



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE SENIOR
SERTIFIKAAT**

GRADE/GRAAD 12

SEPTEMBER 2018

**PHYSICAL SCIENCES P2
FISIESE WETENSKAPPE V2
MARKING GUIDELINE/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 manipulerings 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.*

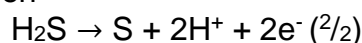
CORRECT KORREK	ANSWER (1) ANTW. (1)	POSSIBLE MOONTLIK	ANSWER (2) ANTW. (2)	POSSIBLE MOONTLIK
$I = \frac{V}{R} \checkmark$ $= \frac{200}{25} \checkmark$ $= 8A \checkmark$	$R = \frac{V}{I} \checkmark$ $= \frac{200}{25} x$ $= 8A x$	$R = \frac{V}{I} x$ $= \frac{200}{25}$ $= 8A$	$R = \frac{V}{I} \checkmark$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

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.

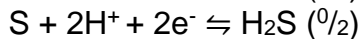
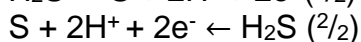
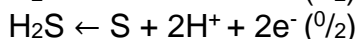
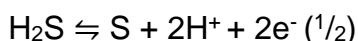
1.5.1 When a chemical **FORMULA** is asked, and the **NAME** is given as answer, only one of the two marks will be awarded. The same rule applies when the **NAME** is asked and the **FORMULA** is given.
Wanneer 'n chemiese FORMULE gevra word en die NAAM word as antwoord gegee, sal slegs een van die twee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



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:



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 $E^{\ominus}_{\text{cell}}$) 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^{\ominus}_{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 molekule 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/VRAAG 1

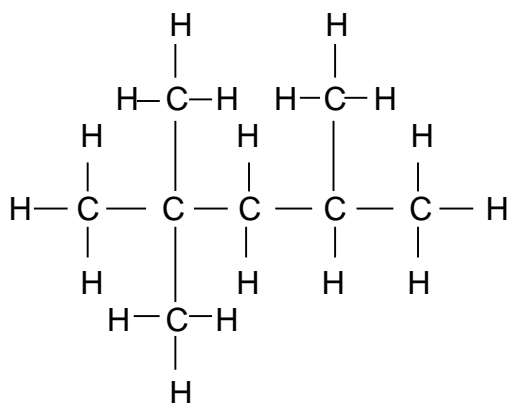
- 1.1 C ✓✓ (2)
- 1.2 B ✓✓ (2)
- 1.3 A ✓✓ (2)
- 1.4 B ✓✓ (2)
- 1.5 D ✓✓ (2)
- 1.6 D ✓✓ (2)
- 1.7 B ✓✓ (2)
- 1.8 A ✓✓ (2)
- 1.9 C ✓✓ (2)
- 1.10 C ✓✓ (2)

[20]

QUESTION/VRAAG 2

- 2.1.1 Alkanes ✓/Alkane (1)

2.1.2

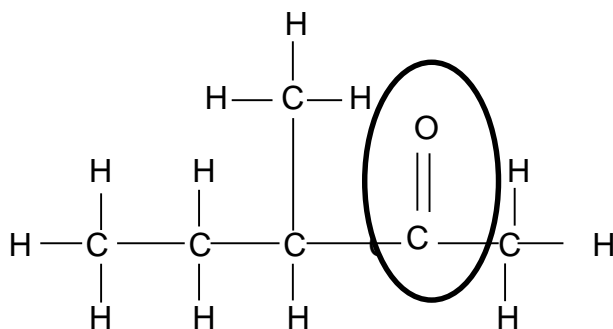
**Marking criteria/Nasienriglyne:**

- Correct stem i.e pentane./
Korrekte stam d.i.pentaan. ✓
- Three methyl substituents
Drie metielsubstituente. ✓
- Whole structure correct./
Hele struktuur korrek. ✓ **3/3**

- 2.1.3 CO₂ ✓ and/en H₂O ✓ (2)

