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JUNE EXAMINATION/

2026

MARKING GUIDELINE
NASIENRIGLYNE

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

13 pages/bladsye



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**MARKING GUIDELINES/
NASIENRIGLYNE****PHYSICAL SCIENCES: CHEMISTRY
FISIËSE WETENSAPPE: CHEMIE
(PAPER/VRAESTEL 2) **GR12 0626******QUESTION / VRAAG 1**

1.1	B	✓✓	(2)
1.2	C	✓✓	(2)
1.3	D	✓✓	(2)
1.4	B	✓✓	(2)
1.5	D	✓✓	(2)
1.6	C	✓✓	(2)
1.7	B	✓✓	(2)
1.8	A	✓✓	(2)
1.9	D	✓✓	(2)
1.10	B	✓✓	(2)
			[20]

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QUESTION / VRAAG 2

2.1 Homologous series is a series of organic molecules/compounds that can be described by the same general formula, ✓✓

OR one member differs from the next with the CH₂ group. **(2 or 0)**

Homoloë reeks: 'n Reeks organiese verbindings/molekule wat deur dieselfde algemene formule beskryf kan word

OF waarin die een lid van die volgende verskil met 'n CH₂-groep. (2)

2.2 Carboxyl group / Karboksielgroep ✓

Do not accept carboxylic acid / Moet nie karboksielsuur aanvaar nie (1)

2.3 2.3.1 F ✓ (1)

2.3.2 C ✓ (1)

2.3.3 H ✓ (1)

2.3.4 G ✓ (1)

2.4 2.4.1 Butyl✓ propanoate ✓/ Butielpropanoaat (2)

2.4.2 2-bromo-5-methylhexane / 2-bromo-5-metielheksaan

Marking criteria/Nasienkriteria:

- Correct stem and substituents / Korrekte stam en substituentte ✓
- Everything correct / heeltetal korrek ✓

(2)

2.5 2.5.1 (Concentrated) sulphuric acid / (gekonsentreerde) swawelsuur ✓ (1)

2.5.2 Esterification **OR** condensation / Esterifikasie **OF** kondensasie ✓ (1)

2.5.3 Water ✓ and/en H₂O ✓ (2)

2.6 2.6.1 Organic compounds with the same molecular formula but different structural formulae. ✓✓ **(2 or 0)**

Strukturisomeer: Organiese molekule met dieselfde molekulêre formule, maar verskillende struktuurformules. (2)



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2.6.2

2.6.3

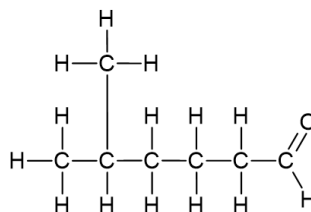
Marking criteria/Nasienkriteria:

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

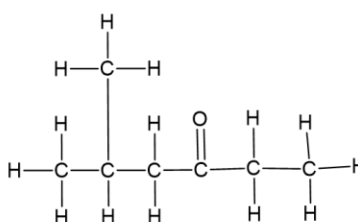
(1)

(2)

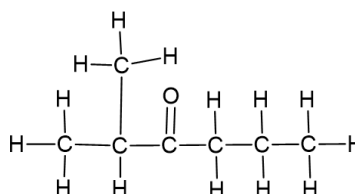
Functional isomers /
Funksionele isomeer ✓



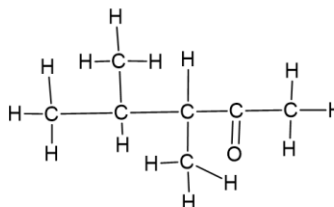
Positional isomer /
Posisionele isomeer



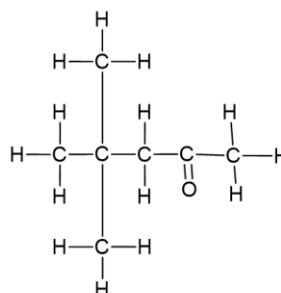
OR



Chain isomer / *Ketting isomeer*



OR

2.7 C₃H₇ ✓✓

(2)

2.8 C_nH_{2n} ✓

(1)

2.9 2C₆H₁₄ + 19 O₂ → 12 CO₂ + 14 H₂O ✓ balancing / *balanseer*(3)
[26]

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QUESTION / VRAAG 3

3.1 **Marking criteria/Nasienkriteria:**

If any one of the underlined key phrases in the correct context is omitted, deduct 1 mark.

