education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE/*GRAAD* 12

PHYSICAL SCIENCES: CHEMISTRY (P2)
FISIESE WETENSKAPPE: CHEMIE (V2)

MEMORANDUM

FEBRUARY/*FEBRUARIE*/MARCH/*MAART* 2010

MARKS/*PUNTE*: 150

This memorandum consists of 20 pages.
Hierdie memorandum bestaan uit 20 bladsye.

Please turn over/*Blaai om asseblief*

SECTION A/*AFDELING A*

QUESTION 1/*VRAAG 1*

1.1	Activation energy / *Aktiveringsenergie* ✓	[12.2.1]	(1)
1.2	Homogeneous /*Homogeen* ✓	[12.2.1]	(1)
1.3	Oxidising agent / *Oksideermiddel*	[12.2.1]	(1)
1.4	Secondary / *Sekondêre* ✓	[12.2.1]	(1)
1.5	Dehydrohalogenation / *Dehidrohalogenering* ✓	[12.2.1]	(1) **[5]**

QUESTION 2/*VRAAG 2*

2.1	The (cyclo)alkanes is the homologous series ...✓✓ Die (siklo)alkane is die homoloë reeks ... OR/OF .. homologous series to which benzene/(any arene belongs). ... homoloë reeks waartoe benseen/(enige areen behoort)	[12.2.3]	(2)
2.2	... average kinetic energy .../... *gemiddelde kinetiese energie* ... ✓✓	[12.2.1]	(2)
2.3	... is equal to $\frac{1}{K}$ /... *is gelyk aan* $\frac{1}{K}$ ✓✓ OR/*OF* ... less (smaller) than K/... *minder (kleiner) as K.*	[12.2.2]	(2)
2.4	Ions flow.../*Ione vloei*... ✓✓ OR/*OF* Electrons flow through the external circuit.../*Elektrone vloei deur die eksterne stroombaan* ...	[12.2.2]	(2)
2.5	... (100 x 3600) C / 3,6 x 10^5 C ✓✓	[12.2.3]	(2) **[10]**

QUESTION 3/*VRAAG 3*

3.1	C ✓✓	[12.2.3]	(2)
3.2	B ✓✓	[12.2.3]	(2)
3.3	B ✓✓	[12.1.2]	(2)
3.4	D ✓✓	[12.2.3]	(2)
3.5	C ✓✓	[12.2.1]	(2) **[10]**

TOTAL SECTION A: 25
TOTAAL AFDELING A: 25

SECTION B/*AFDELING B*

QUESTION 4/*VRAAG 4*

4.1	Ketones/*Ketone* ✓	[12.2.1]	(1)
4.2	Butane/*Butaan* ✓	[12.2.3]	(1)
4.3	Haloalkane/*Haloalkaan* ✓	[12.2.1]	(1)
4.4	Aldehydes/*Aldehiede* ✓	[12.2.3]	(1)
4.5	Haloalkane/*Haloalkaan* ✓	[12.2.3]	(1)
4.6	Hydrolysis/*Hidrolise* ✓	[12.2.3]	(1)
4.7	Amines/*Amiene* ✓	[12.2.1]	(1)
4.8	But-1-ene/*But-1-een* ✓	[12.2.3]	(1)
4.9	Ethyne/*Etyn* ✓	[12.2.1]	(1)
4.10	Hydrohalogenation/*Hidrohalogenering* ✓	[12.2.3]	(1)
			[10]

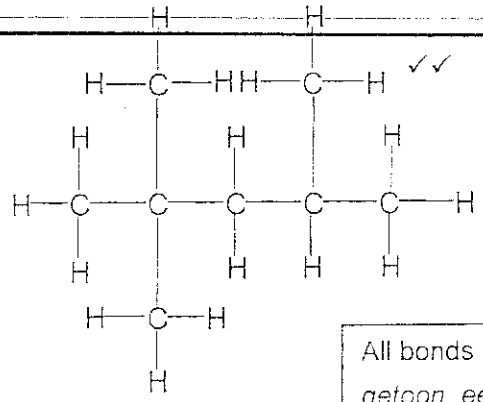
QUESTION 5/*VRAAG 5*

5.1 An (organic) compound that consists of hydrogen and carbon only. ✓✓
'n (Organiese) verbinding wat slegs uit koolstof en waterstof bestaan. ✓✓ [12.2.1] (2)

