Province of the
EASTERN CAPE
EDUCATION

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Provinsie van die Oos Kaap: Department van Onderwys
Porafensie Ya Kapa Botjhabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD 12*

JUNE/*JUNIE* 2026

PHYSICAL SCIENCES: CHEMISTRY P2/ *FISIESE WETENSKAPPE: CHEMIE V2* MARKING GUIDELINE/*NASIENRIGLYN*

MARKS/*PUNTE*: 150

This marking guideline consists of 15 pages./
Hierdie nasienriglyn bestaan uit 15 *bladsye.*

QUESTION/*VRAAG 1*

1.1 D ✓✓ (2)

1.2 B ✓✓ (2)

1.3 C ✓✓ (2)

1.4 B ✓✓ (2)

1.5 D ✓✓ (2)

1.6 B ✓✓ (2)

1.7 D ✓✓ (2)

1.8 B ✓✓ (2)

1.9 D ✓✓ (2)

1.10 A ✓✓ (2)

[20]

QUESTION/*VRAAG 2*

2.1.1 Formyl group / *Formielgroep* ✓ (1)

2.1.2 $C_nH_{2n}O_2$ ✓ (1)

2.2 Unsaturated. ✓ Contains a triple carbon-carbon bond. ✓
Onversadig. *Bevat 'n drievoudige koolstof-koolstofbinding* (2)

2.3.1 3-ethyl-2-methylpentanal ✓✓✓
3-etiel-2-metielpentanal

Marking criteria/ *Nasienkriteria*

- Correct stem – pentanal/
  Korrekte stam – pentanal
- Substituents correctly identified (ethyl and methyl)/
  Substituente korrek geïdentifiseer (etiel en metiel)/
- Whole name correct
  Hele naam korrek

(3)

2.3.2 2,5-dimethylhept-3-yne ✓✓
2,5-dimethyl-3-heptyne ✓✓

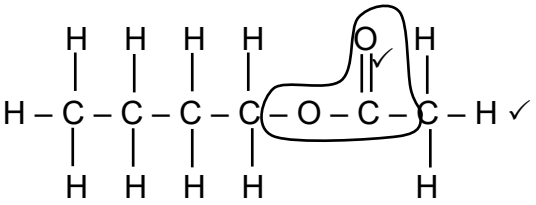
2,5-dimetielhept-3-yn
2,5-dimetiel-3-heptyn

Marking criteria/ *Nasienkriteria*

- Correct stem - hept-3-yne/
  Korrekte stam – hept-3-yn
- Whole name correct/
  Hele naam korrek

(2)

2.4



Marking criteria/ Nasienkriteria

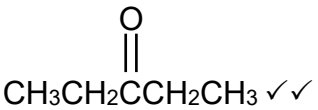
- *Correct functional group/*
  Korrekte funksionele groep
- *Whole structure correct/*
  Hele struktuur korrek

(2)

2.5.1 Pentanal ✓✓ (2)

2.5.2 $CH_3CH_2COCH_2CH_3$ ✓✓

OR



✓✓

Marking criteria/ *Nasienkriteria*

- Position of functional group on carbon 3/
  Posisie van die funksionele groep is op koolstof 3
- Whole structure correct/
  Hele struktuur korrek

(2)
[15]

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QUESTION/*VRAAG 3*

3.1 The experimental boiling points of the compounds will be compared to the known boiling points of compounds ✓ with the given molecular formula. ✓

Die eksperimentele kookpunte van die verbindings sal vergelyk word met die bekende kookpunte van verbindings met die gegewe molekulêre formule. (2)

3.2 Esters ✓ and carboxylic acids ✓
Esters en karboksielsure (2)

3.3.1 **Marking criteria/ *Nasienriglyne***
If any of the underlined key words/phrases in the **correct context** are omitted:
- 1 mark per word/phrase.
Indien enige van die sleutelwoorde/frases in die korrekte konteks weggelaat word:
- 1 punt per word/frase

The temperature at which the vapour pressure of a substance equals the atmospheric pressure ✓✓
Die temperatuur waarby die dampdruk van stof gelyk is aan die atmosferiese druk (2)

3.3.2 **B** ✓ It has the highest boiling point/ *Dit het die hoogste kookpunt* ✓ (2)

3.3.3 2-methylpropanoic acid / *2-metielpropanoësuur* ✓✓ (2)

