basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS
SENIORSERTIFIKAAT-EKSAMEN/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN

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

MAY/JUNE/*MEI/JUNIE* 2026

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 16 pages./
Hierdie nasienriglyne bestaan uit 16 bladsye.

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QUESTION 1/*VRAAG 1*

1.1 A ✓✓ (2)

1.2 C ✓✓ (2)

1.3 C ✓✓ (2)

1.4 C ✓✓ (2)

1.5 D ✓✓ (2)

1.6 A ✓✓ (2)

1.7 A ✓✓ (2)

1.8 D ✓✓ (2)

1.9 B ✓✓ (2)

1.10 B ✓✓ (2)
[20]

QUESTION 2/*VRAAG 2*

2.1 Compounds in which there are no multiple bonds between C atoms in their hydrocarbon chains. ✓✓ **(2 or/*of* 0)**
A compound:
that has ONLY single bonds between C atoms.
that has no double OR triple bonds OR multiple bonds between C atoms.

Verbindings waarin daar geen meervoudige bindings tussen C-atome in hul koolwaterstofkettings is nie
Verbinding wat:
SLEGS enkelbindingsbevat tussen C-atome bevat.
geen dubbel- OF trippelbindings OF meervoudige bindings tussen C-atome nie. (2)

2.2.1 E ✓ (1)

2.2.2 D ✓ (1)

2.2.3 A and/*en* F ✓ (1)

2.3.1

Marking criteria:
- Correct stem, i.e. heptyne. ✓
- Substituent (methyl) correctly identified. ✓
- IUPAC name completely correct including numbering, sequence, hyphens and commas. ✓

Nasienkriteria:
- *Korrekte stam, d.i. heptyn.* ✓
- *Substituente (metiel) korrek geïdentifiseer.* ✓
- *IUPAC-naam heeltemal korrek insluitende nommering, volgorde, koppeltekens en kommas.* ✓

4-methylhept-2-yne /4-methyl-2-heptyne ✓✓✓
4-metielhept-2-yn /4-metiel-2-heptyn (3)

2.3.2

Marking criteria:
- Correct stem, i.e. hexane. ✓
- All substituents (dibromo and dimethyl) correctly identified. ✓
- IUPAC name completely correct including numbering, sequence, hyphens and commas. ✓

Nasienkriteria:
- *Korrekte stam d.i. heksaan.* ✓
- *Alle substituente (dibromo en dimetiel) korrek geïdentifiseer.* ✓
- *IUPAC-naam heeltemal korrek insluitende nommering, volgorde, koppeltekens en kommas.* ✓

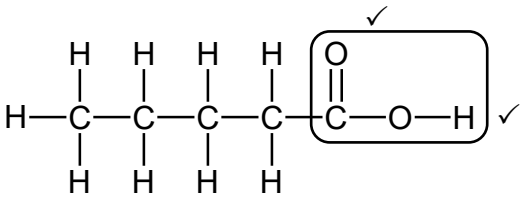
2,4-dibromo-3,5-dimethylhexane/*2,4-dibromo-3,5-dimetielheksaan* ✓✓✓ (3)

2.4.1

Marking criteria/*Nasienkriteria*
If any one of the underlined key phrases in the **correct context** is omitted, deduct 1 mark./*Indien enige van die onderstreepte frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*
The underlined phrases must be in the correct context. / *Die onderstreepte frases moet in die korrekte konteks wees.*

Compounds with the same molecular formula, but different functional groups. ✓✓
Verbindings met dieselfde molekulêre formule, maar verskillende funksionele groepe. (2)

2.4.2



Marking criteria*:*
- Functional group correct. ✓
- Whole structural formula correct. ✓

Nasienkriteria:
- *Funksionele groep korrek.* ✓
- *Hele struktuurformule korrek.* ✓

(2)

2.4.3

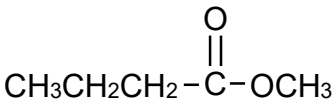
Marking criteria*:*
- Functional group correct. ✓
- Whole condensed structural formula correct. ✓

