basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS
SENIORSERTIFIKAAT-EKSAMEN

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

2017

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/*PUNTE*: 150

These marking guidelines consist of 14 pages.
Hierdie nasienriglyne bestaan uit 14 bladsye.

QUESTION/*VRAAG 1*

1.1 D ✓✓ (2)

1.2 D ✓✓ (2)

1.3 B ✓✓ (2)

1.4 A ✓✓ (2)

1.5 C ✓✓ (2)

1.6 A ✓✓ (2)

1.7 B ✓✓ (2)

1.8 D ✓✓ (2)

1.9 C ✓✓ (2)

1.10 C ✓✓ (2)

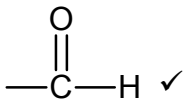
[20]

QUESTION/*VRAAG 2*

2.1 A bond */* an atom / a group of atoms ✓ that <u>determine(s) the</u> (physical and chemical) <u>properties</u> of a group of organic compounds. ✓
'n Binding / 'n atoom / 'n groep atome <u>wat die</u> (fisiese en chemiese) <u>eienskappe</u> van 'n groep organiese verbindings <u>bepaal</u>. (2)

2.2

2.2.1



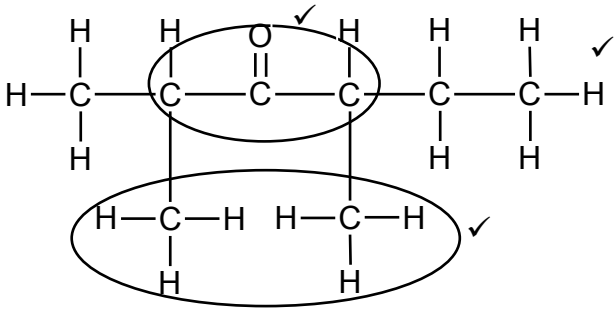
✓ (1)

2.2.2 Carboxyl (group) / *karboksiel(groep)* ✓ (1)

2.3

2.3.1 Ketones / *Ketone* ✓ (1)

2.3.2



<u>Marking criteria/*Nasienriglyne:*</u>
- Functional group/ *Funksionele groep korrek* ✓
- Two methyl substituents/ *Twee metielsubstituente* ✓
- Whole structure correct/ *Hele struktuur korrek:* $\frac{3}{3}$

(3)

2.4

2.4.1 5-bromo-4-ethyl-2,2-dimethylhexane
5-bromo-4-etiel-2,2-dimetielheksaan

Marking criteria/*Nasienriglyne:*
- Correct stem i.e. hexane./*Korrekte stam d.i. heksaan.* ✓
- All substituents (bromo, ethyl and dimethyl) correctly identified./*Alle substituente (bromo, etiel en dimetiel) korrek geïdentifiseer.* ✓
- IUPAC name completely correct including numbering, sequence, hyphens and commas./*IUPAC-naam heeltemal korrek insluitende volgorde, koppeltekens en kommas .* ✓

(3)

2.4.2 4-methylpent-2-yne ✓✓
4-metielpent-2-yn

OR/*OF*
4-methyl-2-pentyne / *4-metiel-2-pentyn*

NOTE/*LET WEL*
4-methyl / *4-metiel* ✓
pent-2-yne / *pent-2-yn* ✓

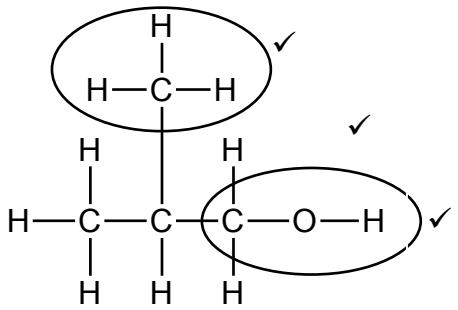
IUPAC name correct but hyphens omitted / *IUPAC naam korrek maar koppeltekens uitgelaat:* ½

