



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE/GRAAD 12

**PHYSICAL SCIENCES: CHEMISTRY (P2)
FISIESE WETENSKAPPE: CHEMIE (P2)**

NOVEMBER 2009(1)

MEMORANDUM

MARKS/PUNTE: 150

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

PHYSICAL SCIENCES GRADE 12 PAPER 2 MARCH 2010
FISIESE WETENSKAPPE GRAAD 12 VRAESTEL 2 MAART 2010

Learning Outcomes and Assessment Standards Leeruitkomst en Assesseringstandaarde		
LO1/LU1	LO2/LU2	LO3/LU3
<p>AS12.1.1: Design, plan and conduct a scientific inquiry to collect data systematically with regard to accuracy, reliability and the need to control variables.</p> <p><i>Ontwerp, beplan en voer 'n wetenskaplike ondersoek uit om data te versamel ten opsigte van akkuraatheid, betroubaarheid en die kontroleer van veranderlikes.</i></p> <p>AS12.1.2: Seek patterns and trends, represent them in different forms, explain the trends, use scientific reasoning to draw and evaluate conclusions, and formulate generalisations.</p> <p><i>Soek patrone en tendense, stel dit in verskillende vorms voor, verduidelik die tendense, gebruik wetenskaplike beredenering om gevolgtrekkings te maak en te evalueer, en formuleer veralgemenings.</i></p> <p>AS12.1.3: Select and use appropriate problem-solving strategies to solve (unseen) problems.</p> <p><i>Kies en gebruik geskikte probleem-oplossingstrategieë om (ongesiene) probleme op te los.</i></p> <p>AS12.1.4: Communicate and defend scientific arguments with clarity and precision.</p> <p><i>Kommunikeer en verdedig wetenskaplike argumente duidelik en presies.</i></p>	<p>AS12.2.1: Define, discuss and explain prescribed scientific knowledge.</p> <p><i>Definieer, bespreek en verduidelik voorgeskrewe wetenskaplike kennis.</i></p> <p>AS12.2.2: Express and explain prescribed scientific principles, theories, models and laws by indicating the relationship between different facts and concepts in the candidate's own words.</p> <p><i>Verduidelik en druk voorgeskrewe wetenskaplike beginsels, teorieë, modelle en wette uit deur die verwantskap tussen verskillende feite en konsepte in die kandidaat se eie woorde aan te dui.</i></p> <p>AS12.2.3: Apply scientific knowledge in everyday-life contexts.</p> <p><i>Pas wetenskaplike kennis in kontekste van die alledaagse lewe toe.</i></p>	<p>AS12.3.1 Research, discuss, compare and evaluate scientific and indigenous knowledge systems and knowledge claims by indicating the correlation among them, and explain the acceptance of different claims.</p> <p><i>Doen navorsing, bespreek, vergelyk en evalueer wetenskaplike en inheemse kennisisteme en kennisaansprake deur die ooreenkoms tussen hulle aan te dui, en verduidelik die aanvaarding van verskillende aansprake.</i></p> <p>AS12.3.2: Research case studies and present ethical and moral arguments from different perspectives to indicate the impact (pros and cons) of different scientific and technological applications.</p> <p><i>Vors gevallestudies na en lewer etiese en morele argumente uit verskillende perspektiewe om die impak (voordele en nadele) van verskillende wetenskaplike en tegnologiese toepassings aan te dui.</i></p> <p>AS12.3.3: Evaluate the impact of scientific and technological research and indicate the contribution to the management, utilisation and development of resources to ensure sustainability continentally and globally.</p> <p><i>Evalueer die impak van wetenskaplike en tegnologiese navorsing en dui die bydrae tot bestuur, benutting en ontwikkeling van bronne aan om volhoubaarheid kontinentaal en globaal te verseker.</i></p>