Indien enige een van die onderstreepte sleutelfrases in die korrekte konteks weggelaat word, trek 1 punt af.

The temperature at which the solid and liquid phases of a substance are at equilibrium. ✓✓

Die temperatuur waarby die vaste- en vloeistoffases van 'n stof in ewewig is. (2)

3.2 3.2.1 Melting point / *Smeltpunt* ✓ (1)

3.2.2 Straight chain alkane ✓ Accept: Homologous series
Requitketting alkane Aanvaar: Homoloë reeks (1)

3.2.3 **Marking Criteria:** show the relationship between the dependent and independent variables. If the question has a yes or no answer – deduct one mark.

Example:

What is the relationship between the chain length/molecular mass/number of carbon atoms and the melting points of organic compounds (from the same homologous series)? ✓✓

(2)

Nasienkriteria: toon die verband tussen die afhanklike en onafhanklike veranderlike. Indien die vraag 'n ja of nee antwoord het – trek een punt af.

Voorbeeld:

Wat is die verband tussen die kettinglengte/molekulêre massa/ getal koolstofatome en die smeltpunt van die organiese verbinding (van dieselfde homoloëreeks)?

- 3.2.4
- The melting point of organic compounds increases with an increase in the chain length/molecular mass/number of carbon atoms/longer chain length of organic compounds. ✓
 - The intermolecular forces in R are stronger than in P and Q ✓
 - More energy is required to overcome the intermolecular forces in R than in P and Q. ✓

- *Die smeltpunt van 'n organiese verbinding verhoog met 'n verhoging in die kettinglente/ molekulêre massa/ getal koolstofatome/langer kettinglengte in die organiese verbinding.*
- *Die intermolekulêrekragte in R is sterker as in P en Q*
- *Meer energie word benodig om die intermolekulêrekragte te oorkom in R as in P en Q.*

(3)

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- 3.3 3.3.1 R ✓ (1)
- 3.3.2 R ✓ (1)
- 3.3.3
- Compound R has a longer straight chain length/larger surface area as compared to the branched compound S. ✓
 - Both have London forces but the intermolecular forces in compound R are stronger than in S. ✓
 - More energy is needed to overcome/weaken the intermolecular forces in compound R. ✓
- *Verbinding R het 'n langer reguit kettinglengte/groter oppervlakarea in vergelyking met die vertakte verbinding S.*
 - *Albei het London-kragte, maar die intermolekulêre kragte in verbinding R is sterker as in S.*
 - *Meer energie is nodig om die intermolekulêre kragte in verbinding R te oorkom/verswak.* (3)
- 3.4 3.4.1 Alkane / Alkaan ✓ (1)
- 3.4.2 2,2-dimethylpropane / dimethylpropane ✓✓
- 2,2-dimetielpropaan / dimetielpropaan*
- Marking criteria/Nasienkriteria:**
- Correct stem and substituents / *Korrekte stam en substituent* ✓
 - Whole name correct / *Hele naam korrek* ✓
- (2)
- [17]