(2)
[13]

QUESTION/*VRAAG 3*

3.1

3.1.1



Marking criteria/*Nasienriglyne:*
- Functional group✓
  Funksionele groep korrek
- Methyl substituent on C-2✓
  Metielsubstituent op C-2
- Whole structure correct
  Hele struktuur korrek: ⅗

Accept/*Aanvaar*:
-OH as condensed
-OH as gekondenseerd

(3)

3.1.2 D ✓

Accept/*Aanvaar:*
butan-1-ol

(1)

3.1.3 G ✓

Accept/Aanvaar
2-methylpropan-2-ol / *2-metielpropan-2-ol*

(1)

3.2

3.2.1 (Increase in) chain length / molecular size / molecular mass/ number of C-atoms/ surface area / contact area / number of electrons✓
(Toename in) kettinglengte / molekulêre grootte / molekulêremassa / aantal C-atome (reaksie)oppervlakte / kontakopperlakte /aantal elektrone (1)

3.2.2 London forces / dispersion forces / induced dipole forces ✓
Londonkragte / dispersiekragte / geïnduseerde dipoolkragte (1)

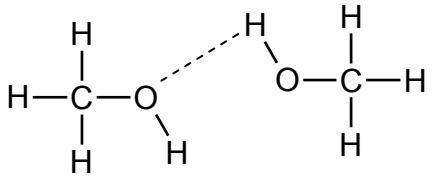
3.3

3.3.1 108 (°C) ✓ (1)

3.3.2 **Compare compound F with compounds C and D:**
Vergelyk verbinding F met verbindings C en D:

- Compound **F** has a larger molecular mass / molecular size / surface area/contact area / number of C-atoms / number of electrons / than compound **C**. ✓
  *Verbinding **F** het 'n groter molekulêre massa/molekulêre grootte / (reaksie)oppervlakte /kontak area / aantal C-atome / aantal elektrone as verbinding **C**.*
- Compound **F** is more branched than compound **D**. ✓
  *Verbinding **F** is meer vertak as verbinding **D**.*
- Intermolecular forces in compound **F** are stronger than in compound **C** and weaker than in compound **D**. ✓
  Intermolekulêre kragte in v*erbinding **F** is sterker as in verbinding **C** en swakker as in verbinding **D**.*
- More energy needed to overcome intermolecular forces in compound **F** than in compound **C** and less energy needed to overcome (break) intermolecular forces in compound **F** than in compound **D**. ✓
  *Meer energie word benodig om intermolekulêre kragte in verbinding **F** te oorkom as in verbinding **C**, en minder energie word benodig om intermolekulêre kragte in verbinding **F** te oorkom / breek as in verbinding **D**.* (4)

3.4



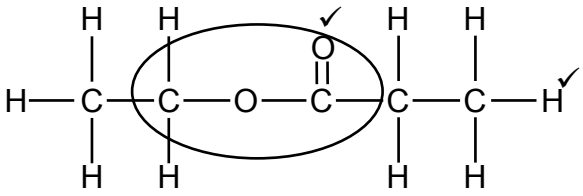
Marking criteria/*Nasienriglyne:*	
At least one structural formula of methanol as shown. *Ten minste een struktuurformule van metanol soos aangetoon.*	✓
Dotted line drawn from O atom on one molecule to H atom bonded to an O atom in the second molecule. (H atom should be between two O atoms.) *Stippellyn getrek van O-atoom op een molekuul na die H-atoom gebind aan 'n O-atoom in die tweede molekuul. (H-atoom moet tussen twee O-atome wees.)* **Accept/*Aanvaar*:** -OH as condensed / *-OH as gekondenseerd*	✓

(2)

3.5

3.5.1 Esterification / Condensation ✓
Verestering / Esterifikasie / Kondensasie (1)

3.5.2



Marking criteria/*Nasienriglyne:*
- Functional group/
  Funksionele groep korrek ✓
- Whole structure correct/
  Hele struktuur korrek: 2/2