GENERAL GUIDELINES/ALGEMENE RIGLYNE

1. CALCULATIONS/BEREKENINGE

- 1.1 Marks will be awarded for: correct formula, correct substitution, correct answer with unit.
Punte sal toegeken word vir: korrekte formule, korrekte substitusie, korrekte antwoord met eenheid.
- 1.2 No marks will be awarded if an incorrect or inappropriate formula is used, even though there 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.
- 1.3 When an error is made during **substitution into a correct formula**, a mark will be awarded for the correct formula and for the correct substitutions, but **no further marks** will be given.
*Wanneer 'n fout gedurende **substitusie in 'n korrekte formule** begaan word, sal 'n punt vir die korrekte formule en vir korrekte substitusies toegeken word, maar **geen verdere punte** sal toegeken word nie.*
- 1.4 If no formula is given, but all substitutions are correct, a candidate will forfeit one mark. Indien geen *formule* gegee is nie, maar al die *substitusies* is korrek, verloor die kandidaat een punt.
- 1.5 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 formule ingestel is en nie vir waardes wat voor 'n berekening gelys is nie.
- 1.6 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.

2. 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.

3. UNITS/EENHEDE

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

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

3.4 Separate compound units with a multiplication dot, not a full stop, for example, mol·dm⁻³. For marking purposes mol.dm⁻³ (or mol/dm³) will also be accepted. *Skei saamgestelde eenhede met 'n vermenigvuldigpunt en nie met 'n punt nie, byvoorbeeld, mol·dm⁻³. Vir nasiendoeleindes sal mol.dm⁻³ (of mol/dm³) ook aanvaar word.*

4. GENERAL/ALGEMEEN

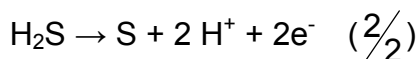
4.1 If one answer or calculation is required, but two given by the candidate, only the first one will be marked, irrespective of which one is correct. If two answers are required, only the first two will be marked, etc.

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.

4.2 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.

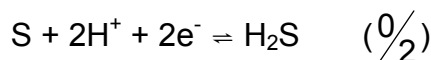
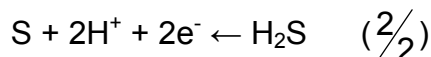
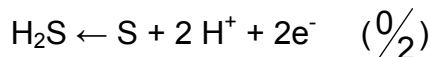
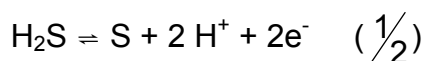
Wanneer 'n chemiese FORMULE gevra word en die NAAM word as antwoord gegee, sal slegs een van die twee punte toegeken word. Dieselfde reël geld wanneer die NAAM gevra word en die FORMULE gegee word.

4.3 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 vergelyking die korrekte antwoord is, sal die volgende punte toegeken word:



- 4.4 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.*

- 4.5 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 vraag weggelaat is.

- 4.6 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 calculation of $E_{\text{cell}}^{\ominus}$) 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_{sel}^{\ominus}) dan word die leerder nie vir die substitusie gekrediteer nie.

- 4.7 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.

- 4.8 When a structural formula is asked, marks will be deducted if the learner writes the condensed formula./Wanneer 'n struktuurformule gevra word, sal punte afgetrek word indien die leerder die gekondenseerde formule skryf.

- 4.9 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.

SECTION A/AFDELING A

QUESTION 1/VRAAG 1

- | | | | |
|-----|--|----------|-----|
| 1.1 | Cracking/ <i>Kraking</i> ✓ | [12.2.1] | (1) |
| 1.2 | Collision theory/ <i>Botsingsteorie</i> ✓ | [12.2.1] | (1) |
| 1.3 | Activation energy/ <i>Aktiveringsenergie</i> ✓ | [12.2.1] | (1) |
| 1.4 | Oxidising agent/ <i>Oksideermiddel</i> ✓ | [12.2.1] | (1) |
| 1.5 | Eutrophication/ <i>Eutrofisering</i> ✓ | [12.2.1] | (1) |
- [5]**

