



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE/GRAAD 12**

**SEPTEMBER 2013**

**PHYSICAL SCIENCES P2  
*FISIESE WETENSKAPPE V2*  
MEMORANDUM**

**MARKS: 150**

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This memorandum consists of 16 pages.  
*Hierdie memorandum bestaan uit 16 bladsye.*

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LEARNING OUTCOMES AND ASSESSMENT STANDARDS LEERUITKOMSTE EN ASSESSERINGSTANDAARDE		
LO/LU1	LO/LU2	LO/LU3
<p><b>AS 12.1.1</b> Plan and conduct a scientific investigation to collect data systematically with regard to accuracy, reliability and the need to control variables.</p> <p><i>Beplan en voer 'n wetenskaplike ondersoek uit om data sistematies te versamel ten opsigte van akkuraatheid, betroubaarheid en die kontroleer van veranderlikes.</i></p>	<p><b>AS 12.2.1</b> Define and discuss basic prescribed and scientific knowledge.</p> <p><i>Definieer en bespreek basiese voorgeskrewe wetenskaplike kennis.</i></p>	<p><b>AS 12.3.1</b> Recognise, discuss and compare scientific and indigenous knowledge systems and knowledge claims by indicating the correlation among them, and explain the acceptance of different claims.</p> <p><i>Herken, bespreek en vergelyk wetenskaplike en inheemse kennissisteme en kennis aansprake deur die ooreenkoms aan te dui en verduidelik die aanvaarding van verskillende aansprake.</i></p>
<p><b>AS 12.1.2</b> Seek pattern and trends, represent them in different forms to draw conclusions, and formulate simple generalisations.</p> <p><i>Soek patrone en tendense, stel dit in verskillende vorms voor om gevolgtrekkings te maak en om eenvoudige veralgemenings te formuleer.</i></p>	<p><b>AS 12.2.2</b> Express and explain prescribed scientific theories, models and laws by indicating the relationship between different facts and concepts in own words.</p> <p><i>Verduidelik en druk voorgeskrewe wetenskaplike beginsels, teorieë, modelle en wette uit deur die verwantskap tussen verskillende feite konsepte in eie woorde aan te dui.</i></p>	<p><b>AS 12.3.2</b> Identify ethical and moral issues related to the development of science and technology and evaluate the impact (pros and cons) of the relationship from a personal viewpoint.</p> <p><i>Identifiseer etiese en morele uitkomst in verband met die ontwikkeling van die wetenskap en tegnologie en evalueer die impak (voordele en nadele) van die verhouding van 'n persoonlike oogpunt.</i></p>
<p><b>AS 12.1.3</b> Apply known problem-solving strategies to solve multi-step problems.</p> <p><i>Pas bekende probleem oplossings strategieë toe om veelvuldigestap probleme op te los.</i></p>	<p><b>AS 12.2.3</b> Apply scientific knowledge in everyday life contexts.</p> <p><i>Pas wetenskaplike kennis in kontekste van die alledaagse lewe toe.</i></p>	<p><b>AS 12.3.3</b> Evaluate the impact of scientific and technological knowledge on sustainable development of resources and suggest long-term and short-term strategies to improve the management of resources in the environment.</p> <p><i>Evalueer die impak van wetenskaplike en tegnologiese kennis op volhoubare ontwikkeling van bronne en om kort-termyn en lang-termyn strategieë voor te stel om die bestuur van bronne in die omgewing te verbeter.</i></p>
<p><b>AS 12.1.4</b> Communicate and defend scientific arguments with clarity and precision.</p> <p><i>Kommunikeer en verdedig wetenskaplike argument duidelik en presies.</i></p>		

## 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 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 beklemtoning op die wetenskaplike konsepte, met betrekking tot die vraag, val.*

### 1.2 FORMULAE AND SUBSTITUTIONS/FORMULES EN SUBSTITUSIE

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 had 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 was om 'n berekening te doen** d.w.s. substitusie was gedoen of 'n numerieke antwoord word 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 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 by Vraestel 1).*

## 1.4 POSTIVE MARKING/POSITIEWE NASIEN

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

- 1.4.1 **Sub-question to sub-question:** When a certain variable is calculated in one sub-question (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 sub-question:** 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 word 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 berekening gedoen moet word (bv. 'n stroombaan diagram vraag) hoef nie noodwendig altyd dieselfde orde te volg 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, sal geen punte 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 voorstellingsfout, kan 'n verkeerde antwoord nie korrek gemotiveer word nie. As die kandidaat derhalwe gevra word met 'n vraag in 3.2 om die antwoord in vraag 3.1 te motiveer, en 3.1 is verkeerd, sal geen punte vir vraag 3.2 toegeken word nie. Maar, as die antwoord in bv. 3.1 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  $\Omega$ , calculate the current.

