/3

Deduct 1 mark for any error, hyphens omitted, incorrect sequence etc/ *Trek 1 punt af vir foute, koppeltekkens wat weggelaat is, verkeerde volgorde ens* ens

2.4.1



Marking criteria/*Nasienkriteria*
• Whole structure correct (2/2) • *Hele struktuur korrek (2/2)* • Functional group correct (1/2) • *Funksionele groep korrek (1/2)*

(2)

2.4.2 Butan-2-one ✓✓ OR 2-butanone

Butan-2-oon OF 2-Butanoon (2)

Marking criteria/*Nasienkriteria*
• Functional group and correct position ✓ E.g pent-2-one (1/2) • *Funksionele groep en korrekte posisie b.v pent-2-oon (1/2)* • Whole name correct (2/2) • *Hele naam korrek (2/2)*

2.4.3 The functional group can only be in position 1 ✓

Die funksionele groep kan slegs by posisie 1 wees.

OR/*OF*

Side chain / branch / methyl group can only be in position 2

Syketting / tak / metielgroep kan slegs by posisie 2 wees (1)

2.5.1 Polymerisation ✓
Polimerisasie (1)

2.5.2 Contains single bonds only ✓ **(1 or 0)**
Bevat slegs enkelbindings ***(1 of 0)*** (1)

2.5.3 Use in plastics (toy cars) ✓
Gebruik in plastiek (speelgoedmotors.) (1)

[16]

QUESTION 3/ *VRAAG 3*

3.1 The temperature at which the vapour pressure ✓of a liquid equals the atmospheric/external pressure. ✓

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

3.2 To ensure a fair test ✓/To ensure there is one independent variable

Om 'n billike toets te verseker / Om te verseker dat daar een onafhanklike veranderlike is. (1)

3.3 Hexane has London forces ✓ (only)
Pentanal has dipole-dipole forces ✓ (and London forces)

Heksaan het (slegs) Londonkragte
Pentanal het dipool-dipoolkragte (en Londonkragte)

Dipole-dipole forces are stronger ✓ (than the london forces in hexane) ✓
OR London forces are weaker (than the Dipole-dipole forces in pentanal)

Dipool-dipoolkragte is sterker (as die Londonkragte in heksaan)
OF Londonkragte is swakker (as die dipool-dipoolkragte in pentanal)

More energy is required to overcome the intermolecular /Dipole-dipole forces in Pentanal ✓

Meer energie word benodig om die intermolekulêrekragte/dipool-dipoolkragte in pentanal te oorkom (4)

3.4 Higher than ✓
Hoër as (1)

3.5 Chain isomer of pentan-2-ol (2-methylbutan-2-ol) has a shorter chain length/ smaller surface area than pentan-2-ol ✓

Kettingisomeer van pentan-2-ol (2-metielbutaan-2-ol) het 'n korter kettinglengte / kleiner oppervlakte as pentan-2-ol

London forces ✓ in the isomer of pentan-2-ol (2-methylbutan-2-ol) will be weaker (than that of pentan-2-ol). ✓

Londonkragte in die isomeer van pentan-2-ol (2-metielbutaan-2-ol) sal swakker (as dié van pentan-2-ol) wees.

OR/*OF*

Pentan-2-ol has a larger chain length/ surface area than its chain isomer

Pentan-2-ol het 'n groter kettinglengte / oppervlakte as sy kettingisomeer

London forces in butan-2-ol is stronger (than that of the isomer of pentan-2-ol (2-methylbutan-2-ol)

Londonskragte in butan-2-ol is sterker (as dié van die isomeer van pentan-2-ol (2-methylbutan-2-ol) (3)

3.6 $2\ C_6H_{14} + 19\ O_2 \rightarrow 12\ CO_2 + 14\ H_2O$

Marking criteria/*Nasienkriteria*
- Reactants/*Reaktante* ✓
- Products */Produkte*✓
- Balancing*/Balansering* ✓