QUESTION 2/VRAAG 2

- | | | | |
|-----|--|----------|-----|
| 2.1 | ... primary alcohol/ <i>primêre alkohol</i> ... ✓✓ | | |
| | OR/OF | | |
| | Propan-2-ol is an example .../ <i>Propan-2-ol is 'n voorbeeld</i> ... | [12.2.3] | (2) |
| 2.2 | ... substitution reaction./... <i>substitusiereaksie</i> ✓✓ | | |
| | OR/OF | | |
| | ... chlorination of an alkene or example of an alkene/alkyne is ... | | |
| | ... <i>chloronering van 'n alkeen of voorbeeld van 'n alkeen/alkyn is</i> ... | [12.2.3] | (2) |
| 2.3 | ... increases <i>the rate of a chemical reaction.</i> ✓✓ | | |
| | ... <i>verhoog die tempo van 'n chemiese reaksie</i> | [12.2.2] | (2) |
| 2.4 | ... the electrolyte is a solution of a soluble <u>silver</u> compound. ✓✓ | | |
| | ... <i>die elektroliet is 'n oplossing van 'n oplosbare <u>silwer</u>verbinding.</i> | [12.2.3] | (2) |
| 2.5 | Carbon, hydrogen and oxygen .../ <i>Koolstof, waterstof en suurstof</i> ... ✓✓ | | |
| | OR/OF | | |
| | ... the three primary nutrients .../... <i>die drie primêre voedingstowwe</i> ... | [12.2.2] | (2) |
- [10]**

QUESTION 3/VRAAG 3

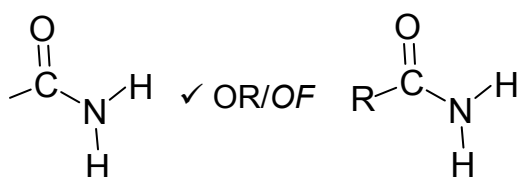
- | | | | |
|-----|------|----------|-----|
| 3.1 | D ✓✓ | [12.2.3] | (2) |
| 3.2 | A ✓✓ | [12.2.3] | (2) |
| 3.3 | B ✓✓ | [12.1.2] | (2) |
| 3.4 | B ✓✓ | [12.1.2] | (2) |
| 3.5 | A ✓✓ | [12.2.3] | (2) |
- [10]**

TOTAL SECTION A/TOTAAL AFDELING A: 25

SECTION B/AFDELING B

QUESTION 4/VRAAG 4

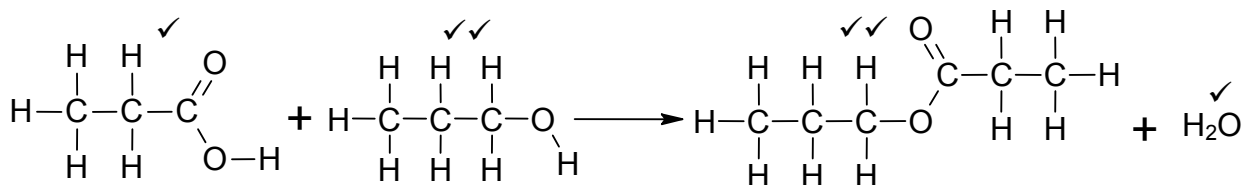
4.1



Condensed structure: no mark
Gekondenseerde struktuur: geen punt

[12.2.1] (1)

4.2.1



Condensed/semi-structural formulae or mixture of both: - 1
Gekondenseerde/semistruktuurformules of mengsel van beide: -1

All bonds shown, one or more H-atoms omitted: - 1 per structure
Alle bindinge getoon, een of meer H-atome uitgelaat: -1 per struktuur

Everything correct, wrong balancing: -1
Alles korrek, verkeerde balansering: -1

Any other reactants or products: - 1
Enige ander reaktante of produkte: -1

[12.2.3] (6)

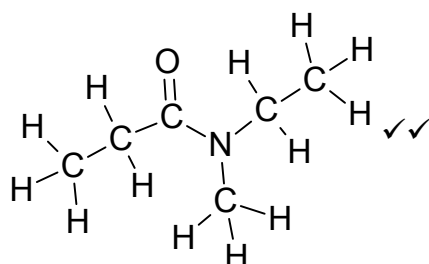
4.2.2 Propyl propanoate/*Propielpropanoaat* ✓

[12.2.3] (1)

4.2.3 (concentrated) sulphuric acid/*(gekonsentreerde) swaelsuur* ✓

[12.2.3] (1)

4.3.1



Condensed or semi-structural formula: - 1
Gekondenseerde of semistruktuurformule: -1

All bonds shown, one or more H-atoms omitted: - 1
Alle bindinge getoon, een of meer H-atome uitgelaat: -1