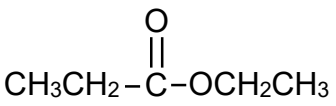
Nasienkriteria:
- *Funksionele groep korrek.* ✓
- *Hele gekondenseerde struktuurformule korrek.* ✓

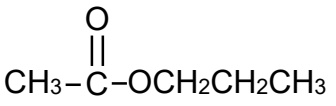
NOTE/*AANTEKENING:*
- Structural formulae used/*Struktuurformule gebruik.* Max./*Maks.* $^1/_2$
- Molecular formulae used/M*olekulêre formule gebruik.* Max./*Maks.* $^0/_2$
- Accept bonds on functional group in condensed structure/*Aanvaar bindings in funksionele groep.*

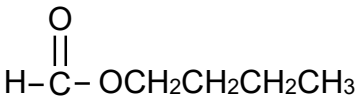
$CH_3CH_2CH_2\overset{\checkmark}{C}OOCH_3$ ✓
$CH_3CH_2COOCH_2CH_3$
$CH_3COOCH_2CH_2CH_3$
$HCOOCH_2CH_2CH_2CH_3$

OR/*OF*







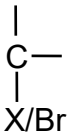


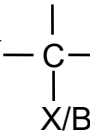
(2)

2.5 Secondary/*Sekondêre* ✓

The halogen (-X/-Br) is bonded to a C atom that is bonded to two other C atoms. ✓
Die halogeen (-X/-Br) is gebind aan 'n C-atoom wat gebind is aan twee ander C-atome

OR

The functional group () is bonded to two other C atoms.

Die funksionele groep () is gebind aan twee ander C-atome.

(2)

2.6 C_5H_{12} + $8O_2$ ✓ → $5CO_2$ + $6H_2O$ ✓ Bal. ✓

Ignore phases./*Ignoreer fases.*

Marking criteria/*Nasienkriteria:*
- Reactants ✓ Products ✓ Balancing: ✓
  Reaktanse *Produkte* *Balansering*
- Ignore double arrows./*Ignoreer dubbelpyle.*
- Marking rule 6.3.10/*Nasienreël 6.3.10.*

IF/*INDIEN*:
Structural formula for C_5H_{12} penalise 1 mark
Struktuur formule vir C_5H_{12} - penaliseer 1 punt.
Equal sign instead of arrow - penalise 1 mark.
Gelykaanteken ipv pyl – penaliseer 1 punt. (3)

[22]

QUESTION 3/*VRAAG 3*

3.1.1 II ✓ (1)

3.1.2 II ✓ (1)

3.1.3 I ✓ (1)

3.2.1

Marking criteria/*Nasienkriteria*
If any one of the underlined key phrases in the **correct context** is omitted, deduct 1 mark./*Indien enige van die onderstreepte frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

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

3.2.2 A, B and C are straight chain primary alcohols ✓
A, B en C is reguitketting primêre alkohole (1)

3.2.3 London/dispersion/Van de Waals forces ✓
London/dispersie/Van de Waalskragte (1)

3.2.4 Increase in chain length ✓
Toename in kettinglengte (1)

3.2.5

Marking criteria:
- Name the TYPES of intermolecular forces. ✓✓
- Compare the strength of intermolecular forces. ✓

OR Compare the energy required to overcome intermolecular forces.
- Compare the boiling points ✓

Nasienkriteria:
- *Vergelyk die TIPE intermolekulêre kragte .*
- *Vergelyk die sterkte van intermolekulêre kragte.*

OF *Vergelyk die energie benodig om intermolekulêre kragte te oorkom.*
- Vergelyk die kookpunt

- Between butan-1-ol molecules are hydrogen bonds (in addition to London and dipole-dipole forces). ✓
- Between butanal molecules are dipole-dipole forces (in addition to London forces). ✓
- Hydrogen bonds are stronger than dipole-dipole forces ✓/More energy needed to overcome/ break hydrogen bonds/ At given temperature less molecules will be in vapour phase.