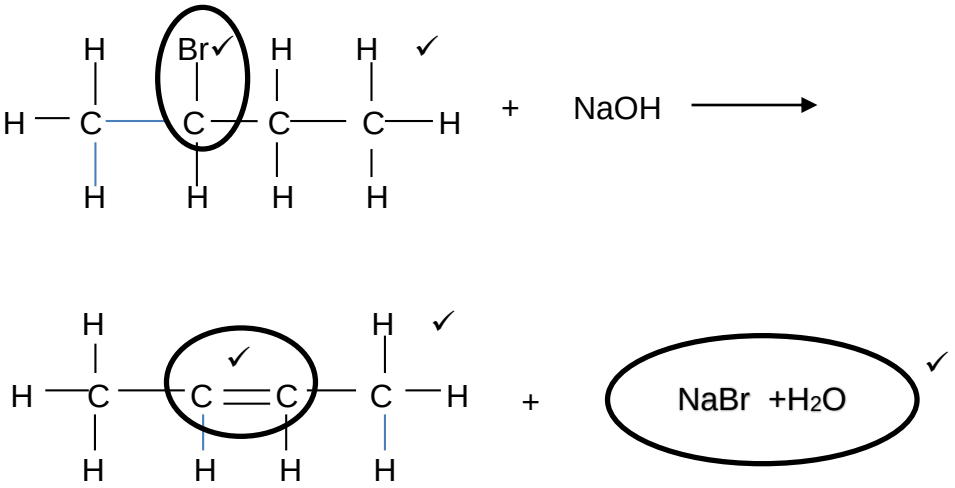
(3)
[14]

QUESTION 4/*VRAAG 4*

4.1.1 Substitution ✓/Hydrolysis
Substitusie/ Hidroliese (1)

4.1.2 Butan-2-ol ✓✓ OR/*OF* 2-butanol (2)

4.2



Balancing /*Balansering* ✓

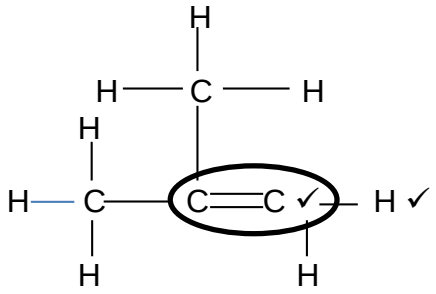
Marking criteria/*Nasienkriteria*
For organic reagents/*vir organiese reagense*
- Whole structure correct(2/2)
- *Hele struktuur korrek (2/2)*
- Functional group correct (1/2)
- *Funksionele groep korrek (1/2)*

(6)

4.3 4.3.1 Hydrogenation ✓*Hidrogenasie* (1)

4.3.2 Platinum/Palladium/Nickel ✓ (1)

4.3.3



Marking criteria/*Nasienkriteria*
For organic reagents/*vir organiese reagense*
- Whole structure correct (2/2)
- *Hele struktuur korrek (2/2)*
- Functional group correct (1/2)
- *Funksionele groep korrek (1/2)*

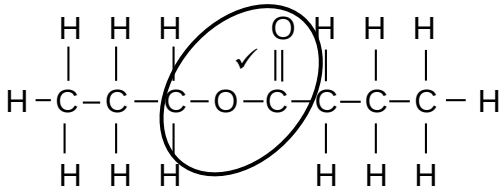
(2)

4.4 4.4.1 Esterification/Condensation ✓ *Esterifikasie/ Kondensasie / verestering* (1)

4.4.2 Heat/Add a catalyst/H_2SO_4 ✓*Hitte/Voeg 'n katalisator by/H_2SO_4* (1)

4.4.3 Water/H_2O ✓ (1)

4.4.4



Propyl ✓butanoate ✓

Propielbutanoaat

Marking criteria/*Nasienkriteria*
- Whole structure correct (2/2)
- *Hele struktuur korrek (2/2)*
- Functional group correct (1/2)
- *Funksionele groep korrek (1/2)*
- Name correct (2/2)
- *Naam korrek (2/2)*

(4)
[20]

QUESTION 5/*VRAAG 5*

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

Die verandering in konsentrasie van reaktante of produkte per tydeenheid. (2)

5.2 Carbon dioxide/CO_2 ✓
Koolstofdioksied/CO_2 (1)

5.3 Stopwatch ✓
Stophorlosie (1)

5.4 Rate/*Tempo* = -Δ m/Δt

Rate/*Tempo* = –(200 -184,80) ✓ / (5 – 0) ✓

Rate/*Tempo* = 3,04 ($g \cdot min^{-1}$) ✓

Accept /Aanvaar

Rate = (184,80 –200) / (5 – 0)
= - 3,04 ($g \cdot min^{-1}$)

Rate/*Temp* = (200 –184,80) /(5 – 0)
Rate/*Tempo* = 3,04 ($g \cdot min^{-1}$) (3)