Only/*Slegs* $2/_2$ or/*of* $0/_2$

5.2 CO_2 ✓
H_2O ✓ [12.2.3] (2)

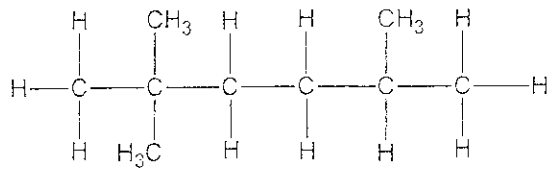
5.3



✓✓

Condensed or semi-structural formula / *Gekondenseerde of semi-struktuurformule:* Max./*Maks* $\frac{1}{2}$

e.g./*bv.*

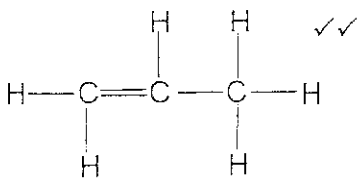


All bonds shown, one or more H atoms omitted / *Alle bindinge getoon, een of meer H-atome uitgelaat:* Max./*Maks.* $\frac{1}{2}$

Molecular formula/*Molekulêre formule:* $\frac{0}{2}$

[12.2.3] (2)

5.4

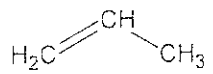


✓✓

prop-1-ene / *prop-1-een* ✓

Condensed or semi-structural formula / *Gekondenseerde of semistruktuurformule:* Max./*Maks.* $\frac{2}{3}$

e.g./*bv.*



All bonds shown, one or more H atoms omitted / *Alle bindinge getoon, een of meer H-atome uitgelaat:* Max./*Maks.* $\frac{2}{3}$

Molecular formula / *Molekulêre formule*: Max./*Maks.* $\frac{1}{3}$

Accept: 1-propene / propene
Aanvaar: 1-propeen / propeen

Hyphen(s) omitted / *Koppelteken(s) uitgelaat:* Max./*Maks.* $\frac{2}{3}$

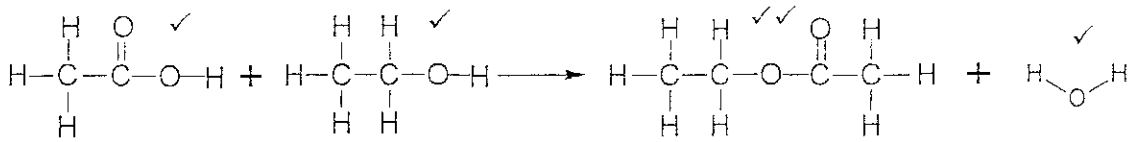
[12.2.3] (3)

[9]

QUESTION 6/*VRAAG 6*

6.1 Alcohols/Alkohole ✓ [12.2.1] (1)

6.2



Marking rule 4.10
Nasienreël 4.10

Accept / Aanvaar: -OH & H_2O as condensed/*gekondenseerd*

Condensed/semi-structural formulae or mixture of both / **Gekondenseerde / semistruktuur formules** *of mengsel van beide:* Max./*Maks.* 4/5

E.g./*Bv.* $CH_3 – COOH$ / CH_3COOH / CH_3CH_2OH

Everything correct, **wrong balancing** / *Alles korrek,* ***verkeerde balansering***: Max./*Maks.* 4/5

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

Molecular formula for all structures/ ***Molekulêre formules*** *vir alle strukture.*
E.g./Bv. $C_2H_4O_2$ Max./*Maks.* 1/5

Any additional reactant(s) or product(s)/ *Enige addisionele reaktant(e) of produk(te):* Max./*Maks.* 4/5

If H atom of –OH attached to C atom: no marks for structure
Indien H-atoom van –OH geheg aan C-atoom: geen punte vir struktuur

If more than 4 bonds formed to C atom: no marks for structure
Indien meer as 4 bindinge gevorm na C-atoom: geen punte vir struktuur

[12.2.3] (5)

6.3 Catalyst / *Katalisator* ✓ [12.2.1] (1)

6.4 Ethanol is flammable. / *Etanol is vlambaar.* ✓ [12.1.1] (1)

6.5 Vapours are cooled down and condense / return to the test tube. ✓
Dampe word afgekoel en kondenseer / keer terug na die proefbuis.