3.3.4 **MARKING CRITERIA /*NASIENKRITERIA***
- Identifying compound **C** has the weakest intermolecular forces
- Identifying compound **C** belong to esters.
- Identifying compounds **A** and **B** belong to the same homologous series.
- Identifying compound **A** has a shorter chain length than compound **B**

- *Identifiseer dat verbinding **C** wat die swakste intermolekulêre kragte het*
- *Identifiseer dat verbinding **C** aan die esters behoort.*
- *Identifiseer dat verbindings **A** en **B** aan dieselfde homoloëreeks behoort.*
- *Identifiseer dat verbinding **A** korter kettinglengte het as verbinding **B***

- Compound **C** has the lowest boiling point.
- Compound **C** will have the weakest intermolecular forces. ✓
- Compound **C** belongs to the ester ✓
- Compounds **A** and **B** boiling points are close to each other
- Compounds **A** and **B** belong to carboxylic acids/same homologous series ✓
- Compound **A** has a lower boiling point than compound **B**
- Compound **A** will have a shorter chain length than compound **B** ✓

- *Verbinding **C** het die laagste kookpunt*
- *Verbinding **C** het die swakste intermolekulêre kragte*
- *Verbinding **C** behoort aan die esters*

- *Verbinding **A** en **B** se kookpunte is naby mekaar*
- *Verbinding **A** en **B** behoort aan dieselfde homoloë reeks / karboksielsure*
- *Verbinding **A** het 'n korter kettinglengte as verbinding **B*** (4)

[14]

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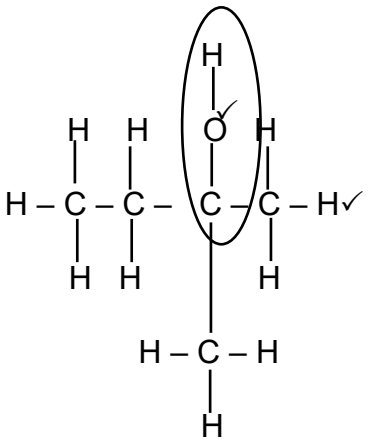
QUESTION/*VRAAG 4*

4.1.1 Addition / Hydration ✓
Addisie / Hidrasie (1)

4.1.2 Substitution / Hydrohalogenation of alcohols ✓
Substitusie / Hidrohalogenering van alkohole (1)

4.1.3 Substitution / Hydrolysis of haloalkanes ✓
Substitusie / Hidratering van haloalkane (1)

4.1.4



Marking criteria/ Nasienkriteria

- *Correct functional group/ Korrek funksionele groep*
- *Whole structure correct/ Hele struktuur korrek*

(2)

4.1.5 2-bromo-2-methylbutane ✓✓✓
2-bromo-2-metielbutaan

Marking criteria/ *Nasienkriteria*

- Correct stem – butane/ *Korrekte stam - butaan*
- Substituents correctly identified (bromo and methyl)/ *Substituente korrek geïdentifiseer (bromo en metiel)*
- Whole name correct/*Hele naam korrek*

(3)

4.1.6 Diluted / *Verdun* ✓ (1)

4.1.7 Conc/ *Gekons* H_2SO_4 / H_3PO_4 ✓ and / *en* heat / *hitte* (under reflux) ✓ (2)

4.2.1 The breaking up of long chain hydrocarbons into smaller more useful molecules ✓✓ **(2 or 0)**
*Die opbreek van langkettingkoolwaterstowwe in kleiner, meer bruikbare molekules **(2 of 0)*** (2)

4.2.2 Ignition/spark source is needed / *Ontstekings-/vonkbron is nodig* ✓ (1)

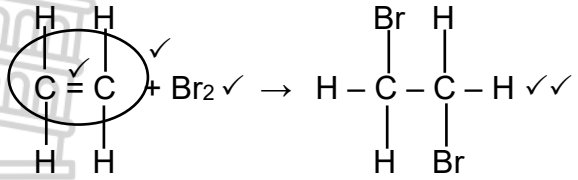
4.2.3 C = 16/ 2 = 8
H = 18x2 / 2 = 18 } ✓

C_8H_{18}
Octane / *Oktaan* ✓✓ (3)

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4.2.4 The combustion reaction is highly exothermic. / *Die verbrandingsreaksie is hoogs eksotermies.* ✓ (1)