*Vir 'n **foutdraendebeginnel**, sal **geen punte** toegeken word nie (Reël 1) bv. As die potensiaalverskil 200 V en die weerstand 25  $\Omega$  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 VAN NASIEN BY CHEMIE

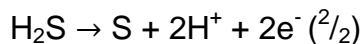
The following are a number of guidelines that specifically apply to Paper 2.

*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.

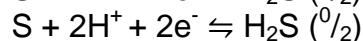
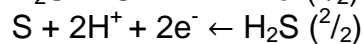
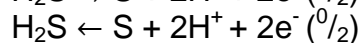
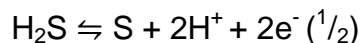
*Wanneer 'n chemiese **FORMULE** gevra word en die **NAAM** word as antwoord gegee, sal slegs een van die twee punte toegeken word. Dieselfde reël geld wanneer die **NAAM** gevra word en die **FORMULE** gegee word.*

- 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  $\text{Cu}^{2+}$  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  $\text{Cu}^{2+}$ -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 sub-question and carries the answer to another sub-question (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 of  $E^{\ominus}_{\text{sel}}$ ) 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 galvaniesesel 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 dra 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 struktuurformules 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 gekondenseerde 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 pent-1-teen of 1-penteen skryf 'n kandidaat pent 1 een of 1 penteen), sal punte verbeur word.*



**SECTION/AFDELING A****QUESTION/VRAAG 1**

1.1	Hydrocarbons/ <i>Koolwaterstowwe</i> ✓	[12.2.1]	(1)
1.2	Catalyst/ <i>Katalisator</i> ✓	[12.2.1]	(1)
1.3	Redox (reaction)/ <i>redoks (reaksie)</i> ✓	[12.2.1]	(1)
1.4	Halogenation/bromination/ <i>Halogenasie/broominasie</i> ✓	[12.2.1]	(1)
1.5	Primary batteries/ <i>Primêre batterye</i> ✓	[12.2.1]	(1)
			<b>[5]</b>

**QUESTION/VRAAG 2**

2.1	B ✓✓	[12.2.3]	(2)
2.2	D ✓✓	[12.2.3]	(2)
2.3	C ✓✓	[12.2.3]	(2)
2.4	C ✓✓	[12.2.2]	(2)
2.5	D ✓✓	[12.1.2]	(2)
2.6	C ✓✓	[12.2.3]	(2)
2.7	A ✓✓	[12.2.3]	(2)
2.8	C ✓✓	[12.2.3]	(2)
2.9	B ✓✓	[12.2.3]	(2)
2.10	B ✓✓	[12.2.3]	(2)
			<b>[20]</b>

**TOTAL SECTION/TOTAAL AFDELING A: 25**

## SECTION/AFDELING B

## QUESTION/VRAAG 3

3.1 Butane/*butaan* ✓ C<sub>4</sub>H<sub>10</sub> ✓ [12.1.2] (2)

3.2  
 B:  $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CH}_2\text{CCHCH}_3 \end{array}$  ✓✓ OR/OF  $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CHCCH}_2\text{CH}_3 \end{array}$  ✓✓  
 D: CH<sub>3</sub>CH<sub>2</sub>COOH ✓✓ [12.1.2] (4)

3.3 C: carboxylic acid/ *karboksielsuur* ✓  
 E: Aldehyde/ *aldehyd* ✓ [12.2.1] (2)

3.4  $\begin{array}{c} \text{O} \\ || \\ -\text{C}-\text{C}-\text{H} \\ | \end{array}$  ✓ OR/OF  $\begin{array}{c} \text{O} \\ || \\ -\text{C}-\text{H} \end{array}$  ✓ [12.1.1] (1)

3.5 Isomers are molecules with the same molecular formula but different structural formulae./ *Isomere is molekule met dieselfde molekulêre formule maar verskillende strukturele formules.* ✓✓ [12.2.1] (2)