OR/*OF*
Prevents vapours from leaving the test tube. / *Verhoed dat dampe die proefbuis verlaat.*

OR/*OF*
Functions as a condenser. / *Tree op as 'n kondensator.*

OR/*OF*
Causes mixture to reflux.
Veroorsaak dat die mengsel onder terugvloei verhit word. [12.1.1] (1)

6.6 Sodium carbonate solution is a base ✓and will neutralise both acids, ✓ preventing them from masking the smell of the ester.

Natriumkarbonaatoplossing is 'n basis ✓en sal beide sure neutraliseer ✓ wat verhoed dat die ester geruik word. [12.2.3] (2)

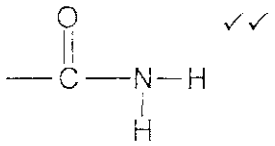
6.7 *Vapour pressure / dampdruk* ✓

OR/*OF*
Boiling point / *kookpunt*

OR/*OF*
Volatility / *vlugtigheid* [12.2.2] (1)
[12]

QUESTION 7/*VRAAG 7*

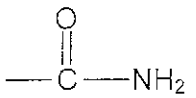
7.1.1



✓✓

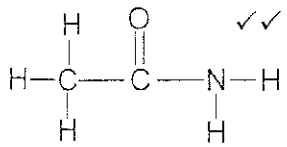
Molecular formula / *Molekulêre formule:* 0/2

Condensed or semi-structural formula / *Gekondenseerde of semistruktuurformule:* Max./*Maks.* 1/2
E.g./ *Bv.*:



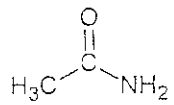
[12.2.1] (2)

7.1.2



✓✓

Condensed or semi-structural formula / *Gekondenseerde of semistruktuurformule:* Max./*Maks.* 1/2
E.g./ *Bv.*:



Molecular formula / *Molekulêre formule:* 0/2

All bonds shown, one or more H atoms omitted / *Alle bindinge getoon, een of meer H-atome uitgelaat:* Max./*Maks.* 1/2

[12.2.3] (2)

7.2 The nitrogen atom is bonded to one other alkyl group/C-group. ✓
Die stikstofatoom is aan een ander alkielgroep/C-groep gebind. [12.2.3] (1)

7.3.1 Chain length increases with increase in molecular mass (of straight chain hydrocarbons.) ✓
Van der Waals forces increases with increase in chain length. ✓

Kettinglengte neem toe met toename in molekulêre massa (van reguitketting koolwaterstowwe.) ✓
Van der Waalskragte neem toe met toename in kettinglengte. ✓ [12.2.2] (2)

7.3.2 Boiling points of amides decrease with increase in molecular mass. ✓✓
Kookpunte van amiede neem af met toename in molekulêre massa. [12.1.2] (2)

7.3.3
- A Ethanamide (primary amide, smallest molecular mass): most hydrogen bonding (two sites for hydrogen bonding), highest boiling point. ✓
- C *N,N*-dimethylethanamide (tertiary amide, biggest molecular mass): no hydrogen bonding, only weak Van der Waals forces, lowest boiling point. ✓
- B *N*-methylethanamide (secondary amide, molecular mass between the above two amides): one site for hydrogen bonding, boiling point between the above two amides (closer to that of primary amide due to H bonding.) ✓

- *Etaanamied (primêre amied, kleinste molekulêre massa): meeste waterstofbinding (twee punte vir waterstofbinding), hoogste kookpunt.* ✓
- *N,N-dimetieletaanamied (tersiêre amied, grootste molekulêre massa): geen waterstofbinding, slegs swak Van der Waalskragte, laagste kookpunt.* ✓
- *N-metieletaanamied (sekondêre amied, molekulêre massa tussen die twee bogenoemde amiede): een moontlikheid vir waterstofbinding, kookpunt tussen die twee amiede (nader aan die van primêre amied weens H-binding).* ✓ [12.2.2] (3)

7.3.4 Only the molecular mass will change. ✓
The number of H bonds will remain the same. ✓
(It will be a better indication of the relationship between mass and boiling points.)