- 2.2.1 Compounds with the same molecular formula, ✓ but different positions of the functional group. ✓ / Verbindings met dieselfde molekulêre formule, maar verskillende posisies van die funksionele groep. (2)

2.2.2

**Marking criteria/Nasiëriglyne:**

- Correct functional group./
Korrekte funksionele groep. ✓
- Whole structure correct./
Hele struktuur korrek. ✓ 2/2

3-methyl ✓ pentan-2-one ✓ / 3-methyl-2- pentanone

3-metiel ✓ pentan-2-oon ✓ / 3-metiel-2- pentanoon

(4)

2.3.1 2-chloro-3,4-dimethylhexane / 2-chloor-3,4-dimetielheksaan

Marking criteria/Nasiëriglyne:

- Correct stem i.e. hexane ✓ *Korrekte stam d.i. heksaan*
- First substituent, chloro, correctly identified ✓
Eerste substituent, chloor korrek geïdentifiseer.
- Second substituent, dimethyl, correctly identified ✓
Tweede substituent, dimetiel, korrek geïdentifiseer.
- Subtract a mark for missing hyphens, commas, incorrect numbering.
Trek 'n punt af vir enige koppelteken, komma wat uitgelaat is, verkeerde nommering.

(3)

2.3.2 SECONDARY ✓ / SEKONDÊR

(1)

[16]

QUESTION/VRAAG 3

3.1 They are organic compounds that contain hydrogens and carbons only. ✓✓
Hulle is organiese verbindings wat slegs uit waterstof- en koolstofatome bestaan. (2 or/of 0) (2)

3.2 53,3 ✓ (kPa)

**From A to C/Van A na C**

Chain length decreases/surface area decreases/more branches. ✓
Strength of intermolecular forces/London forces/dispersion forces/induced-dipole forces decreases. ✓
Less energy needed to overcome/break intermolecular forces. ✓

Kettinglengte neem af/oppervlaksarea neem af/meer vertakkings. Sterkte van intermolekulêre kragte/Londonkragte/dispersiekragte/geïnduseerde-dipool kragte neem af.

Minder energie word benodig om die intermolekulêre kragte te oorkom/breek.

OR/OF**From C to A/Van C na A**

Chain length increases/surface area increases/less branches. ✓
Strength of intermolecular forces/London forces/dispersion forces/induced-dipole forces increases. ✓
More energy needed to overcome/break intermolecular forces. ✓

Kettinglengte neem toe/oppervlaksarea neem toe/minder vertakkings.

Sterkte van intermolekulêre kragte/Londonkragte/dispersiekragte/geïnduseerde-dipool kragte neem toe.

Meer energie word benodig om die intermolekulêre kragte te oorkom/breek. (4)

3.3 E ✓ (1)

3.3.1 Compound with lowest vapour pressure ✓
Verbinding met die laagste dampdruk (1)

3.3.2 • Compound **D**(ethanol) has one site for hydrogen bonding, whereas compound **E**(methanoic acid) has two sites for hydrogen bonding. ✓
Verbinding D(etanol) het een punt vir waterstofbindings, waar verbinding E(metanoësuur) twee punte het vir waterstofbindings.

• Compound **E** has stronger hydrogen bonds than compound **D**. ✓
Verbinding E het sterker waterstofbindings as verbinding D.

(2)
[10]

QUESTION/VRAAG 4

4.1 Substitution ✓/Substitusie (1)

4.2.1 Waft your hand across the beaker/test tube toward your nose and sniff/smell (cautiously). ✓/
Wai met jou hand oor die beker of proefbuis en ruik (versigtig).