(2)
[17]

QUESTION/*VRAAG 4*

4.1

4.1.1 Addition / hydrogenation ✓
Addisie / hidrogenering / hidrogenasie (1)

4.1.2 Substitution / halogenation / chlorination ✓
Substitusie / halogenering / halogenasie / chlorinering / chlorinasie (1)

4.1.3 Elimination / dehydration ✓ (1)
Eliminasie / dehidrasie / dehidrering

4.2 2-bromopropane ✓
2-bromopropaan

Note/*Aantekening:*
IF/*INDIEN*:
Bromopropane/*bromopropaan* 1/2
2-bromo✓
propane✓
(2)

4.3

4.3.1 Dehydrohalogenation / Dehydrobromination ✓
Dehidrohalogenering / dehidrohalogenasie / dehidrobrominering / dehidrobrominasie (1)

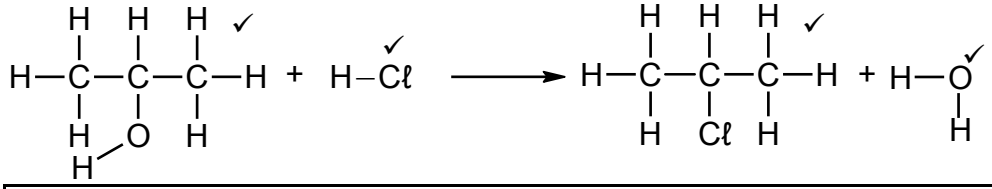
4.3.2 Hot✓ ethanolic strong base✓

- Concentrated strong base / NaOH / KOH✓
  Gekonsentreerde sterk basis / NaOH / KOH
  OR/*OF*
  Strong base with no water */ Sterk basis met geen water nie.*
  OR/*OF*
  Strong base in (pure) ethanol as solvent. / *Sterk basis in (suiwer) etanol as oplosmiddel.*
- Strongly heated or hot base / *Sterk verhitte of warm basis*
  OR/*OF*
  High temperature/heat strongly / *Hoë temperatuur/sterk verhit* (2)

4.4

4.4.1 H_2O / NaOH / KOH ✓ (1)

4.4.2



Notes/*Aantekeninge*:
- Ignore/*Ignoreer* ⇌
- Accept HCℓ and H_2O as condensed./*Aanvaar HCℓ en H_2O as gekondenseerd.*
- Any additional reactants and/or products
  Enige addisionele reaktanse en/of produkte: Max./*Maks.* $^3/_4$
- Accept coefficients that are multiples.
  Aanvaar koëffisiënte wat veelvoude is.
- Incorrect balancing/*Verkeerde balansering*: Max./*Maks.* $^3/_4$
- Molecular/condensed formulae
  Molekulêre/gekondenseerde formule: Max./*Maks.* $^2/_4$

Accept/*Aanvaar*: -OH as condensed / *-OH as gekondenseerd* (4)

[13]

QUESTION/*VRAAG 5*

5.1

5.1.1 To measure volume / amount ✓ of gas/oxygen produced.
Om die volume van die gas / suurstof berei te meet. (1)

5.1.2 Catalyst / Speeds up the reaction. / Increases reaction rate. ✓
Katalisator / Versnel die reaksie. / Verhoog die reaksietempo. (1)

5.2 No gas / bubbles produced. / *Geen gas / borrels word gevorm nie.* ✓
OR/*OF*
Volume of gas in syringe remains constant. / The plunger stops moving.
Volume van gas in spuit bly konstant. / Die suier hou op beweeg. (1)