Slegs die molekulêre massa sal dan verander. ✓
Die aantal H-bindinge sal dieselfde bly. ✓
(Dit sal 'n beter aanduiding van die verwantskap tussen ,oelkulêre massa en kookpunt wees.)

OR/*OF*
There will then be only one independent variable (molecular mass) ✓ and not two (molecular mass and number of H bonds) as in the current investigation.) ✓

Daar sal dan slegs een onafhanklike veranderlike (molekulêre massa) ✓ *wees en*
nie twee (molekulêre massa en aantal H-bindinge) soos in die huidige eksperiment nie. ✓ [12.1.2] (2)
[14]

QUESTION 8/*VRAAG 8*

8.1 Any two / *Enige twee:*

- Burning of fuel when cars are used - exhaust gases contains oxides of nitrogen. ✓
  Verbranding van brandstof wanneer motors gebruik word – uitlaatgasse bevat oksiede van stikstof.
- Burning of coal (generation of electricity)/nitrogen containing compounds/organic waste. ✓
  Verbranding van steenkool (opwek van elektrisiteit)/stikstofbevattende verbindings/organiese afval.
- Factories and other industrial plants that emits nitrogen oxides into the atmosphere as waste.
  Fabrieke en ander industriële aanlegte wat stikstofoksiede in die atmosfeer as afval vrystel. [12.3.2] (2)

8.2 $4NO_2(g) + O_2(g) + 2H_2O(\ell)$ ✓→ $4HNO_3(aq)$ ✓ bal ✓

OR/*OF*
$3NO_2(g) + H_2O(\ell)$ ✓→ $2HNO_3(aq) + NO(g)$ ✓ bal ✓ [12.2.3] (3)

8.3 $NO_2(g)$ dissolves in rainwater to form acid rain that burns/destroys crops. ✓
$NO_2(g)$ los op in reënwater om suurreën te vorm wat gewasse brand/beskadig. [12.3.2] (1)

8.4 ~~$NO_3^-(aq)$ is a strong oxidising agent ✓~~
and oxidise Cu (to Cu^{2+}). ✓
$H^+(aq)$ is not a strong enough oxidising agent ✓ and cannot oxidise Cu to Cu^{2+}.

$NO_3^-(aq)$ is 'n sterk oksideermiddel ✓
en oksideer Cu (na Cu^{2+}). ✓
$H^+(aq)$ is nie 'n sterk genoeg oksideermiddel nie ✓ en kan nie Cu na Cu^{2+} te oksideer nie.

[12.2.3] (3)

8.5.1

	$2NO_2$	N_2O_4
Initial number of mole (mol) *Aanvanklike aantal mol (mol)*	2	x
Number of moles used/formed (mol) *Aantal mol gereageer/gevorm*	-1,2✓	+0,6 ✓
Number of moles at equilibrium(mol) *Aantal mol by ewewig (mol)*	0,8✓	x + 0,6 ✓
Equilibrium concentration ($mol \cdot dm^{-3}$) *Ewewigskonsentrasie ($mol \cdot dm^{-3}$)*	0,4	$\frac{x + 0,6}{2}$ ✓

(+)

$$K_c = \frac{[N_2O_4]}{[NO_2]^2} \checkmark \therefore 2 \checkmark = \frac{\left(\frac{x + 0,6}{2}\right)}{(0,4)^2} \checkmark \therefore x = 0,04 \text{ mol} \cdot \checkmark$$

[12.1.3] (9)

8.5.2 Decreases / *Verminder* ✓ [12.2.3] (1)

8.5.3 When the pressure is increased the system will try to decrease the pressure. ✓
The forward reaction (2 mol to 1 mol) is favoured. ✓

Expressions with the same meaning as "forward reaction is favoured":
Equilibrium position shifts to the right. / Equilibrium lies to the right.
Accept: The equilibrium shifts to the right.

Wanneer die druk verhoog word, sal die sisteem poog om die druk te verlaag. ✓
Die voorwaartse reaksie word bevoordeel (2 mol na 1 mol).

Uitdrukkings met dieselfde betekenis as "voorwaartse reaksie bevoordeel":
Ewewigsposisie skuif na regs. / Ewewigsposisie lê na regs.
Aanvaar: Die ewewig skuif na regs.