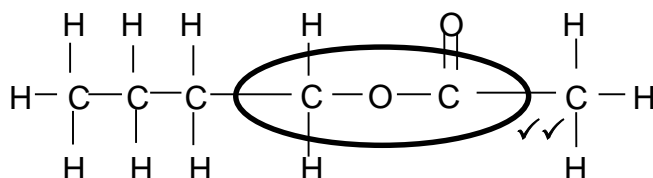
OR/OF

Pour the ester into a bowl of water and this will help you to identify the smell of the ester. / Gooi die ester in 'n glasbak met water om die reuk van die ester te kan identifiseer. (1)

4.2.2 Esterification ✓/Esterifikasie (1)

4.2.3 Ethanoic acid ✓✓/Etanoësuur (2)

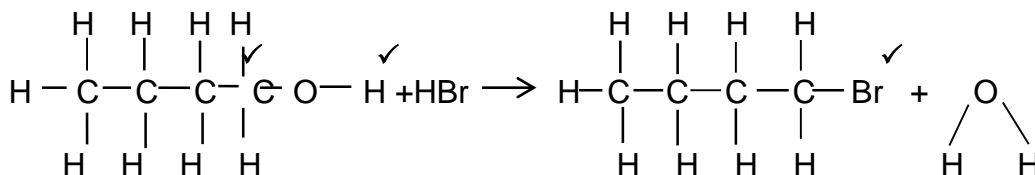
4.2.4

**Marking criteria/Nasiëriglyne:**

- Functional group correct.
Funksionele groep korrek 1/2
- Whole structure correct.
Hele struktuur korrek. 2/2

(2)

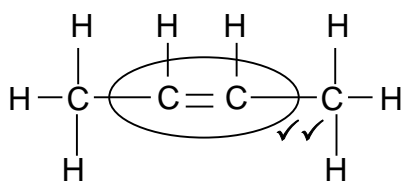
4.3



Accept/Aanvaar: H₂O

(4)

4.4.1

**Marking criteria/Nasiëriglyne:**

- Correct functional group.
Korrekte funksionele groep. ✓ 1/2
- Whole structure correct.
Hele struktuur korrek. ✓ 2/2

(2)

4.4.2 Concentrated H₂SO₄/Sulphuric acid ✓
Gekonsentreerde H₂SO₄/Swaelsuur

(1)

4.4.3 (Excess) water/H₂O ✓/ Concentrated H₂SO₄
(Oormaat) water/H₂O /Gekonsentreerde H₂SO₄

(1)

[15]

QUESTION/VRAAG 5

5.1 **ONLY ANY ONE OF / SLEGS ENIGE EEN VAN:**

- Change in concentration ✓ of reactants/products per (unit) time. ✓
Verandering in konsentrasie van reaktanse en produkte per (eenheids) tyd.
- Rate of change in concentration. ✓✓
Tempo van verandering in konsentrasie.
- Change in the amount/number of moles.volume/mass ✓ of products or reactants per (unit) time. ✓
Verandering in hoeveelheid/aantal mol/volume/massa van produkte of reaktanse per (eenheids) tyd.
- Amount / number of moles/volume/mass (of products) formed/ (reactants) used ✓ per (unit) time. ✓
Hoeveelheid / aantal mol /volume /masss (van produkte) gevorm/ (reaktantse) gebruik per (eenheids) tyd

(2)

5.2 EQUAL TO ✓ / GELYK AAN

(1)

5.3 Ave rate/Gem. tempo = $\frac{\Delta V}{\Delta t} = \frac{28-0}{15-0} \checkmark = 1,87 \text{ (cm}^3\text{.s}^{-1}\text{)} \checkmark$

(2)

5.4	Criteria for investigative question/Riglyne vir ondersoekende vraag:	
	Dependent and independent variables correctly identified. <i>Afhanklike en onafhanklike veranderlikes korrek geïdentifiseer.</i>	✓
	Asks a question about the relationship between independent and dependent variables./ <i>Vra 'n vraag oor die verwantskap tussen die afhanklike en onafhanklike veranderlikes.</i>	✓