5.3 CuO / Copper(II) oxide / catalyst ✓
CuO / koper(II)oksied / katalisator (1)

5.4
- A catalyst provides an alternative pathway of lower activation energy. ✓
  'n Katalisator verskaf 'n pad van laer aktiveringsenergie.
- More molecules have sufficient / enough kinetic energy. / *Meer molekule het voldoende/genoeg kinetiese energie.* ✓
  OR/*OF*
  More molecules have kinetic energy equal to or greater than the activation energy./ M*eer molekule het kinetiese energie gelyk aan of groter as die aktiveringsenergie.*
- More effective collisions per unit time. / Frequency of effective collisions increases. ✓
  Meer effektiewe botsings per eenheidtyd. / Frekwensie van effektiewe botsings neem toe. (3)

5.5

5.5.1 Released / *Vrygestel* ✓
Products at lower (potential) energy than reactant. / Reaction is exothermic / $\Delta H < 0$ ✓
Produkte by laer (potensiële) energie as reaktans. / Reaksie is eksotermies. / $\Delta H < 0$ (2)

5.5.2 B ✓ (1)

5.6

$n(O_2)_{produced} = \frac{V}{V_m}$

$= \frac{0,4}{25}$ ✓

$= 0,016$ mol

Marking criteria/*Nasienriglyne:*
- Use 0,4 dm^3 and 25 dm^3 to calculate $n(O_2)$. ✓
  Gebruik 0,4 dm^3 en 25 dm^3 om $n(O_2)$ te bereken.
- Use/*Gebruik* $n(H_2O_2) = 2n(O_2)$. ✓
- Substitute/*Vervang* 0,05 dm^3 in a/*'n* relevant formula /*relevante formula* ✓
- Substitute $\Delta c/\Delta n$ in rate formula. ✓
  Vervang $\Delta c/\Delta n$ in tempoformule.
- Substitute Δt in rate formula ✓
  Vervang Δt in tempoformule.
- Final answer/*Finale antwoord:*
  0,11 $mol \cdot dm^{-3} \cdot min^{-1}$ ✓
  Range/*Gebied*: 0,11 to 0,14 $mol \cdot dm^{-3} \cdot min^{-1}$

OPTION/*OPSIE 1*

$n(H_2O_2)_{used/gebruik} = 2(0,016)$ ✓
$= 0,032$ mol

$[H_2O_2] = \frac{n}{V}$

$= \frac{0,032}{0,05}$ ✓

$= 0,64$ $mol \cdot dm^{-3}$

Rate/*tempo* $= -\frac{\Delta c}{\Delta t}$

$= -\frac{0 - 0,64}{5,8 - 0}$ ✓ ✓

$= 0,11$ $(mol \cdot dm^{-3} \cdot min^{-1})$ ✓

Accept /*Aanvaar*: $\frac{0,64}{5,8}$ ✓ and $\frac{-0,64}{5,8}$

OPTION/*OPSIE 2*

Rate at which O_2 is formed:
Tempo waarteen O_2 vorm:

rate $= \frac{\Delta n}{\Delta t}$

$= \frac{0,016 - 0}{5,8 - 0}$ ✓ ✓

$= 2,76 \times 10^{-3}$ $mol \cdot min^{-1}$

Rate/*tempo* H_2O_2 used $= 2$(rate $O_{2formed}$)
$= 2(2,76 \times 10^{-3})$ ✓
$= 5,52 \times 10^{-3}$ $mol \cdot min^{-1}$

Rate/*tempo* $= \frac{5,52 \times 10^{-3}}{0,05}$ ✓

$= 0,11$ $(mol \cdot dm^{-3} \cdot min^{-1})$ ✓

(6)
[16]

QUESTION/*VRAAG 6*

6.1

6.1.1 Products can be converted back to reactants. ✓
Produkte kan omgeskakel word na reaktanse.

OR/*OF*

Both forward and reverse reactions can take place.
Beide voor-en terugwaartse reaksies kan plaasvind. (1)

