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 √
GEKONSENTREERD (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 H_2O √ (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 √ = 4,55 n = 9,1/1 √= 9,1 n =(100-54.55-9.1) √ /16 √ = 2.27
= 2 = 4
Empirical formula/*Empiriese formule* C_2H_4O √
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*= $C_4H_8O_2$ √ (8)

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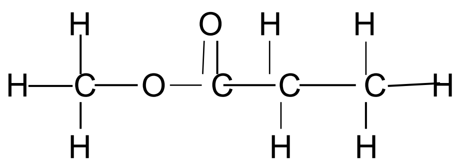
QUESTION 3/*VRAAG 3*

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
<u>Same molecular formula</u> √ but <u>different structural formulae</u> √
<u>Dieselfde molekulêre formule</u> maar <u>verskillende struktuurformules</u> (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)
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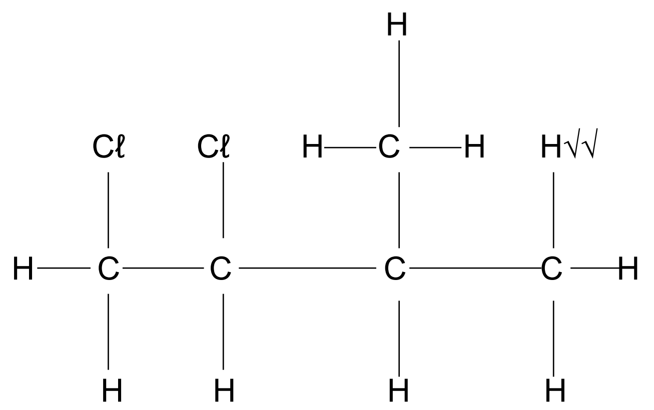
QUESTION 4/*VRAAG 4*

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

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

4.1.2 (a)



Marking criteria/*Nasienriglyne*

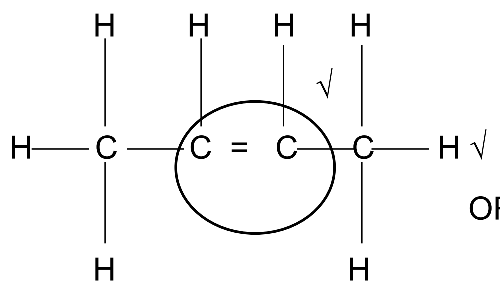
- Whole structure correct 3/3
- *Volle struktuur korrek 3/3*
- Two Br atoms in structure 1/3
- *Twee Br atome in struktuur 1/3*

(3)

(b) Chlorine √
Choor (1)

4.1.3 (a)

R



but-2-ene√ √
OR 2-butene
but-2-een
OF 2-buteen

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 <u>Concentrated strong base</u>
Vurige hitte OF <u>Gekonsentreerde sterk basis</u> (1)

4.2 4.2.1 ADDITION √
ADDISIE (1)

4.2.2 n = 1000 √ (1)

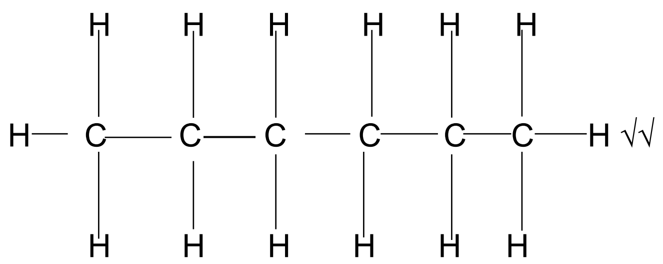
4.2.3 Monomer √
Monomeer (1)

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



Hexane √√
Heksaan

Marking criteria/*Nasienriglyne*
- Whole structure correct 2/2
- *Volle struktuur korrek 2/2*
- If one or more hydrogens are omitted ½
- *Een of meer waterstofatoome uitgesluit ½*

(4)
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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* = - Δc/Δt= - (1,45-1,9) √ /(15-0) √

= 0,03√ ($mol \cdot dm^{-3} \cdot min^{-1}$) (3)

5.3.2 High concentration √√ (of H_2O_2 initially)
Hoë konsentrasie (van H_2O_2 oorspronklik) (2)

5.4 5.4.1 ENDOTHERMIC √
ENDOTERMIES (1)

5.4.2 Catalyst increases rate of reaction√/*Katalisator verhoog reaksietempo*

- By lowering activation energy /*Deur aktiveringsenergie te verlaag* √
- More particles have sufficient E_k to react √/More particles have E_k greater or equal to E_a/*Meer deeltjies het genoeg* E_k *om te reageer* √ / *meer deeltjies het 'n* E_k *groter of gelyk aan* E_a √
- More effective collisions per unit time √/*Meer effektiewe botsings per eenheidstyd* (4)

5.5 5.5.1 Experiment 1 √ : More particles have higher Ek √
Eksperiment 1 : Meer deeltjies het hoër Ek (2)

5.5.2 EQUAL TO √
GELYK AAN

Same amount of H_2O_2 used in both experiments √
Dieselfde hoeveelheid $H_2 O_2$ word in beide eksperimente gebruik (2)

