



Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isabe leMfundo
Provinsie van die Oos Kaap: Departement van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE//IBANGA 12

SEPTEMBER 2024

PHYSICAL SCIENCES P2 *IFIZIKHALI SAYENSIZI P2* MARKING GUIDELINE/UMGAQO WOKUMAKISHA

AMANQAKU: 150

This marking guideline consists of 21 pages./Lo
mgaqowokumakisha unamaphepha angama 21

QUESTION 1 /UMBULO 1

- | | | |
|------|------|-------------|
| 1.1 | C ✓✓ | (2) |
| 1.2 | C ✓✓ | (2) |
| 1.3 | B ✓✓ | (2) |
| 1.4 | A ✓✓ | (2) |
| 1.5 | B ✓✓ | (2) |
| 1.6 | B ✓✓ | (2) |
| 1.7 | C ✓✓ | (2) |
| 1.8 | A ✓✓ | (2) |
| 1.9 | B ✓✓ | (2) |
| 1.10 | B ✓✓ | (2) |
| | | [20] |

QUESTION 2 / UMBUZO 2

2.1 **Marking criteria/ Umgaqo woniko manqaku**

If any of the underlined key words/phrases in the **correct context** are omitted:
- 1 mark per word/phrase.

*Ukuba esinye seziqhwengana ezingu ndoqo esinomgca ngaphantsi ngokwe **khonteksti eyiyo** sishiyiwe, nyiba inqaku libe-1.*

A bond or an atom or a group of atoms that determine(s) the physical and chemical properties of a group of organic compounds. ✓✓

*Yibhondi okanye i-athom okanye igruphu yee-athomu edithemina iifizikhali nee **khemikhali propatizi** ze gruphu yee oganikhi **khompawundi**.* ✓✓

(2)

2.2.1 E ✓

(1)

2.2.2 A ✓

(1)

2.2.3 C ✓

(1)

2.3 EQUAL TO. ✓

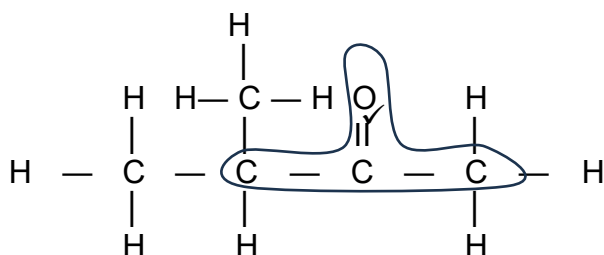
Compound **E** and ethyl methanoate are functional isomers / structural isomers / have the same molecular formula / same number and type of atoms / same number of C, H and O atoms ✓✓

ILINGANA NO. ✓

*Ukhompawundi **E** no ethyl methanoate baziifunctional isomers/ structural isomers/ bane molecularfomyula efanayo/bane nani elilingayo netayiphu yee **athom/ banenani** lee **athom** zika C,H no O elilinganayo.* ✓✓

(3)

2.4.1

**Marking criteria/ Umgaqo woniko manqaku**

- Functional group correct ✓
iFunctional gruphu
- Whole structure correct ✓
Isitraktsha sonke sichanekile

(2)

2.4.2 Propanoic acid / *Propanoic asidi* ✓✓

(2)

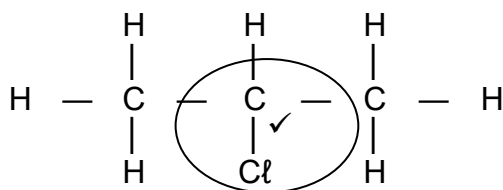
2.4.3 4-methylhex-2-yne / 4-methyl-2-hexyne

Marking criteria/ Umgaqo woniko manqaku

- Hexyne ✓
- Methyl ✓
- Whole name correct / *igama lonke lichanekile* ✓

(3)

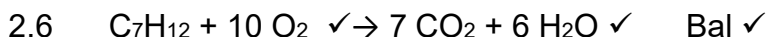
2.5

**Marking criteria/ Umgago woniko mangaku**

- Functional group on 2nd carbon ✓
iFunctional gruphu ikwikhabhoni yesibini
- Whole structure correct ✓

Isitraktsha sonke sichanekile

(2)

**NOTES / AMANQAKU**

- Reactant / Irhiecktenti ✓ Products/ iProwdukti ✓ Balancing / ukuBalansisa ✓

(3)
[20]**QUESTION 3 / UMBUZO 3**3.1.1 **Marking criteria/ Umgago woniko mangaku**

If any of the underlined key words/phrases in the **correct context** are omitted:
- 1 mark per word/phrase.

*Ukuba esinye seziqwengana ezingu ndoqo esinomgca ngaphantsi ngokwe **khonteksti eyiyo** sishiyiwe, nyiba inqaku libe-1*

The temperature at which the vapour pressure of a substance / liquid equals the atmospheric pressure ✓✓

Itempritsha apho ivapour pressure yesabsitensi/ ilikhwidi ilingana ne atmospheric presha.

