

education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

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

MEMORANDUM

**PREPARATORY EXAMINATION
VOORBEREIDINGSEKSAMEN**

MARKS/PUNTE: 150

**This memorandum consists of 11 pages.
Hierdie memorandum bestaan uit 11 bladsye.**

Learning Outcomes and Assessment Standards
Leeruitkomst en Assesseringstandaarde

LO 1/LU 1	LO 2/LU 2	LO 3/LU 3
<p>AS 12.1.1: 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>AS 12.1.2: 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 tendense, gebruik wetenskaplike beredenering om gevolgtrekkings te maak en te evalueer, en formuleer veralgemenings.</i></p> <p>AS 12.1.3: Select and use appropriate problem-solving strategies to solve (unseen) problems.</p> <p><i>Kies en gebruik geskikte probleemoplossingsstrategieë toe om (ongesiene) probleme op te los.</i></p> <p>AS 12.1.4: Communicate and defend scientific arguments with clarity and precision.</p> <p><i>Kommunikeer en verdedig wetenskaplike argumente duidelik en presies.</i></p>	<p>AS 12.2.1: Define, discuss and explain prescribed scientific knowledge.</p> <p><i>Definieer, bespreek en verduidelik voorgeskrewe wetenskaplike kennis.</i></p> <p>AS 12.2.2 Express and explain prescribed scientific principles, 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>AS 12.2.3: Apply scientific knowledge in everyday life contexts.</p> <p><i>Pas wetenskaplike kennis in kontekste van die alledaagse lewe toe.</i></p>	<p>AS 12.3.2: 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>AS 12.3.3: 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 om volhoubaarheid kontinentaal en globaal te verseker.</i></p>

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

- | | | | |
|-----|---|----------|------------|
| 1.1 | Dehydration/ <i>dehidrasie</i> ✓ | [12.2.1] | (1) |
| 1.2 | alkynes/ <i>alkyne</i> ✓ | [12.2.1] | (1) |
| 1.3 | alkyl halides (halo-alkanes)/ <i>alkielhaliede (haloalkane)</i> ✓ | [12.2.1] | (1) |
| 1.4 | chlorine/ <i>chloor</i> ✓ | [12.2.3] | (1) |
| 1.5 | cathode/ <i>katode</i> ✓ | [12.2.1] | (1) |
| | | | [5] |

QUESTION 2/VRAAG 2

- | | | | |
|-----|-----|----------|------------|
| 2.1 | I ✓ | [12.2.1] | (1) |
| 2.2 | E ✓ | [12.2.1] | (1) |
| 2.3 | H ✓ | [12.2.1] | (1) |
| 2.4 | C ✓ | [12.2.1] | (1) |
| 2.5 | F ✓ | [12.2.1] | (1) |
| | | | [5] |

QUESTION 3/VRAAG 3

- | | | | |
|-----|--|----------|-------------|
| 3.1 | False/ <i>Onwaar</i> ✓
They belong to different series./ <i>Hulle behoort tot verskillende reekse</i> ✓ | [12.2.1] | (2) |
| 3.2 | True/ <i>Waar</i> ✓✓ | [12.2.1] | (2) |
| 3.3 | True/ <i>Waar</i> ✓✓ | [12.2.3] | (2) |
| 3.4 | False/ <i>Onwaar</i> ✓
Decrease temperature/ <i>Verlaag temperatuur...</i> ✓
..... decrease K_c /.... <i>verlaag K_c</i> ✓ | [12.2.3] | (2) |
| 3.5 | False/ <i>Onwaar</i> ✓
Should be N, P and K. ✓/ <i>Moet wees N, P en K</i> | [12.2.1] | (2) |
| | | | [10] |