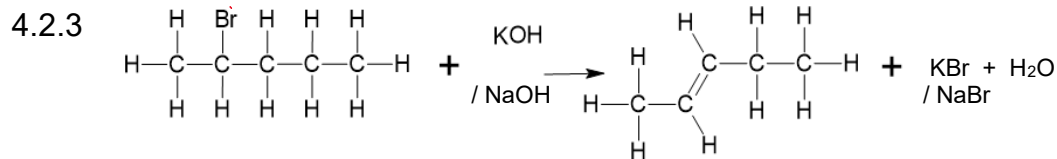
QUESTION / VRAAG 4

- 4.1 4.1.1 Hydrogenation / *Hydrogenering* ✓ (1)
- 4.1.2 Hydration / *hidrasie* ✓ (1)
- 4.1.3 Hydrohalogenation / *hydrohalogenering* ✓ (1)
- 4.2 4.2.1 Elimination / dehydrohalogenation / dehydrobromination
- Eliminasie / dehydrohalogenasie / dehydrobrominasie* ✓ (1)
- 4.2.2 Concentrated strong base / NaOH(c) / KOH(c) / LiOH(c) ✓
Heat ✓ (under reflux)
- Gekonsentreerde sterk basis / NaOH(c) / KOH(c) / LiOH(c)*
Hitte (onder reflux) (2)



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Marking criteria/Nasienkriteria:

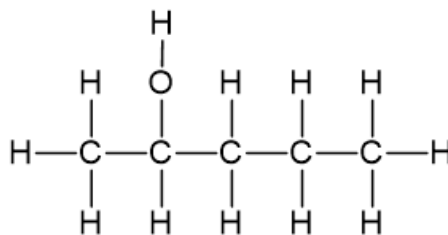
- Correct structural formula of 2-bromopentane where the Br is on the correct carbon ✓ and KOH / NaOH / LiOH ✓
- Functional group of alkene ✓
- Correct structural formula of pent-2-ene ✓ and KBr + H₂O ✓
- *Korrekte struktuurformule vir 2-bromopentaan waar die Br op die regte koolstof is en KOH / NaOH / LiOH*
- *Funksionele groep van alkeen*
- *Korrekte struktuurformule vir pent-2-ene en KBr + H₂O*

(5)

4.3 4.3.1 Alcohol / alkohol ✓

(1)

4.3.2

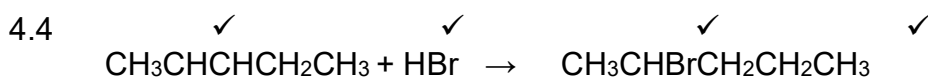

Marking
criteria/Nasienkriteria:

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

(2)

4.3.3 pentan-2-ol / pentan-2-ol ✓✓ (2 or 0)

(2)


Marking criteria for product/Nasienkriteria vir produk:

- Functional group / *Funksionele groep* ✓
- Whole formula correct/*Hele formule korrek* ✓

NOTE / NOTA

If structural formulae used – max ¾

indien struktuurformule – maks ¾

If molecular formula used – ¼ only for HBr

Indien molekulêre formule gebruik – slegs ¼ vir HBr

(4)

4.5 Substitution / *Substitusie* ✓

(1)



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4.6 4.6.1 Hydrolysis / *Hidrolise* ✓ (1)

4.6.2 Diluted Strong base / NaOH(aq) ✓ (1)
Verdunde Sterk basis / NaOH(aq) (1)
[23]

QUESTION / VRAAG 5

5.1 The change in concentration of reactants or products per unit time. ✓✓ (2 or 0)
OR Rate of change in concentration of reactants or products

Die verandering in konsentrasie van reaktante of produkte per eenheid tyd.
OF *Tempo van verandering in konsentrasie van reaktante of produkte* (2)

5.2

- Measure the volume of hydrogen gas using a gas syringe/downward displacement of water. ✓
- Measure the decrease in mass on a scale/the rate of colour change of the solution. ✓
(accept any two reasonable answers – be it collecting gas or measuring the mass).
- *Meet die volume van die waterstofgas met die hulp van 'n gasspuit/afwaarde verplasing van water.*
- *Meet die afname aan massa op 'n skaal/die tempo van kleurverandering van die oplossing.*
(aanvaar enige twee redelike antwoorde – wat hetsy gasversameling of die meting van die massa). (2)