4.2.5 Bromine water decolourises / *Broomwater ontkleur* ✓ (1)

4.2.6 

Marking criteria for organic compounds/ Nasienkriteria vir organiese verbindings

- *Correct functional group/ Korrek funksionele groep*
- *Whole structure correct/ Hele struktuur korrek*

(5)
[24]

QUESTION/*VRAAG 5*

5.1 **Marking criteria/ *Nasienriglyne***
If any of the underlined key words/phrases in the **correct context** are omitted: - 1 mark per word/phrase.
Indien enige van die sleutelwoorde/frases in die korrekte konteks weggelaat word: - 1 punt per woord/frase

ANY ONE
- Change in concentration of reactants or products per (unit) time. ✓✓
- Change in amount/number of moles/volume/mass of reactants or products per (unit) time. ✓✓
- Change in amount/number of moles/volume/mass of products formed or reactants used per (unit) time. ✓✓

ENIGE EEN
- *Verandering in konsentrasie van reaktante of produkte per (eenheid) tyd.*
- *Verandering in hoeveelheid/aantal mol/volume/massa van reaktante of produkte per (eenheid) tyd.*
- *Verandering in hoeveelheid/aantal mol/volume/massa van produkte wat gevorm word of reaktante wat per (eenheid) tyd gebruik word.*

OR/*OF*

The rate of changes in concentration/amount of moles/mumber of moles/volume/mass of reactants or products. ✓✓ **(2 or 0)**
Die tempo van veranderinge in konsentrasie/hoeveelheid mol/aantal mol/volume/massa van reaktante of produkte. ***(2 of 0)*** (2)

5.2 No. ✓ There is more than one independent variable / Both the concentration of HCℓ and the initial temperature is different. ✓
Nee. Daar is meer as een onafhanklike veranderlike/ Beide die konsentrasie van HCℓ en die aanvanklike temperatuur is verskillend. (2)

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5.3 The larger the state of division the faster the reaction rate. ✓✓
Hoe groter die toestand van verdeeldheid, hoe vinniger die reaksietempo. (2)

5.4
- Experiment 3 has a higher concentration. ✓
- More particles with correct orientation/ higher average kinetic energy. ✓
- More effective collision per unit time/ Frequency of the effective collision increases. ✓

OR

- Experiment 1 has a lower concentration. ✓
- Less particles with correct orientation/ higher average kinetic energy. ✓
- Less effective collision per unit time/ Frequency of the effective collision decreases. ✓

- *Eksperiment 3 het 'n hoër konsentrasie.*
- *Meer deeltjies met korrekte oriëntasie/ hoër gemiddelde kinetiese energie.*
- *Meer effektiewe botsing per tydseenheid/ Frekwensie van die effektiewe botsing neem toe*

OF

- *Eksperiment 1 het laer konsentrasie.*
- *Minder deeltjies met korrekte oriëntasie/ hoër gemiddelde kinetiese energie.*
- *Minder effektiewe botsing per tydseenheid/ Frekwensie van die effektiewe botsing neem af* (3)

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5.5

OPTION 1	**OPTION 2**
Marking criteria a) Substitution into rate equation *Vervanging in tempo vergelyking* b) Use of mole ratio to determine n ($MgCO_3$) *Gebruik van mol verhouding om n ($MgCO_3$) te bepaal* c) Formula/ *Formule* m = nM d) Subsitution into m = nM *Vervanging in m = nM* *e) Final answer / Finale antwoord* Rate/ *Tempo* $= \frac{\Delta n}{\Delta t}$ $1,488 \times 10^{-4} = \frac{n-0}{40}$ (a) ✓ $n = 5,952 \times 10^{-3}$ mol $n(MgCO_3) = n(CO_2)$ $n(MgCO_3) = 5,952 \times 10^{-3}$ mol (b) ✓ m = nM (c) ✓ $m(MgCO_3) = (5,952 \times 10^{-3})(84)$ (d) ✓ $m(MgCO_3) = 0,5$ g (e) ✓	**Marking criteria** a) Comparing the rate of $MgCO_3$ and CO_2 ✓ *Vergelyk die tempo van $MgCO_3$ en CO_2* b) Substitution into rate equation *Vervanging in tempo vergelyking* c) Formula/ *Formule* m = nM d) Subsitution into m = nM *Vervanging in m = nM* e) Final answer / *Finale antwoord* Rate ($MgCO_3$) = rate (CO_2) (a) ✓ $1,488 \times 10^{-4} = -\frac{0-n}{40}$ (b) ✓ $n = 5,952 \times 10^{-3}$ mol m = nM (c) ✓ $m(MgCO_3) = (5,952 \times 10^{-3})(84)$ (d) ✓ $m(MgCO_3) = 0,5$ g (e) ✓