3.6 3.6.1 

Option/Opsie 1
$\begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \\   \quad    \quad   \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{C}-\text{H} \\   \quad \quad   \\ \text{H} \quad \quad \text{H} \end{array}$ ✓✓

Option/Opsie 2
$\begin{array}{c} \text{H} \quad \text{H} \quad \text{O} \\   \quad   \quad    \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{C}-\text{H} \\   \quad   \\ \text{H} \quad \text{H} \end{array}$ ✓✓

 [12.1.2] (2)

3.6.2 If/ indien **Option/opsie 1:**  
methyl ✓ ethanoate ✓/ metiel ✓ etanoaat ✓  
 If/ indien **Option/opsie 2:**  
ethyl ✓ methanoate ✓/ etiel ✓ metanoaat ✓ [12.1.2] (2)

3.6.3 Esters ✓ [12.2.3] (1)

[16]

## QUESTION/VRAAG 4

4.1 4.1.1 Propene/*Propeen* ✓ [12.2.3] (1)

4.1.2  $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \diagdown \quad | \quad | \\ \text{C}=\text{C}-\text{C}-\text{H} \\ \diagup \quad \quad | \\ \text{H} \quad \quad \text{H} \end{array}$  ✓ + H-H →  $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ | \quad | \quad | \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ | \quad | \quad | \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$  ✓ [12.1.2] (3)

4.1.3 Hydrogenation/addition/*Hidrogenering/addisie* ✓✓ [12.2.1] (2)

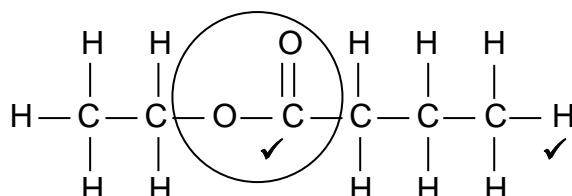
4.1.4 Propane/*Propaan* ✓ [12.2.1] (1)

4.1.5  $C_nH_{2n}$  ✓✓ [12.3.1] (2)

4.2 4.2.1 Ethanol/ *etanol* ✓ [12.2.3] (1)

4.2.2  $H_2SO_4$  ✓ [12.2.3] (1)

4.2.3 ethyl ✓ butanoate ✓/ etiel ✓ butanoaat ✓



Functional group: ✓  
Whole structure correct: ✓  
*Funksionele groep:* ✓  
*Hele struktuur korrek:* ✓

[12.1.2] (4)

### QUESTION/ VRAAG 5

5.1 Ethanoic acid/ *etanoësuur* ✓

- ⊖ ↓ • The hydrogen bonds/intermolecular forces between the ethanoic acid molecules are **stronger** than the Van der Waals forces/intermolecular forces between the methyl methanoate molecules/*Die waterstofbindings/ intermolekulêre kragte tussen etanoësuurmolekule is sterker as die Van der Waalskragte/intermolekulêre kragte tussen die metielmetanoaatmolekule.* ✓
- More energy is therefore needed to break the bonds between the ethanoic acid molecules/*Meer energie word dus benodig om die bindings tussen die etanoësuurmolekule te breek.* ✓

[12.2.3] (3)

5.2 Methyl methanoate/ *metielmetanoaat* ✓

- ⊖ ↓ • The Van der Waals/intermolecular forces between the methyl methanoate molecules are weaker than the hydrogen bonds/intermolecular forces between the ethanoic acid molecules/*Die Van der Waalskragte/intermolekulêre kragte tussen die metielmetanoaatmolekule is swakker as die waterstofbindings/intermolekulêre kragte tussen die etanoësuurmolekule.* ✓
- Less energy is needed to break the bonds between the ester molecules/*Minder energie word benodig om die bindings tussen die estermolekule te breek.* ✓

[12.2.3] (3)

5.3 butanoic acid/ *butanoësuur* ✓

- ⊖ ↓ Van der Waals forces increase with molecular size/*Van der Waalskragte neem met molekulêre grootte toe.* ✓✓

[12.2.3] (3)

[9]