5.5 $m_{CO2\ produced}$ = 200- 184,80 ✓
= 15.2 g

nCO_2 = m/M ✓

= 15,2 /44 ✓

= 0,35 mol

$nCaCO_{3\ reacting}$ = 0.35 mol ✓

(Ratio/*Verhouding*)

$mCaCO_{3\ reacting/reageer}$ = n.M

= 0.35 x 100 ✓

= 35 g ✓ (6)

Marking guidelines/*Nasienriglyne*
- Mass of CO_2 */Massa van CO_2*
- Formula/*Formule* n = m/M
- Substitution of/*Substitusie van* 44 into/ *in* n = m/M
- Use of ratio/ *Gebruik van verhouding* CaCO3: CO2 (1:1)
- Substitution of/ *Subtitusie van* 100 into/*in* n = m/M
- Final answer/*Finale antwoord*

5.6.1 Temperature/*Temperatuur* ✓ (1)

5.6.2 B ✓ (1)

5.6.3 Higher temperature increases average kinetic energy of the particles increases./ *Hoër temperatuur verhoog die gemiddelde kinetiese energie van die deeltjies*. ✓

More particles have sufficient kinetic energy (to collide effectively) ✓/ More particles have E_k greater or equal to E_a

Meer deeltjies het genoeg kinetiese energie (om effektief te bots) / Meer deeltjies het E_k groter of gelyk aan E_a

More effective collisions per unit time/ *Meer effektiewe botsings per tydseenheid* ✓ (3)

5.7.1 What effect will the concentration (of a substance) have on the rate of reaction? ✓✓
Watter effek sal die konsentrasie (van 'n stof) op die reaksietempo het?

OR/*OF*
What is the relationship between reaction rate and concentration?
Wat is die verhouding tussen reaksietempo en konsentrasie?

OR/*OF*
How does concentration affect reaction rate?
Hoe beïnvloed konsentrasie die reaksietempo?

Marking criteria/*Nasienkriteria*
For organic reagents/*vir organiese reagense*
- Independent variable and dependent variable correct
  Onafhanklike veranderlike en afhanklike veranderlike korrek
- In the form of a question/ *in die vorm van 'n vraag*

(2)

5.7.2 LOWER THAN/*LAER AS*✓ (1)

5.7.3 EQUAL TO/*GELYK AAN* (1)

5.8 The same amount of $CaCO_3$ (the limiting reagent) is used in both experiments ✓✓
In beide eksperimente word dieselfde hoeveelheid $CaCO_3$ (die beperkende reagens) gebruik (2)
[24]

QUESTION 6/ *VRAAG 6*

6.1 Reaction in which products can be converted back to reactants ✓✓
Reaksie waarin produkte teruggeskakel kan word na reaktante (2)

6.2 FORWARD REACTION/ VOORWAARTSE REAKSIE ✓ (1)

6.3 No/ *Nee* ✓

The rate of forward reaction is equal to the rate of reverse reaction ✓✓
/Reaction reached equilibrium

Die tempo van voorwaartse reaksie is gelyk aan die tempo van terugwaartse reaksie / Reaksie bereik ewewig (3)

6.4.1 Increases / *Verhoog* ✓ (1)

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

6.4.3 Increases / *Verhoog* ✓ (1)

6.5 The amount of HI remains constant./ *Die hoeveelheid stof van HI bly konstant* ✓
The volume decreases/ *Die volume neem af*
The concentration increases according to c = n/V / *Die konsentrasie verhoog volgend c=n/v* ✓ (2)

6.6.1 High yield/ *Hoë opbrengs* ✓ Kc is large/ *groot* ✓ OR / *OF* Kc >1 (2)

6.6.2 EXOTHERMIC / *EKSOTERMIES* ✓

−

The value Kc decreases with an increase in temperature./ *Die waarde van Kc neemaf met 'n toename in temperatuur.* ✓
As temperature increases, the [prdoducts] decreases / *Soos die temperatuur verhoog, neem die [produkte] af* ✓
Reverse reaction is favoured by an increase in temperature/ *Die terugwaartse reaksie word bevoordeel deur 'n toename in temperatuur.* ✓

OR/*OF*

The value Kc increases with a decrease in temperature./ *Die waarde van Kc verhoog met die afname in temperatuur.*
As temperature decreases the [products] increases / *Soos die temperatuur verlaag, neem die [produkte] toe.*
Forward reaction is favoured by a decrease in temperature/ *Die terugwaartse reaksie word bevoordeel deur 'n toename in temperatuur* (4)