6.1.2 Endothermic/*Endotermies* ✓ (1)

6.1.3
- K_c increases with increase in temperature. ✓
  K_c neem toe met toename in temperatuur.
- Forward reaction is favoured. / Concentration of products increases. / Concentration of reactants decreases. ✓
  Voorwaartse reaksie word bevoordeel. / Konsentrasie van produkte neem toe. / Konsentrasie van reaktanse neem af.
- Increase in temperature favours an endothermic reaction. ✓
  Toename in temperatuur bevoordeel 'n endotermiese reaksie. (3)

6.1.4 Increases / *Vermeerder* ✓ (1)

6.1.5 Remains the same / *Bly dieselfde* ✓ (1)

6.2

6.2.1

Marking criteria/*Nasienriglyne:*

(a) Use 48 $g \cdot mol^{-1}$ to calculate n(Ti). ✓
Gebruik 48 $g \cdot mol^{-1}$ om n(Ti) te bereken.

(b) Use 71 $g \cdot mol^{-1}$ to calculate $n(C\ell_2)$. ✓
Gebruik 71 $g \cdot mol^{-1}$ om $n(C\ell_2)$ te bereken.

(c) Use mole ratio/*Gebruik molverhouding*: $n(C\ell_2) = 2n(Ti)$. ✓

(d) $n(C\ell_2)_{equilibrium/ewewig} = n(C\ell_2)_{initial/aanvanklik} - n(C\ell_2)_{reacted/reageer}$. ✓

(e) Divide by volume/*Deel deur volume.* ✓

(f) K_c expression/*K_c uitdrukking.* ✓

(g) Substitution of $c(C\ell_2)$ in K_c/*Vervanging van $c(C\ell_2)$ in K_c.* ✓

(h) Final answer/*Finale antwoord*: 0,25 ✓

OPTION/*OPSIE 1*

	$C\ell_2$	Ti
Initial quantity (mol) *Aanvangshoeveelheid (mol)*	6 ✓(b)	7 ✓(a)
Change (mol)/*Verandering (mol)*	2	1
Quantity at equilibrium (mol) *Hoeveelheid by ewewig (mol)*	4 ✓(d)	6 (a)
Equilibrium concentration ($mol \cdot dm^{-3}$) *Ewewigskonsentrasie ($mol \cdot dm^{-3}$)*	2	

Use mole ratio✓(c)
Gebruik molverhouding

Divide by 2✓(e)
Deel deur 2

$K_c = \frac{1}{[Cl_2]^2}$ ✓(f)

$= \frac{1}{(2)^2}$ ✓(g)

$= 0{,}25$ ✓(h)

No K_C expression/*Verkeerde K_c-uitdrukking*: Max./M*aks.* $\frac{7}{8}$

Wrong K_C expression/*Verkeerde K_c-uitdrukking*: Max./M*aks.* $\frac{5}{8}$

OPTION/*OPSIE 2*

$n(Ti)_{reacted/reageer} = \frac{m}{M} = \frac{336 - 288}{48}$ ✓ $= 1$ mol

$n(C\ell_2)_{reacted/reageer} = 2n(Ti) = 2(1)$ ✓ $= 2$ mol

$n(C\ell_2)_{initial/aanvanklik} = \frac{m}{M} = \frac{426}{71}$✓ $= 6$ mol

$n(C\ell_2)_{equilibrium/ewewig} = 6 - 2$ ✓ $= 4$ mol

$c = \frac{n}{V} = \frac{4}{2}$ ✓

$= 2\ mol \cdot dm^{-3}$

$K_c = \frac{1}{[Cl_2]^2}$ ✓

$= \frac{1}{(2)^2}$✓

$= 0{,}25$ ✓

No K_C expression/*Verkeerde K_c-uitdrukking*: Max./M*aks.* $\frac{7}{8}$

Wrong K_C expression/*Verkeerde K_c-uitdrukking*: Max./M*aks.* $\frac{5}{8}$

(8)

6.2.2 Remains the same / *Bly dieselfde* ✓ (1)

[16]