## QUESTION/VRAAG 6

- 6.1 6.1.1 **A** – Conical/Erlenmeyer flask/koniese fles/Erlenmeyer fles ✓  
**B** – Delivery tube/Afvoerpype ✓  
**C** – Gas syringe/Gasspuit ✓ [12.1.1] (1)
- 6.1.2 Stopwatch/timer/stophorlosie/tydhouer ✓ [12.1.1]
- 6.1.3 **Step 1:** Close the flask with the rubber stopper ✓ and simultaneously start the stopwatch ✓  
**Step 1:** Maak die fles met die rubberprop toe ✓ en begin die stophorlosie gelyktydig ✓ (1)  
**Step 2:** Measure the volume of gas/hydrogen given off ✓ in a certain time interval ✓  
**Step 2:** Meet die volume gas/waterstof vrygestel ✓ in 'n sekere tyd interval ✓ [12.1.1] (4)
- 6.1.4 Increases/Neem toe. ✓ [12.1.2] (1)
- 6.1.5 At higher temperatures, the particles have more energy and move faster ✓ so effective collisions occur more frequently and more energetically ✓ *Teen hoër temperature het die partikels meer energie en beweeg vinniger ✓ sodat effektiewe botsings meer gereeld en met meer energie plaasvind.* ✓ [12.1.4] (2)
- 6.1.6 Exothermic/Eksotermies ✓  
 (–) ↓  $\Delta H$  is less than zero/heat is given off/more energy is released than absorbed/ $\Delta H$  is minder as nul/hitte word vrygestel/meer energie word vrygestel as geabsorbeer. ✓✓ [12.1.2] (3)
- 6.1.7
- $E_p$   
(kJ·mol<sup>-1</sup>)

✓	Correct Shape Korrekte vorm
✓	Both axes labelled/ Beide asse benoem
- Reaction progress/  
Verloop van reaksie
- [12.1.2] (2)
- 6.1.8 Increase/Toeneem ✓  
 (–) ↓ [12.1.2] (1)

- 6.1.9 More collisions will occur because there are more particles that can collide in a given volume ✓ The chances of effective collisions are higher. ✓ / *Meer botsings sal plaasvind want daar is meer partikels wat kan bots in 'n gegewe volume ✓ Die kans vir effektiewe botsings is hoër. ✓* [12.1.4] (2)
- 6.2 6.2.1 • What is the relationship between concentration and reaction rate? / *Wat is die verhouding/verwantskap tussen konsentrasie en reaksietempo? ✓✓* **OR/OF**  
 • What is the effect of a change in concentration on the rate of a reaction? *Watter effek het 'n verandering in konsentrasie op die tempo van 'n reaksie? ✓✓* [12.1.1] (2)
- 6.2.2 60 cm<sup>3</sup> ✓ [12.1.2] (1)
- 6.2.3 4 minutes/minute ✓ [12.1.2] (1)
- 6.2.4 Experiment/Eksperiment A ✓  
 ⊖ ↓ The gradient/slope/incline of the graph is steeper/  
*Die gradiënt/helling van die grafiek is steiler. ✓✓* [12.1.2] (2)
- 6.2.5 • Reaction rate increases/decreases with an increase/decrease in concentration / *Reaksietempo neem toe/neem af met 'n toename/afname in konsentrasie. ✓✓*  
**OR**  
 • Reaction rate is directly proportional to concentration / *Reaksietempo is direk eweredig aan konsentrasie. ✓✓* [12.1.2] (2)

[25]

**QUESTION/VRAAG 7**

- 7.1  $S + O_2 \checkmark \rightarrow SO_2 \checkmark$  [12.2.3] (2)
- 7.2 7.2.1 Reverse (reaction)/*terugwaartse (reaksie) ✓✓* [12.2.1] (2)
- 7.2.2 According to Le Chatelier's principle, an increase in temperature will favour the endothermic reaction/reaction that uses energy. ✓ The reverse reaction is endothermic because  $\Delta H$  is negative/less than zero ✓ / *Volgens Le Chatelier se beginsel sal 'n toename in temperatuur die endotermiese reaksie/reaksie wat energie gebruik bevoordeel. ✓ Die terugwaartse reaksie is endotermies want  $\Delta H$  is negatief/minder as nul. ✓* [12.2.3] (2)

- 7.3 7.3.1 Decreases/*Neem af* ✓ [12.2.3] (1)  
 7.3.2 Decreases/*Neem af* ✓ [12.2.3] (1)  
 7.3.3 Stays the same/*Bly dieselfde* ✓ [12.2.3] (1)
- 7.4 Mark distribution/*Punteverspreiding*:

0,2 mol SO <sub>2</sub>	✓	K <sub>c</sub> expression/ <i>ekspresie</i>	✓
0,2 mol SO <sub>3</sub>	✓	substitution/ <i>substitusie</i>	✓✓
0,05 mol O <sub>2</sub>	✓	Final answer/ <i>finale antwoord</i>	✓
Concentration calculations (÷2) <i>konsentrasie berekeninge (÷2)</i>		✓	

	SO <sub>2</sub>	O <sub>2</sub>	SO <sub>3</sub>
Molar ratio	2	1	2
n (initially/ <i>aanvanklik</i> ) mol	0,3	0,15	0
n (reacted/ <i>reageer</i> ) mol	0,2 ✓	0,1	0,2 ✓
n (equilibrium/ <i>ewewig</i> ) mol	0,1	0,05 ✓	0,2
c (equilibrium/ <i>ewewig</i> ) mol·dm <sup>-3</sup>	0,05	0,025	0,1

(÷2 ✓)

$$K_c = \frac{[\text{SO}_3]^2}{[\text{SO}_2]^2[\text{O}_2]} \quad \checkmark = \frac{(0,1)^2}{(0,05)^2(0,025)} \quad \checkmark\checkmark = 160 \quad \checkmark$$

No K <sub>c</sub> expression/ <i>Geen K<sub>c</sub> ekspresie</i>	Max/Maks. 7/8
Wrong K <sub>c</sub> expression/ <i>Verkeerde K<sub>c</sub> ekspresie</i>	Max/Maks. 4/8

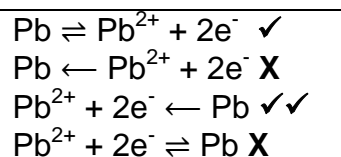
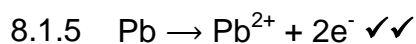
[12.1.3] (8)  
[17]

### QUESTION/VRAAG 8

- 8.1 8.1.1 (Concentration of)/(*Konsentrasie van*) 1 mol·dm<sup>-3</sup> ✓  
 (temperature of)/(*temperatuur van*) 25 °C/ 298 K ✓ [12.2.1] (2)
- 8.1.2 E°<sub>cell</sub> = E°<sub>cathode</sub> – E°<sub>anode</sub> ✓ (OR Any other correct formula as on Data Sheet)  
 0,93 ✓ = E°<sub>cathode</sub> – (-0,13) ✓  
 ∴ E°<sub>cathode</sub> = 0,80 V ✓  
 Metal X is therefore Ag/silver/*Metaal X is dus Ag/silwer.* ✓ [12.2.3] (5)

If formula used is NOT shown on data sheet, but substitutions are correct/ <i>Indien formule wat gebruik word NIE op gegewens-bladsy voorkom NIE, maar substitusies is korrek:</i>	Maks/ Maks. 4/5
--	-----------------------

- 8.1.3 Pb | Pb<sup>2+</sup> ✓ || ✓ Ag<sup>+</sup> | Ag ✓ [12.2.3] (1)  
 8.1.4 Ag<sup>+</sup>/silver ions/*silwer ione* ✓ [12.2.3] (1)



Marking rule	1.5.2
Nasienreël	

[12.2.3] (2)

8.1.6 From the Pb half-cell to half-cell X  
*Vanaf die Pb halfsel na halfsel X* ✓✓



Concentration of  $\text{Ag}^+$  ions/cations/positive ions in half-cell X decreases. ✓ To maintain electrical neutrality, cations flow from the Pb half-cell, through the salt bridge, to half-cell X. ✓  
*Konsentrasie  $\text{Ag}^+$  -ione/katione/positiewe ione neem in halfsel X af.* ✓ *Om elektriese neutraliteit te behou, vloei katione vanaf die Pb halfsel, deur die soutbrug, na halfsel X.* ✓

**OR/OF**

Concentration of  $\text{Pb}^{2+}$  ions/cations/positive ions in the Pb half-cell increases. ✓ To prevent a buildup of cations in the Pb half-cell, cations flow through the salt bridge to half-cell X. ✓

*Konsentrasie  $\text{Pb}^{2+}$  -ione/katione/positiewe ione neem toe in die Pb halfsel.* ✓ *Om 'n opbou van katione in die Pb halfsel te voorkom, vloei die katione deur die soutbrug na halfsel X.* ✓