**Examples/Voorbeelde:**

- What is the effect of a catalyst on the rate of the reaction?
Wat is die effek van 'n katalisator op die reaksietempo?
- What is the relationship between a catalyst and the rate of reaction? *Wat is die verwantskap tussen 'n katalisator en die reaksietempo?*

(2)

Notes/Aantekeninge:

- IF the answer to the question is a "YES" or "NO":/
INDIEN die antwoord op die vraag "JA" of "NEE" is. Max/Maks: 1/2

Examples/Voorbeelde:

- Does the catalyst influence the rate of the reaction?
Beïnvloed die katalisator die reaksietempo?
- Is there a relationship between the addition of a catalyst and reaction rate?
Is daar 'n verwantskap tussen die toevoeging van 'n katalisator en reaksietempo?

5.5 EXOTHERMIC/EKSOTERMIES ✓



(Net) Energy is absorbed./More energy is released than absorbed. ✓/ Energy of reactants > Energy of products.

(Netto) Energie word geabsorbeer./Meer energie word vrygestel as geabsorbeer./Energie van reaktante > Energie van produkte.

(2)

5.6 Experiment II ✓/Eksperiment II

(1)

- 5.7
- A catalyst provides an alternative pathway of lower activation energy. ✓
 - More particles will have sufficient/enough (kinetic) energy / $E_k \geq E_A$. ✓
 - More effective collisions per unit time ✓/second. /Frequency of effective collisions increases.

- 'n Katalisator verskaf 'n alternatiewe pad van laer aktiveringsenergie.
- Meer deeltjies het genoegsame (kinetiese) energie / $E_k \geq E_A$.
- Meer effektiewe botsings per eenheidstyd/sekonde. / Frekwensie van effektiewe botsings neem toe.

(3)

[13]

QUESTION/VRAAG 6

- 6.1 The stage in a chemical reaction when the rate of the forward reaction equals the rate of the reverse reaction. ✓✓ (2 marks or no marks)

Die stadium in 'n chemiese reaksie wanneer die tempo van die voorwaartse reaksie gelyk is aan die terugwaartse reaksie. (2 punte of geen punte nie)

OR/OF

The state where the concentrations/quantities of reactants and products remain constant. ✓✓ (2 marks or no marks)

Die toestand wanneer die konsentrasie/hoeveelhede van reaktanse en produkte konstant bly. (2 punte of geen punte nie)

(2)

- 6.2.1 DECREASES✓/AFNEEM

(1)

- 6.2.2 NO EFFECT✓/GEEN EFFEK



K_c will only change with a change in temperature.✓/ K_c is temperature dependent

K_c sal slegs verander met 'n verandering in temperatuur./ K_c is temperatuur afhanklik

(2)

- 6.3.1

Mark Allocations/Puntetoekenning:

- Correct K_c expression (formulae in square brackets). ✓ **Exp/Eksp 1 or/of 2**
Korrekte K_c uitdrukking (formules in vierkanthakies).
- Substitution of concentrations into K_c expression. ✓
Vervanging van konsentrasies in K_c uitdrukking.
- Substitution of K_c -value/Vervanging van K_c uitdrukking. ✓ **Exp/Eksp 3**
- Substitution of concentrations into K_c expression. ✓
Vervanging van konsentrasies in K_c uitdrukking.
- Formula/Formule: $n = cV$
- Calculate/Bereken $n(N_2O_4)_{eq/ewe}$ ✓
- Calculate/Bereken $n(NO_2)_{eq/ewe}$. ✓
- Calculate/Bereken $\Delta n(NO_2) = n(NO_2)_{eq/ewe} - n(NO_2)_{initial/begin}$ ✓
- Use ratio $n(N_2O_4) : n(NO_2) = 1 : 2$ to calculate $\Delta n(N_2O_4)$ ✓
Gebruik verhouding: $n(N_2O_4) : n(NO_2) = 1 : 2$ om $\Delta n(N_2O_4)$ te bereken.
- Calculate/Bereken $n(N_2O_4)_{initial/begin} = n(N_2O_4)_{eq/ewe} + \Delta n(N_2O_4) = 0,12 \text{ mol}$ ✓

