



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)

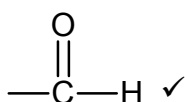
[20]

QUESTION/VRAAG 2

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

2.2

2.2.1



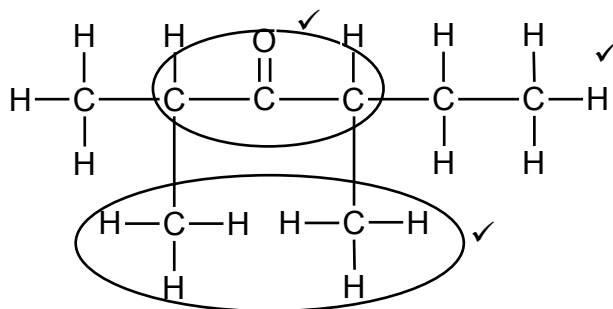
(1)

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

2.3

- 2.3.1 Ketones / *Ketone* ✓ (1)

2.3.2



Marking criteria/Nasienriglyne:

- Functional group/
Funksionele groep korrek ✓
- Two methyl substituents/
Twee metielsubstituent ✓
- 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-etiesel-2,2-dimetieselheksaan

Marking criteria/Nasienriglyne:

- Correct stem i.e. hexane./Korrekte stam d.i. heksaan. ✓
- All substituents (bromo, ethyl and dimethyl) correctly identified./Alle substituenten (bromo, etiel en dimetiesel) 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-metieselpent-2-yn

OR/OF

4-methyl-2-pentyne / 4-metiesel-2-pentyn

NOTE/LET WEL

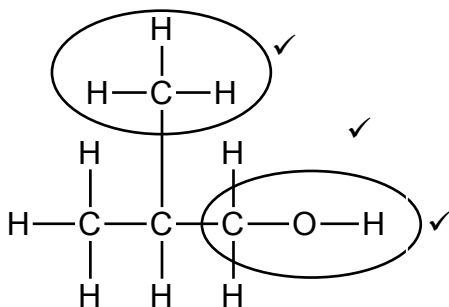
4-methyl / 4-metiesel ✓
pent-2-yne / pent-2-yn ✓

IUPAC name correct but hyphens omitted / IUPAC naam korrek maar koppeltekens uitgelaat: $\frac{1}{2}$

(2)
[13]**QUESTION/VRAAG 3**

3.1

3.1.1

**Marking criteria/Nasienriglyne:**

- Functional group ✓
Funksionele groep korrek
- Methyl substituent on C-2 ✓
Metieselsubstituent op C-2
- Whole structure correct
Hele struktuur korrek: $\frac{3}{3}$

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-metieselpropan-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 / kontakoppervlakte /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)

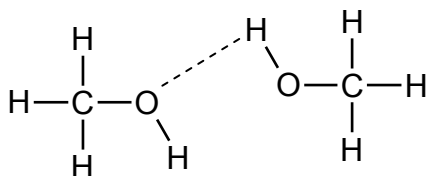
3.3.2 Compare compound F with compounds C and D:

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 verbinding 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. <i>Ten minste een struktuurformule van metanol soos aangetoon.</i>	✓
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.) <i>Stippellyn getrek van O-atoom op een molekule na die H-atoom gebind aan 'n O-atoom in die tweede molekule. (H-atoom moet tussen twee O-atome wees.)</i>	✓
Accept/Aanvaar: -OH as condensed / -OH as gekondenseerd	

(2)

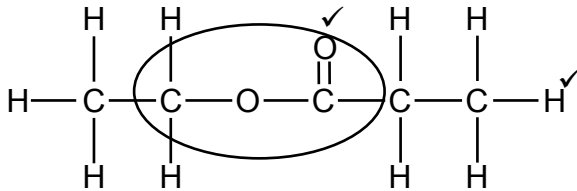
3.5

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 / chlorinerings / chlorinasie

(1)

4.1.3 Elimination / dehydration ✓

Eliminasie / dehidrasie / dehidreering

(1)

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 / dehidrobrominerings / dehidrobrominasie

(1)

4.3.2 Hot ✓ ethanolic strong base ✓

- Concentrated strong base / NaOH / KOH ✓
Gekonsentreerde sterk basis / NaOH / KOH