QUESTION 4/VRAAG 4

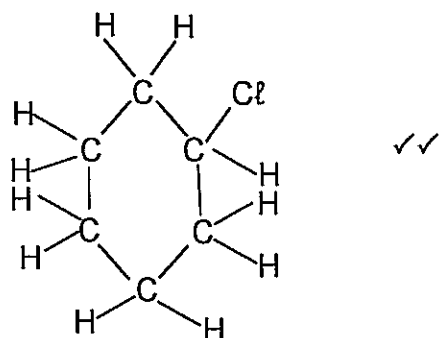
4.1	D ✓✓✓	[12.2.3]	(3)
4.2	A ✓✓✓	[12.2.3]	(3)
4.3	B ✓✓✓	[12.2.2]	(3)
4.4	C ✓✓✓	[12.2.3]	(3)
4.5	A ✓✓✓	[12.2.1]	(3)
			[15]

TOTAL SECTION A: 35
TOTAAL AFDELING A: 35

SECTION B/AFDELING B

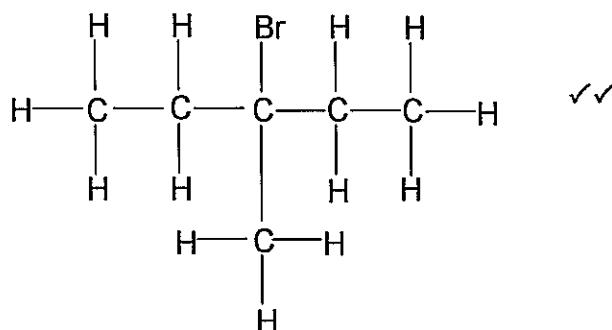
QUESTION 5/VRAAG 5

5.1.1

Chlorohexane/*chloorheksaan* ✓

[12.2.3] (3)

5.1.2

3-bromo 3-methylpentane/*3-broom 3-metielpentaan* ✓

[12.2.3] (3)

5.2.1 Substitution / *substitusie* ✓

[12.2.3] (1)

5.2.2 $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{OH}$ ✓✓

[12.2.3] (2)

5.3.1 Dividing longer chains of hydrocarbons into shorter chains ✓✓
Verdeel langer kettings van koolwaterstowwe in korter kettings

[12.2.1] (2)

5.3.2 To obtain a larger percentage usable products from larger fractions crude oil ✓✓/ shorter chains (which burn more evenly) / shorter chains are blended with fuel to enrich fuel

Om 'n groter persentasie bruikbare produkte van groter fraksies van ru-olie te verkry/ korter kettings brand meer egalig / korter kettings word met brandstof gemeng om dit te verryk

[12.3.2] (2)

5.3.3 Boiling point increases with increasing molecular mass. ✓ Van der Waals forces increases with increasing molecular mass ✓
Kookpunte neem toe met toenemende molekulêre massa. Van der Waalskragte neem toe met toenemende molekulêre massa

[12.2.2] (2)

- 5.3.4 (a) gas ✓
(b) liquid / vloeistof ✓ [12.2.2] (2)
[17]

QUESTION 6/VRAAG 6

- 6.1 Alcohols are flammable/Alkohole is vlambaar ✓ [12.1.1] (1)

- 6.2.1
- | | | |
|---|-----------------|--|
| $ \begin{array}{ccccccc} & \text{H} & & \text{H} & & \text{H} & \\ & & & & & & \\ \text{H} & - \text{C} & - & \text{C} & - & \text{C} & - \text{OH} \\ & & & & & & \\ & \text{H} & & \text{H} & & \text{H} & \end{array} $ | propan-1-ol ✓ ✓ | |
| $ \begin{array}{ccccccc} & \text{H} & & \text{OH} & & \text{H} & \\ & & & & & & \\ \text{H} & - \text{C} & - & \text{C} & - & \text{C} & - \text{H} \\ & & & & & & \\ & \text{H} & & \text{H} & & \text{H} & \end{array} $ | propan-2-ol ✓ ✓ | |
- [12.2.3] (6)

- 6.2.2 propan-1-ol ✓ [12.2.2] (1)

- 6.2.3 The position of the OH-group in the chain will affect the intermolecular forces. ✓ ✓
Die posisie van die OH-groep in die ketting sal die intermolekulêre kragte beïnvloed. [12.2.3] (2)

- 6.3.1 The boiling point of the alcohols will increase with molecular mass ✓ ✓ /
The larger the molecular mass of a member of the same homologous series/alcohol, the higher the boiling point. OR acceptable alternative.