(2)

3.1.2 All Primary alcohols / Zonke iiprayimari alkhoholi ✓

(1)

3.1.3 London forces / dispersion forces/ induced-dipole forces ✓
iiLondon fosi/ iidispersion fosi/ ii- induced-dipole fosi

(1)

3.1.4 Pentan-1-ol / 1-pentanol / i-Pentan-1-ol / i-1-pentanol / ✓✓

(2)

3.2.1 Compound **C** / propanoic acid ✓
*Ukhomawundi **C** / ipropanoikhi aside*

(1)

3.2.2 **Marking criteria/ Umgago woniko mangaku**

- Type of intermolecular forces in compound A ✓
- Compound B and C have hydrogen bonds ✓
- Compare the number of sites for hydrogen bonding in B and C ✓
- Compare the strength of intermolecular forces ✓
- Compare energy required to overcome the intermolecular forces ✓
- *Itayiphu ye intamoletyhula fosi ku khompawundi A*
- *Ukhompawundi B no C bane hydrogen bhondi*
- *Thelekisa inani lee site ze hydrogen bhodi ku B naku C*
- *Thelekisa isitrhithi se-itamoletyhula fosi*

- | |
|--|
| <ul style="list-style-type: none"> • Thelekisa i-eneji efunekayo ukoyisa ii-intamoletyhula fosi |
|--|

- Compound A/butanone has dipole-dipole forces ✓ (and London forces / dispersion forces/ induced-dipole forces)
- Compound B/butan-1-ol and C/propanoic acid has hydrogen bonds ✓ (and London forces / dispersion forces/ induced-dipole forces)
- Compound B/butan-1-ol has one site for hydrogen bonding and C/propanoic acid has two sites for hydrogen bonding ✓
- Strength of the intermolecular forces increases from compound A / butanone to compound B / butan-1-ol to compound C / propanoic acid ✓
- More energy is needed to overcome the intermolecular forces in compound C / propanoic acid than compounds A/ butanone and B/butan-1-ol ✓
- Ukhompawundi A/ ibutanone unee dipole-dipole fosi (neeLondon forces / needispersion fosi/nee-induced-dipole fosi)
- Ukhompawundi B/ ibutan-1-ol no C/ ipropanoic asidi inee hydrogen bhond (neeLondon fosi / iidispersion fosi/ ii-induced-dipole fosi)
 - UkhompawundiB/ ibutan-1-ol ine site enye yehydrogen bhondingi noC /ipropanoic asidi inee site ezimbini zehydrogen bhondingi
 - iiStrength se-intermolecular fosi siyanda ukusuka kukhompawundi A / ibutanone ukuya kukhompawundi B / ibutan-1-ol ukuya kukhompawundi C / ipropanoic asidi
- i-eneji eninzi iyafuneka ukoyisa ii- intermolecular fosi kukhompawundi C / kwipropanoic asidi kuno khompawundi A/ ibutanone noB/ ibutan-1-ol

(5)
[12]

QUESTION 4 / UMBUZO 4

- 4.1.1 UNSATURATED ✓ It contains a double bond between its carbon-carbon atoms in the hydrocarbon chain ✓
I-ANSATSHUREYITHEDI ✓ Inee double bhondi phakathi kwee carbon-carbon athom kwihydrocarbon chain.

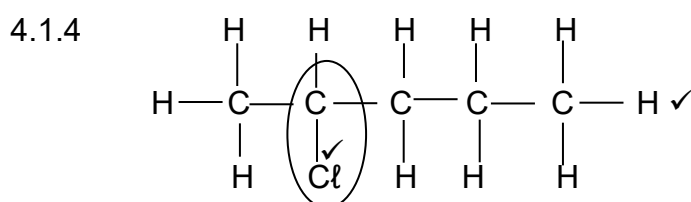
(2)

- 4.1.2 Substitution / Hydrolysis of a haloalkane ✓
yiSabsitityushini /y iHydrolysis yeehaloalkane

(1)

- 4.1.3 Elimination / dehydrohalogenation of haloalkanes ✓
yiElimination / yidehydrohalogenation /yidehydrohalogenation yeehaloalkane

(1)



Marking criteria/ Umgago woniko manqaku

- Functional group correct ✓
iFunctional gruphu
Whole structure correct ✓
Isitraktsha sonke sichanekile

(2)

- 4.1.4 Pentan-2-ol / 2-pentanol /iPentan-2-ol / i-2-pentanol ✓✓

(2)

- 4.1.6 Dilute strong base / NaOH ✓ and mild heat ✓
iDilute strong base / iNaOH ✓ nemild heat

(2)

- 4.1.7 Positional isomers ✓✓
iPositional isomers

(2)

4.2

Marking criteria / Umgago woniko mangaku Reaction 1:

Dehydration reaction and correct chemicals. ✓

Reactants with correct condensed structural formula ✓

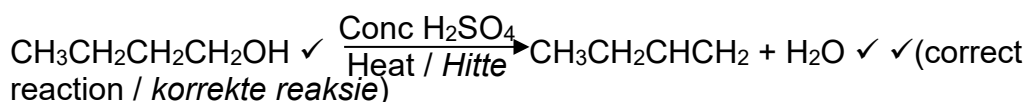
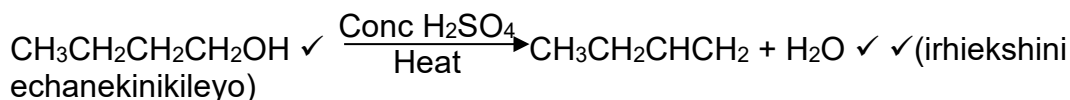
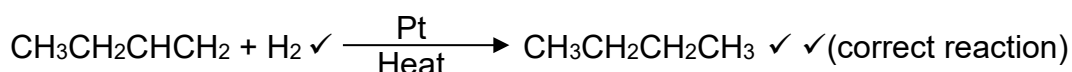
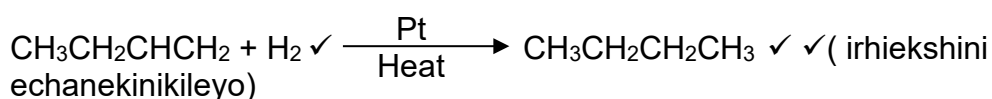
Products with correct condensed structural formula ✓

uRhiektshini 1:*i*Dehydration rhiekshini neekhemikhali ezichanekileyo.*ii*Rhiekhenti eziziKhocondenisidi straktshaliral fomyula echanekileyo*ii*Prowdacti eziziKhondenisidi straktshaliral fomyula echanekileyo.**Reaction 2:**

Addition reaction and correct chemicals used. ✓

Reactants with correct condensed structural formula ✓

Products with correct condensed structural formula ✓

uRhiekshini 2:*i*-Addition rhiekshini nokusetyenziswa kweekhemikhali ezichanekileyo*ii*Rhiekithenti ezizikhondensinisi straktsharali fomyula*ii*Prowudakti ezizikhondensinisi straktsharali fomyula**Reaction 1****Urhiexshini 1:****Reaction 2****Urhiexshini 2**(6)
[18]

QUESTION 5 / UMBUZO 4

5.1

Marking criteria/ *Umgqo woniko manqaku*

If any of the underlined key words/phrases in the **correct context** are omitted: - 1 mark per word/phrase.

*Ukuba esinye seziqwigana ezingu ndoqo esinomgca ngaphantsi ngokwe **khonteksti eyiyo** sishiyiwe, nyiba inqaku libe-1.*

ANY ONE

Change in concentration ✓ of reactant or product per (unit) time. ✓

Change in amount/number of moles/volume/mass of products or reactants per (unit) time. ✓✓

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

NAYIPHI ENYE

Uthintsho kwi khonsentreyishini yee prowudakthi/rhiekthenti per (unit) time.

Uthintsho kwi amawunti/inumber of moles/ivoluyumu/imass yee prowudakthi okanye yee rhiekthenti per (unit) time.

Uthintsho kwi amawunti/inumber of moles/ivoluyumu/imass yee prowudakthi ezifonyishiweyo okanye yee rhiekthenti ezisetyenzisiweyo per (unit) time.

OR/OF

The rate of change in concentration / amount of moles / number of moles / volume / mass. ✓✓ **(2 or 0).**

Irheyithi yotshintsho kwi khonsentreyishini/ I-amawunti yee mowuli/inumber of moles/ivoluyumu/imass **(2 of 0)**

(2)

5.2

Marking Criteria for investigative question / *Umgqo woniko manqaku kwi investigative question*

The independent and dependent variables are stated ✓

I-independent nedependent variables zichaziwe

Ask a question about the relationship between the independent and dependent variables ✓

Buza umbuzo ngereleyinshiphu phakathi kwe-independent ne dependent variables

What is the effect of the increase / decrease / change of concentration on the reaction rate? ✓✓

Ithini impembelelo yokonyusa/nokunciphisa/utshintsho kwikhonsentreyishini kwi reaction rate?

OR / OKANYE

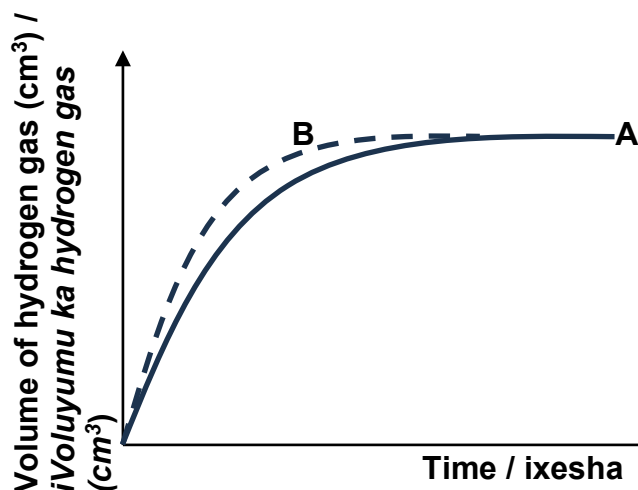
What is the relationship between the concentration and reaction rate? ✓✓
Ithini irhileyishinishiphu phakathi kwekhonsentreyishini ne reaction rate?

