



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

JUNE/JUNIE 2019

**PHYSICAL SCIENCES P2
MARKING GUIDELINE/
FISIESE WETENSKAPPE V2
NASIENRIGLYN**

MARKS/PUNTE: 150

*This marking guideline consists of 10 pages.
Hierdie nasienriglyn bestaan uit 10 bladsye.*

QUESTION 1/VRAAG 1

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

[20]**QUESTION 2/VRAAG 2**

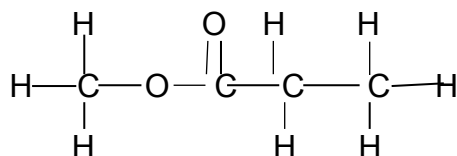
- 2.1 CONCENTRATED ✓
 GEKONSENTEERD (1)
- 2.2 To prevent reagents escaping ✓ /To smell the ester/Acts as a condenser
 Om te voorkom dat reagense ontsnap / Om die esters te ruik ✓ / Dit tree as
 'n kondensor op (1)
- 2.3 H₂O ✓ (1)
- 2.4 propan-1-ol ✓✓ Accept 1-propanol propanol (1/2)
 propaan-1-ol Aanvaar 1- propanol propanol (1/2) (2)
- 2.5 $n = 54,55/12 \checkmark = 4,55$ $n = 9,1/1 \checkmark = 9,1$ $n = (100-54.55-9.1) \checkmark /16 \checkmark = 2.27$
 $= 2$ $= 4$
 Empirical formula/Empiriese formule C₂H₄O ✓
 Molar mass(R)/Molêre massa(R) = 130 + 18 – 60 = 88 ✓
 MMolar Mass (Empirical formula)/Molêre massa (Empiriese formule) = 2 x
 12 + 4 x 1 + 1 x 16 = 44 ✓
 Molecular formula/Molekulêre formule = C₄H₈O₂ ✓ (8)

[13]

QUESTION 3/VRAAG 3

3.1 3.1.1 (a) Esters ✓ (1)

(b)

**Marking Criteria**

Whole structure correct

2/2

Volle struktuur 2/2

Only functional group correct ½

Slegs funksionele groep korrek ½

(2)

3.1.2 Same molecular mass ✓✓ / Same molar mass
Dieselfde molekulêre massa / Dieselfde molêre massa (2)

3.1.3 **B** has two sites for hydrogen bonding ✓. **A** has one site for hydrogen bonding ✓
B het twee plekke vir waterstofbinding. ✓ A het een plek vir waterstofbinding (2)

3.2 3.2.1 Yes ✓
Ja
 Same molecular formula ✓ but different structural formulae ✓
Dieselfde molekulêre formule maar verskillende struktuurformules (3)

3.2.2 **Y** ✓
D has a larger surface area/chain length than **E** ✓
D het 'n groter oppervlakte/ kettinglengte as E
 London forces/Induced-dipole forces ✓/Dispersion forces stronger✓
 in **D** than in **E**
Londonkragte/geïnduseerde-dipool kragte/Dispersie-kragte is sterker in D as in E
 More energy needed to break/overcome forces in **D**✓
Meer energie word benodig om die kragte te breek/oorkom in D
OR/OF
Y ✓
E has a smaller surface area/chainlength than **D** ✓
E het 'n kleiner oppervlakte/ kettinglengte as D
 London forces/Induced-dipole forces ✓/Dispersion forces weaker
 in **E** than in **D**
Londonkragte/geïnduseerde-dipool kragte/Dispersie-kragte is swakker in E as in D
 Less energy needed to break forces in **E** ✓
Minder energie word benodig om intermolekulêre kragte te breek/oorkom in E

(4)