[Independent (M), dependant (bp)]

Die kookpunt van die alkohole sal toeneem met toename in molekulêre mass ✓ ✓ / Hoe groter die molekulêre massa van 'n lid van dieselfde homologe reeks/alkohol, hoe hoër die kookpunt. OF aanvaarbare alternatief.

[Onafhanklik (M), afhanklik (kp)] [12.1.1] (2)

- 6.3.2 Don't heat alcohols over an open flame ✓
Moet nie alkohole oor 'n oop vlam verhit nie [12.1.1] (1)

- 6.3.3 Measuring cylinder/Maatsilinder ✓
Thermometer/Termometer ✓
8 containers e.g. test-tubes/beakers/flasks/8 houers b.v.
proefbuis/bekers/flesse ✓
Heat source e.g. Hot plate / (accept Bunsen burner)/Bron van hitte b.v.
warm plaat / (aanvaar Bunsen brander) ✓ [12.1.1] (4)

- 6.3.4 Measure equal volumes of the eight alcohols and transfer it to separate containers. ✓
Heat samples of each compound (in a water bath) until it boils. ✓
Measure the temperature with a thermometer at boiling point. ✓
Meet gelyke volumes van die agt alkohole en dra dit oor na aparte houers ✓
Verhit ✓ monsters van elke verbinding (in 'n waterbad) tott kookpunt ✓,
Meet die temperatuur met 'n thermometer b kookpunt. ✓ [12.1.1] (3)

Checklist / Kontrolelys	Marks/ Punte
Criteria for method / <i>Kriteria vir metode:</i>	
Measuring equal volumes / <i>Meting van gelyke volumes.</i>	✓
Heating samples till boiling point / <i>Verhit monsters tot kookpunt.</i>	✓
Measuring temperature at boiling point / <i>Meet temperatuur by kookpunt.</i>	✓

[20]

QUESTION 7/VRAAG 7

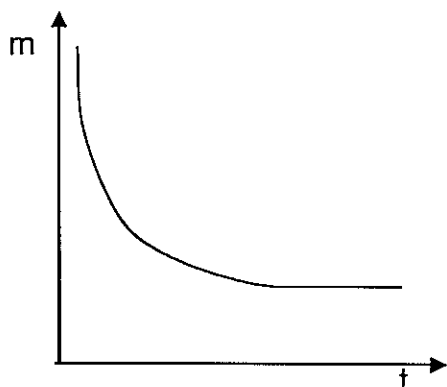
- 7.1 The oxygen molecules now collide more frequently with the wood. ✓✓
Die suurstof molecule bots nou meer gereeld met die hout. [12.3.2] (2)
- 7.2 He can chop his wood into smaller pieces, thereby increasing the surface area. ✓✓
Hy kan die hout in kleiner stukke kap, om sodoende die reaksie-oppervlakte te vergroot. [12.3.2] (2)
- 7.3 A wind may blow the fire on and cause a veld fire. ✓✓
Die wind kan die vuur aanwaai en 'n brand veroorsaak. [12.3.3] (2)
- 7.4 Activation energy / *Aktiveringsenergie* ✓ [12.2.3] (1)
[7]

QUESTION 8/VRAAG 8

- 8.1.1 (Higher) temperature / *Hoër temperatuur* ✓✓ [12.1.2] (2)
- 8.1.2 At higher temperature a bigger fraction of the molecules / more molecules ✓ move faster / have more kinetic energy ✓, leading to more effective collisions. ✓
By 'n hoër temperatuur 'n groter fraksie van die molekule / meer molekule ✓ beweeg vinniger / het hoër kinetiese energie ✓ wat tot meer effektiewe botsings lei. ✓ [12.1.2] (3)
- 8.2.1 He added a catalyst. / *Hy het 'n katalisator bygevoeg* ✓✓ [12.1.2] (2)
- 8.2.2 P: ΔH , heat of reaction / change in enthalpy / ΔH , *reaksiewarmte / verandering in entalpie* ✓
Q: activation energy / *aktiveringsenergie* ✓ [12.1.2] (2)
[9]