[12.2.3] (2)

4.3.2 *N*-ethyl-*N*-methylpropanamide ✓
N-etiel-*N*-metielpropaanamied

No hyphens in the name: no mark
Geen koppeltekens in naam: geen punt

N,N-ethylmethylpropanamide; ethylmethylpropanamide: no mark
N,N-etielmetielpropaanamied; etielmetielpropaanamied: geen punt

[12.2.2] (1)

[12]

QUESTION 5/VRAAG 5

- 5.1.1 Carboxylic acids/*Karboksielsure* ✓ [12.2.3] (1)
- 5.1.2 Alcohols/*Alkohole* ✓ [12.2.3] (1)
- 5.1.3 Aldehydes/*Aldehiede* ✓ [12.2.3] (1)
- 5.2.1 Propanal/*Propanaal* ✓ [12.2.3] (1)
- 5.2.2 Pentan-1-ol ✓
Pentan-1-ol
- No hyphens in the name: no mark
Geen koppeltekens in naam: geen punt
- Accept/*Aanvaar*:
1-pentanol [12.2.3] (1)
- 5.3 What is the relationship between boiling point and the type of functional group/type of homologous series? ✓✓
Wat is die verwantskap tussen kookpunt en die tipe funksionele groep/tipe homoloë reeks?
- OR/OF
How does the boiling points of the carboxylic acid, aldehyde and alcohol compare?
Hoe vergelyk die kookpunte van karboksielsure, aldehiede en alkohole? [12.1.1] (2)
- 5.4 Molar mass/molecular mass ✓
Molêre massa/molekulêre massa [12.1.1] (1)
- 5.5 For the same molar/molecular mass, carboxylic acids have the highest boiling points, followed by alcohols, and aldehydes have the lowest boiling points. ✓✓
Vir dieselfde molêre/molekulêre massa, het karboksielsure die hoogste kookpunt, gevolg deur alkohole, en aldehiede het die laagste kookpunte
- OR/OF
Compounds with a carboxyl (COOH) group have the highest boiling points, followed by compounds with a hydroxy (OH) group, while compounds with an aldehyde (CHO) functional group have the lowest boiling points.
Verbindings met 'n karboksielgroep (COOH-groep) het die hoogste kookpunte, gevolg deur verbindings met 'n hidroksiegroep (OH), terwyl verbindings met 'n aldehiede (CHO) funksionele groep die laagste kookpunte het.
- OR/OF
Boiling points decrease from COOH to OH to CHO.
Kookpunte neem af van COOH na OH na CHO.
- OR/OF
Boiling points decrease from D to F.
Kookpunt neem af van D na F. [12.1.2] (2)

- 5.6
- Carboxylic acids have two sites for hydrogen bonding and therefore have the highest boiling points. ✓
Karboksielsure het twee punte vir waterstofbinding en het dus die hoogste kookpunte.

OR/OF

Carboxylic acids form dimers (through hydrogen bonding), increased molecular size results in stronger Van der Waals forces.
Karboksielsure vorm dimere (deur waterstofbindinge), groter molekulêre grootte het sterker Van der Waalskragte tot gevolg.

- Alcohols have one site for hydrogen bonding and will have lower boiling points than carboxylic acids. ✓
Alkohole het een punt vir waterstofbindinge en sal laer kookpunte as karboksielsure hê.
- Among aldehyde molecules are only Van der Waals forces that are weaker than hydrogen bonds. ✓
Tussen aldehydemolekule is slegs *Van der Waalskragte* wat swakker as waterstofbindinge is.

[12.1.4] (3)
[13]

QUESTION 6/VRAAG 6

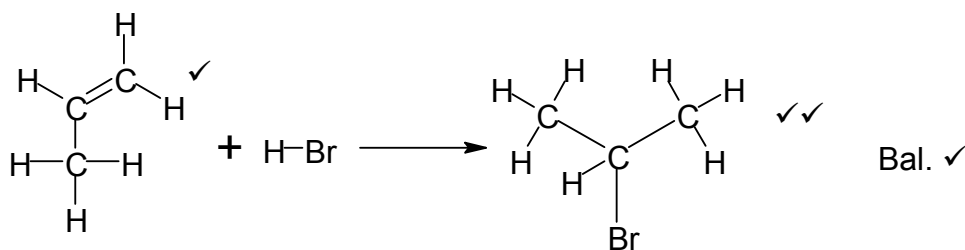
- 6.1 Contains a double bond/Bevat 'n dubbelbinding ✓

OR/OF

Carbon not bonded to the maximum number of H-atoms
Koolstof is nie aan die maksimum aantal H-atome gebind nie.