5.3 5.3.1 $\text{Rate} = \frac{\Delta V}{\Delta t}$ ✓ for the conversion / *vir die omskakeling*
 $= \frac{5 - (0)}{60 - (0)}$ ✓
 $= 0,08 \text{ (dm}^3 \cdot \text{s}^{-1})$ ✓
 Accept calculation done in cm³ and then converted.
Aanvaar berekening wat in cm³ gedoen word en dan omgeskakel word. (4)



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5.3.2	<u>Marking criteria:</u> (a) Substituting 5 and 22,4 into $n = \frac{V}{V_M}$ ✓ (b) Equation $n = \frac{m}{M}$ ✓ (c) Substitution ✓ (d) Final answer $m = 0,45$ g (0,4464 g) ✓	<u>Nasienkriteria</u> (a) <i>Vervanging van 5 en 22,4 in $n = \frac{V}{V_M}$</i> ✓ (b) <i>Vergelyking $n = \frac{m}{M}$</i> ✓ (c) <i>Vervanging</i> ✓ (d) <i>Finale antwoord $m = 0,45$ (0,4464) g</i> ✓
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$$n = \frac{V}{V_M}$$

$$= \frac{5}{22,4} \quad \checkmark \text{ (a)}$$

$$= 0,2232 \text{ mol}$$

$$n(\text{H}_2) = \frac{m}{M} \quad \checkmark \text{ (b)}$$

$$0,2232 = \frac{m}{2} \quad \checkmark \text{ (c)}$$

$$m = 0,45 \text{ g} \quad \checkmark \text{ (d)}$$

(4)

5.3.3	<u>Marking criteria:</u> (a) $n = 0,16673 \text{ mol}$ ✓ (b) mole ratio Cr: H ₂ ; 2:3; 0,16673: 0,25 ✓ (c) $m = 0,5 \text{ g}$ ✓ (d) substitution $\frac{0,45}{0,5} \times 100$ into percentage yield equation ✓ (e) Final answer: 90% ✓ (Range 89,25%-90%)	<u>Nasienkriteria</u> (a) $n = 0,16673 \text{ mol}$ ✓ (b) <i>molverhouding Cr: H₂; 2:3; 0,16673: 0,25</i> ✓ (c) $m = 0,5 \text{ g}$ ✓ (d) <i>vervanging $\frac{0,45}{0,5} \times 100$ in persentasieopbrengs vergelyking</i> ✓ (e) <i>Finale antwoord: 90% ✓ (Gebied 89,25%-90%)</i>
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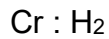
OPTION 1 / OPSIE 1

$$n = \frac{m}{M}$$

$$= \frac{8,67}{52} \quad \checkmark \text{ (a)}$$

$$= 0,16673 \text{ mol}$$

Mole ratio/*Molverhouding*



$$2 : 3 \quad \checkmark \text{ (b)}$$

$$0,16673 : 0,25$$

$$n(\text{H}_2) = \frac{m}{M}$$

$$0,25 = \frac{m}{2} \quad \checkmark \text{ (c)}$$

$$m = 0,5 \text{ g}$$

Percentage Yield / *Persentasie opbrengs*

$$= \frac{\text{Actual yield/Werklike opbrengs}}{\text{Theoretical yield/Teoretiese opbrengs}} \times 100$$

$$= \frac{0,45}{0,5} \times 100 \quad \checkmark \text{ (d)}$$

$$= 90\% \quad \checkmark \text{ (e) (Accept range/Aanvaar reeks 89,25\%-90\%)}$$

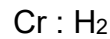
OPTION 2 / OPSIE 2

$$n = \frac{m}{M}$$

$$= \frac{8,67}{52} \quad \checkmark \text{ (a)}$$

$$= 0,16673 \text{ mol}$$

Mole ratio/*Molverhouding*



$$2 : 3 \quad \checkmark \text{ (b)}$$

$$0,16673 : 0,25$$

$$\text{from / van Q5.2.3} = 0,2232 \text{ mol} \quad \checkmark \text{ (c)}$$

Percentage Yield / *Persentasie opbrengs*

$$= \frac{\text{Actual yield/Werklike opbrengs}}{\text{Theoretical yield/Teoretiese opbrengs}} \times 100$$