QUESTION 9/VRAAG 9

- 9.1 It starts at zero in t_0 ✓ and increases to time t_1 ✓
Dit is nul in t_0 ✓ en neem toe tot tyd t_1 . ✓ [12.1.2] (2)
- 9.2 Equilibrium reached / *Ewewig is bereik* ✓ [12.1.2] (1)
- 9.3



Checklist/Kontrolelys		Marks/ Punte
Criteria for graph/ <i>Kriteria vir grafiek:</i>		
Axes labelled correctly/ <i>Asse korrek benoem.</i>		✓
Gradient of graph initially high		✓
Gradient decreases with time		✓
Graph ends parallel to x-axis to represent equilibrium		✓

- [12.1.2] (4)
- 9.4.1 decreases/*neem af* ✓ [12.2.3] (1)
- 9.4.2 decreases/*neem af* ✓ [12.2.3] (1)
- 9.4.3 decreases/*neem af* ✓ [12.2.3] (1)
- 9.5 At lower T, the exothermic reaction is favoured. ✓
Therefore the reverse reaction is favoured ✓
reducing the concentration of the gas (products). ✓
 $K_c = \frac{[\text{products}]}{[\text{reactants}]}$ will decrease. ✓
- By laer T word die eksotermiese reaksie bevoordeel. ✓
Dus word die terugwaarde reaksie bevoordeel ✓
wat die konsentrasie van die gas (produkte) verlaag. ✓
 $K_c = \frac{[\text{produkte}]}{[\text{reaktante}]}$ neem dus af. ✓
- [12.2.3] (4)
- 9.6 $K_c = [\text{CO}_2]$ ✓ = $1,4 \times 10^{-2}$ ✓ [12.2.3] (2)

[16]

QUESTION 10/VRAAG 10

- 10.1 Pb ✓ [12.2.3] (1)
- 10.2 $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$ ✓✓ [12.2.3] (2)
- 10.3 $E_{\text{cell}}^{\theta} = E_{\text{oxidising agent}}^{\theta} - E_{\text{reducing agent}}^{\theta}$ ✓
 $= -0,13 \checkmark - (-0,76) \checkmark$
 $= 0,63 \text{ V} \checkmark$ [12.2.3] (4)
- 10.4 Temperature ✓, (initial) concentration of electrolytes ✓
Temperatuur, (aanvanklike) konsentrasie van elektroliete [12.1.1] (2)
- 10.5.1 Equal to/Gelyk aan ✓ [12.2.2] (1)
- 10.5.2 Area/size of electrodes has no effect on the emf of a cell. ✓✓/It is still a standard cell
Area/grootte van elektrodes het geen effek op die emk van 'n sel nie. ✓✓/Dit is steeds 'n standaard sel. [12.2.3] (2)
- 10.6.1 The cell has internal resistance./Die sel het interne weerstand ✓✓ [12.2.3] (2)
- 10.6.2 The emf decreases as the concentration of $\text{Pb}^{2+}(\text{aq})$ decreases./The cell is running flat as the electrolyte concentration in the Pb cell decreases. ✓✓
Die emk neem af wanneer die konsentrasie van $\text{Pb}^{2+}(\text{aq})$ afneem./Die sel word pap omdat die elektrolietkonsentrasie in die Pb-sel verminder. [12.2.3] (2)

[16]