OPTION/OPSIE 1

$$K_c = \frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]} \checkmark$$

$$= \frac{(0,0125)^2}{0,0336} \checkmark$$
$$= 0,00465$$

OR/OF

OPTION/OPSIE 2

$$K_c = \frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]}$$

$$= \frac{(0,0107)^2}{0,0246}$$
$$= 0,00465$$

$$K_c = \frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]}$$

$$0,00465 \checkmark = \frac{(0,0156)^2}{[\text{N}_2\text{O}_4]} \checkmark$$

$$[\text{N}_2\text{O}_4]_{\text{eq}} = 0,052 \text{ mol.dm}^{-3}$$

	N_2O_4	2NO_2	
$n_{\text{initial/begin}}$	0,1202	0	
Δn	0,0156	0,0312	Ratio/Verhouding
$n_{\text{eq/eue}}$	0,1046	0,0312	
c_{eq}	0,052	0,0156	

OPTION/OPSIE 3

$$K_c = \frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]} \checkmark$$

$$= \frac{(0,0125)^2}{0,0336} \checkmark$$
$$= 0,00465$$

OR/OF

OPTION/OPSIE 4

$$K_c = \frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]}$$

$$= \frac{(0,0107)^2}{0,0246}$$
$$= 0,00465$$

$$K_c = \frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]}$$

$$0,00465 \checkmark = \frac{(0,0156)^2}{[\text{N}_2\text{O}_4]} \checkmark$$

$$[\text{N}_2\text{O}_4]_{\text{eq}} = 0,052 \text{ mol.dm}^{-3}$$

$$n(\text{N}_2\text{O}_4)_{\text{eq}} = cV = (0,052)(2) \checkmark = 0,1046 \text{ mol}$$

$$n(\text{NO}_2)_{\text{eq}} = cV = (0,0156)(2) \checkmark = 0,0312 \text{ mol}$$

$$\Delta n(\text{NO}_2) = n(\text{NO}_2)_{\text{eq}} - n(\text{NO}_2)_i = 0,0312 - 0 = 0,0312 \text{ mol} \checkmark$$

$$\Delta n(\text{N}_2\text{O}_4) = \frac{1}{2}(0,0312) \checkmark = 0,0156 \text{ mol}$$

Ratio = 1:2

$$n(\text{N}_2\text{O}_4)_i = n(\text{N}_2\text{O}_4)_{\text{eq}} + \Delta n(\text{N}_2\text{O}_4)$$

$$= 0,1046 + 0,0156$$
$$= 0,12 \text{ mol} \checkmark$$

(9)

- 6.3.2 EQUAL TO ✓ / GELYK AAN (1)
- 6.3.3 Decrease in concentration of N_2O_4 . ✓ / Decrease in $[N_2O_4]$
Afname in konsentrasie van N_2O_4 / Afname in $[N_2O_4]$ (1)
- [16]**

QUESTION/VRAAG 7

7.1.1 WEAK ACID✓/SWAK SUUR



It has a low K_a value ✓/ The ionisation is NOT complete/incomplete.
Dit het 'n lae K_a waarde./ Die ionisasie is NIE volledig nie/onvolledig.