QUESTION/*VRAAG 7*

7.1

7.1.1 Weak (acid) / *Swak (suur)* ✓ (1)

7.1.2 $pH = -\log[H_3O^+]$ ✓
4 ✓ $= -\log[H_3O^+]$
$[H_3O^+] = 1 \times 10^{-4}$ mol·dm^{-3} ✓ (3)

7.2

7.2.1 A substance that produces hydroxide ions / OH^- in water. ✓✓
'n Stof wat hidroksiedione / OH^- in water vorm.

NOTE/*LET WEL:*
If water is omitted/*Indien water weggelaat is:* $\frac{1}{2}$ (2)

7.2.2

Marking guidelines/*Nasienriglyne:*

- Formula/*Formule:* $c = \frac{n}{V}$ /n = cV/ $\frac{c_a \times V_a}{c_b \times V_b} = \frac{n_a}{n_b}$ ✓
- Use mol ratio/*Gebruik molverhouding:* 1:1 ✓
- Substitution of/*Vervanging van:* 0,16 x 25 /0,16 x 0,025 ✓
- Use/*Gebruik* V_b = 12,5 cm^3/0,0125 dm^3 ✓
- Use/*Gebruik 56 g·mol*$^{-1}$ ✓
- Substitute/*Vervang* V = 0,25 dm^3 ✓
- Final answer/*Finale antwoord:* 4,48 g ✓

OPTION/*OPSIE 1*

$\frac{c_a \times V_a}{c_b \times V_b} = \frac{n_a}{n_b}$ ✓

$\frac{0,16 \times 25}{c_b \times 12,5} = \frac{1}{1}$ ✓✓

c_b = 0,32 mol·dm^{-3}

$c = \frac{m}{MV}$

$0,32 = \frac{m}{56 \times 0,25}$ ✓

m = 4,48 g ✓

OPTION/*OPSIE 2*

$\frac{c_a \times V_a}{c_b \times V_b} = \frac{n_a}{n_b}$ ✓

$\frac{0,16 \times 25}{c_b \times 12,5} = \frac{1}{1}$ ✓✓

c_b = 0,32 mol·dm^{-3}

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

$0,32 = \frac{n}{0,25}$ ✓

n = 0,08 mol

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

$0,08 = \frac{m}{56}$ ✓

m = 4,48 g ✓

OPTION/*OPSIE 3*

$n(acid)_{used} = cV$ ✓
= (0,16)(0,025) ✓
= 4 x 10^{-3} mol

n(KOH) = 4 x 10^{-3} mol ✓

In 12,5 cm^3:
n(KOH) = 4 x 10^{-3} mol

In 250 cm^3
$n(KOH) = \frac{250}{12,5} \times 4 \times 10^{-3}$ ✓✓
= 0,08 mol

m(KOH) = nM
= 0,08 x 56 ✓
= 4,48 g ✓

OPTION/*OPSIE 4*	**OPTION/*OPSIE 5***
$n(CH_3COOH)_{used} = cV$ ✓ $= (0,16)(0,025)$ ✓ $= 4 \times 10^{-3}$ mol ↓ $n(KOH) = 4 \times 10^{-3}$ mol ✓ $c = \frac{n}{V}$ $= \frac{4 \times 10^{-3}}{0,0125}$ ✓ $c_b = 0,32$ mol·dm^{-3} $c = \frac{m}{MV}$ $0,32 = \frac{m}{56 \times 0,25}$ ✓ $m = 4,48$ g ✓	$n(CH_3COOH)_{used} = cV$ ✓ $= (0,16)(0,025)$ ✓ $= 4 \times 10^{-3}$ mol ↓ $n(KOH) = 4 \times 10^{-3}$ mol ✓ $c = \frac{n}{V}$ $= \frac{4 \times 10^{-3}}{0,0125}$ ✓ $c_b = 0,32$ mol·dm^{-3} $c = \frac{n}{V}$ $0,32 = \frac{n}{0,25}$ ✓ $n = 0,08$ mol $n = \frac{m}{M}$ $0,08 = \frac{m}{56}$ ✓ $m = 4,48$ g ✓