(2)

5.3.1 HIGHER THAN / NGAPHEZULU KUNO✓

(1)

5.3.2



Marking criteria / Umgago woniko mangaku

- Gradient B of is higher than A ✓
IGradient kaB ingaphezulu kune ka A.
- Final volume of curve A and B is the same and is horizontal /
iFinal volumyu kakhevu A noB iyafana kwihorizontal ✓

NOTE: A or B must be indicated
 Ignore the labels of the axes.

QAPHELA: uA noB mababonakaliswe. Zinanze iileyibheli ze-axes

(2)

5.4 **Marking criteria**

- a) Subst. into rate equation ✓
- b) Subst. 486,62 and 25 000 into $n = \frac{V}{V_m}$ ✓
- c) Use of mol ratio $n(\text{Zn}) : n(\text{H}_2)$ ✓
- d) Subst. 0,02 and 65 into $m = nM$ ✓
- e) Final answer ✓

Umgqo woniko mangaku

- a) Sabst. Kwi-ikhweyzhini ye rheyithi n □
- b) Sabst. u486,62 no 25 000 ku " $n = \frac{V}{V_m}$ " □
- c) ukusetyenziswa okwe mol ratio ku $n(\text{Zn}) : n(\text{H}_2)$ □
- d) Subst. 0,02 and 65 into $m = nM$ □
- e) Impendulo yokugqibela

$$\text{rate} = \frac{\Delta V}{\Delta t}$$

$$8,39 = \frac{V - 0}{58} \quad (a) \quad \checkmark$$

$$V = 486,62 \text{ cm}^3$$

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

$$n = \frac{486,62}{24000} \quad (b) \quad \checkmark$$

$$n(\text{H}_2) = 0,020 \text{ mol}$$

$$n(\text{Zn}) = n(\text{H}_2) = 0,020 \quad (c) \quad \checkmark$$

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

$$m(\text{Zn}) = (0,020)(65) \quad (d) \quad \checkmark$$

$$m(\text{Zn}) = 1,30 \text{ g} \quad (e) \quad \checkmark$$

(5)

5.5 INCREASES / IYNYUKA ✓

(1)

5.6

- At higher temperature the average kinetic energy of the particles is higher ✓
- More particles have enough / sufficient kinetic energy or more particles have kinetic energy equal or higher than the activation energy ✓
- More effective collisions per unit time/ Higher frequency of effective collisions ✓
- *Kwitthempritsha ephezulu i-average kinetic energy yee particles iyeniyuka* ✓
 - ii-particles ezininzi zine-enough / isufficient kinetic energy okanye ii-particles ezinzi zikineti energy elingana okanye engaphezulu kune activation energy ✓
 - ii-effective collisions ezininzi per unit time/ ifrequency ephezulu yee effective collisions.

(3)

[16]

QUESTION 6 / UMBUZO 6

- 6.1.1 **Marking criteria/ *Umgqo woniko manqaku***
If any of the underlined key words/phrases in the correct context are omitted: - 1 mark per word/phrase.
Ukuba esinye seziqwigana ezingu ndogo esinomqca ngaphantsi ngokwe khonteksti eyiyo sishiyiwe, nyiba ingaku libe-1.

When the equilibrium in a closed system is disturbed, the system will re-instate a new equilibrium by favouring the reaction that will oppose/cancel the disturbance. ✓✓

Xa i-ekhwilibriyam kwiclosed system is disturbed iphazanyisiwe, isystem iyal ure-instata i-ekhwilibriyam entsha ngoku feyiva irhiekshinieza ku-opposa/ icancel isiphazamiso.

(2)

- 6.1.2 Forward (reaction). ✓ The equilibrium concentration of B is higher than A. ✓
Fowadi (rhiekishini). i-ekhwilibriyam khonsentreyishini kaB iphezulu kune ka-A.

(2)

- 6.1.3 INCREASES / IYENYUKA ✓

(1)

- 6.1.4 NO EFFECT/ AKUKHO MPEMBELELO ✓

(1)

- 6.1.5 EXOTHERMIC / I-EKZOTHEMIKHI ✓

(1)

- 6.1.6
- The concentration of A increased / [B] decreased ✓
 - (According to Le Chatelier's principle) an increase in temperature favours the endothermic reaction. ✓
 - The reverse reaction was favoured / The equilibrium position shifted towards the left ✓
 - *I-khonsentreyishini ka A yonyukile / [B] yehlile*
 - *(ngoku kaLe Chatelier's principle) ukonyuka kwethempritsa kufeyiva i-endothermikhi rhiekshini.*
 - *irivesi rhiekshini feyiviwe / i-equilibrium position ishiftele ngase kunxele*

(3)