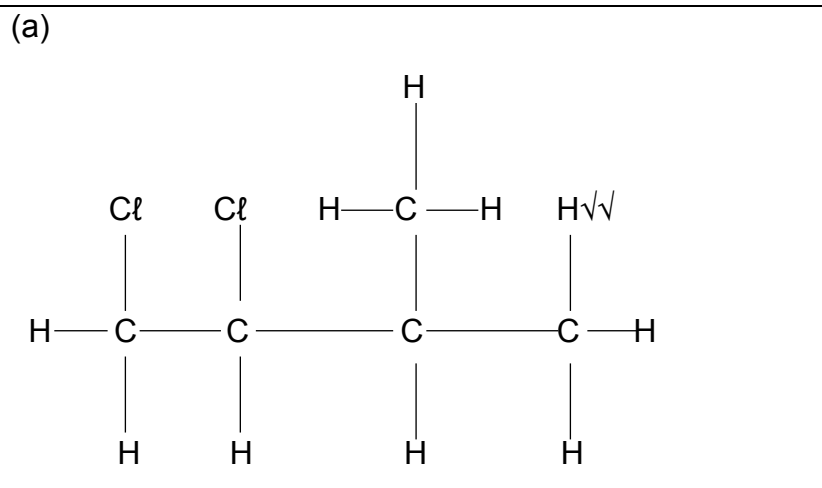
[14]

QUESTION 4/VRAAG 4

4.1 4.1.1 (a) Addition ✓ /Halogenation/Bromination ✓
Addisie / Halogenasie ✓/Brominasie (1)

(b) Elimination ✓/Dehydrohalogenation ✓
Eliminasie / Dehidrohalogenering (1)

4.1.2

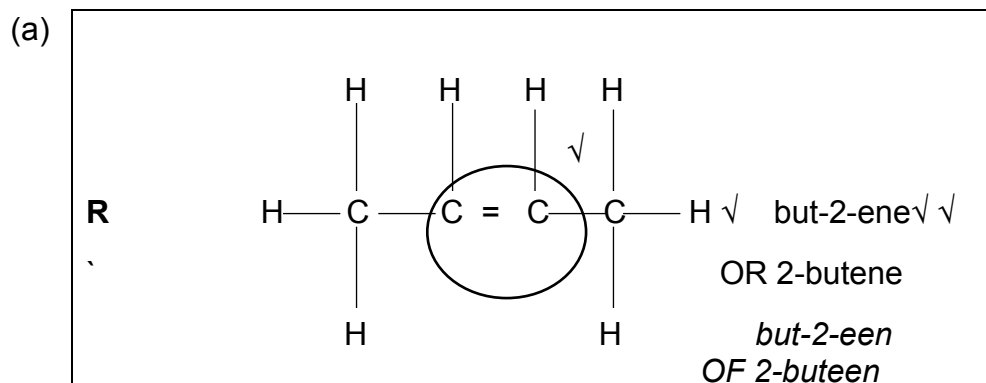
**Marking criteria/Nasienriglyne**

- Whole structure correct 3/3
- Volle struktuur korrek 3/3
- Two Br atoms in structure 1/3
- Twee Br atome in struktuur 1/3

(3)

(b) Chlorine ✓
Chloor (1)

4.1.3

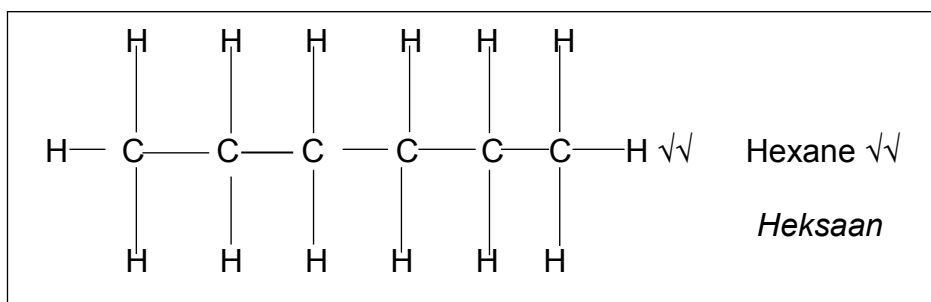
**Marking criteria/Nasienriglyne**

- Whole structure correct 2/2
- Vollestruktuur korrek 2/2
- Only functional group correct ½
- Slegs een funksionele groep korrek ½

(4)

(b) Strong heat ✓ OR Concentrated strong base
Vurige hitte OF Gekonsentreerde sterk basis (1)