[12.2.2] (1)

- 6.2



Criteria/Kriteria:	Marks/Punte
Correct structure for propene/Korrekte struktuur vir propeen	✓
Identification of and correct structure for 2-bromopropane/Identifikasie van en korrekte struktuur vir 2-broompropaan	✓✓
Correct balancing/Korrekte balansering	✓

Any other reactants or products: - 1
Enige ander reaktante of produkte: -1

Condensed/semi-structural formulae or mixture of both: - 1
Gekondenseerde/semistruktuurformules of mengsel van beide: -1

All bonds shown, one or more H-atoms omitted: - 1 per structure
Alle bindinge getoon, een of meer H-atome uitgelaat: -1 per struktuur

[12.1.2] (4)

6.3 Addition/hydrohalogenation/hydrobromination ✓
Addisie/hidrohalogenering/hidrobrominerings [12.1.2] (1)

6.4

$$\begin{array}{c}
 \text{H} \\
 | \\
 \text{H}-\text{C}-\text{H} \\
 | \\
 \text{H}-\text{C}-\text{OH} \quad \checkmark\checkmark \\
 | \\
 \text{H}-\text{C}-\text{H} \\
 | \\
 \text{H}
 \end{array}$$

Propan-2-ol/2-propanol ✓
Propan-2-ol/2-propanol

Condensed or semi-structural formula: - 1
Gekondenseerde of semistruktuurformule: -1

All bonds shown, one or more H-atoms omitted: - 1
Alle bindinge getoon, een of meer H-atome uitgelaat: -1

No hyphen in the name: - 1 mark
Geen koppelteken in naam: - 1 punt

[12.1.2] (3)

6.5 Hydrolysis/hidrolise ✓ [12.1.2] (1)

6.6.1 Water ✓ [12.2.3] (1)

6.6.2 $\text{H}_3\text{PO}_4 / \text{H}_2\text{SO}_4 / \text{HX}$ (X = Cl, Br) ✓ [12.2.3] (1)

6.6.3 Addition/hydration ✓
Addisie/hidrasie/hidratering [12.2.3] (1)

6.7.1 Propene/Propeen

Accept/Aanvaar:
Prop-1-ene/1-propene
Prop-1-een/1-propeen [12.2.3] (1)

6.7.2 Dehydrohalogenation/Dehidrohalogenering

OR/OF
Elimination/Eliminasie [12.2.3] (1)

[15]

QUESTION 7/VRAAG 7

7.1 Smaller than/kleiner as ✓ [12.1.2] (1)

7.2 Reaction rate increases with increase in concentration.
Reksietempo neem toe met toename in konsentrasie.

OR/OF
Reaction rate decreases with increase in concentration.
Reksietempo neem af met afname in konsentrasie.

Criteria for hypothesis/Kriteria vir hipotese:	Mark
Refers to relationship between dependent and independent variables/ Verwys na die verwantskap tussen die afhanklike en onafhanklike veranderlikes	✓
Answer to an investigative question – not stated as an aim/ Antwoord op 'n ondersoekende vraag – nie as 'n doel gegee nie.	✓

[12.1.1] (2)