6.2 **OPTION 1: CONCENTRATION : Marking criteria**

- Correct K_c expression with square brackets ✓
- Substitution of $6,34 \times 10^{-4}$ into correct K_c expression ✓
- Correct substitution of $[Br_2]$ into correct K_c expression ✓
- Use of the correct ratio $[Br_2] : [Br]$ ✓
- Determine initial $[Br_2]$ ✓
- Substitution into $c = n/V$ ✓
- Final answer ✓

INDLELA 1: IKHONSENTREYISHINI/Umgqo woniko manqaku

- I- K_c expression echanekileyo enesquare brackets.*
- iSabstityushini ka $6,34 \times 10^{-4}$ kwi K_c expression echanekileyo.*
- iSabstityushini ka $[Br_2]$ ka K_c expression echanekileyo.*
- Ukusetyenziswa kweratio $[Br_2] : [Br]$ echanekileyo.*
- Fumana $[Br_2]$ yokuqala*
- iSabstityushini ku $c = n/V$*
- Impendulo yokugqibela*

$$K_c = \frac{[Br]^2}{[Br_2]} \text{ (a) } \checkmark$$

$$6,34 \times 10^{-4} \text{ (b) } \checkmark = \frac{[Br]^2}{(2,074)} \text{ (c) } \checkmark$$

$$[Br] = 0,03626 \text{ mol} \cdot \text{dm}^{-3}$$

- No K_c expression, correct substitution / *akho K_c expression, iSabstityushini echanekileyo.* Max / Makz 6/7
- Wrong K_c expression / K_c expression engachanekanga. Max. Makz 3/7

	Br_2	$2 Br$
Initial conc	2,09213 ✓ (e)	-
Change in conc <i>Utshintsho kwi khons</i>	0,01813	0,03626 ✓ (d)
Equilibrium conc.	2,074	0,03626

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

$$V = \frac{1,05}{2,09213} \text{ (f) } \checkmark$$

$$V = 0,50 \text{ dm}^3 \text{ (g) } \checkmark$$

OPTION 2: CONCENTRATION : Marking criteria

- Determine $\Delta [\text{Br}_2]$ ✓
- Use of the correct ratio $[\text{Br}_2] : [\text{Br}]$ ✓
- Correct K_c expression with square brackets ✓
- Substitution of $6,34 \times 10^{-4}$ into correct K_c expression ✓
- Correct substitution of $[\text{Br}_2]$ and $[\text{Br}]$ into correct K_c expression ✓
- Substitution into $c = n/V$ ✓
- Final answer ✓

INDLELA 2: IKHONSENTREYISHINI/Umgqo woniko manqaku

- Fumana i- $\Delta [\text{Br}_2]$
- sebenzisa iratio ka $[\text{Br}_2] : [\text{Br}]$ echanekileyo
- i K_c expression enesquare brackets echanekileyo
- iSabstityushini ka $6,34 \times 10^{-4}$ kwi K_c expression echanekileyo
- Isabstityushini ka $[\text{Br}_2]$ echanekileyo no $[\text{Br}]$ kwi K_c expression echanekileyo
- iSabstityushini kuc = n/V
- impendulo yokugqibela

$$\Delta[\text{Br}_2] = x(0,865/100) = 0,0865x \quad \checkmark \text{ (a)}$$

	Br_2	2 Br
Initial conc	x	-
Change in conc <i>Utshintsho kwi khons</i>	$-0,00865x$	$0,0173x \quad \checkmark \text{ (b)}$
Equilibrium conc.	$2,074$	$0,0173x$

$$K_c = \frac{[\text{Br}]^2}{[\text{Br}_2]} \quad \text{(c) } \checkmark$$

$$6,34 \times 10^{-4} \quad \text{(d) } \checkmark = \frac{(0,0173x)^2}{(2,074)} \quad \text{(e) } \checkmark$$

$$x / [\text{Br}_2]_0 = 2,096 \text{ mol} \cdot \text{dm}^{-3}$$

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

$$V = \frac{1,05}{2,096} \quad \text{(f) } \checkmark$$

$$V = 0,50 \text{ dm}^3 \quad \text{(g) } \checkmark$$

- No K_c expression, correct substitution / *akho K_c expression, iSabstityushini echanekileyo.* Max / Makz 6/7
- Wrong K_c expression / K_c expression engachanekanga. Max. Makz 3/7

OPTION 3: MOLE CALCULATION : Marking criteria

- a) Determine Δ mol Br_2 ✓
 b) Use of the correct ratio $\text{Br}_2 : \text{Br}$ ✓
 c) Correct K_c expression with square brackets ✓
 d) Substitution of $6,34 \times 10^{-4}$ into correct K_c expression ✓
 e) Correct substitution of $[\text{Br}]$ and $[\text{Br}_2]$ into correct K_c expression ✓
 f) Substitution into $c = n/V$ ✓
 g) Final answer ✓