6.7.1 $K_c = [HI]^2/[H_2].[I_2]$ ✓

50,3✓ $= [HI]^2/(0.46)(0,39)$ ✓

$[HI] = 3\ mol.dm^{-3}$ ✓ (4)

6.7.2 **POSITIVE MARKING FROM 6.7.1 / *POSITIEWE NASIEN VANAF 6.7.1***

OPTION 1 : CALCULATIONS USING NUMBER OF MOLES
OPSIE 1 : BEREKENINGE DEUR DIE GEBRUIK VAN MOL

Marking Criteria for Mole Option/ *Nasienkriteria vir Mol Opsie*

- Multiplication/ *Vermenigvulding* of/ *van* c equilibrium/ *ewewig* by/ *met* 0,5 dm^3 for/ *vir* I_2 ,H_2 and HI
- Calculations of moles of/ *Berekening van mole vir* HI reacting/ *reageer*✓
- Using mole ratio/ *gerbuik van mol verhouding* 2 n(HI) = n(H_2) = n (I_2) reacting ✓
- Calculation of / *Berekening van* n (H_2) initial and/ *en* n (I_2) initial (Δn + $n_{equilibrium}$)✓
- Multiplication / *Vermenigvuldinging* of / *van* n (I_2) by 2 to find / om te vind n (HI) theoretical / *teoreties* ✓✓
- Substitution into Yield/ *Substiteer in opbrengs* = $n_{produced}/n_{theoretical}$ x 100 ✓
- Final answer / *finale antwoord* ✓ **(RANGE / *GEBIED*: 78,95% – 79,37%)**

CALCULATION USING MOLES / *BEREKEN DEUR DIE GEBRUIK VAN MOL*

	H_2	I_2	2HI
n_i	0,98	0,945 ✓	0
Δn	0,75	0,75 ✓ Ratio	1,5 ✓
$n_{equilibrium}$ / *ewewig*	0,23	0,195	1,5 ✓ (x 0,5 dm^3)
$c_{equilibrium}$ / *ewewig*	0.46	0,39	3

I_2 is the limiting reagent / *I_2 is die beperkende reagens*

n (HI) theoretical / *teoreties* = 2 (n I_2 initial / *begin*) = 2 ✓x (0,945) = 1,89 mol

% Yield / *Opbrengs* = $n_{produced}/n_{theoretical}$ X 100 = 1,5/1,89 x 100✓ = 79,37 %✓

H_2 used as limiting reagent Max 3/7
H_2 gebruik as beperkende reagens maks 3/7

OPTION 2: CALCULATION USING CONCENTRATIONS
OPSIE 2: BEREKENING DEUR KONSENTRASIE

Marking Criteria for concentration Option / *Nasienkriteria vir konsentrasie opsie*

- Calculations of / *Berekening van* $c_{HI\ reacting}$✓
- Using mole ratio / *Gebruik van mol verhouding* 2 c(HI) = c(H_2) = c(N_2) reacting /*reageer* ✓
- Calculation of / *Berekening van* $cH_{2\ initial\ /\ begin}$ and $c_{I2\ initial\ /\ begin}$ ($\Delta c + c_{equilibrium\ /\ ewewig}$)✓
- Multiplication of / *Vermenigvuldiging van* c_{I2} by 2 to find / *om te vind* n_{HI} theoretical / *teoreties* ✓✓
- Substitution into Yield / *Substiteer in opbrengs* = $n_{HIproduced}/n_{Hitheoretical}$ x 100 ✓
- Final answer / *Finale antwoord* ✓
  (RANGE / *GEBIED*: 78,95% -79,37%)

	H_2	I_2	2HI
c_i	1,96	1,89✓	0
Δc	1,5	1,5✓ (Ratio)	3✓ ($c_{HI\ equil}$)
$c_{equilibrium}$	0.46	0,39	3

I_2 is the limiting reagent / *I_2 is die beperkende reagens*

C (HI) theoretical / *teoreties* = 2 x 1,89✓✓ = 3,78 mol.dm^{-3}

% Yield / *Opbrengs* = $c_{produced}/c_{theoretical}$ x 100 =3/3,78 x 100✓ =79,37%✓

H_2 used as limiting reagent Max 3/7 *H_2 gebruik as beperkende reagens maks 3/7*