- 7.3 To make a fair comparison/test ✓✓
Om dit 'n regverdige vergelyking/toets te maak
- OR/OF
To ensure that all variables are controlled except the concentration/To make concentration the only independent variable
Om te verseker dat alle veranderlikes, behalwe konsentrasie, gekontroleerd is/Om konsentrasie die enigste onafhanklike veranderlike te maak.
- OR/OF
To ensure that there is only one independent variable, i.e. concentration.
Om te verseker dat daar slegs een onafhanklike veranderlike, d.i. konsentrasie, is. [12.1.1] (2)
- 7.4 Magnesium is the limiting reagent ✓✓
Magnesium is die beperkende reaktans.
- OR/OF
When Mg is used up, the reaction will stop
Wanneer Mg opgebruik is, sal die reaksie stop.
- OR/OF
The same amount of Mg will react with the same amount of acid in each experiment.
Dieselfde hoeveelheid magnesium sal in elke eksperiment met dieselfde hoeveelheid suur reageer. [12.1.1] (2)
- 7.5.1 60 m³ ✓ [12.1.2] (1)
- 7.5.2 42 cm³ ✓ [12.1.2] (1)
- 7.6 Experiment/*Eksperiment 1* ✓
- The gradient of the graph is steeper ✓
Die gradiënt van die grafiek is steiler. [12.1.2] (2)
- 7.7 The amount (mass) of Mg used in both experiments were the same ✓
Die hoeveelheid (massa) Mg gebruik in beide eksperimente was dieselfde. [12.1.1] (1)
- 7.8 Reaction rate increases with increase in concentration ✓✓
Reaksietempo neem toe met toename in konsentrasie.
- OR/OF
Reaction rate decreases with decrease in concentration.
Reaksietempo neem af met afname in konsentrasie. [12.1.2] (2)
- 7.9.1 Remains the same/*Bly dieselfde* ✓ [12.1.2] (1)
- 7.9.2 Increases/*Vermeerder* ✓ [12.1.2] (1)

[16]

QUESTION 8/VRAAG 8

8.1 Reactants and products are in different phases
Reaktanse en produkte is in verskillende fases. [12.2.1] (1)

8.2 $K_c = [\text{CO}_2]$ ✓
 $0,0108 = [\text{CO}_2]$
 $[\text{CO}_2] = 1,08 \times 10^{-2} \text{ mol}\cdot\text{dm}^{-3}$ ✓

$$n(\text{CO}_2) = cV \checkmark = (1,08 \times 10^{-2})(0,5) \checkmark = 5,4 \times 10^{-3} \text{ mol}$$

$$n(\text{CaCO}_3)_{\text{used}} = 5,4 \times 10^{-3} \text{ mol} \checkmark$$

$$m(\text{CaCO}_3)_{\text{used}} = nM \checkmark = (5,4 \times 10^{-3})(100) \checkmark = 0,54 \text{ g}$$

Mass present at equilibrium/*Massa teenwoordig by ewewig*
 $= 5 - \checkmark 0,54 = 4,46 \text{ g} \checkmark$ [12.1.3] (9)

8.3 Endothermic/*Endotermies* ✓

When the temperature is increased, the forward reaction is favoured
Wanneer die temperatuur verhoog word, word die voorwaartse reaksie bevoordeel. ✓

According to Le Chatelier's principle, an increase in temperature favours the endothermic reaction./*Volgens Le Chatelier se beginsel sal 'n toename in temperatuur die endotermiese reaksie bevoordeel.* ✓ [12.1.4] (3)

8.4.1 Remains the same/*Bly dieselfde* ✓ [12.2.3] (1)

8.4.2 Increases/*Vermeerder* ✓ [12.2.3] (1)

8.4.3 Remains the same/*Bly dieselfde* ✓ [12.2.3] (1)

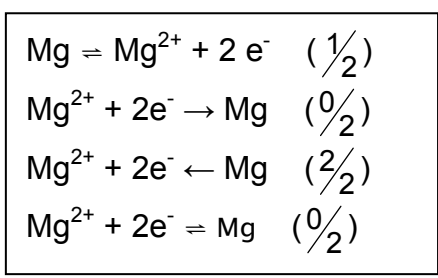
8.5 Remains the same/*Bly dieselfde* ✓ [12.2.3] (1)

[17]

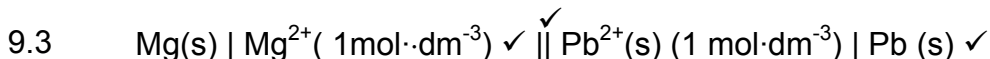
QUESTION 9/VRAAG 9

9.1 Temperature/*Temperatuur*: 298 K (25 °C) ✓
Concentration of electrolyte must be 1 mol·dm⁻³ ✓
Konsentrasie van elektroliet moet 1 mol·dm⁻³ wees. [12.2.1] (2)