$$= \frac{0,2232}{0,25} \times 100 \quad \checkmark \text{ (d)}$$

$$= 89,28\% \quad \checkmark \text{ (e)}$$

OPTION 3 / OPSIE 3

$$n = \frac{m}{M}$$

$$= \frac{8,67}{52} \quad \checkmark \text{ (a)}$$

$$= 0,16673 \text{ mol}$$

Mole ratio / *Molverhouding*



$$2 : 3 \quad \checkmark \text{ (b)}$$

$$0,16673 : 0,25$$

$$n = \frac{V}{V_M}$$

$$V = 0,25(22,4) \quad \checkmark \text{ (c)}$$

$$= 5,6 \text{ dm}^3$$

Percentage Yield / *Persentasie opbrengs*

$$= \frac{\text{Actual yield/Werklike opbrengs}}{\text{Theoretical yield/Teoretiese opbrengs}} \times 100$$

$$= \frac{5}{5,6} \times 100 \quad \checkmark \text{ (d)}$$

$$= 89,29\% \quad \checkmark \text{ (e)}$$

(5)



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5.3.4 DECREASES / VERLAAG ✓ (1)

- 5.3.5
- As surface area decreases, the exposed area decreases, ✓ and
 - fewer molecules will have sufficient energy ✓, less than or equal to the activation energy, / less particles with $E_k \geq E_a$
 - leading to less effective collisions per unit time / lower frequency of effective collisions ✓

- Soos die oppervlak afneem, neem die blootgestelde area af,
- en minder molekules sal voldoende energie hê, minder as of gelyk aan die aktiveringsenergie, / minder deeltjies met $E_k \geq E_a$
- wat lei tot minder effektiewe botsings per eenheid tyd / laer frekwensie van effektiewe botsings

(3)
[21]

QUESTION / VRAAG 6

6.1 **Marking criteria/Nasienkriteria**

If any one of the underlined key phrases in the correct context is omitted, deduct 1 mark.

Indien enige een van die onderstreepte sleutelfrases in die korrekte konteks weggelaat word, trek 1 punt af.

When the equilibrium in a closed system is disturbed, the system will reinststate a new equilibrium by favouring the reaction that will oppose the disturbance. ✓✓

Wanneer die ewewig in 'n geslote sisteem versteur word, stel die sisteem 'n nuwe ewewig in deur die reaksie wat die versteuring teenwerk, te bevoordeel. (2)

6.2 A CLOSED ✓ system is isolated from its surroundings/in a sealed gas syringe. ✓

'n GESLOTE system is geïsoleer van die omgewing/ in 'n geseëde gasspuit (2)

6.3 6.3.1 INCREASES / VERHOOG ✓ (1)

6.3.2 REMAINS THE SAME / BLY DIESELFDE ✓ (1)

6.4 6.4.1 EXOTHERMIC / EKSOTERMIES ✓ (1)



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- 6.4.2
- Placing the syringe in ice cubes will decrease the temperature. ✓
 - The system will decrease the effect by favouring an exothermic reaction. ✓
 - The forward reaction is favoured because the syringe turns colourless. ✓
- *As die gasspuit in ysblokkies geplaas word, verlaag die temperatuur.*
 - *Die sisteem sal die effek teenwerk deur die eksotermiese reaksie te bevoordeel.*
 - *Die voorwaartse reaksie word bevoordeel omdat die spuit kleurloos raak.*
- (3)

6.5 6.5.1 $n = \frac{m}{M}$ ✓

$$= \frac{8,28}{92}$$

(3)

6.5.2 **Marking criteria:**

- (a) Initial quantities of all substances ✓
- (b) Using the correct mol ratio ✓
- (c) Calculating the quantity(mol) at equilibrium of NO₂ and N₂O₄ ✓
- (d) Divide the number of moles at equilibrium by 1 dm³ ✓
- (e) K_c expression ✓ (no or wrong expression 6/7)
- (f) Correct substitution of equilibrium concentrations into K_c expression ✓
- (g) Final Answer K_c = 0,36 ✓

NOTE: If concentration table was used, the values will be the same, but the labels will differ.