(2)

7.1.2 $C_2O_4^{2-}$ ✓

(1)

7.2.1 Hydrolysis is the reaction (of a salt) with water✓✓
Hidrolise is die reaksie (van 'n sout) met water

(2)

7.2.2 CH_3COOH ✓and/en OH^- ✓

(2)

7.3.1 $pH = -\log[H_3O^+]$ ✓
 1 ✓ = $-\log[H_3O^+]$
 $[H_3O^+] = 0,1 \text{ mol.dm}^{-3}$ ✓

(3)

7.3.2 **POSTIVE MARKING FROM QUESTION 7.3.1****POSITIEWE NASIEN VANAF VRAAG 7.3.1****OPTION/OPSIE 1****OPTION/OPSIE 2**

$$\begin{aligned} n(\text{NaOH}) &= cV \checkmark \\ &= (0,025)(0,0322) \checkmark \\ &= 8,05 \times 10^{-4} \text{ mol} \end{aligned}$$

$$\begin{aligned} n(\text{HCl})_{\text{excess/oormaat}} &= n(\text{NaOH}) \\ &= 8,05 \times 10^{-4} \text{ mol} \checkmark \end{aligned}$$

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

$$\frac{1}{1} = \frac{(0,1)V_a}{(0,025)(32,2)} \checkmark$$

$$V(\text{HCl})_{\text{excess/oormaat}} = 8,05 \text{ cm}^3$$

$$\begin{aligned} n(\text{HCl})_{\text{excess/oormaat}} &= cV \\ &= 0,1(0,00805) \\ &= 8,05 \times 10^{-4} \text{ mol} \checkmark \end{aligned}$$

(3)

7.3.3 POSTIVE MARKING FROM QUESTION 7.3.2

POSITIEWE NASIEN VANAF VRAAG 7.3.2



OPTION/OPSIE 1

$$V(\text{HCl})_{\text{excess/oormaat}} = n/c$$

$$= 0,000805 / 0,1$$

$$= 0,00805 \text{ dm}^3$$

$$V(\text{HCl})_{\text{reacted/gereageer}} = 0,050 - 0,00805 \checkmark$$

$$= 0,04195 \text{ dm}^3$$

$$n(\text{HCl})_{\text{reacted/gereageer}} = cV$$

$$= (0,1)(0,04195) \checkmark$$

$$= 0,004195 \text{ mol}$$

$$n(\text{CaCO}_3) = \frac{1}{2} n(\text{HCl})_{\text{reacted/gereageer}}$$

$$= 0,0020975 \text{ mol} \checkmark$$

$$m(\text{CaCO}_3) = nM$$

$$= (0,0020975)(100) \checkmark$$

$$= 0,20975 \text{ g}$$

$$\% \text{ purity/suiwerheid} = \frac{0,20975 \times 100}{0,3} \checkmark$$

$$= 69,92\% \checkmark$$

OPTION/OPSIE 2

$$[\text{HCl}] = [\text{H}_3\text{O}^+] = 0,1 \text{ mol} \cdot \text{dm}^{-3}$$

$$n_{\text{HCl initial}} = cV = 0,1 \times 50/1000 \checkmark$$

$$= 5 \times 10^{-3} \text{ mol}$$

$$n_{\text{HCl excess}} = 8,05 \times 10^{-4} \text{ mol (From 7.3.2)}$$

$$n_{\text{HCl reacted}} = 5 \times 10^{-3} - 8,05 \times 10^{-4} \checkmark$$

$$= 4,195 \text{ mol}$$

$$n_{\text{CaCO}_3} = \frac{1}{2} \times 4,195 \checkmark$$

$$= 2,097 \times 10^{-3} \text{ mol}$$

$$m = nM = 2,097 \times 10^{-3} \times 100 \checkmark$$

$$= 0,20975 \text{ g}$$

$$\% \text{ Purity} = m_{\text{pure}}/m_{\text{impure}} \times 100$$

$$= 0,20975/0,3 \times 100 \checkmark$$

$$= 69,92\% \checkmark$$

Marking guidelines/Nasienriglyne:

- Subtract 0,00805 from 0,005 ✓
Trek 0,00805 van 0,005 af
- Substitution into/ Vervanging in $n(\text{HCl})_{\text{reacted/gereageer}} = cV \checkmark$
- Use ratio/Gebruik verhouding 1 : 2 ✓
- Substitution into / Vervanging in $m(\text{CaCO}_3) = nM \checkmark$
- Calculate/Bereken: % purity/suiwerheid ✓
- Final answer/Finale antwoord: 69,92% ✓