[12.2.3] (2)
[21]

QUESTION 9/*VRAAG 9*

9.1 The change in amount/mass/volume of products formed per unit time.
Die verandering in die hoeveelheid/massa/volume van produkte gevorm per eenheidstyd.

OR/*OF*
The change in amount/mass/volume of reactants used per unit time.
Die verandering in die hoeveelheid/massa/volume van reaktanse gebruik per eenheidstyd. [12.2.1] (2)

9.2 Change in mass/*Verandering in massa* = 200 – 184,8
= 15,2 g [12.2.3] (1)

9.3
$$\text{Rate of reaction} = \frac{\text{mass change}}{\text{time change}} /$$
$$\textit{Reaksietempo} = \frac{\textit{massa verandering}}{\textit{tydsverandering}}$$
$$= \frac{15,2}{8} \checkmark$$
$$= 1,9 \text{ g·min}^{-1} \checkmark (CO_2 \text{ produced } /\textit{gevorm}) \quad [12.2.3] \quad (2)$$

9.4

OPTION 1/*OPSIE 1:*

mol CO_2 formed/*gevorm:*

$n = \frac{m}{M} \checkmark = \frac{200 - 184,8}{44} \checkmark = 0,35$ mol CO_2

Mol $CaCO_3$ consumed/*verbruik*:

$n(CaCO_3) = n(CO_2) = 0,35$ mol ✓ (ratio/*verhouding*)

$m(CaCO_3) = nM = (0,35)(100) \checkmark = 35$ g ✓ (34,54 g)

OPTION 2/*OPSIE 2:*

From balanced equation/*Uit gebalanseerde vergelyking*:

100 g $CaCO_3$ ✓ forms / *vorm* 44 g CO_2 ✓

$m(CO_2)$ formed / *gevorm* = 200 – 184,8 ✓ = 15,2 g

$m(CaCO_3) = \frac{100 \times 15,2}{44} \checkmark = 35$ g (34,54 g) ✓

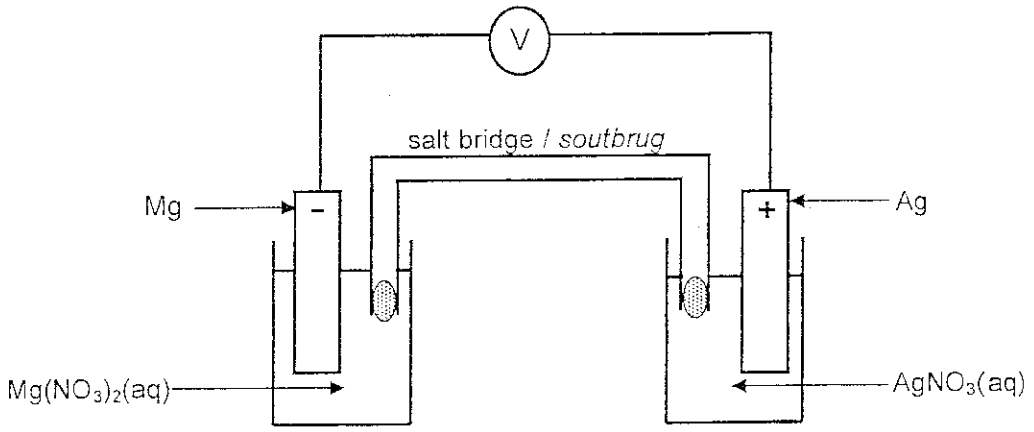
[12.1.3] (5)

9.5 Powder - larger surface area. ✓
More effective collisions per unit time / more molecules colliding with the correct orientation. ✓
Increase in reaction rate. ✓

Poeier - groter reaksieoppervlakte. ✓
Meer effektiewe botsings per eenheidstyd / meer molekule wat met korrekte oriëntasie bots. ✓
Toename in reaksietempo. ✓ [12.1.3] (3)
[13]

QUESTION 10/*VRAAG 10*

10.1



Checklist/*Kontrolelys* Criteria for diagram / *Kriteria vir diagram:*	Marks/ *Punte*
Both electrodes connected to voltmeter. / *Beide elektrodes aan voltmeter geskakel.*	✓
Salt bridge connecting two solutions in containers. (sketch + label) / *Soutbrug verbind twee oplossings in houers. (skets + benoeming)*	✓
Mg electrode /*elektrode* in $Mg(NO_3)_2(aq)$. (sketch as well as labels / *skets sowel as benoemings)*	✓
Ag electrode / *elektrode* in $AgNO_3(aq)$.	✓
Ag electrode indicated as positive and Mg electrode as negative. / *Ag-elektrode as positief en Mg-elektrode as negatief aangedui.*	✓