- 4.2 4.2.1 ADDITION ✓
ADDISIE (1)
- 4.2.2 $n = 1000$ ✓ (1)
- 4.2.3 Monomer ✓
Monomeer (1)
- 4.2.4 Make plastics✓/ (Any other correct answer)
Vervaardiging van plastiek / (Enige ander korrekte antwoord) (1)
- 4.3 4.3.1 Breaking down of a long chain ✓ / hydrocarbon/alkane into more useful shorter chains ✓
Breek van 'n lang ketting / koolwaterstof / alkaan in nuttiger korter kettings (2)
- 4.3.2 THERMAL CRACKING ✓
TERMIESE KRAKING (1)
- 4.3.3



Marking criteria/Nasienriglyne

- Whole structure correct 2/2
- Volle struktuur korrek 2/2
- If one or more hydrogens are omitted ½
- Een of meer waterstofatome uitgesluit ½

(4)
[22]

QUESTION 5/VRAAG 5

- 5.1 Temperature✓/Concentration ✓ (of H_2O_2)/Add a catalyst ✓
Temperatuur / Konsentrasie (van H_2O_2) / addisie van 'n katalisator (3)
- 5.2 Change in concentration per unit time/Rate of change of concentration ✓✓
OR change in amount/volume/mass of reactant/product per unit time.
- Verandering in konsentrasie per eenheidstyd / Tempo van verandering van konsentrasie
OF 'n verandering in hoeveelheid / volume / massa van reaktant / produk per eenheidstyd (2)

- 5.3 5.3.1 Average rate/*Gemiddelde tempo* = $-\Delta c/\Delta t = -(1,45-1,9) \sqrt{}/(15-0) \sqrt{}$
 $= 0,03 \sqrt{}$ (mol·dm⁻³·min⁻¹) (3)
- 5.3.2 High concentration $\sqrt{\sqrt{}}$ (of H₂O₂ initially)
Hoë konsentrasie (van H₂O₂ oorspronklik) (2)
- 5.4 5.4.1 ENDOTHERMIC $\sqrt{}$
ENDOTERMIES (1)
- 5.4.2 Catalyst increases rate of reaction $\sqrt{}$ /*Katalisator verhoog reaksietempo*
- By lowering activation energy /*Deur aktiveringsenergie te verlaag* $\sqrt{}$
 - More particles have sufficient E_k to react $\sqrt{}$ /More particles have E_k greater or equal to E_a/*Meer deeltjies het genoeg E_k om te reageer*
 $\sqrt{}$ / *meer deeltjies het 'n E_k groter of gelyk aan E_a* $\sqrt{}$
 - More effective collisions per unit time $\sqrt{}$ /*Meer effektiewe botsings per eenheidstyd* (4)
- 5.5 5.5.1 Experiment 1 $\sqrt{}$: More particles have higher E_k $\sqrt{}$
Eksperiment 1 : Meer deeltjies het hoër E_k (2)
- 5.5.2 EQUAL TO $\sqrt{}$
GELYK AAN
- Same amount of H₂O₂ used in both experiments $\sqrt{}$
Dieselfde hoeveelheid H₂ O₂ word in beide eksperimente gebruik (2)
- 5.6 $n_{O_2} = V/V_m = 0,2/24,8 \sqrt{=} 8,065 \times 10^{-3}$ mol
 $n_{H_2O_2} = 2 \sqrt{ } \times 8,065 \times 10^{-3}$
 $= 0,061$ mol
 $m_{H_2O_2} = nM \sqrt{=} 0,0161 \times (2+32) \sqrt{}$
 $= 0,547g \sqrt{}$ (0,55 g) (5)
- 5.7 5.7.1 Q $\sqrt{}$ (1)
- 5.7.2 R $\sqrt{}$ (1)
- 5.7.3 P $\sqrt{}$ (1)
- [27]**