RANGE (69,92 TO 70%)

(6)
[19]

QUESTION/VRAAG 8

8.1 A solution / liquid / dissolved substance that conducts electricity through the movement of ions ✓✓
’n Oplossing / vloeistof / opgeloste stof wat elektrisiteit gelei deur die beweging van ione (2)


8.2.1 Pressure: 1 atmosphere (atm) ✓/101,3 kPa / 1,013 x 10⁵ Pa
Druk: 1 atmosfeer (atm) / 101,3 kPa / 1,013 x 10⁵ Pa (1)

8.2.2 Platinum is a conductor of electricity ✓
Platinum is ’n geleier van elektrisiteit (1)

8.3 ANODE ✓ (1)

<p>8.4</p> <p><u>OPTION/OPSIE 1</u> $E^0_{\text{cell/SEL}} = E^0_{\text{cathode/katode}} - E^0_{\text{anode}} \checkmark$ $1,5 \checkmark = E^0_{\text{cathode/katode}} - (-0,14) \checkmark$ $E^0_{\text{cathode/katode}} = 1,36 \text{V} \checkmark$</p> <p>$X_2 = \text{Cl}_2 \checkmark$ / Chlorine(gas) / Chloor(gas)</p> <p><u>Accept/Aanvaar:</u> $\text{Cl}_2 / \text{Cl}^-$ half reaction / halfreaksie</p>	<p><u>Notes/Aantekeninge:</u></p> <ul style="list-style-type: none"> Accept any other correct formula from the data sheet. <i>Aanvaar enige ander korrekte formule vanaf gegewensblad.</i> Any other formula using unconventional abbreviations, e.g. $E^0_{\text{cell}} = E^0_{\text{OA}} - E^0_{\text{RA}}$ <i>Enige ander formule wat onkonvensionele afkortings gebruik, bv.</i> $E^0_{\text{sell}} = E^0_{\text{OM}} - E^0_{\text{RM}}$ gevolg deur korrekte vervangings: Max/Maks: 3/4
<p><u>OPTION/OPSIE 2</u></p> <p>$\begin{array}{l} X_2 + 2e^- \rightarrow X_2 \quad + 1,36(\text{V}) \checkmark \\ \checkmark \quad \text{Sn} \rightarrow \text{Sn}^{+2} + 2e^- \quad + 0,14(\text{V}) \checkmark \\ \hline X_2 + \text{Sn} \rightarrow X_2 + \text{Sn}^{+2} \quad 1,50(\text{V}) \checkmark \end{array}$</p> <p>$X_2 = \text{Cl}_2 \checkmark$ / Chlorine(gas) / Chloor(gas)</p> <p><u>Accept/Aanvaar:</u> $\text{Cl}_2 / \text{Cl}^-$ half reaction / halfreaksie</p>	

8.5 BECOMES ZERO ✓ / WORD NUL

 The electrical circuit is incomplete ✓ /
Die elektriese stroombaan is onvolledig (2)

8.6 $3\text{Mg}(\text{s}) + 2\text{Al}^{+3}(\text{aq}) \checkmark \rightarrow 3\text{Mg}^{+2}(\text{aq}) + 2\text{Al}(\text{s}) \checkmark$ Bal ✓

<u>Notes/Aantekeninge:</u>		
• Reactants ✓	Products ✓	Balancing ✓
• Reaktanse	Produkte	Balansering
• Ignore double arrows / Ignoreer dubbelpyle		
• Marking rule 6.3.10 / Nasienreël 6.3.10		

(3)
[15]

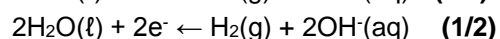
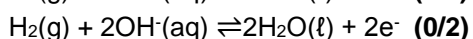
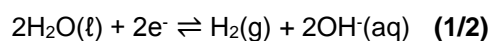
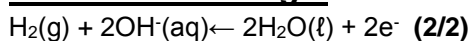
QUESTION/VRAAG 9