(7)

7.2.3 Greater than 7 / *Groter as 7* ✓ (1)

7.2.4 $CH_3COO^-(aq) + H_2O(\ell)$ ✓ ⇌ $CH_3COOH(aq) + OH^-(aq)$ ✓

Due to formation of (OH^-), the solution is <u>basic</u> / alkaline ✓
As gevolg van die vorming van (OH^-) is die oplossing basies / alkalies

<u>Notes/*Aantekeninge*</u>
- Reactants ✓ *Reaktanse* Products ✓ *Produkte* Ignore balancing *Ignoreer balansering*
- Ignore/*Ignoreer* → and phases/*en fases*.
- Marking rule 6.3.10/*Nasienreël 6.3.10*

(3)
[17]

QUESTION/*VRAAG 8*

8.1

8.1.1 Emf / *Emk* ✓ (1)

8.1.2 Voltmeter / Multimeter ✓ (1)

8.1.3 Salt bridge / *Soutbrug* ✓ (1)

8.1.4 Temperature / *Temperatuur*: 25 °C / 298 K ✓
Concentration / *Konsentrasie*: 1 mol·dm^{-3} ✓ (2)

8.2

Marking criteria/*Nasienriglyne*:	
Dependent and independent variables correctly identified. *Afhanklike en onafhanklike veranderlikes korrek geïdentifiseer.*	✓
Relationship between the independent and dependent variables correctly stated./*Verwantskap tussen die afhanklike en onafhanklike veranderlikes korrek genoem.*	✓

Examples/*Voorbeelde*:
Emf increases as concentration (of oxidising agent) increases.
Emk neem toe soos wat konsentrasie (van die oksideermiddel) toeneem.

NOTE/*LET WEL*:
IF/*INDIEN:* Emf is directly proportional to concentration.
Emk is direk eweredig aan konsentrasie. . ½ (2)

8.3

OPTION/*OPSIE 1*

$E^{\theta}_{cell} = E^{\theta}_{reduction} - E^{\theta}_{oxidation}$ ✓
1,11 ✓ = $E^{\theta}_{X/X^{2+}}$ - (- 0,76) ✓
$E^{\theta}_{X/X^{2+}}$ = 0,35 (V) ✓

X = Copper / Cu / *koper* ✓

Accept/*Aanvaar:*
Cu/Cu^{2+} half reaction / *half-reaksie*

Notes/*Aantekeninge*
- Accept any other correct formula from the data sheet./*Aanvaar enige ander korrekte formule vanaf gegewensblad.*
- Any other formula using unconventional abbreviations, e.g. $E°_{cell} = E°_{OA} - E°_{RA}$ followed by correct substitutions:/*Enige ander formule wat onkonvensionele afkortings gebruik bv.* $E°_{sel} = E°_{OM} - E°_{RM}$ *gevolg deur korrekte vervangings: Max/Maks:* ¾

OPTION/*OPSIE 2*

✓ $X^{2+}(aq) + 2e^- \rightarrow X(s)$ 0,35 (V) ✓
$Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$ 0,76 (V) ✓
$X^{2+}(aq) + Zn(s) \rightarrow X(s) + Zn^{2+}(aq)$ 1,11 (V) ✓

X = Copper/Cu/*koper* ✓

Accept/*Aanvaar:*
Cu/Cu^{2+} half reaction / *half-reaksie*

(5)

8.4 $Cu^{2+}(aq) + Zn(s)$ ✓ $\rightarrow Zn^{2+}(aq) + Cu(s)$ ✓ Bal. ✓

Accept/*Aanvaar*:
- $X^{2+}(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + X(s)$
- Any metal identified in QUESTION 8.3 of which the ion has a +2 charge. *Enige metaal geïdentifiseer in VRAAG 8.3 waarvan die ioon 'n +2-lading het.*