OR/OFStrong 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/OFHigh temperature/heat strongly / *Hoë temperatuur/sterk verhit*

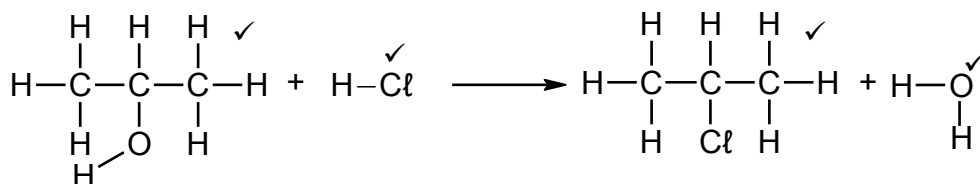
(2)

4.4

4.4.1 H₂O / NaOH / KOH ✓

(1)

4.4.2

**Notes/Aantekeninge:**

- Ignore/Ignoreer ⇌
- Accept HCl and H₂O as condensed./Aanvaar HCl en H₂O 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./ *Meer 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

$n(\text{O}_2)_{\text{produced}} = \frac{V}{V_m}$ $= \frac{0,4}{25} \checkmark$ $= 0,016 \text{ mol}$	<p>Marking criteria/Nasienriglyne:</p> <ul style="list-style-type: none"> Use 0,4 dm³ and 25 dm³ to calculate n(O₂). ✓ Gebruik 0,4 dm³ en 25 dm³ om n(O₂) te bereken. Use/Gebruik n(H₂O₂) = 2n(O₂). ✓ Substitute/Vervang 0,05 dm³ in al'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·dm⁻³·min⁻¹ ✓ Range/Gebied: 0,11 to 0,14 mol·dm⁻³·min⁻¹
<p>OPTION/OPSIE 1</p> $n(\text{H}_2\text{O}_2)_{\text{used/gebruik}} = 2(0,016) \checkmark$ $= 0,032 \text{ mol}$ $[\text{H}_2\text{O}_2] = \frac{n}{V}$ $= \frac{0,032}{0,05} \checkmark$ $= 0,64 \text{ mol}\cdot\text{dm}^{-3}$ $\text{Rate/tempo} = -\frac{\Delta c}{\Delta t}$ $= -\frac{0 - 0,64}{5,8 - 0} \checkmark$ $= 0,11 \text{ (mol}\cdot\text{dm}^{-3}\cdot\text{min}^{-1})$ <p>1) ✓</p> <p>Accept /Aanvaar: $\frac{0,64}{5,8}$ and $\frac{-0,64}{5,8}$</p>	<p>OPTION/OPSIE 2</p> <p>Rate at which O₂ is formed: Tempo waarteen O₂ vorm:</p> $\text{rate} = \frac{\Delta n}{\Delta t}$ $= \frac{0,016 - 0}{5,8 - 0} \checkmark$ $= 2,76 \times 10^{-3} \text{ mol}\cdot\text{min}^{-1}$ <p>Rate/tempo H₂O₂ used = 2(rate O₂formed)</p> $= 2(2,76 \times 10^{-3}) \checkmark$ $= 5,52 \times 10^{-3} \text{ mol}\cdot\text{min}^{-1}$ $\text{Rate/tempo} = \frac{5,52 \times 10^{-3}}{0,05} \checkmark$ $= 0,11 \text{ (mol}\cdot\text{dm}^{-3}\cdot\text{min}^{-1}) \checkmark$

(6)

[16]