OR

Dipole-dipole forces are weaker than hydrogen bonds /Less energy needed to overcome/ break dipole-dipole forces./ At given temperature more molecules will be in vapour phase.
- Butan-1-ol has a higher boiling point **OR** Butanal has lower boiling point ✓

- *Tussen die butan-1-ol molekules is waterstofbindings (asook London en dipool-dipoolkragte).*
- *Tussen die butanaal molekules is dipool-dipoolkragte (asook Londonkragte).*
- *Waterstofbindings is sterker as die dipool-dipoolkragte/ Meer energie is nodig om die waterstofbinding te oorkom/breek./ By 'n gegewe temperatuur is minder molekules in dampfase.*

OF

Dipool-dipoolkragte is swakker as die waterstofbinding./ Minder energie word benodig om die dipool-dipoolkragte te oorkom/ breek as die waterstofbindings. By 'n gegewe temperatuur is meer molekules in die dampfase.
- *Butan-1-ol het 'n hoër kookpunt **OF** Butanaal het 'n laer kookpunt*

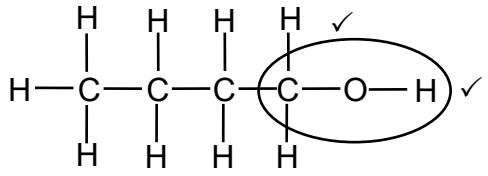
(4)
[12]

QUESTION 4/*VRAAG 4*

4.1.1 Substitution/halogenation/bromination ✓✓
Substitusie/halogenering/brominering (2)

4.1.2 Heat/sunlight/UV / *Hitte/sonlig* ✓ (1)

4.2.1



Marking criteria*:*
- Functional group correct. ✓
- Whole structural formula correct. ✓

Nasienkriteria:
- *Funksionele groep korrek.* ✓
- *Hele struktuurformule korrek.* ✓

(2)

4.2.2 Esterification/Condensation/*Verestering/Esterifikasie/Kondensasie* ✓ (1)

4.2.3 Butyl ✓methanoate ✓ / *Butielmetanoaat* (2)

4.3 Substitution/Hydrolysis / *Substitusie/Hidrolise* ✓✓ (2)

4.4 Hydrogen bromide/HBr / Waterstofbromied ✓

ACCEPT/*AANVAAR*:
Sodium bromide AND sulphuric acid/NaBr + H_2SO_4
Natriumbromied EN swawelsuur (1)

4.5.1 Elimination / *Eliminasie* ✓ (1)

4.5.2 Concentrated strong base/NaOH/KOH/LiOH/ *Gekonstreerde sterk basis* ✓ (1)

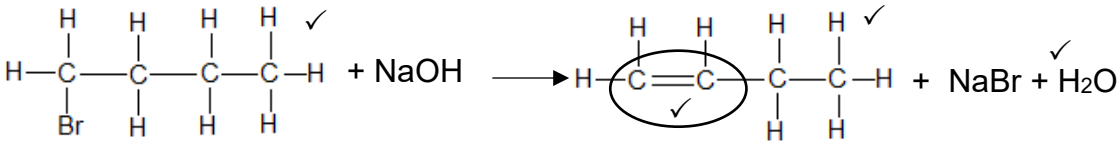
4.5.3 Concentrated sulphuric acid/H_2SO_4/ *Gekonsentreerde swawelsuur*/ ✓
Concentrated phosphoric acid/H_3PO_4 / *Gekonsentreerde fosforsuur* (1)

4.5.4

Marking criteria:
- Whole structural formula of bromoalkane correct (functional group on first C atom).✓
- Functional group of alkene correct. ✓
- Whole structural formula of alkene correct (functional group on first C atom). ✓
- *NaOH, NaBr + H_2O / LiOH, LiBr + H_2O / KOH, KBr + H_2O* ✓

Nasienkriteria:
- *Hele struktuurformule van van haloakaan korrek (funksionele groep op de eerste C-atoom).* ✓
- *Funksionele groep van alkeen korrek.*
- *Hele struktuurformule van van alkeen korrek (funksionele groep op de eerste C-atoom).* ✓
- *NaOH, NaBr + H_2O / LiOH, LiBr + H_2O / KOH, KBr + H_2O* ✓