5.6 $nO_2 = V/V_m$ = 0,2/24,8 √ = 8,065 x 10^{-3} mol
nH_2O_2 = 2 √ x 8,065 x 10^{-3}
= 0,061 mol
m H_2O_2 = nM √= 0,0161 x (2+32) √
= 0,547g√ (0,55 g) (5)

5.7 5.7.1 Q √ (1)

5.7.2 R √ (1)

5.7.3 P √ (1)
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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 $nCO_{2\ equilm}$ & nCO_{equilm} by 2 √
- $\Delta n(CO_2) = n_{initial} - n_{eq}$ √
- Ratio *verhouding* CO_2 : CO 1 : 2 √
- n_{equil} CO = $nCO_{initial} + \Delta n(CO)$ √
- Kc expression/*Uitdrukking* √
- Substituting/*Substitusie* $c_{equilmCO}$ en $c_{equilimCO2}$ √
- Final answer /Finale *antwoord* √

OPTION 1/*OPSIE 1*

$n_{initial}$ CO_2= m/M = 104,72/44 √ = 2,38 mol

	CO_2	C	CO
$n_{initial}$	2,38		0
Δn	0,48 √		0,96√(Ratio)
n_{equilm}	1,9		0,96√
c_{equilm}	7,6		3,84√(Division by 0,25)

Kc = $[CO]^2/[CO_2]$ √
= $3,84^2/7,6$ √
= 1,94 √

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√
- $\Delta c(CO_2) = c_{initial} - c_{eq}$ √
- Ratio/*Verhouding* CO_2 : CO 1:2 √
- c_{equil} CO = $cCO_{initial} + \Delta c(CO)$ √
- Kc expression /*Uitdrukking* √
- Substituting /*Substitusie* $c_{equilmCO}$ and $c_{equilimCO2}$ √
- Final answer /*Finale antwoord* √

Initial Concentration of CO_2 *Aanvanklike konsentrasie van CO_2*	Equilibrium concentration of CO_2 *Ekwilibrium konsentrasie van CO_2*
$c = \frac{m}{MV}$ $c = \frac{104,72}{(44)(0,25)}$ √ $c = 9,52 mol \cdot dm^{-3}$	$c = \frac{n}{v}$ $c = \frac{1,9}{0,25}$ √ $c = 3,84 mol \cdot dm^{-3}$

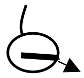
	CO_2	C	CO
$c_{initial}$	9,52	-	0
Δc	1,90√	-	3,84√(Ratio)
c_{equilm}	7,60	-	3,84√

Kc = $[CO]^2/[CO_2]$ √
= $3,84^2/7,6$ √
= 1,94 √

(8)

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

6.6.2 Exothermic √ *Eksotermies*



- As <u>temperature decreases,</u> Kc decreases, <u>[Products] decreases</u> √
  OR [Reactants increases]
- Reverse reaction is favoured √
- Decrease in temperature favours exothermic reaction √
- *Soos temperatuur afneem, verminder Kc, verminder [Produkte]* √
  OF [Reaktante neem toe]
- *Omgekeerde reaksie word bevoordeel* √
- *Afname in temperatuur bevoordeel eksotermiese reaksie* √ (4)

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QUESTION 7

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

7.2 7.1.2 Can act as acid and as a base √√/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^- √ (1)

7.1.4 H_2CO_3 √ (1)

7.2 7.2.1 Standard √ (solution)
Standaard (oplossing) (1)

7.2.2 CH_3COOH √√ (2)

7.2.3 $c_1V_1=c_2V_2$
0,2 x 20 √ = 0,16 x V_2 √
V_2 = 25 cm^3√ OR 0,025 dm^3

n=cV=(0,2)(0.02) √ =0,004 mol
V=n/c= (0,004)/(0,16) √
V=25 cm^3 √ **OR/OF** 0,025 dm^3 (3)

7.3 7.3.1 Neutralisation √
Neutralisasie (1)

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

7.3.3 $n_{NaOH\ reacting}$ = cV = 0,1 x 30/1000 √= 0,003 mol
n_{HCl} reacting = 0,003 mol √
c_{HCl} = n/V = 0,003/(25/1000) √
= 0,12 $mol.dm^{-3}$ √
OR $c_AV_A/c_BV_B= n_A/n_B$
c_A x 25/0,1 x30 = 1/1
c_A = 0,12 $mol.dm^{-3}$ (4)

7.3.4 Point where an <u>indicator changes colour</u> √√
Punt waar 'n <u>indikator van kleur verander</u> (2)

7.3.5 **<u>POSITIVE MARKING FROM 7.3.3</u>**
$n_{HCl\ excess}$ = cV√ = 0,12 x 8/1000 √
=9,6 x 10^{-4} mol
c_{HCl}= n/V = 9,6 x 10^{-4}/(30 + 25 + 8) √/1 000 √
= 0,015 $mol.dm^{-3}$

pH = -log[H_3O^+] √
= - log (0,15) √
= 0,82 √ (7)

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TOTAL /*TOTAAL:* 150