QUESTION/VRAAG 6

6.1

- 6.1.1 Products can be converted back to reactants. ✓
Produkke 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 $48 \text{ g}\cdot\text{mol}^{-1}$ to calculate $n(\text{Ti})$. ✓
Gebruik $48 \text{ g}\cdot\text{mol}^{-1}$ om $n(\text{Ti})$ te bereken.
- (b) Use $71 \text{ g}\cdot\text{mol}^{-1}$ to calculate $n(\text{Cl}_2)$. ✓
Gebruik $71 \text{ g}\cdot\text{mol}^{-1}$ om $n(\text{Cl}_2)$ te bereken.
- (c) Use mole ratio/Gebruik molverhouding: $n(\text{Cl}_2) = 2n(\text{Ti})$. ✓
- (d) $n(\text{Cl}_2)_{\text{equilibrium/ewewig}} = n(\text{Cl}_2)_{\text{initial/aanvanklik}} - n(\text{Cl}_2)_{\text{reacted/reageer}}$. ✓
- (e) Divide by volume/*Deel deur volume.* ✓
- (f) K_c expression/ *K_c uitdrukking.* ✓
- (g) Substitution of $c(\text{Cl}_2)$ in K_c /*Vervanging van $c(\text{Cl}_2)$ in K_c .* ✓
- (h) Final answer/*Finale antwoord:* 0,25 ✓

OPTION/OPSIE 1

	Cl ₂	Ti
Initial quantity (mol) <i>Aanvangshoeveelheid (mol)</i>	6 ✓(b)	7 ✓(a)
Change (mol)/ <i>Verandering (mol)</i>	2	1
Quantity at equilibrium (mol) <i>Hoeveelheid by ewewig (mol)</i>	4 ✓(d)	6 (a)
Equilibrium concentration (mol·dm ⁻³) <i>Ewewigskonsentrasie (mol·dm⁻³)</i> □	2	

Use mole ratio ✓(c)
*Gebruik molverhouding*Divide by 2 ✓(e)
Deel deur 2

$$K_c = \frac{1}{[\text{Cl}_2]^2} \quad \checkmark \text{(f)}$$

$$= \frac{1}{(2)^2} \quad \checkmark \text{(g)}$$

$$= 0,25 \quad \checkmark \text{(h)}$$

No K_c expression/*Verkeerde K_c-uitdrukking:*
Max./Maks. $\frac{7}{8}$ Wrong K_c expression/*Verkeerde K_c-uitdrukking:*
Max./Maks. $\frac{5}{8}$ **OPTION/OPSIE 2**

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

$$n(\text{Cl}_2)_{\text{reacted/reageer}} = 2n(\text{Ti}) = 2(1) \quad \checkmark = 2 \text{ mol}$$

$$n(\text{Cl}_2)_{\text{initial/aanvanklik}} = \frac{m}{M} = \frac{426}{71} \quad \checkmark = 6 \text{ mol}$$

$$n(\text{Cl}_2)_{\text{equilibrium/ewewig}} = 6 - 2 \quad \checkmark = 4 \text{ mol}$$

$$c = \frac{n}{V} = \frac{4}{2} \quad \checkmark$$

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

$$K_c = \frac{1}{[\text{Cl}_2]^2} \quad \checkmark$$

$$= \frac{1}{(2)^2} \quad \checkmark$$

$$= 0,25 \quad \checkmark$$

No K_c expression/*Verkeerde K_c-uitdrukking:*
Max./Maks. $\frac{7}{8}$ Wrong K_c expression/*Verkeerde K_c-uitdrukking:*
Max./Maks. $\frac{5}{8}$

(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 $\text{pH} = -\log[\text{H}_3\text{O}^+] \checkmark$ $4 \checkmark = -\log[\text{H}_3\text{O}^+] \checkmark$ $[\text{H}_3\text{O}^+] = 1 \times 10^{-4} \text{ mol}\cdot\text{dm}^{-3} \checkmark$