IF/*INDIEN*
- Condensed, semi structural or molecular formula.
  Gekondenseerde, semi-struktuurformule of molekulêre formule. Max/*Maks*: $^1/_5$
- Marking rule 6.3.10/*Nasienreël 6.3.10*



(4)
[17]

QUESTION 5/*VRAAG 5*

5.1 A substance where the number of moles is stoichiometrically more than needed / A substance that is not first consumed completely /used up in a chemical reaction. ✓✓
Die stof waarvan die aantal mol stoichiometries meer is as wat benodig word. /Die stof wat nie eerste opgebruik is nie in 'n chemiese reaksie. (2)

5.2.1
- At t_3, the concentration of HNO_3 has decreased/Cu is being used up. ✓
- Less (HNO_3) particles per unit volume. ✓
- Less effective collisions per unit time./Lower frequency of effective collisions. ✓

- *By t_3, het die konsentrasie van HNO_3 afgeneem/Cu word opgebruik.*
- *Minder (HNO_3) deeltjies per eenheidsvolume.*
- *Minder effektiewe botsings per eenheidtyd/sekonde./ Laer frekwensie van effektiewe botsings.* (3)

5.2.2 Higher than / *Hoër as* ✓ (1)

5.2.3 Steeper gradient ✓
Steiler helling (1)

5.2.4

Marking criteria/*Nasienkriteria:*
- Substitute the volume and rate into rate formula. ✓
  Vervang volume en die tempo in tempo formule.
- Final correct answer/*Finale korrekte antwoord:* 85 s ✓

$$\text{Ave rate/}gem\ tempo = \frac{\Delta V(NO_2)}{\Delta t}$$

$$0,02 = \frac{1,7}{t_2} \checkmark$$

$$t_2 = 85\ (s) \checkmark$$

(2)

5.2.5

Marking criteria	***Nasienkriteria:***
(a) Formula $n = \frac{V}{V_m}$ or $n = cV$ ✓	(a) *Formule* $n = \frac{V}{V_m}$ *or* $n = CV$ ✓
(b) Substitute 12 and 0,04 in $n = cV$ ✓	(b) *Vervang 12 en 0,04 in* $n = cV$ ✓
(c) Substitute 25 in $n = \frac{V}{V_m}$ ✓	(c) *Vervang 25 in* $n = \frac{V}{V_m}$ ✓
(d) USE mol ratio: $n(HNO_3) : n(NO_2) = 4 : 2$ ✓	(d) *GEBRUIK molverhouding:* $n(HNO_3) : n(NO_2) = 4 : 2$ ✓
(e) Calculate excess moles $n(HNO_3)_{inital} – n(HNO_3)_{used}$/ $c(HNO_3)_{inital} – c(HNO_3)_{used}$. ✓	a) *Bereken oormaat* n $(HNO_3)_{aanvank} – n(HNO_3)_{gebruik}$ $c(HNO_3)_{aanvank} – c(HNO_3)_{gebruik}$.✓
(f) Final correct answer: 4,5 mol·dm^{-3} ✓ Range: 4 to 4,5 mol·dm^{-3}	b) *Finale korrekte antwoord:* 4,5 mol·dm^{-3}✓ *Gebied: 4 to 4,5 mol·dm^{-3}*

$$n(HNO_3)_{ini} = cV \checkmark$$
$$= (12)(0,02) \checkmark$$
$$= 0,24 \text{ mol}$$

$$n(NO_2)_{prod} = \frac{V}{V_m}$$
$$= \frac{1,92}{25} \checkmark$$
$$= 0,077 \text{ mol}$$

$$n(HNO_3)_{used} = \frac{4}{2} n(NO_2)$$
$$= \frac{4}{2}(0,077) \checkmark$$
$$= 0,15 \text{ mol}$$

$$n(HNO_3)_{excess} = 0,24 – 0,15 \checkmark$$
$$= 0,09 \text{ mol}$$

$$c(HNO_3)_{excess} = \frac{n}{V}$$
$$= \frac{0,09}{0,02}$$
$$= 4,32 \text{ mol·dm}^{-3}$$

$$c(H_3O^+) = c(HNO_3) = 4,32 \text{ mol·dm}^{-3} \checkmark$$

(6)