INDLELA 3: I-MOLE KHALTYHULEYISHINI: Umqago woniko mangaku

- a) Fumana $i\Delta$ mol Br_2
 b) sebenzisa iratio ka $\text{Br}_2 : \text{Br}$ echanekileyo
 c) i K_c expression enesquare brackets echanekileyo
 d) iSabstityushini ka $6,34 \times 10^{-4}$ kwi K_c expression echanekileyo
 e) Isabstityushini ka $[\text{Br}_2]$ echanekileyo no $[\text{Br}]$ kwi K_c expression echanekileyo
 f) iSabstityushini kuc $= n/V$
 g) impendulo yokugqibela

$$\Delta n(\text{Br}_2) = 1,05 \times 0,865 / 100 = 0,0090825 \text{ mol } \checkmark \text{ (a)}$$

	Br_2	2 Br
Initial mol	1,05	-
Change in mol <i>Utshintsho kwi mol</i>	-0,0090825	0,0818165 ✓ (b)
Equilibrium mol.	2,074V	0,0818165
Equilibrium conc. <i>Equilibrium khons.</i>	2,074	0,018165 / V

$$K_c = \frac{[\text{Br}]^2}{[\text{Br}_2]} \text{ (c) } \checkmark$$

$$6,34 \times 10^{-4} \text{ (d) } \checkmark = \frac{[\text{Br}]^2}{(2,074)} \text{ (e) } \checkmark$$

$$[\text{Br}]_0 = 0,03626 \text{ mol} \cdot \text{dm}^{-3}$$

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

$$0,03626 = \frac{0,018165}{V} \text{ (f) } \checkmark$$

$$V = 0,50 \text{ dm}^3 \text{ (g) } \checkmark$$

- No K_c expression, correct substitution / akho K_c expression, iSabstityushini echanekileyo. Max / Makz 6/7
- Wrong K_c expression / K_c expression engachanekanga. Max. Makz 3/7
-

OPTION 4: MOLE CALCULATION: Marking criteria

- Correct K_c expression with square brackets ✓
- Substitution of $6,34 \times 10^{-4}$ into correct K_c expression ✓
- Correct substitution of $[Br]$ and $[Br_2]$ into correct K_c expression ✓
- Determine change in mol Br ✓
- Use of the correct ratio $[Br_2] : [Br]$ ✓
- Substitution into $n_e = n_i - \Delta n$ for Br_2 ✓
- Final answer ✓

INDLELA 4: IMOLE KHALTYHULEYISHINI /Umgqo woniko mangaku

- I- K_c expression echanekileyo enesquare brackets.
- iSubstityushini ka $6,34 \times 10^{-4}$ kwi K_c expression echanekileyo.
- iSubstityushini ka $[Br_2]$ ka K_c expression echanekileyo.
- Fumana utshintsho kwimoli zika Br
- Ukusetyenziswa kweratio $[Br_2] : [Br]$ echanekileyo
- iSubstityushini ku $n_e = n_i - \Delta n$ ku Br_2
- Impendulo yokugqibela

$$K_c = \frac{[Br]^2}{[Br_2]} \quad (a) \checkmark$$

$$6,34 \times 10^{-4} (b) \checkmark = \frac{[Br]^2}{(2,074)} (c) \checkmark$$

$$[Br] = 0,03626 \text{ mol} \cdot \text{dm}^{-3}$$

- No K_c expression, correct substitution / akho K_c expression, iSubstityushini echanekileyo. Max / Makz 6/7
- Wrong K_c expression / K_c expression engachanekanga. Max. Makz 3/7

	Br₂	2 Br
Initial mol	1,05	-
Change in mol <i>utshintsho kwimol</i>	-0,01813V ✓ (e)	0,03626V ✓ (d)
Equilibrium mol.	2,074V	0,03626V
Equilibrium conc. <i>Equilibrium khons.</i>	2,074	0,03626

$$n_e = n_i - \Delta n$$

$$2,074V = 1,05 - 0,01813V \checkmark (f)$$

$$V = 0,5 \text{ dm}^3 \checkmark (g)$$

(7)
[17]

QUESTION 7 / UMBUZO 7

7.1.1 Strong acids ionise completely in water ✓ to produce a high concentration of the hydronium ions / (H_3O^+) ✓

iiStrong acid ziayonayiza ngokupheleleyo emanzini completely ✓ ukuprodyusa ikhonsentreyishini ephezulu yeehydronium ions / (H_3O^+) . (2)

7.1.2 It donates two protons/ H^+ / Idoneytha iiproton ezimbini / H^+ / H^+ ✓ (1)

7.1.3 H_2O ✓ (1)

7.1.4 HSO_4^- ✓✓ (2)

7.1.5 **Marking criteria/ Umgaqo woniko mangaku**

- a) Ratio / iRatio $[H_3O^+] : [H_2SO_4]$ ✓
- b) Formula / iFomyula $pH = -\log [H_3O^+]$ ✓
- c) pH value substituted into formula / i-pH value isabstityhwe kwifomyula✓
- d) Final answer / impendulo yokugqibela ✓