[12.1.1] (5)

10.5 ~~10.2~~ Ni(s) | $Ni(NO_3)_2(aq)$ (1 mol.dm^{-3}) ✓ ‖ $AgNO_3(aq)$ (1 mol.dm^{-3} | Ag(s) ✓

Accept /*Aanvaar*: Ni | Ni^{2+} ✓ ‖ Ag^+ | Ag ✓

NOTE: Give1 mark for salt bridge only if complete notation is written.
LET WEL: *Gee 1 punt vir die soutbrug slegs indien volledige notasie geskryf is.*

[12.2.3] (3)

10.6 Option B/*Opsie B* ✓

~~The reaction leading to the highest emf (or potential difference) will be~~ between the strongest reducing agent (Mg) ✓and the strongest oxidising agent (Ag^+). ✓
Die reaksie wat tot die hoogste emk (of potensiaalverskil) lei, sal tussen die sterkste reduseermideel (Mg)✓ *en die sterkste oksideermiddel (Ag^+) wees.* ✓ [12.2.2] (3)

10.2 $Mg(s) + 2Ag^+(aq)$ ✓$\rightarrow Mg^{2+}(aq) + 2Ag(s)$ ✓ bal ✓ [12.2.3] (3)

10.3 $E^\theta_{cell} = E^\theta_{cathode} - E^\theta_{anode}$ ✓ /$E^\theta_{sel} = E^\theta_{katode} - E^\theta_{anode}$
$= 0,80$ ✓$- (- 2,36)$ ✓
$= 3,16$ V ✓

OR any other correct formula from **data sheet**
OF enige ander korrekte formule vanaf gegewensblad

OR/*OF*
✓$\begin{cases} Mg \rightarrow Mg^{2+} + 2e^- & E^\circ = + 2,36 \text{ ✓} \\ Ag^+ + e^- \rightarrow Ag & \underline{E^\circ = + 0.80 \text{ ✓}} \\ & E^\circ = + 3,16 \text{ V ✓} \end{cases}$

Marking rule 4.6
Nasienreël 4.6

Any other formula using unconventional abbreviations, e.g.
$E^\circ_{cell} = E^\circ_{OA} - E^\circ_{RA}$ followed by correct substitutions: $^3/_4$
Enige ander formule wat onkonvensionele afkortings gebruik, bv.
$E^\circ_{sel} = E^\circ_{OM} - E^\circ_{RM}$, *gevolg deur korrekte substitusies:* $^3/_4$

[12.2.3] (4)

10.4 Ensure a temperature of 25 °C ✓
and solutions of concentration 1 mol·dm^{-3} ✓

Verseker 'n temperatuur van 25 °C ✓
en oplossing van konsentrasie 1 mol·dm^{-3}✓ [12.1.1] (2)
[20]

QUESTION 11/*VRAAG 11*

11.1 P:
$2C\ell^- \rightarrow C\ell_2(g) + 2e^-$ ✓✓ OR/*OF* $C\ell^-(aq) \rightarrow \frac{1}{2}C\ell_2(g) + e^-$

Q:
$2H_2O(\ell) + 2e^- \rightarrow H_2(g) + 2OH^-(aq)$ ✓✓ [12.2.3] (4)

11.2 H_2O is a stronger oxidising agent (than Na^+) ✓
and is more readily reduced than the Na^+. ✓

H_2O *is 'n sterker oksideermiddel as* Na^+ ✓
en word meer gereedelik gereduseer as die Na^+. ✓ [12.2.3] (2)

11.3 Allows only the cation (Na^+) to move across to the cathode compartment. / *Laat slegs die katioon (Na^+) toe om na die katode gedeelte oor te beweeg.* ✓

OR/*OF*
To separate the $C\ell^-$ ions from the OH^-./ *Om die $C\ell^-$ ione van die OH^-* [12.2.3] (1)

ione te skei.