5.2.6 B ✓✓ (2)

5.3 (+)5 ✓✓ (2)
[19]

QUESTION 6/*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 van die onderstreepte frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

When the equilibrium in a closed system is disturbed, the system will re-instate a new equilibrium by favouring the reaction that will cancel/oppose the disturbance. ✓✓
Wanneer die ewewig in 'n geslote sisteem versteur word, sal die sisteem 'n nuwe ewewig instel deur die reaksie te bevoordeel wat die versteuring kanselleer/teenwerk. (2)

6.2 Equilibrium is reached. / *Ewewig is bereik.* ✓ (1)

6.3 Decreased / *Verlaag* ✓
- Forward reaction is favoured/ Concentration of $ICℓ_3$/products increases/ Concentration of I_2 and $Cℓ_2$ /reactants decreases. ✓
- The reaction that produces a fewer number of moles/amount of gas (4 mole gas to 2 moles gas) is favoured/The reaction that decreases the pressure is favoured. ✓

- *Voorwaartse reaksie is bevoordeel/Konsentrasie van $ICℓ_3$/produkte verhoog /Konsentrasie van I_2 en $Cℓ_2$ /reaktanse verminder.*
- *Die reaksie wat 'n kleiner aantal mol/hoeveelheid gas (4 mol gas na 2 mol gas) produseer word bevoordeel./Die reaksie wat die druk verlaag word bevoordeel.* (3)

6.4 Decrease in temperature./*Verlaging van temperatuur.* ✓✓

IF/*INDIEN*:
Temperature/*Temperatuur* Max/*Maks:* $^1/_2$ (2)

6.5

CALCULATIONS USING CONCENTRATION
BEREKENINGE WAT KONSENTRASIE GEBRUIK
Marking criteria*:*
(a) Initial concentrations. ✓
(b) **USE** ratio: $I_2(g)$: $3C\ell_2(g)$: $2IC\ell_3(g)$ ✓
(c) Equilibrium $[I_2]$ = initial $[I_2]$ - change in $[I_2]$
Equilibrium $[C\ell_2]$ = initial $[C\ell_2]$ - change in $[C\ell_2]$
Equilibrium $[IC\ell_3]$ = initial $[IC\ell_3]$ + change in $[IC\ell_3]$ ✓
(d) K_c expression ✓
(e) Substitute K_c value in K_c expression ✓
(f) Substitute concentrations in K_c expression ✓
(g) Calculate $n(I_2)$, substitute 2 dm^3 in n = cV ✓
(h) ***CORRECT*** final answer. ✓
Range: 1,34 – 1,42 mol

Nasienkriteria*:
(a) *Aanvangskonsentrasie.* ✓
(b) ***GEBRUIK*** *verhouding:* $I_2(g)$: $3C\ell_2(g)$: $2IC\ell_3(g)$ ✓
(c) Ewewig $[I_2]$ = *initial* $[I_2]$ - *change in* $[I_2]$
Equilibrium $[C\ell_2]$ = *initial* $[C\ell_2]$ - *change in* $[C\ell_2]$
Equilibrium $[IC\ell_3]$ = *initial* $[IC\ell_3]$ + *change in* $[IC\ell_3]$ ✓
(d) K_c*-uitdrukking* ✓
(e) Vervang K_c *waarde in Kc -uitdrukking* ✓
(f) Vervang konsentrasies in Kc - uitdrukking ✓
(g) Bereken $n(I_2)$, *vervang 2* dm^3 *in n = cV* ✓
(h) ***KORREKTE*** *finale antwoord.* ✓
Gebied: *1,34 – 1,42 mol*