Nasienkriteria:

- (a) *Aanvanklike hoeveelhede van alle stowwe*
- (b) *Gebruik die korrekte mol verhouding*
- (c) *Bereken die hoeveelheid(mol) by ewewig van NO₂ en N₂O₄*
- (d) *Deel die aantal mol in ewewig deur 1 dm³*
- (e) *K_c uitdrukking (Verkeerde of geen K_c 6/7)*
- (f) *Vervang ekwilibriumkonsentrasies in die K_c uitdrukking*
- (g) *Finale antwoord K_c = 0,36*

NOTA: Indien konsentrasie in tabel gebruik word, sal die waardes dieselfde bly, maar die byskrifte sal verskil.



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	2NO ₂ (g)	N ₂ O ₄ (g)
Initial amount(mol) <i>Aanvanklike hoeveelheid(mol)</i>	0,52	0,08 ✓ (a)
Change(mol) <i>Verandering(mol)</i>	-0,02	+ 0,01 ✓ (b)
Equilibrium amount(mol) <i>Ewewigshoeveelheid(mol)</i>	0,50	0,09 ✓ (c)
Equilibrium concentration(mol·dm ⁻³) <i>Ewewigskonsentrasie(mol·dm⁻³)</i>	$\frac{0,50}{1} = 0,50$	$\frac{0,09}{1} = 0,09$ ✓ (d)

$$K_c = \frac{[N_2O_4]}{[NO_2]^2} \checkmark \text{ (e)}$$

$$= \frac{(0,09)}{(0,50)^2} \checkmark \text{ (f)}$$

$$= 0,36 \checkmark \text{ (g)}$$

(7)
[20]

QUESTION /VRAAG 7

7.1 Strong acids ionise completely in water to form a high concentration of H₃O⁺ ions. ✓ ✓ (2 or 0)

'n Suur is 'n stof wat waterstofione (H⁺)/hidroniumione (H₃O⁺) vorm wanneer dit in water oplos. (2)

7.2 HCl ; Cl⁻ ✓ ✓ (2 or 0)
OR/OF
H₂O : H₃O⁺ (2)

7.3 Acids that release/donate ONLY ONE PROTON / H⁺ ion ✓

Sure wat NET EEN PROTON / H⁺ ioon vrystel / skenk (1)

7.4 7.4.1 $c(HCl) = \frac{n}{V}$ ✓
n = (0,8) (0,15) ✓
n = 0,12 mol ✓ (3)



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7.4.2

Marking criteria:

- (a) Substituting (0,5)(0,06) into $c_{(\text{NaOH})} = \frac{n}{V}$ ✓
 (b) Using the correct mol ratio NaOH : HCl 1:1 ✓
 (c) Calculating $n_{(\text{HCl})_{\text{reacted}}} = n_{\text{initial}} - n_{\text{excess}}$ by substituting ✓
 (d) $n_{(\text{HCl})_{\text{reacted}}} = 0,09 \text{ mol}$ ✓
 (e) Mole Ratio CaCO₃: HCl 1:2; 0,045 : 0,09 ✓
 (f) Substituting 0,045 and 100 into $n = \frac{m}{M}$ ✓
 (g) Final answer $m = 4,5 \text{ g}$ ✓

Nasienkriteria:

- (a) Vervang (0,5)(0,06) in $c_{(\text{NaOH})} = \frac{n}{V}$ ✓
 (b) Gebruik die korrekte molverhouding NaOH : HCl 1:1 ✓
 (c) Bereken $n_{(\text{HCl})_{\text{reacted}}} = n_{\text{initial}} - n_{\text{excess}}$ deur vervanging ✓
 (d) $n_{(\text{HCl})_{\text{reacted}}} = 0,09 \text{ mol}$ ✓
 (e) molverhouding CaCO₃: HCl 1:2; 0,045 : 0,09 ✓
 (f) Vervang 0,045 en 100 in $n = \frac{m}{M}$ ✓
 (g) Finale Antwoord $m = 4,5 \text{ g}$ ✓