$$[H_3O^+] = 2(0,1) \checkmark (a) = 0,2 \text{ mol} \cdot \text{dm}^{-3}$$

$$pH = -\log[H_3O^+] \checkmark (b)$$

$$pH = -\log (0,2) \checkmark (c)$$

$$pH = 0,70 \checkmark (d) \quad (4)$$

7.2.1	<u>OPTION 1/ INDLELA 1</u>	<u>OPTION 2 / INDLELA2</u>
	$c = \frac{m}{MV} \checkmark$	$n = \frac{m}{M}$
	$c = \frac{1,2}{(90)(50 \times 10^{-3})} \checkmark$	$n = \frac{1,2}{90}$
	$c = 0,27 \text{ mol} \cdot \text{dm}^{-3} \checkmark$	$n = 0,013 \text{ mol} \cdot \text{dm}^{-3}$
		$c = \frac{n}{V} \checkmark$
		$c = \frac{0,013}{50 \times 10^{-3}} \checkmark$
		$c = 0,26 \text{ mol} \cdot \text{dm}^{-3} \checkmark$

(3)

7.2.2

Positive marking from / IPozitivi makhinqi ukusuka ku 7.2.1
Marking criteria / Umgaqo woniko mangaku

- a) Subst. values of $\text{H}_2\text{C}_2\text{O}_4$ into / $n = cV$ Subst. iiveliyu zika $\text{H}_2\text{C}_2\text{O}_4$ ku $n = cV$ ✓
 b) **Using** ratio / **sebenzisa iratio**
 $\text{H}_2\text{C}_2\text{O}_4$: NaOH 1:2 ✓
 c) Subst of values of / subst iiveliyu ka NaOH ku $c = n/V$ ✓
 d) Subst into values / *Vervang waardes van* NaOH into/ in $c_1V_1 = c_2V_2$ ✓
 e) Formula / *iFomyula* $m = cMV$ ✓
 f) Subst into / *sabst* $m = cMV$ ✓
 g) Final answer / *impendulo yokugqibela* ✓

$$\begin{aligned} n(\text{H}_2\text{C}_2\text{O}_4) &= cV \\ &= 0,27 \times 25 \times 10^{-3} \text{ (a) } \checkmark \\ &= 6,75 \times 10^{-3} \text{ mol} \end{aligned}$$

$$n(\text{NaOH}) = 2 \times 6,75 \times 10^{-3} \text{ (b) } \checkmark$$

$$n(\text{NaOH}) = 0,0135 \text{ mol}$$

$$c(\text{NaOH}) = \frac{n}{V}$$

$$c(\text{NaOH}) = \frac{0,0135}{43,8 \times 10^{-3}} \text{ (c) } \checkmark$$

$$c(\text{NaOH}) = 0,308 \text{ mol} \cdot \text{dm}^{-3}$$

Positive marking from / IPozitivi makhinqi ukusuka ku 7.2.1
Marking criteria / Umgaqo woniko mangaku

- a) Subst. values of/ Subst iiveliyu ka n_a / n_b ku $\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$ ✓
 b) Subst. values of/ Subst iiveliyu ka $c_a V_a$ into/ ku $\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$ ✓
 c) Subst. values of/ Subst iiveliyu *in/ka* V_b ku $\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$ ✓
 d) Subst into values/ Subst iiveliyu zika NaOH into/ ku $c_1V_1 = c_2V_2$ ✓
 e) Formula / *iFomyula* $m = cMV$ ✓
 f) Subst into/ Subst $m = cMV$ ✓
 g) Final answer/ *Impendulo okugqibela* ✓

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

$$\frac{(0,27)(25) \text{ (b) } \checkmark}{c_b(43,8) \text{ (c) } \checkmark} = \frac{1}{2} \text{ (a) } \checkmark$$

$$c_b = 0,308 \text{ mol} \cdot \text{dm}^{-3}$$

$$c_1V_1 = c_2V_2$$

$$c_1(25) = (0,308)(100) \text{ (d) } \checkmark$$

$$c_1 = 1,232 \text{ mol} \cdot \text{dm}^{-3}$$

$$m = cMV \text{ (e) } \checkmark$$

$$m = (1,232)(40)(2) \text{ (f) } \checkmark$$

$$m = 98,56 \text{ g (g) } \checkmark$$

(7)
[20]

QUESTION 8 / UMBUZO 8

- 8.1 Chemical energy to electrical energy ✓✓
iChemical energy kwielectrical energy (2)
- 8.2 Provide path for movement of ions / *Bied pad vir beweging van ione*
Ensures electrical neutrality in the cell /
Iprovayida indlela yokuhambahamba kwee-ayoni / iqinisekisa i- electrical neutrality kwiseli (Any one/ Nayiphi enye) ✓ (1)
- 8.3 $\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$ ✓✓ (2)

Marking criteria / Umgago woniko mangaku

- $\text{Fe}^{3+} + \text{e}^- \rightleftharpoons \text{Fe}^{2+}$ 1/2
- $\text{Fe}^{2+} \leftarrow \text{Fe}^{3+} + \text{e}^-$ 2/2
- $\text{Fe}^{2+} \rightleftharpoons \text{Fe}^{3+} + \text{e}^-$ 0/2
- $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$ 0/2