OPTION 1/*OPSIE 1*

	$I_2(g)$	$C\ell_2(g)$	$IC\ell_3(g)$	
Initial concentration ($mol \cdot dm^{-3}$) *Aanvangskonsentrasie ($mol \cdot dm^{-3}$)*	0,15 + x	0,36	0,05	✓**(a)**
Change in concentration ($mol \cdot dm^{-3}$) *Verandering in konsentrasie ($mol \cdot dm^{-3}$)*	0,02	0,06	0,04	✓**(b)**
Equilibrium concentration ($mol \cdot dm^{-3}$) *Ewewigskonsentrasie ($mol \cdot dm^{-3}$)*	0,13 + x	0,3	0,09	✓**(c)**

$$K_c = \frac{[ICl_3]^2}{[I_2][Cl_2]^3} \quad ✓\textbf{(d)}$$

$$0,357 \overset{✓\textbf{(e)}}{=} \frac{(0,09)^2}{\left(\frac{0,26 + x}{2}\right)(0,3)^3} \quad ✓\textbf{(f)}$$

No K_c expression, correct substitution/*Geen K_c-uitdrukking, korrekte substitusie*: Max./*Maks.* $^7/_8$

Wrong K_c expression/
Verkeerde K_c-uitdrukking: Max./M*aks.* $^5/_8$

$x = 0,7103 \ mol \cdot dm^{-3}$

$n\ I_2(g) = cV$ ✓**(g)**
$= (0,7103)(2)$ ✓**(h)**
$= 1,4206$ mol

OPTION 2/*OPSIE 2*

	$I_2(g)$	$C\ell_2(g)$	$ICl_3(g)$	
Initial moles (mol) *Aanvangsmol (mol·dm^{-3})*	0,3 + x	0,72	0,1	✓**(a)**
Change in moles (mol) *Verandering in mol (mol·dm^{-3})*	0,04	0,12	0,08	✓**(b)**
Equilibrium moles (mol) *Ewewigsmol (mol·dm^{-3})*	0,26 + x	0,6	0,18	✓**(c)**
Equilibrium concentration (mol·dm^{-3}) *Ewewigskonsentrasie (mol·dm^{-3})*	$\frac{0,26 + x}{2}$	0,3	0,09	✓**(g)**

$$K_c = \frac{[ICl_3]^2}{[I_2][Cl_2]^3}$$ ✓**(d)**

$$0,357 \overset{\checkmark\textbf{(e)}}{=} \frac{(0,09)^2}{\left(\frac{0,26 + x}{2}\right)(0,3)^3}$$ ✓**(f)**

$x = 1,4206$ mol ✓**(h)**

No K_c expression, correct substitution/*Geen K_c-uitdrukking*, *korrekte substitusie*: Max./*Maks.* $^7/_8$

Wrong K_c expression/
Verkeerde K_c-uitdrukking: Max./*Maks.* $^5/_8$

(8)
[16]

QUESTION 7/*VRAAG 7*

7.1.1
- Endothermic ✓
- Forward reaction is favoured. ✓/K_w increased with an increase in temperature.
- Increase in temperature favours endothermic reaction. ✓

- *Endotermies*
- *Voorwaartse reaksie word bevoordeel./K_w verhoog met 'n toename in temperatuur.*
- *Verhoging in temperatuur bevoordeel die endotermiese reaksie.* (3)

7.1.2

OPTION 1/*OPSIE 1*

$K_w = [H_3O^+][OH^-]$
$5,48 \times 10^{-14} = [H_3O^+]^2$ ✓
$[H_3O^+] = 2,34 \times 10^{-7}$

$pH = -\log[H_3O^+]$ ✓
$= -\log(2,34 \times 10^{-7})$ ✓
$= 6,63$ ✓

OPTION 2/*OPSIE 2*

$pH = -\log[H_3O^+]$ ✓
$= -\log\sqrt{5,48 \times 10^{-14}}$ ✓✓
$= 6,63$ ✓

(4)

7.2.1

Marking criteria/*Nasienkriteria:*
Products / *Produkte* ✓✓ one mark for each/*een punt vir elk*

Marking rule 6.3.10/*Nasienreël 6.3.10*
IF/*INDIEN*:
Ignore/*Ignoreer* ⇌ and phases/*en fases*
Equal sign instead of ⇌ ignore/ Gelykaanteken ipv ⇌ ignoreer

$HCO_3^-(aq) + H_2O(\ell) \rightarrow H_2CO_3(aq)$ ✓ $+ OH^-(aq)$ ✓ (2)

7.2.2

Marking criteria/*Nasienkriteria:*
Products / *Produkte* ✓✓ one mark for each/*een punt vir elk*