9.1.1 Battery ✓/Energy source/Power source
Battery/Kragbron (1)

9.1.2 Chlorine ✓/Chloor/Cl₂ (1)

9.1.3 2H₂O(l) + 2e⁻ → H₂(g) + 2OH⁻(aq) ✓✓

Ignore phases/Ignoreer fases

Notes/Aantekeninge:

(2)

9.1.4 Cl⁻ ✓ OR/OF NaCl (1)

9.2 [H₃O⁺] > 1 x 10⁻⁷ ✓



Solution is alkaline ✓/NaOH is formed

Oplossing is alkalies/NaOH word gevorm

(2)

9.3 Cu⁺² is a stronger oxidising agent ✓ (than Na⁺) and will be reduced ✓ to Cu. ✓
Cu⁺² is 'n sterker oksideermiddel (as Na⁺) en sal gereduseer word (na Cu). (3)

[10]

QUESTION/VRAAG 10

- 10.1.1 Vanadium pentoxide/*Vanadiumpentoksied* / V_2O_5 ✓ (1)
- 10.1.2 H_2SO_4 ✓ (1)
- 10.1.3 Water ✓ (1)
- 10.1.4 Contact (process) / *Kontak (proses)* ✓ (1)
- 10.1.5 $NH_3(g) + H_2SO_4(aq) \checkmark \rightarrow (NH_4)_2SO_4 \checkmark$ Bal. ✓ (3)

Notes/Aantekeninge:

- Reactants ✓ Products ✓ Balancing ✓
Reaktante *Produkte* *Balansering*
- Ignore/*Ignoreer* \rightleftharpoons and phases/*en fases*
- Marking rule 6.3.10/*Nasienreël 6.3.10*

10.1.6 HIGHER THAN 450 °C ✓/ HOËR AS 450 °C

Mark independently/Merk onafhanklik:

- For all pressure values ✓
Vir alle waardes vir druk
- Yield is lower for graph Q ✓
Opbrengs vir Q is laer
- Reverse reaction which is endothermic will be favoured ✓
Terugwaartse reaksie wat endotermies is, word bevoordeel (4)

10.2.1 Ensures quality seeds, fruit, vegetables and flowers. ✓
Verseker kwaliteit saad, vrugte, groente en blomme.

OR/OF

Help plants fight frost and resist diseases. ✓
Help plante veg teen ys en bied weerstand teen siektes. (1)

10.2.2 **OPTION/OPSIE 1**
 % fertiliser = $100 - 76 = 24\%$ ✓
 % K = $24 - (4+8) \checkmark = 12$
 $m(K) = \underline{12}$
 $x \ m(\text{bag}) = 6 \ \text{kg} \checkmark$
 100
 $m(\text{bag}) = 50 \ \text{kg} \checkmark$

OPTION/OPSIE 2
 % fertiliser = $100 - 76 = 24\%$ ✓
 % K = $24 - (4+8) \checkmark = 12$
 $m(K) = \frac{12}{24} \times m(\text{fertiliser}) = 6 \ \text{kg} \checkmark$
 $m(\text{fertiliser}) = 12 \ \text{kg} \checkmark$
 $m(\text{filler}) = \frac{12}{24} \times 76 = 38 \ \text{kg} \quad (24 : 76)$
 $m(\text{bag}) = 12 + 38 = 50 \ \text{kg}$

Marking criteria/Nasienriglyne:

- Subtract to obtain % fertiliser. ✓
Aftrekking om % kunsmis te kry.
- $-(4+8)$ for % K in bag of fertiliser/*in sak kunsmis* ✓
- Calculate mass **m** /*Bereken massa m* ✓
- Final answer/*Finale antwoord: 50 kg* ✓

(4)
[16]

TOTAL/TOTAAL: 150