[12.1.4] (4)

8.2 8.2.1 Electrical energy is converted to chemical energy/*elektriese energie word omgesit in chemiese energie.* ✓✓

[12.2.1] (2)

8.2.2 It is much lighter for the same strength/stronger for the same mass/*Dit is baie ligter vir dieselfde sterkte/sterker vir dieselfde massa.* ✓

*It is corrosion free/Dit is roesvry.* ✓

[12.3.2] (2)

8.2.3 It uses huge amounts of electricity which is generated by huge amounts of burning coal and thus indirectly contributes to the greenhouse effect/climate change/*Dit gebruik 'n groot hoeveelheid elektrisiteit wat deur die verbranding van 'n groot hoeveelheid steenkool verkry word en dra dus indirek by tot die kweekhuseffek/klimaatverandering.* ✓✓

**IF/INDIEN**

*It is responsible for (air) pollution/Dit is verantwoordelik vir besoedeling.* ✓ (1 Mark only/Slegs 1 punt)

[12.3.3] (2)

**[23]**

## QUESTION/ VRAAG 9

- 9.1 9.1.1 (Electrode) A ✓ [12.2.3] (1)
- ⊖ ↓
- 9.1.2 Chlorine/*Chloor* ✓ [12.3.2] (1)
- 9.1.3 Chlorine gas is poisonous and can cause serious respiratory problems if it leaks./*Chloorgas is giftig en kan ernstige asemhalingsprobleme veroorsaak as dit moet lek.* ✓✓ [12.3.3] (2)
- 9.1.4  $2 \text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$  ✓✓
- |  |   |
|--|---|
| $2 \text{Cl}^- \rightleftharpoons \text{Cl}_2 + 2\text{e}^-$ ✓ | Marking rule<br><i>Nasienreël</i> 1.5.2 |
| $2 \text{Cl}^- \leftarrow \text{Cl}_2 + 2\text{e}^-$ X         |   |
| $\text{Cl}_2 + 2\text{e}^- \leftarrow 2 \text{Cl}^-$ ✓✓        |   |
| $\text{Cl}_2 + 2\text{e}^- \rightleftharpoons 2 \text{Cl}^-$ X |   |
- [12.2.3] (2)
- 9.1.5 Sodium ions/ *Natriumione* ✓ IF/INDIEN  $\text{Na}^+$  ions/ *-ione* X [12.2.3] (1)
- 9.2 9.2.1 Ammonia/*ammoniak* ✓ (Accept/*aanvaar* :  $\text{NH}_3$  ✓) [12.2.3] (1)
- 9.2.2  $\text{NH}_3 + \text{HNO}_3 \checkmark \rightarrow \text{NH}_4\text{NO}_3 \checkmark$  (Bal. ✓)  
**OR/OF**  
 $2\text{NH}_3 + \text{H}_2\text{SO}_4 \checkmark \rightarrow (\text{NH}_4)_2\text{SO}_4 \checkmark$  (Bal. ✓) [12.2.3] (3)
- 9.2.3 They do not occur naturally/ are manufactured in a factory/ are manmade./*Hulle kom nie natuurlik voor nie/word in fabriek vervaardig/is mens gemaak.* ✓ [12.3.2] (1)
- 9.2.4 Important component of amino acids ✓ which are the building blocks for proteins/enzymes/DNA ✓/*Belangrike komponent van aminosure ✓ wat die boustone is vir proteïene/ensieme/ DNA.* ✓  
**IF/INDIEN**  
enhances growth/bevorder groei ✓ (1 Mark only/Slegs 1 punt) [12.3.3] (2)
- 9.3 9.3.1 Zinc-carbon/*sinkkoolstof* (battery) ✓✓ [12.2.3] (2)
- 9.3.2 Alkaline/*alkali* (battery) ✓ [12.3.2] (1)
- 9.3.3 Remote controls/torches/radios/etc./*Afstandbeheer/flitse/ radio's/ ens.* ✓ [12.3.2] (1)
- 9.3.4 It cannot be recharged/recycled/*Dit kan nie herlaai/herwin word nie.* ✓✓ [12.3.3] (2)

**TOTAL SECTION B/TOTAAL AFDELING B: 125**  
**GRAND TOTAL/GROOTTOTAAL: 150**