11.4 Any two:

~~As chemical reactant in the production of:~~

- Medicines to cure diseases
- Polymers
  - PVC to make plastic products e.g. pipes, insulation, handbags
  - Nylon for carpeting, clothing, etc.
- Household products e.g. toiletries, cosmetics, CD's etc.
- Hydrochloric acid used in building industry and swimming pools
- Bromine used in photography
- Solvents e.g. "tippex"
- Solvents used for dry cleaning
- Titanium dioxide used as white pigment in paint
- Dyes used in textile industry
- Pesticides used to protect crops
- Compounds that can be used to sterilize medical equipment e.g. kidney dialysis machines, wounds and work surfaces in medical labs
- Extraction of titanium used in aircrafts

As disinfectant to:

- Purify/sterilize drinking water

As bleaching agent in the:

- Textile industry
- Paper industry

Enige twee:

As chemiese reagens in die vervaardiging van:

- *Medisyne om siektes te genees*
- *Polimere*
  - *PVC vir die vervaardiging van plastiekprodukte bv. pype. Isolasie, handsakke ens.*
  - *Nylon vir matte, klerasie, ens.*
- *Huishoudelike produkte bv. toiletware, skoonheidsmiddels, CD's, Soutsuur vir gebruik in byvoorbeeld die bou-industrie en swembaddens*
- *Broom vir gebruik in fotografie*
- *Oplosmiddels bv. "tippex"*
- *Oplosmiddels vir gebruik in droogskoonmaak*
- *Titaandioksied gebruik as wit pigment in verf*
- *Kleurstowwe vir gebruik in die tekstielnywerheid*
- *Insekdoders gebruik om gewasse te beskerm*
- *Verbindings wat gebruik kan word om mediese toerusting te steriliseer bv. nierdialisemasjiene, wonde en werkoppervlakke in mediese laboratoriums*
- *Ekstraksie van titaan vir gebruik in vliegtuie*

As ontsmettingsmiddel om:

- *Drinkwater te suiwer/steriliseer*

As bleikmiddel in die:

- *Tekstielindustrie*
- *Papierindustrie*

[12.2.3] (2)
[9]

QUESTION 12/*VRAAG 12*

12.1 Fractional distillation/Fraksionele distillasie [12.2.1] (1)

12.2 Low temperature increases the amount of NH_3. ✓
Rate is too slow. ✓
At higher temperature NH_3 is produced at a faster rate. ✓✓

Lae temperature verhoog die hoeveelheid NH_3. ✓
Tempo is te laag. ✓
By hoër temperature word NH_3 teen 'n vinniger tempo berei. ✓✓ [12.2.3] (4)

12.3 $HNO_3(aq) + NH_3(g)$ ✓→ $NH_4NO_3(aq)$ ✓ bal ✓ [12.2.3] (3)

12.4
- Rain washes excess of fertilisers into dams, lakes, streams and rivers causing eutrofication that leads to dead zones. ✓
  Reën spoel oormatige kunsmis in damme, mere, strome en riviere in waar dit eutrofosering veroorsaak wat tot dooie sones kan lei.
- Excessive fertiliser in the environment promotes excessive alien growth at the expense of indigenous plants. ✓
  Oormaat kunsmis in die omgewing bevorder groei van indringerplante ten koste van inheemse plante.
- Groundwater can be contaminated when excessive fertiliser seeps into it. ✓
  Grondwater kan gekontamineer word deur insyfering van oormaat kunsmis.
- Nitrates in water that can result in blue baby syndrome. ✓
  Nitrate in water kan tot bloubabasindroom lei.

[12.3.3] (4)

12.5.1 The ratio (proportion) in which nitrogen, phosphorous and potassium occurs in a certain quantity of fertiliser. ✓✓
Die verhouding (proporsie) waarin stikstof, fosfor en kalium in 'n sekere hoeveelheid kunsmis voorkom. [12.2.1] (2)

12.5.2 No / *Nee* ✓
The higher proportion of N will enhance leaf growth ✓
and less crops. ✓
Die hoër N-inhoud sal blaargroei bevorder ✓
en minder gewas/vrug ✓ [12.3.2] (3)
[17]

TOTAL SECTION / *TOTAAL AFDELING B:* 125

GRAND TOTAL / *GROOTTOTAAL:* 150