Marking rule 6.3.10/*Nasienreël 6.3.10*
IF/*INDIEN*:
Ignore/*Ignoreer* ⇌ and phases/*en fases*
Equal sign instead of ⇌ ignore/ Gelykaanteken ipv ⇌ ignoreer

$HCO_3^-(aq) + H_2O(\ell) \rightarrow CO_3^{2-}(aq)$ ✓ $+ H_3O^+(aq)$ ✓ (2)

NOTE:
If Q7.2.1 and 7.2.2 are swapped around, then 2/4 max.
LET WEL:
Indien V7.2.1 en 7.2.2 omgeruil word, dan 2/4 maks.

7.3.1 **ANY ONE***:*

- A substance whose (aqueous) solution contains ions. ✓
- Substance that dissolves in water to give a solution that conducts electricity.
- A substance that forms ions in water / when melted.

ENIGE EEN*:*

- *'n Stof waarvan die (waterige) oplossing ione bevat*. ✓
- *'n Stof wat in water oplos om 'n oplossing te vorm wat elektrisiteit gelei.*
- *'n Stof wat ione in water vorm / wanneer gesmelt word.* (1)

7.3.2 $H_2C_2O_4$ ✓
Highest K_a value/Strongest acid/Highest concentration of ions formed. ✓
Hoogste K_a waarde/Sterkste suur./*Hoogste konsentrasie ione vorm*. (2)

7.4.1

Marking criteria	***Nasienkriteria:***
(a) Substitute: 0,5 mol·dm^{-3} & 0,05 dm^3 in n = cV ✓	*(a) Vervang: 0,5 mol·dm^{-3} & 0,05 dm^3 in n = cV ✓*
(b) Substitute: 0,378 mol·dm^{-3} & 0,0265 dm^3 in n = cV ✓	*(b) Vervang: 0,378 mol·dm^{-3} & 0,0265 dm^3 in n = cV ✓*
(c) USE ratio: n(HCℓ) = n(NaOH)✓	*(c) GEBRUIK verhouding ratio: n(HCℓ) = n(NaOH) ✓*
(d) nHCℓ = $n_{ini} - n_{excess}$ ✓	*(d) nHCℓ = $n_{aanvanklik} - n_{oormaat}$ ✓*
(e) Final answer: 0,015 mol ✓ Range: 0,01498 to 0,02 mol	*(e) Finale antwoord: 0,015 mol ✓ Gebied: 0,01498 tot 0,02 mol*

nHCℓ = cV
= (0,5)(0,05) ✓**(a)**
= 0,025 mol

nNaOH in titrate = cV
= (0,378)(0,0265) ✓**(b)**
= 1 x 10^{-2} mol

nHCℓ = nNaOH ✓**(c)**
= 1 x 10^{-2} mol

nHCℓ reacted with nOH^- in tablet = 0,025 - 1 x 10^{-2} ✓**(d)**
= 0,015 mol

nOH^- = nHCℓ
= 0,015 mol ✓**(e)**

(5)

7.4.2 **POSITIVE MARKING FROM QUESTION 7.4.1/**
POSITIEWE NASIEN VANAF VRAAG 7.4.1

Marking criteria	***Nasienkriteria:***
(a) 5 parts of nOH^- ions in tablet ✓	*(a) 5 dele van nOH^- ione in tablet ✓*
(b) 3 parts from nAℓ(OH)$_3$ ✓	*(b) 3 dele van nAℓ(OH)$_3$ ✓*
(c) Use ratio nAℓ(OH)$_3$:nOH^- ✓	*(c) Gebruik verhouding nAℓ(OH)$_3$:nOH^- ✓*
(d) Substitute: nAℓ(OH)$_3$ and 78 in $n = \frac{m}{M}$ ✓	*(d) Vervang: nAℓ(OH)$_3$ en 78 in $n = \frac{m}{M}$ ✓*
(e) Final answer = 0,234 g ✓	*(e) Finale antwoord = 0,234 g ✓*