Ignore if the charge omitted on electron / *INanza ukuba itshaji kwignoreer kwi elektroni ishiyiwe.*

- 8.4 $E^\theta_{\text{cell}} = E^\theta_{\text{cathode/reduction/oxidising agent}} - E^\theta_{\text{anode/oxidation/reducing agent}}$ ✓

$$E^\theta_{\text{cell}} = (0,77) \checkmark - (-0,13) \checkmark$$

$$E^\theta_{\text{cell}} = 0,90 \text{ V} \checkmark$$

Marking criteria/ Umgago woniko mangaku

- Any other formula using unconventional abbreviation, e.g. /
 $E^\theta_{\text{cell}} = E^\theta_{\text{OA}} - E^\theta_{\text{RA}}$ followed by the correct substitution Max 3/4
- *Nayiphi ifomyula ekusetyenziswe i-unconventional abbreviation, umz. /
 $E^\theta_{\text{cell}} = E^\theta_{\text{OA}} - E^\theta_{\text{RA}}$ ilandelwe
yisabstityushininechanekileyo followed by the c
Makz 3/4*

- 8.5.1 Increases / *Iyanda* ✓ (1)

- 8.5.2 Remains the same / *ihlala injalo* ✓ (1)

- 8.5.3 Increases / *iyanda* ✓ (1)

- 8.6 Zn is a stronger reducing agent than Pb ✓
More energy per unit charge is released for the reaction between Zn and Fe^{3+} / The reaction between Zn and Fe^{3+} is more strongly product-favoured / equilibrium position lies further to the right than Pb and Fe^{3+} ✓

i-Zn yireducing agent enamandla kunoPb ✓
I-ieneji eninzi iyakhutshwa per unit charge kwirhiekshini ephakathi koZn no Fe^{3+} / Irhiekshini ephakathi koZn no Fe^{3+} iproduct-favoured kakhulu ngamandla / i-equilibrium position ikekelele kakhulu ngase kunene kune kaPb no Fe^{3+}

(2)
[14]

QUESTION 9 / UMBUZO 9

- 9.1 The chemical process in which electrical energy is converted to chemical energy **(2 or 0)** ✓✓
yichemical process apho i-electrical energy iguqulelwa kwichemical energy
(2 of 0)

OR / OKANYE

The use of electrical energy to produce a chemical change **(2 or 0)** ✓✓
Kuksetyenziswa kwe-electrical energy ukuprodyusa ichemical change **(2 of 0)**

(2)

- 9.2 Battery/ ibhetri ✓

(1)

- 9.3 Hydrogen gas / H₂ ✓

(1)

- 9.4 $2 \text{Cl}^- (\text{aq}) + 2\text{e}^- \rightarrow \text{Cl}_2(\text{g})$ ✓✓ Ignore phases / *Nanza iphase*

Marking criteria / Umgaqo woniko mangaku

- | | |
|--|-----|
| • $2 \text{Cl}^- (\text{aq}) + 2\text{e}^- \rightleftharpoons \text{Cl}_2(\text{g})$ | 1/2 |
| • $\text{Cl}_2(\text{g}) \leftarrow 2 \text{Cl}^- (\text{aq}) + 2\text{e}^-$ | 2/2 |
| • $\text{Cl}_2(\text{g}) \rightleftharpoons 2 \text{Cl}^- (\text{aq}) + 2\text{e}^-$ | 0/2 |
| • $\text{Cl}_2(\text{g}) \rightarrow 2 \text{Cl}^- (\text{aq}) + 2\text{e}^-$ | 0/2 |

Ignore if the charge omitted on electron/
Nanza ukuba itshaji kwi-elektroni ishiyiwe

(2)

- 9.5 Pink / iPink ✓ . OH⁻ ✓

(2)

- 9.6.1 Zinc/ iZinc ✓

(1)

- 9.6.2 **Marking criteria / Umgaqo woniko mangaku**

- a) **Using** ratio / **Sebenzisa iratio** Cu: e⁻ = 1:2 ✓
 b) Subst. of values of / Sabst *iveliyu ka* Cu into / ku m = nM ✓
 c) Adding the mass of Cu reduced to initial mass /Ukwengeza imass ka Cu emva kwephuyurifikheyishini.phuryifawa. ✓
 d) Final answer / *Finale antwoord* ✓

$$n(\text{Cu}) = \frac{1}{2} \times 1,38 \times 10^{-2} \text{ (a) } \checkmark$$

$$n(\text{Cu}) = 6,9 \times 10^{-3} \text{ mol}$$

$$m = nM$$

$$m = (6,9 \times 10^{-3})(63,5) \text{ (b) } \checkmark$$

$$m = 0,43815 \text{ g}$$

$$m(\text{cathode /katode}) = 2 + \underline{0,43815} \text{ (c) } \checkmark$$

(4)

m (cathode/*katode*) = 2,43815 g (d) ✓

[13]

TOTAL / ITOTAL: 150