Notes/*Aantekeninge*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse *Produkte* *Balansering*
- Ignore phases./*Ignoreer fases*.
- Ignore double arrows./*Ignoreer dubbelpyle.*
- Marking rule 6.3.10/*Nasienreël 6.3.10.*

(3)
[15]

QUESTION/*VRAAG 9*

9.1 Electrolytic (cell) / *Elektrolitiese (sel)* ✓ (1)

9.2 P ✓ (1)

9.3
9.3.1 $Au(s) \rightarrow Au^{3+}(aq) + 3e^-$ ✓✓

Ignore phases / *Ignoreer fases*

Notes/*Aantekeninge*
$Au^{3+} + 3e^- \leftarrow Au$ $(^2/_2)$ $Au^{3+} + 3e^- \rightleftharpoons Au$ $(^0/_2)$
$Au \rightleftharpoons Au^{3+} + 3e^-$ $(^1/_2)$ $Au^{3+} + 3e \rightarrow Au$ $(^0/_2)$

(2)

9.3.2 (+)3 ✓ (1)

9.3.3 Electrical energy (is converted) to chemical energy. ✓
Elektriese energie (omgeskakel) na chemiese energie. (1)

9.3.4 Becomes smaller / thinner / eroded / decrease in mass. □
Word kleiner / dunner / weggevreet / afname in massa. (1)

9.4 **ANY ONE/*ENIGE EEN*:**
- Increase in value. / *Neem toe in waarde.* ✓
- Protection against rust. / *Beskerming teen roes.* (1)

9.5 **ANY ONE/*ENIGE EEN*:**
- Replace $Au^{3+}(aq)$ / electrolyte with $Ag^+(aq)$ / silver(I) solution / use a silver solution
  Vervang $Au^{3+}(aq)$ / elektroliet met $Ag^+(aq)$ / silwer(I)-oplossing / gebruik 'n silwer oplossing
- Replace P / anode / gold with Ag(s) / silver
  Vervang P / anode / goud met Ag(s) / silwer. (1)

[9]

QUESTION/*VRAAG 10*

10.1

10.1.1 B/air/*lug* ✓ & C/methane/*metaan* ✓ (2)

10.1.2 Nitric acid / HNO_3 / *salpetersuur* ✓ (1)

10.1.3 A / Sulphur / *Swael* / S ✓ (1)

10.1.4 $2NH_3(g) + H_2SO_4$ ✓ $\rightarrow$ $(NH_4)_2SO_4$ ✓ Bal. ✓

Notes/*Aantekeninge*
- Reactants ✓ Products ✓ Balancing ✓
  Reaktanse *Produkte* *Balansering*
- Ignore/*Ignoreer* $\rightleftharpoons$ and phases/*en fases*.
- Marking rule 6.3.10/*Nasienreël 6.3.10* (3)

10.1.5 D / potassium chloride / *kalium chloried*✓ (1)

10.2

10.2.1

OPTION/*OPSIE 1*:	**OPTION/*OPSIE 2:***
$\%P = \frac{3}{7}$ ✓ x 22% = 9,43% $\therefore m(P) = \frac{9,43}{100} \times 2$ kg ✓ = 0,19 kg ✓	$\therefore m(P) = \frac{3}{7}$ ✓(0,44) ✓($\frac{22}{100}$ x 2 = 0,44) = 0,19 kg ✓

(3)

10.2.2

OPTION/*OPSIE 1*	**OPTION/*OPSIE 2***
m(fertiliser/*kunsmis*) = $\frac{22}{100}$ x 2 ✓ = 0,44 kg m(filler/bindstof) = 2 – 0,44 ✓ = 1,56 kg ✓	%filler/*bindstof* = 100 – 22 ✓ = 78% m(filler/*bindstof*) = ($\frac{78}{100}$ x 2) ✓ = 1,56 kg ✓

(3)

[14]

TOTAL/*TOTAAL:* 150