OPTION 1/*OPSIE 1*

nOH^- = 3x + 2x ✓**(a)** = 0,015 mol

nOH^- from/van Aℓ(OH)$_3$
$= \frac{3x}{5x}$ ✓**(b)** x 0,015
= 9 x 10^{-3} mol

nAℓ(OH)$_3$ = $\frac{9 \times 10^{-3}}{3}$ ✓**(c)**
= 3 x 10^{-3} mol Aℓ(OH)$_3$

nAℓ(OH)$_3$ = $\frac{m}{M}$

3 x 10^{-3} = $\frac{m}{78}$ ✓**(d)**

m = 0,234 g ✓**(e)**

OPTION 2/*OPSIE 2*

$\frac{3}{5}$ ✓**(b)** x 0,015 OH^- = nAℓ(OH)$_3$
✓**(a)** = 9 x 10^{-3}

nAℓ(OH)$_3$ = $\frac{9 \times 10^{-3}}{3}$ ✓**(c)**
= 3 x 10^{-3} mol Aℓ(OH)$_3$

nAℓ(OH)$_3$ = $\frac{m}{M}$

3 x 10^{-3} = $\frac{m}{78}$ ✓**(d)**

m = 0,234 g ✓**(e)**

(5)
[24]

QUESTION 8/*VRAAG 8*

8.1 A cell in which chemical energy is converted to electrical energy. ✓✓
'n Sel waarin chemiese energie omgeskakel word na elektriese energie. (2)

8.2.1 $Cd(s) \mid Cd^{2+}(aq) \parallel C\ell_2(g) \mid C\ell^-(aq) \mid Pt(s)$ ✓ ✓ ✓

OR/OF
$Cd(s) \mid Cd^{2+}\ (1\ mol{\cdot}dm^{-3}) \parallel C\ell_2(g) \mid C\ell^-(1\ mol{\cdot}dm^{-3}) \mid Pt\ (s)$

OR/OF
$Cd \mid Cd^{2+} \parallel C\ell_2 \mid C\ell^- \mid Pt$ (3)

8.2.2 Q to/*na* P ✓ (1)

8.2.3

Marking criteria/*Nasienkriteria:*

- $C\ell_2(g) + 2e^- \rightleftharpoons 2C\ell^-(aq)$ $(\frac{1}{2})$ $2C\ell^-(aq) \leftarrow C\ell_2(g) + 2e^-$ $(\frac{2}{2})$
- $C\ell_2(g) + 2e^- \leftarrow 2C\ell^-(aq)$ $(\frac{0}{2})$ $2C\ell^-(aq) \rightleftharpoons C\ell_2(g) + 2e^-$ $(\frac{0}{2})$
- Ignore if charge omitted on electron./*Ignoreer indien lading weggelaat op elektron.*
- If charge (-) omitted on $C\ell^-$/*Indien lading (-) weggelaat op* $C\ell^-$.
  Example/*Voorbeeld:* $C\ell_2 + 2e^- \rightarrow 2C\ell$ Max./*Maks:* $\frac{1}{2}$
- Ignore phases/*Ignoreer fases.*

$C\ell_2(g) + 2e^- \rightarrow 2C\ell^-(aq)$ ✓✓ (2)

8.3 Decreases. /*Verminder.* ✓
Reverse reaction is favoured. / *Terugwaartse reaksie is bevoordeel*. ✓ (2)
[10]

QUESTION 9/*VRAAG 9*

9.1 The chemical process in which electrical energy is converted to chemical energy. ✓✓
OR
The use of electrical energy to produce a chemical change.

Die chemiese proses waar elektriese energie omgeskakel word in chemiese energie.
OF
Die gebruik van elektriese energie om 'n chemiese verandering te weeg te bring. (2)

9.2 $2H_2O \rightarrow O_2(g) + 4H^+ + 4e^-$ ✓✓

$2C\ell^- \rightarrow C\ell_2(g) + 2e^-$ ✓✓ (4)

9.3 $C\ell_2$/Chlorine/*Chloor* ✓ (1)

9.4.1 Copper / Cu / *Koper* ✓ (1)

9.4.2 Iodine / I_2 / *Jodium* ✓ (1)
[9]

TOTAL/*TOTAAL*: 150

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