(7)
[28]

QUESTION 7 / *VRAAG 7*

7.1.1 An acid is a substance that donates protons /H^+ions ✓✓

'n Suur is 'n stof wat protone / H^+ -ione skenk (2)

7.1.2 $H_2PO_4^-$ ✓ (1)

7.1.3 Reaction **I** : Reverse reaction it accepts a proton (H^+) / acts as a base ✓
*Reaksie **I**: Terugwaartse reaksie, dit aanvaar 'n proton (H^+) / dien as basis*
Reaction **II**: Foward reaction donates a proton (H^+)/ act as an acid. ✓
*Reaksie **II**: Foward-reaksie skenk 'n proton (H^+) / dien as 'n suur* (2)

7.1.4 HPO_4^{2-} ✓

The conjugate base of a weak acid/ *Die gekonjugeerde basis van 'n swak suur* ✓
lower K_a value is the stronger base/ *laer K_a-waarde is die sterker* basis ✓ (3)

7.2.1 Reaction of a salt with water/ *Reaksie van 'n sout met water* ✓✓ (2)

7.2.2 $C_2HO_4^-$ ✓✓ (2)

7.2.3 (Excess) OH^- ions/hydroxide ions are produced /*(Oormaat) OH^- ione / hidroksiedione word geproduseer* ✓✓ (2)

7.3.1 A strong base undergoes complete ionisation ✓✓/disociation

'n Sterk basis ondergaan volledige ionisasie / disosiasie (2)

7.3.2

OPTION 1 / *OPSIE 1*	**OPTION 2 / *OPSIE 2***
$K_w = [H_3O^+][OH^-]$ ✓	pOH = -log[OH^-]
$1x10^{-14} = [H_3O^+](0,5)$ ✓	pOH = - log (0,5) ✓
$[H_3O^+] = 2x10^{-14}$ mol·dm^{-3}	pOH = 0,30
pH = -log[H_3O^+] ✓	pH + pOH = 14 ✓
pH = - log($2x10^{-14}$) ✓	pH + 0,30 ✓ = 14 ✓
pH = 13,70 ✓	pH = 13,70 ✓

(5)

7.3.3 **OPTION 1 / *OPSIE 1***

$$\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b} \checkmark$$

$$\frac{c_a(25)}{(0,5)(24)} \checkmark = \frac{1}{2} \checkmark$$

c_a = 0,24 mol·dm^{-3}

$$c = \frac{m}{MV}$$

$$0,24 \checkmark = \frac{\checkmark\ 7,56}{(90+18x)(0,25)} \checkmark$$

x = 2 ✓

OPTION 2 / *OPSIE 2*:

Marking guideline / *Nasienriglyne*

- Substitution of / *Vervang* 0,5 and / *en* 24/100 in n = cV
- Use of mole ratio / *Gebruik van mol in* Acid/*Suur*: Base/*Basis* 1:2
- Calculating number of moles of acid in original solution / *Bereken die aantal mol in suur in oorspronklike oplossing*
- Use of / *Gebruik van* 90 in m = nM
- Calculation of mass of water of crystallization in original solution / *Berekening van die massa kristalwater in die oorspronklike oplossing*
- Calculating ration of n_{Water}/n_{Acid} *Berekening van die verhouding van* n_{Water} / n_{suur}
- Final answer */ Finale antwoord*

$n_{NaOH\ reacting\ /\ reageer}$ = cV= 0.5 x 24/1000✓ = 0.012 mol

$n_{oxalic\ acid\ reacting\ /\ reaksie\ van\ oksaalsuur}$= ½ x 0.012 mol✓ = 0,006 mol

$n_{oxalic\ acid\ in\ original\ solution\ /\ oksaalsuur\ in\ oorspronklike\ oplossing}$ = 250/25✓ x 0,006
= 0,06 mol ✓

$m_{\text{oxalic acid in original solution / oksaalsuur in oorspronklike oplossing}}$ = nM = 0,06 x 90 ✓
= 5,4 g

$m_{H_2O \text{ of crystallisation in original solution / } kristallisasie\ in\ oorspronklike\ oplossing}$ = 7,56 - 5,4 ✓
= 2.16 g

$n\ H_2O$ crystalllisation / *kristallisasie* = 2,16 /18 = 0,12 mol

x = 0,12/0,06 = 2✓ (7)
[28]

TOTAL / *TOTAAL* 150