QUESTION 6/VRAAG 6

- 6.1 Stage reached by a chemical reaction where the rate of forward reaction equals the rate of reverse reaction ✓✓
Fase word bereik deur 'n chemiese reaksie waar die tempo van voorwaartse reaksie gelyk is aan die tempo van terugwaartse reaksie (2)
- 6.2 6.2.1 REMAINS THE SAME ✓
 BLY DIESELFDE (1)
- 6.2.2 INCREASES ✓
 TOENEEM (1)
- 6.2.3 INCREASES ✓
 TOENEEM (1)
- 6.3 Decreasing pressure is opposed ✓
 Reaction which produces more gas moles is favoured ✓
 Forward reaction is favoured ✓
Afnemende druk is word teengestaan
Reaksie wat meer gasmol produseer, word bevoordeel
Voorwaartse reaksie word bevoordeel (3)
- 6.4 6.4.1 REVERSE ✓
 TERUGWAARTS (1)
- 6.4.2 Catalyst ✓✓ (added)
 Katalisator (bygevoeg) (2)

OPTION 1/OPSIE 1

6.5 **CALCULATIONS USING NUMBER OF MOLES**
BEREKENINGE MET DIE GEBRUIK VAN AANTAL MOL

- Divide by/Deel deur 44 in $n = m/M$ ✓
- Divide $n_{\text{CO}_2 \text{ equil}}$ & $n_{\text{CO equil}}$ by 2 ✓
- $\Delta n(\text{CO}_2) = n_{\text{initial}} - n_{\text{eq}}$ ✓
- Ratio *verhouding* $\text{CO}_2 : \text{CO}$ 1 : 2 ✓
- $n_{\text{equil CO}} = n_{\text{CO initial}} + \Delta n(\text{CO})$ ✓
- K_c expression/*Uitdrukking* ✓
- Substituting/*Substitusie* $c_{\text{equil CO}}$ en $c_{\text{equil CO}_2}$ ✓
- Final answer /Finale *antwoord* ✓

OPTION 1/OPSIE 1

$$n_{\text{initial CO}_2} = m/M = 104,72/44 \sqrt = 2,38 \text{ mol}$$

	CO₂	C	CO
n_{initial}	2,38		0
Δn	0,48 $\sqrt$		0,96 $\sqrt$ (Ratio)
n_{equilim}	1,9		0,96 $\sqrt$
C_{equilim}	7,6		3,84 $\sqrt$ (Division by 0,25)

$$K_c = [\text{CO}]^2/[\text{CO}_2] \sqrt$$

$$= 3,84^2/7,6 \sqrt$$

$$= 1,94 \sqrt$$

OPTION 2/OPSIE 2**CALCULATIONS USING CONCENTRATION****BEREKENINGE MET DIE GEBRUIK VAN KONSENTRASIE**

- Substitute into / *Substitusie in C=m/MV*
Substitute into/ *Substitusie in c=n/V* $\sqrt$
- $\Delta c(\text{CO}_2) = c_{\text{initial}} - c_{\text{eq}} \sqrt$
- Ratio/Verhouding CO₂ : CO 1:2 $\sqrt$
- $c_{\text{equil CO}} = c_{\text{CO initial}} + \Delta c(\text{CO}) \sqrt$
- K_c expression / *Uitdrukking* $\sqrt$
- Substituting / *Substitusie* $c_{\text{equilim CO}}$ and $c_{\text{equilim CO}_2}$ $\sqrt$
- Final answer / *Finale antwoord* $\sqrt$

Initial Concentration of CO ₂ <i>Aanvanklike konsentrasie van CO₂</i>	Equilibrium concentration of CO ₂ <i>Ekwilibrium konsentrasie van CO₂</i>
$c = \frac{m}{MV}$ $c = \frac{104,72}{(44)(0,25)} \sqrt$ $c = 9,52 \text{ mol} \cdot \text{dm}^{-3}$	$c = \frac{n}{v}$ $c = \frac{1,9}{0,25} \sqrt$ $c = 3,84 \text{ mol} \cdot \text{dm}^{-3}$

	CO₂	C	CO
C_{initial}	9,52	-	0
Δc	1,90 $\sqrt$	-	3,84 $\sqrt$ (Ratio)
C_{equilim}	7,60	-	3,84 $\sqrt$

$$K_c = [\text{CO}]^2/[\text{CO}_2] \sqrt$$

$$= 3,84^2/7,6 \sqrt$$

$$= 1,94 \sqrt$$

(8)