QUESTION 11/VRAAG 11

- 11.1.1 Electrical energy ✓ → chemical energy ✓
Elektriese energie → chemiese energie [12.2.1] (2)
- 11.1.2 $Al^{3+} + 3e^{-} \rightarrow Al$ ✓✓ [12.2.3] (2)
- 11.1.3 Aluminium has a lower reduction potential (-1,66 V)/ weaker oxidising agent compared to that of iron (-0,44 V) [and copper (+0,34 V)]. ✓ The aluminium ions therefore require a large amount of energy to be reduced/will reduce more difficult than iron (and copper). ✓
Aluminium het 'n lae reduksiepotensiaal (-1,66 V)/swakker oksideermiddel in vergelyking met yster (-0,44 V) en koper (+0,34 V). ✓ Die aluminiumione sal dus groot hoeveelhede energie nodig hê om gereduseer te word/sal moeiliker reduseer as Fe^{2+} (en Cu^{2+}). ✓ [12.2.3] (2)
- 11.1.4 It is much lighter for the same strength (or stronger for the same mass). ✓
It is corrosion free. ✓
Dit is baie ligter vir dieselfde sterkte (of sterker vir dieselfde massa). ✓ Dis roesvry. ✓ [12.3.2] (2)
- 11.2.1 (a) It will consume a huge amount of electricity./Will cause power failures ✓
Dit gaan groot hoeveelhede elektrisiteit gebruik./Gaan kragonderbrekings veroorsaak. [12.3.2] (1)
- 11.2.1 (b) It will create jobs/Create foreign investment./
Contributes to GDP ✓
Dit gaan werkseleenthede skep/Buitelandse beleggings veroorsaak [12.3.2] (1)
- 11.2.2 The production of the large amount of electricity used enhances the greenhouse effect (or climate change). ✓
OR
The process is responsible for toxic waste of fluoride OR pollution.
Die produksie van die groot hoeveelheid elektrisiteit bevorder die kweekhuiseffek (of klimaatverandering).
OF
Die proses is verantwoordelik vir giftige fluoried-afval OF besoedeling. [12.3.3] (1)

[11]

QUESTION 12/VRAAG 12

12.1.1	Production will not contribute to global warming/fight against climate change and environmental degradation ✓	[12.3.2]	(1)
12.1.2	Production of biofuels will contribute to food shortage ✓	[12.3.2]	(1)
12.2	Resource that cannot be regenerated/can be used up ✓	[12.3.3]	(1)
12.3	Pollution during combustion and thus climate change. ✓ Mining affects environment e.g. plant growth that is destroyed in area of mining. ✓	[12.2.1]	(2)
12.4	Fertilizers become more expensive. ✓ Transport costs increase ✓ [More food is used for bio-fuels] <i>Kunsmis word duurder ✓ Vervoerkostes neem toe ✓ [Meer voedsel word vir biobrandstof gebruik]</i>	[12.2.1]	(2)
12.5	Can results in leaching into water resources ✓ Excessive growth of algae/alien plants ✓ that leads to eutrophication ✓/ deterioration of soil quality <i>Kan in grondwater insyfer. ✓ Oormatige groei van alge. indringerplante ✓ kan to eutrofisering/ agteruitgang van grondkwaliteit lei. ✓</i>	[12.3.3]	(3)
12.6.1	Nitrogen/stikstof ✓	[12.2.1]	(1)
12.6.2	Enhance growth/Bevorder groei ✓	[12.2.1]	(1)
12.6.3	Heating ✓ and compression ✓ / <i>Verhitting en kompressie ✓</i>	[12.2.3]	(2)
12.6.4	$N_2 + 3H_2 \rightleftharpoons 2NH_3$ ✓ bal. ✓	[12.2.3]	(3)
12.6.5	Leads to eutrophication (algae bloom ✓) and deterioration of soil quality ✓. <i>Lei tot eutrofikasie (opbloei van alge) en agteruitgang van grondkwaliteit. ✓✓</i>	[12.3.2]	(2)

[19]**TOTAL SECTION/TOTAAL AFDELING B: 115****GRAND TOTAL/GROOT TOTAAL: 150**