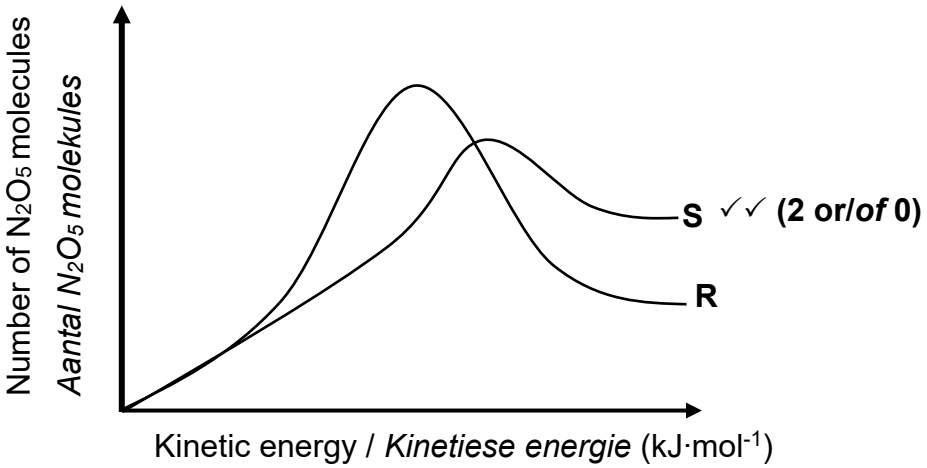
(5)

5.6 5.6.1 Released. ✓ Heat / Enthalpy of the reactants/ H_r is greater than the Heat / Enthalpy of the products/ H_p ✓
Vrygestel. Die warmte / entalpie van die reaktante / Hr is groter as die warmte / entalpie van die produkte / Hp (2)

5.6.2 E_a = 33,33 – 26,6 ✓= 6,73 kJ·mol^{-1} ✓ (2)

5.6.3 **Q** ✓ (1)

5.6.4



(2)

5.7 V(N_2O_5) reacted / *reageer* = 2V(O_2)

V(N_2O_5) reacted / *reageer* = 2(10) ✓

V(N_2O_5) reacted / *reageer* = 20 cm^3

V(N_2O_5) remaining/ *oorbly* =25 – 20 ✓

V(N_2O_5) remaining/ *oorbly* = 5 cm^3 ✓ (3)

[24]

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QUESTION/*VRAAG 6*

6.1 6.1.1 The state at which the rate of the forward reaction equals the rate of the reverse reaction. ✓✓ **(2 or 0)**
Die toestand waarteen die tempo van die voorwaartse reaksie gelyk is aan die tempo van die terugwaartse reaksie. ***(2 of 0)*** (2)

6.1.2 **X** ✓ (1)

6.1.3 Product favoured ✓. The concentration of **X**/N_2O_4 is higher than the concentration of **Y**/NO_2 ✓
*Produkte bevoordeel. Die konsentrasie van **X**/N_2O_4 is hoër as die konsentrasie van **Y**/NO_2* (2)

6.1.4 4 minutes / *minute*. ✓
The concentrations of **X**/N_2O_4 and **Y**/NO_2 remains constant. ✓
*Die konsentrasies van **X**/N_2O_4 en **Y**/NO_2 bly constant.* (2)

6.2.1 Pressure was decreased ✓
- Both forward and reverse reaction rates drop instantly. ✓
- The forward reaction rate drops significantly more. ✓
- Reverse reaction was favoured/The equilibrium shifted towards the left. ✓

Druk was verlaag
- *Beide voorwaartse en terugwaartse reaksiestempo daal onmiddellik.*
- *Die voorwaartse reaksietempo daal aansienlik meer*
- *Terugwaartse reaksie is bevoordeel/Die ewewig het na links verskuif* (4)