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

OPTION/OPSIE 1

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

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

$$c_b = 0,32 \text{ mol}\cdot\text{dm}^{-3}$$

$$c_b = 0,32 \text{ mol}\cdot\text{dm}^{-3}$$

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

$$0,32 = \frac{m}{56 \checkmark \times 0,25 \checkmark}$$

$$m = 4,48 \text{ g} \checkmark$$

OPTION/OPSIE 2

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

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

$$c_b = 0,32 \text{ mol}\cdot\text{dm}^{-3}$$

$$c_b = 0,32 \text{ mol}\cdot\text{dm}^{-3}$$

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

$$0,32 = \frac{n}{0,25 \checkmark}$$

$$n = 0,08 \text{ mol}$$

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

$$0,08 = \frac{m}{56 \checkmark}$$

$$m = 4,48 \text{ g} \checkmark$$

OPTION/OPSIE 3

$$n(\text{acid})_{\text{used}} = cV \checkmark$$

$$= (0,16)(0,025) \checkmark$$

$$= 4 \times 10^{-3} \text{ mol}$$

$$n(\text{KOH}) = 4 \times 10^{-3} \text{ mol} \checkmark$$

$$\text{In } 12,5 \text{ cm}^3: n(\text{KOH}) = 4 \times 10^{-3} \text{ mol}$$

$$\text{In } 250 \text{ cm}^3$$

$$n(\text{KOH}) = \frac{250}{12,5} \times 4 \times 10^{-3} \checkmark \checkmark$$

$$= 0,08 \text{ mol}$$

$$m(\text{KOH}) = nM$$

$$= 0,08 \times 56 \checkmark$$

$$= 4,48 \text{ g} \checkmark$$

OPTION/OPSIE 4	OPTION/OPSIE 5
$n(\text{CH}_3\text{COOH})_{\text{used}} = cV \checkmark$ $= (0,16)(0,025) \checkmark$ $= 4 \times 10^{-3} \text{ mol}$	$n(\text{CH}_3\text{COOH})_{\text{used}} = cV \checkmark$ $= (0,16)(0,025) \checkmark$ $= 4 \times 10^{-3} \text{ mol}$
$n(\text{KOH}) = 4 \times 10^{-3} \text{ mol} \checkmark$	$n(\text{KOH}) = 4 \times 10^{-3} \text{ mol} \checkmark$
$c = \frac{n}{V}$ $= \frac{4 \times 10^{-3}}{0,0125} \checkmark$	$c = \frac{n}{V}$ $= \frac{4 \times 10^{-3}}{0,0125} \checkmark$
$c_b = 0,32 \text{ mol} \cdot \text{dm}^{-3}$	$c_b = 0,32 \text{ mol} \cdot \text{dm}^{-3}$
$c = \frac{m}{MV}$	$c = \frac{n}{V}$
$0,32 = \frac{m}{56 \checkmark \times 0,25 \checkmark}$ $m = 4,48 \text{ g} \checkmark$	$0,32 = \frac{n}{0,25} \checkmark$ $n = 0,08 \text{ mol}$
	$n = \frac{m}{M}$
	$0,08 = \frac{m}{56} \checkmark$ $m = 4,48 \text{ g} \checkmark$

(7)

7.2.3 Greater than 7 / Groter as 7 ✓

(1)

7.2.4 $\text{CH}_3\text{COO}^-(\text{aq}) + \text{H}_2\text{O}(\ell) \checkmark \rightleftharpoons \text{CH}_3\text{COOH}(\text{aq}) + \text{OH}^-(\text{aq}) \checkmark$ Due to formation of (OH^-) the solution is basic / alkaline ✓As gevolg van die vorming van (OH^-) is die oplossing basies / alkalies**Notes/Aantekeninge**

- Reactants ✓ Products ✓ Ignore balancing
- *Reaktanse* *Produkte* *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.* · $\frac{1}{2}$

(2)

8.3

OPTION/OPSIE 1

$$E_{\text{cell}}^{\theta} = E_{\text{reduction}}^{\theta} - E_{\text{oxidation}}^{\theta} \quad \checkmark$$

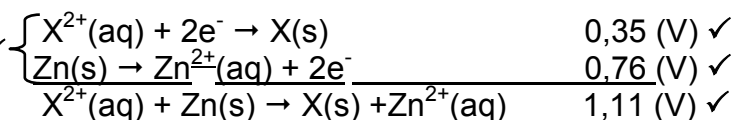
$$1,11 \checkmark = E_{\text{X}/\text{X}^{2+}}^{\theta} - (-0,76) \checkmark$$

$$E_{\text{X}/\text{X}^{2+}}^{\theta} = 0,35 \text{ (V)} \checkmark$$

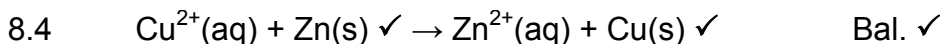
X = Copper / Cu / *koper* ✓**Accept/Aanvaar:**Cu/Cu²⁺ half reaction / *half-reaksie***Notes/Aantekeninge**