6.6 6.6.1 Low $\checkmark$ Yield/ *Lae Opbrengs*
 K_c is low $\checkmark$ / K_c is less than 1 / $[REACTANTS] > [PRODUCTS]$
K_c is laag / K_c is minder as 1 / [REAKTANTE] > [PRODUKTE] (2)

6.6.2 Exothermic $\checkmark$ *Eksotermies*



- As temperature decreases, K_c decreases, [Products] decreases $\checkmark$
 OR [Reactants increases]
- Reverse reaction is favoured $\checkmark$
- Decrease in temperature favours exothermic reaction $\checkmark$
- *Soos temperatuur afneem, verminder K_c, verminder [Produkte] $\checkmark$*
OF [Reaktante neem toe]
- *Omgekeerde reaksie word bevoordeel $\checkmark$*
- *Afname in temperatuur bevoordeel eksotermiese reaksie $\checkmark$*

(4)

[25]

QUESTION 7

7.1 7.1.1 Reaction of a salt with water $\checkmark\checkmark$
Reaksie van 'n sout met water (2)

7.2 7.1.2 Can act as acid and as a base $\checkmark\checkmark$ / Can donate H^+ and accept H^+
Kan as suur en as 'n basis optree / kan H^+ skenk en H^+ aanvaar (2)

7.1.3 HCO_3^- $\checkmark$ (1)

7.1.4 H_2CO_3 $\checkmark$ (1)

7.2 7.2.1 Standard $\checkmark$ (solution)
Standaard (oplossing) (1)

7.2.2 CH_3COOH $\checkmark\checkmark$ (2)

7.2.3 $c_1V_1 = c_2V_2$ $n = cV = (0,2)(0,02) \checkmark = 0,004 \text{ mol}$
 $0,2 \times 20 \checkmark = 0,16 \times V_2 \checkmark$ $V = n/c = (0,004)/(0,16) \checkmark$
 $V_2 = 25 \text{ cm}^3 \checkmark$ OR $0,025 \text{ dm}^3$ $V = 25 \text{ cm}^3 \checkmark$ **OR/OF** $0,025 \text{ dm}^3$ (3)

7.3 7.3.1 Neutralisation $\checkmark$
Neutralisasie (1)

7.3.2 6,8 to 7,2 $\checkmark$
Titration between strong base and a strong acid $\checkmark$
Solution at endpoint is neutral $\checkmark$
Titrasie tussen sterk basis en 'n sterk suur
Oplossing by eindpunt is neutraal (3)

7.3.3 $n_{\text{NaOH reacting}} = cV = 0,1 \times 30/1000 \checkmark = 0,003 \text{ mol}$
 $n_{\text{HCl reacting}} = 0,003 \text{ mol} \checkmark$
 $c_{\text{HCl}} = n/V = 0,003/(25/1000) \checkmark$
 $= 0,12 \text{ mol.dm}^{-3} \checkmark$
 OR $c_A V_A / c_B V_B = n_A / n_B$
 $c_A \times 25 / 0,1 \times 30 = 1/1$
 $c_A = 0,12 \text{ mol.dm}^{-3}$

(4)

7.3.4 Point where an indicator changes colour $\checkmark\checkmark$
Punt waar 'n indikator van kleur verander

(2)

7.3.5 **POSITIVE MARKING FROM 7.3.3**

$n_{\text{HCl excess}} = cV \checkmark = 0,12 \times 8/1000 \checkmark$
 $= 9,6 \times 10^{-4} \text{ mol}$
 $c_{\text{HCl}} = n/V = 9,6 \times 10^{-4} / (30 + 25 + 8) \checkmark / 1\ 000 \checkmark$
 $= 0,015 \text{ mol.dm}^{-3}$

$\text{pH} = -\log[\text{H}_3\text{O}^+] \checkmark$
 $= -\log(0,15) \checkmark$
 $= 0,82 \checkmark$

(7)

[29]**TOTAL /TOTAAL: 150**