$$c_{(\text{NaOH})} = \frac{n}{V}$$

$$n_{(\text{NaOH})} = (0,5)(0,06) \text{ ✓ (a)}$$

$$n_{(\text{NaOH})} = 0,03 \text{ mol}$$

Mole Ratio NaOH : HCl

1:1

$$0,03: 0,03 \text{ mol (in excess/in oormaat) ✓ (b)}$$

$$n_{(\text{HCl})_{\text{reacted/gereageer}}} = n_{\text{initial/aanvanklik}} - n_{\text{excess/oormaat}}$$

$$= 0,12 - 0,03 \text{ ✓ (c)}$$

$$= 0,09 \text{ mol}$$

Mole Ratio

CaCO₃: HCl

1 : 2

$$0,045 \text{ ✓ (e)} : 0,09 \text{ ✓ (d)}$$

$$n = \frac{m}{M}$$

$$0,045 = \frac{m}{100} \text{ ✓ (f)}$$

$$m = 4,5 \text{ (g) ✓ (g)}$$

(7)

7.4.3 NO. ✓ It is a salt of a strong acid and a strong base. ✓

NEE. Dit is 'n sout van 'n sterk suur en 'n sterk basis.

(2)



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**MARKING GUIDELINES/
NASIENRIGLYNE**

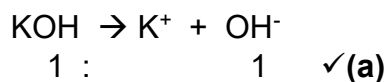
**PHYSICAL SCIENCES: CHEMISTRY
FISIËSE WETENSAPPE: CHEMIE
(PAPER/VRAESTEL 2) GR12 0626**

- 7.4.4
- The equivalence point is at pH of 7. ✓
 - Bromothymol blue changes colour at a pH equal to 7. ✓ The endpoint of this titration is within the pH range (of 6 -7,6) in which bromothymol blue / indicator changes colour.
 - Die ekwivalensiepunt is by 'n pH van 7.
 - Broomtimolblou verander van kleur by 'n pH gelyk aan 7. Die eindpunt van hierdie titrasie is binne die pH-gebied van (6 -7,6) waarin bromotimolblou / indikator van kleur verander. (2)

7.5

Marking criteria/Nasienkriteria

- (a) Using the ratio of the base of KOH:OH⁻ / Gebruik die verhouding van die KOH:OH⁻ ✓
- (b) Substitution/Vervanging $K_w = [H_3O^+][OH^-] = 1 \times 10^{-14}$ ✓
- (c) Substituting/Vervanging $0,4 \times 10^{-7}$ into/in $pH = -\log [H_3O^+]$ ✓
- (d) Final answer/Finale antwoord $pH = 7,3979$ (7,40) ✓

OPTION 1/ OPSIE 1

$$K_w = [H_3O^+][OH^-] = 1 \times 10^{-14}$$

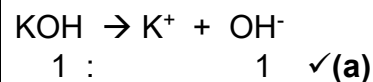
$$\frac{1 \times 10^{-14}}{[H_3O^+]} = [OH^-] = 2,5 \times 10^{-7} \quad \checkmark(b)$$

$$[H_3O^+] = 0,4 \times 10^{-7} \text{ mol} \cdot \text{dm}^{-3}$$

$$pH = -\log [H_3O^+]$$

$$= -\log (0,4 \times 10^{-7}) \quad \checkmark(c)$$

$$= 7,3979 \text{ (7,40)} \quad \checkmark(d)$$

OPTION 2/ OPSIE 2

$$pOH = -\log [OH^-]$$

$$pOH = -\log (2,5 \times 10^{-7}) \quad \checkmark(b)$$

$$= 6,60209$$

$$pOH + pH = 14$$

$$pH = 14 - 6,60209 \quad \checkmark(c)$$

$$= 7,3979 \quad \checkmark(d)$$

(4)

[23]**TOTAL: 150****SA EXAM PAPERS**

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