- Accept any other correct formula from the data sheet./*Aanvaar enige ander korrekte formule vanaf gegewensblad.*

- Any other formula using unconventional abbreviations, e.g. $E^{\circ}_{\text{cell}} = E^{\circ}_{\text{OA}} - E^{\circ}_{\text{RA}}$ followed by correct substitutions./*Enige ander formule wat onkonvensionele afkortings gebruik bv.*

$$E^{\circ}_{\text{sel}} = E^{\circ}_{\text{OM}} - E^{\circ}_{\text{RM}}$$
gevolg deur korrekte vervangings: Max/Maks: $\frac{3}{4}$
OPTION/OPSIE 2X = Copper/Cu/*koper* ✓**Accept/Aanvaar:**Cu/Cu²⁺ half reaction / *half-reaksie*

(5)

**Accept/Aanvaar:**

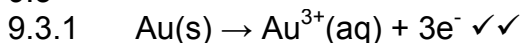
- $\text{X}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{X}(\text{s})$
- Any metal identified in QUESTION 8.3 of which the ion has a +2 charge.
Enige metaal geïdentifiseer in VRAAG 8.3 waarvan die ioon 'n +2-lading het.

Notes/Aantekeninge

- | | | |
|--|---|--|
| • Reactants \checkmark
<i>Reaktanse</i> | • Products \checkmark
<i>Produkte</i> | • Balancing \checkmark
<i>Balansering</i> |
| • Ignore phases. <i>Ignoreer fases.</i> | • Ignore double arrows. <i>Ignoreer dubbelpyle.</i> | |
| • Marking rule 6.3.10/Nasienreël 6.3.10. | | |

(3)
[15]**QUESTION/VRAAG 9**9.1 Electrolytic (cell) / *Elektrolitiese (sel)* \checkmark (1)9.2 P \checkmark (1)

9.3

Ignore phases / *Ignoreer fases***Notes/Aantekeninge**

(2)

9.3.2 (+)3 \checkmark (1)9.3.3 Electrical energy (is converted) to chemical energy. \checkmark
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.* \checkmark
- Protection against rust. / *Beskerming teen roes.* (1)

9.5 **ANY ONE/ENIGE EEN:**

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

(1)
[9]

QUESTION/VRAAG 10

10.1

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

10.1.2 Nitric acid / HNO₃ / salpetersuur ✓ (1)

10.1.3 A / Sulphur / Swael / S ✓ (1)

10.1.4 2NH₃(g) + H₂SO₄ ✓ → (NH₄)₂SO₄ ✓ Bal. ✓**Notes/Aantekeninge**

- | | | |
|--|------------|-------------|
| • Reactants ✓ | Products ✓ | Balancing ✓ |
| Reaktanse | Produkte | Balansering |
| • Ignore/Ignoreer ⇌ 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:

$$\begin{aligned} \%P &= \frac{3}{7} \times 22\% \\ &= 9,43\% \\ \therefore m(P) &= \frac{9,43}{100} \times 2 \text{ kg} \\ &= 0,19 \text{ kg} \end{aligned}$$

OPTION/OPSIE 2:

$$\begin{aligned} \therefore m(P) &= \frac{3}{7} \times (0,44) \times \left(\frac{22}{100} \times 2 = 0,44\right) \\ &= 0,19 \text{ kg} \end{aligned}$$

(3)

10.2.2

OPTION/OPSIE 1

$$\begin{aligned} m(\text{fertiliser/kunsmis}) &= \frac{22}{100} \times 2 \text{ kg} \\ &= 0,44 \text{ kg} \\ m(\text{filler/bindstof}) &= \frac{2 - 0,44}{1} \text{ kg} \\ &= 1,56 \text{ kg} \end{aligned}$$

OPTION/OPSIE 2

$$\begin{aligned} \% \text{filler/bindstof} &= \frac{100 - 22}{100} \times 100 \\ &= 78\% \\ m(\text{filler/bindstof}) &= \frac{78}{100} \times 2 \text{ kg} \\ &= 1,56 \text{ kg} \end{aligned}$$

(3)

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