6.2.2 Addition of a catalyst / *Addisie van 'n katalisator* ✓ (1)

6.3.1 It is a reaction in which products can be converted back to reactants (and vice versa) ✓✓
Dit is reaksie waarin produkte terug na reaktanse, (en omgekeerd) omgeskakel kan word. (2)

6.3.2 Low yield. ✓ The Kc-value is less than one. ✓
Lae opbrengs. Die Kc-waarde is kleiner as een. (2)

6.3.3 Endothermic ✓

- An increase in temperature favours the endothermic reaction. ✓
- The equilibrium constant, Kc-value increases as the temperature increases. ✓
- The forward reaction is favoured /The equilibrium position shifts towards the right. ✓

Endotermies

- *Toename in temperatuur bevoordeel die endotermiese reaksie.*
- *Die ewewigskonstante, Kc-waarde, neem toe soos die temperatuur toeneem.*
- *Die voorwaartse reaksie word bevoordeel / Die ewewigsposisie verskuif na regs.* (4)

6.4.1 **OPTION 1: MOLE OPTION**

a) Calculating the equilibrium mole of Br_2
b) Use the ratio to calculate the change in mole of NOBr and NO
c) Calculating the equilibrium mole of NOBr and NO
d) Calculating the equilibrium concentration of NOBr and NO
e) Correct equilibrium constant formula
f) Substituting into the correct equilibrium constant formula
g) Final answer

OPSIE 1: MOL OPSIE

a) Berekening van die ewewigsmol van Br_2
b) Gebruik die verhouding om die verandering in mol NOBr en NO te bereken
c) Berekening van die ewewigsmol van NOBr en NO
d) Berekening van die ewewigskonsentrasie van NOBr en NO
e) Korrekte formule vir ewewigskonstante
f) Vervanging in die korrekte ewewigskonstante formule
g) Finale antwoord

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	2 NOBr(g)	⇌	2 NO(g)	Br_2 (g)
Initial mole *Aanvangsmol*	0,157 mol			
Change in mole *Verandering in mol*	0,0195		0,0195 (b) ✓	$9,75 \times 10^{-3}$
Equilibrium mole / *ewewigsmol*	0,1375		0,0195 (c) ✓	0,0195x0,5 (a) ✓ $= 9,75 \times 10^{-3}$
Equilibrium Concentration *Ewewigs konsentrasie* ($mol \cdot dm^{-3}$)	= 0,1375 / 0,5 = 0,275		= 0,0195/0,5 (d) ✓ = 0,039	0,0195

$$Kc = \frac{[Br_2][NO]^2}{[NOBr]^2} \text{ (e) } ✓$$

$$Kc = \frac{(0,0195)(0,039)^2}{(0,275)^2} \text{ (f) } ✓$$

$Kc = 3,92 \times 10^{-4}$ (g) ✓

OPTION 2: CONCENTRATION

a) Calculating the initial concentration of NOBr
b) Determine the change in concentration of Br_2
c) Use the ratio to calculate the change in concentration of NOBr and NO
d) Calculating the equilibrium concentration of NOBr and NO
e) Correct equilibrium constant formula
f) Substituting into the correct equilibrium constant formula
g) Final answer

OPSIE 2: KONSENTRASIE

a) Berekening van die aanvanklike konsentrasie van NOBr
b) Bepaal die verandering in die konsentrasie van Br_2
c) Gebruik die verhouding om die verandering in konsentrasie NOBr en NO te bereken
d) Berekening van die ewewigskonsentrasie van NOBr en NO
e) Korrekte formule vir ewewigskonstante
f) Vervanging in die korrekte ewewigskonstante formule
g) Finale antwoord (7)

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	2 NOBr(g)	⇌	2 NO(g)	Br_2 (g)
Initial conc. *Aanvang kons.*	0,157 / 0,5 = 0,314 (a) ✓			
Change in conc. *Verandering in kons*	0,039		0,039 (c) ✓	0,0195 (b) ✓
Equilibrium Concentration *Ewewigs konsentrasie* ($mol \cdot dm^{-3}$)	0,275		0,039 (d) ✓	0,0195

$$Kc = \frac{[Br_2][NO]^2}{[NOBr]^2} \text{ (e) } ✓$$

$$Kc = \frac{(0,0195)(0,039)^2}{(0,275)^2} \text{ (f) } ✓$$

$Kc = 3,92 \times 10^{-4}$ (g) ✓

6.4.2 REMAINS THE SAME / *BLY DIESELFDE* ✓ (1)

[28]