9.2 $\text{Mg(s)} \rightarrow \text{Mg}^{2+}(\text{aq}) + 2\text{e}^-$ ✓✓



[12.2.3] (2)



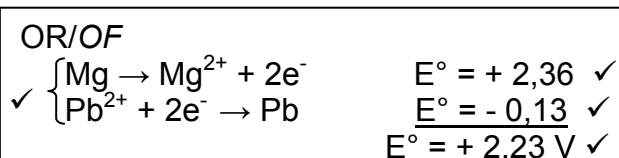
Accept/Aanvaar:



[12.2.3] (3)

9.4 $E^{\theta}_{\text{Cell}} = E^{\theta}_{\text{cathode}} - E^{\theta}_{\text{anode}} \checkmark$
 $= -0,13 \checkmark - (-2,36) \checkmark$
 $= 2,23 \text{ V} \checkmark$

OR any other correct formula from data sheet/OF enige ander korrekte formule vanaf inligtingsblad



Any other formula using unconventional abbreviations, e.g.

$E^{\circ}_{\text{cell}} = E^{\circ}_{\text{OA}} - E^{\circ}_{\text{RA}}$ followed by correct substitutions: $\frac{3}{4}$

Enige ander formule wat onkonvensionele afkortings gebruik, bv.

$E^{\circ}_{\text{cell}} = E^{\circ}_{\text{OA}} - E^{\circ}_{\text{RA}}$, gevolg deur korrekte substitusies: $\frac{3}{4}$

[12.2.3] (4)

9.5.1 Decreases/Verminder \checkmark

[12.2.2] (1)

9.5.2 Increases/Vermeerder \checkmark

[12.2.2] (1)

9.6 Half-cell A to half-cell B/Halfsel A na halfsel B \checkmark

- Cations/Pb²⁺ ions/positive ions are reduced at the cathode in half-cell B – concentration of positive ions decreases in half-cell B. \checkmark
Katione/Pb²⁺-ione/positiewe ione word gereduseer by die katode in halfsel B – konsentrasie van positiewe ione neem af in halfsel B
- Mg is oxidised at the anode in half-cell A - concentration of positive ions/cations/Mg²⁺ ions increase in half-cell A. \checkmark
Mg word geoksideer by die anode in halfsel A – konsentrasie van positiewe ione/katione/Mg²⁺-ione neem toe in halfsel A
- To prevent a build-up of positive ions in half-cell B and negative ions in half-cell A/For electrical neutrality, positive ions migrate through the salt bridge (from half-cell A to half-cell B). \checkmark
Om 'n opbou van positiewe ione in halfsel B en negatiewe ione halfsel A te voorkom/Vir elektriese neutraliteit, migreer positiewe ione deur die soutbrug (van halfsel A na halfsel B).

[12.1.4] (4)

[17]

QUESTION 10/VRAAG 10

- 10.1 The process in which electricity is used to bring about a chemical change/*Die proses waartydens elektrisiteit gebruik word om 'n chemiese verandering teweeg te bring.* ✓✓

OR/OF

A process in which electrical energy is converted to chemical energy
'n Proses waartydens elektriese energie omgeskakel word na chemiese energie.

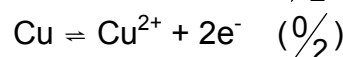
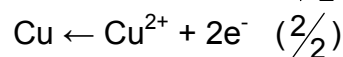
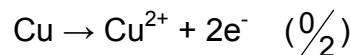
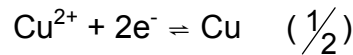
[12.2.1] (2)

- 10.2 P ✓

P is the positive electrode/*is die positiewe elektrode* ✓
Oxidation takes place at the positive electrode/anode ✓
Oksidasie vind by die positiewe elektrode (anode) plaas.

[12.2.3] (3)

- 10.3 $\text{Cu}^{2+}(\text{aq}) + 2\text{e}^{-} \rightarrow \text{Cu}(\text{s})$ ✓✓



[12.2.3] (2)

- 10.4 Pt and Ag are both weaker reducing agents ✓ (than copper) and will not be oxidised. ✓
Pt en Ag is beide swakker reduseermiddels (as koper) en sal nie geoksideer word nie.