QUESTION/*VRAAG 7*

7.1.1 **Marking criteria/ Nasienriglyne**
If any of the underlined key words/phrases in the **correct context** are omitted: - 1 mark per word/phrase.
*Indien enige van die sleutelwoorde/frases in die **korrekte konteks** weggelaat word: - 1 punt per woord/frase*

A weak acid ionizes incompletely in water to produce low concentrations of H_3O^+ ✓✓

'n Swak suur ioniseer onvolledig in water om lae konsentrasies van H_3O^+ te produseer. (2)

7.1.2 Yes ✓ Both acids have the same concentration. ✓
Ja. Beide sure het dieselfde konsentrasie. (2)

7.1.3 HNO_3 ✓
For the same concentrations of the acids, HNO_3 has a lower pH-value. ✓
HNO_3 have a higher concentration of H_3O^+ ✓
HNO_3 ionises to a greater extend. ✓

Vir dieselfde konsentrasies van die sure het HNO_3 'n laer pH-waarde.
HNO_3 het hoër konsentrasie H_3O^+
HNO_3 ioniseer tot groter mate. (4)

7.2.1 It is a substance that can act as either acid or base. ✓✓
Dit is 'n stof wat as 'n suur of basis kan optree. (2)

7.2.2 Conjugate base. ✓

$HC_2O_4^-$ has one less proton/H^+ than $H_2C_2O_4$ / $H_2C_2O_4$ is one more proton/H^+ than $HC_2O_4^-$ / $H_2C_2O_4$ donated one proton/H^+ to produce $HC_2O_4^-$. ✓

Gekonjugeerde basis

$HC_2O_4^-$ het een proton/H+ minder as $H_2C_2O_4$ / $H_2C_2O_4$ is een proton/H^+ meer as $HC_2O_4^-$ / $H_2C_2O_4$ het een proton/H^+ geskenk om $HC_2O_4^-$ te produseer. (2)

7.3.1 Hydrolysis / *Hidrolise* ✓ (1)

7.3.2 Acidic / *Suur* ✓

$NH_4^+ + H_2O$ ✓ $\rightleftharpoons NH_3 + H_3O^+$ ✓

Produces excess Hydronium / H_3O^+ ions ✓
Produseer oormaat hidronium- / H_3O^+-ione (4)

7.4.1 Colourless / *Kleurloos* ✓ (1)

7.4.2 **Marking Criteria**

a) Substituting c and V for NaOH into n = cV
b) Using correct mol ratio to calculate moles of H_2A
c) Calculating the concentration of H_2A
d) Formula c = m /MV
e) Substitution into c = m /MV
f) Calculation of molar mass of $H_2C_4H_4O_6$ or $H_2C_2O_4$
g) Final answer

Nasienkriteria

a) Vervanging van c en V vir NaOH in n = cV
b) Gebruik die korrekte molverhouding om mol H_2A te bereken
c) Berekening van die konsentrasie van H_2A
d) Formule c = m /MV
e) Vervanging in c = m /MV
f) Berekening van molêre massa van $H_2C_4H_4O_6$ of $H_2C_2O_4$
g) Finale antwoord

n (NaOH) =cV

n (NaOH) = (0,513)(29,1 x 10^{-3}) (a) ✓
n (NaOH) = 0,0149 mol

n (H_2A) = ½ (0,0149) (b) ✓

n (H_2A) = 7,45x10^{-3} mol

$$c(H_2A) = \frac{n}{V}$$

$$c(H_2A) = \frac{7{,}45\times10^{-3}}{25\times10^{-3}} \text{ (c) ✓}$$

c (H_2A) = 0,298 mol·dm^{-3}

$$c(H_2A) = \frac{m}{MV} \text{ (d) ✓}$$

$$0{,}298 = \frac{45}{M(1)} \text{ (e) ✓}$$

M = 151 g·mol^{-1}

M ($H_2C_4H_4O_6$) = 150 g·mol^{-1}
M ($H_2C_2O_4$) = 90 g·mol^{-1}
} Any one / *Enige een* (f) ✓

H_2A is tartaric acid / *wynsteensuur* / $H_2C_4H_4O_6$ (g) ✓ (7)
[25]

TOTAL/*TOTAAL*: 150

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