OR/OF

Cu is a stronger reducing agent (than Pt and Ag) ✓
and will be oxidised. ✓/Cu is 'n sterker reduseermiddel (as Pt en Ag) en sal geoksideer word.

[12.2.3] (2)

- 10.5 The rate at which copper is oxidised at the anode is equal to the rate at which copper ions are reduced at the cathode ✓✓
Die tempo waarteen koper by die anode geoksideer word, is gelyk aan die tempo waarteen koperione by die katode gereduseer word.

[12.2.3] (2)

- 10.6 Contains valuable/expensive metals ✓✓
Bevat waardevolle/duur metale

OR/OF

Platinum and silver are valuable/expensive metals
Platinum en silwer is waardevolle/duur metale

[12.3.2] (2)

[13]

QUESTION 11/VRAAG 11

11.1 A solution that conducts electricity ✓✓
'n Vloeistof wat elektrisiteit gelei [12.2.1] (2)

11.2 Contains (positive and negative) ions that are free to move ✓
Bevat (positiewe en negatiewe) ione wat vry is om te beweeg [12.2.3] (1)

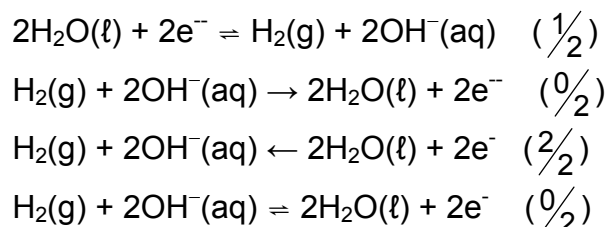
11.3 Chloride ions/*Chloriedione* ✓

OR/OF

Sodium chloride/*Natriumchloried*

Chloride ions are oxidised ✓ (to form Cl_2)
Chloriedione word geoksideer (om Cl_2 te vorm) [12.2.3] (2)

11.4 $2\text{H}_2\text{O}(\ell) + 2\text{e}^- \rightarrow \text{H}_2(\text{g}) + 2\text{OH}^-(\text{aq})$ ✓✓



[12.2.3] (2)

11.5 Anode ✓
 $\text{Cl}^-(\text{aq})$ is oxidised to/word geoksideer na $\text{Cl}_2(\text{g})$ – oxidation at the anode/oksidasie by die anode ✓

OR/OF

$2\text{Cl}^-(\text{aq}) \rightarrow \text{Cl}_2(\text{g}) + 2\text{e}^-$ [12.2.3] (2)

11.6 The membrane ✓ separates the chloride ions from the cathode compartment
by allowing only positive ions (Na^+) ✓ to move from the anode compartment to the cathode.

Die membraan skei die chloriedione van die katodekompartement deur slegs positiewe ione (Na^+) toe te laat om vanaf die anodekompartement na die katode te beweeg. [12.2.1] (2)

11.7 Any ONE/*Enige EEN*:

- Products formed are poisonous/dangerous/*Produkte gevorm is giftig/gevaarlik* ✓ [12.3.2] (1)
- Too much noise/*Te veel geraas* [12]

QUESTION 12/VRAAG 12

- 12.1 Secondary cells/*Sekondêre selle* ✓ [12.2.1] (1)
- 12.2.1 Equation/*vergelyking* II ✓
Reduction takes place at the cathode ✓
Reduksie vind by die katode plaas [12.2.3] (2)
- 12.2.2 $\text{NiO}_2(\text{s}) + \text{Cd}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \checkmark \rightarrow \text{Ni}(\text{OH})_2(\text{s}) + \text{Cd}(\text{OH})_2(\text{s}) \checkmark$
Bal ✓ [12.2.3] (3)
- 12.2.3 $W = VQ \checkmark$
 $= 1,4 \checkmark \times 2(9,65 \times 10^4) \checkmark$
 $= 27,02 \text{ J} \checkmark$ [12.2.3] (4)
- [10]**

TOTAL SECTION B/TOTAAL AFDELING B: 125

GRAND TOTAL/GROOTTOTAAL: 150