basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

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

TECHNICAL SCIENCES P2
TEGNIESE WETENSKAPPE V2

2022

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 75

These marking guidelines consist of 10 pages.
Hierdie nasienriglyne bestaan uit 10 bladsye.

QUESTION/*VRAAG* 1

1.1 C ✓✓ (2)

1.2 B/C ✓✓ (2)

1.3 D ✓✓ (2)

1.4 B ✓✓ (2)

1.5 A ✓✓ (2)

[10]

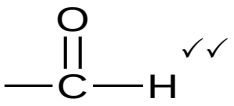
QUESTION/*VRAAG* 2

2.1.1 E ✓ (1)

2.1.2 F ✓ (1)

2.2 C_nH_{2n-2} ✓✓ (2)

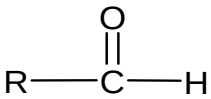
2.3.1



✓✓

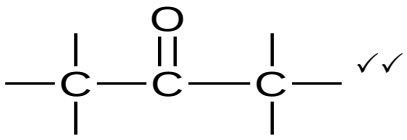
Marking criteria/*Nasienkriteria*:
- If a bond is missing (0/2)
- *Indien 'n binding uitgelaat is (*0/2)

OR/*OF*



(2)

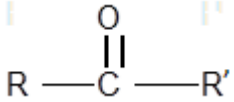
2.3.2



✓✓

Marking criteria/*Nasienkriteria*:
- If a bond is missing *(*0/2)
- *Indien 'n binding uitgelaat is (*0/2)

OR/*OF*



(2)

2.4.1 Propan✓-2-ol✓

OR/*OF*

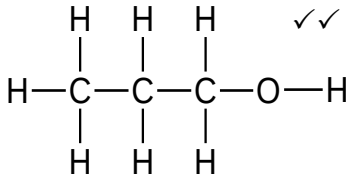
2 – propanol

Marking criteria/*Nasienkriteria*:
- Correct functional group and the stem
- Correct position of the functional group
- If a hyphen is missing ½

- *Korrekte funksionele groep en die stam*
- *Korrekte posisie van die funksionele groep*
- *Indien koppelteken uitgelaat is ½*

(2)

2.4.2



✓✓

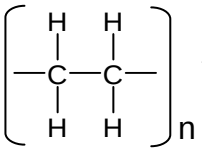
Marking criteria/*Nasienkriteria*:
- Correct position of the functional group
- The whole structure correct.
- If a bond or hydrogen is missing ½

- *Korrekte posisie van die funksionele groep*
- *Die hele struktuur is korrek.*
- *Indien koppelteken uitgelaat is ½*

(2)

2.5.1 A large molecule composed of smaller monomer units ✓covalently bonded to each other in a repeating pattern. ✓
'n Groot molekuul bestaande uit kleiner monomeereenhede, kovalent met mekaar verbind in 'n herhalende patroon. (2)

2.5.2



✓✓ (2)

2.5.3 Polythene/Polyethylene ✓✓
Politeen/Poliëtileen (2)

[18]

QUESTION/*VRAAG* 3

3.1.1 What is the relationship between chain length/molecular mass/surface area and boiling point in alkanes? ✓✓
Wat is die verhouding tussen kettinglengte/molekulêre massa/oppervlakarea en kookpunt in alkane?

OR/*OF*

How does the chain length/molecular mass/surface area affect the boiling point of alkanes?
Hoe beïnvloed die kettinglengte/molekulêre massa/oppervlakarea die kookpunt van alkane?

Marking criteria/*Nasienkriteria*:
- Dependant and independent variables correctly identified.
- Question correctly/appropriately asked about the relationship between the dependent and independent variable.
- Do not penalise if 'alkanes' is omitted.
- *Afhanklike en onafhanklike veranderlikes korrek geïdentifiseer*
- *Vraag korrek/toepaslik gevra oor die verhouding tussen die afhanklike en onafhanklike veranderlike*
- *Moenie penaliseer indien 'alkane' uitgelaat is nie.*

(2)

3.1.2 Chain length/molecular mass/surface area/compounds✓
Kettinglengte/molekulêre massa/oppervlakarea/verbindings (1)

3.1.3 Boiling point ✓/*Kookpunt* (1)

3.1.4 Homologous series ✓/Functional group
Homoloë reeks/Funksionele groep
Accept/*Aanvaar*: Type of intermolecular forces./*Tipe intermolekulêre kragte* (1)

3.2.1 London/Dispersion/Induced dipole forces.✓/*Londen-/Dispersie-/Geïnduseerde-dipool-kragte* (1)

3.2.2 Incorrect ✓/*Verkeerd* (1)

3.2.3 **Apply negative marking from QUESTION 3.2.2./**
***Pas negatiewe nasien vanaf VRAAG 3.2.2 toe*.**

- The chain length/molecular mass/surface area decreases from compound **C** (butane) to compound **A** (ethane). ✓
- The smaller the chain length/molecular mass/surface area, the weaker the intermolecular forces. ✓
- The weaker the intermolecular forces, the lower is the boiling point. ✓

- *Die kettinglengte/molekulêre massa/oppervlakarea verminder van verbinding **C** (butaan) na verbinding **A** (etaan).*
- *Hoe kleiner die kettinglengte/molekulêre massa/oppervlakarea, hoe swakker die intermolekulêre kragte.*
- *Hoe swakker die intermolekulêre kragte, hoe laer is die kookpunt.*

OR/*OF*

- The chain length/molecular mass/surface area increases from compound **A** (ethane) to compound **C** (butane).
- The larger the chain length/molecular mass/surface area, the stronger the intermolecular forces.
- The stronger the intermolecular forces, the higher is the boiling point.

- *Die kettinglengte/molekulêre massa/oppervlakarea vergroot vanaf verbinding **A** (etaan) na verbinding **C** (butaan).*
- *Hoe groter die kettinglengte/molekulêre massa/oppervlakarea, hoe sterker die intermolekulêre kragte.*
- *Hoe sterker die intermolekulêre kragte, hoe hoër is die kookpunt.* (3)

3.2.4 Boiling point increases with an increase in chain length/molecular mass/surface area. ✓✓ /*Kookpunt styg met 'n toename in kettinglengte/molekulêre massa/oppervlakarea.*

OR/*OF*

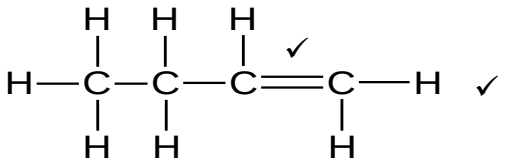
Boiling point decreases with a decrease in chain length/molecular mass/surface area./*Kookpunt daal met 'n afname in kettinglengte/molekulêre massa/oppervlakarea.* (2)
[12]

QUESTION/*VRAAG* 4

4.1.1 Addition/hydration (reaction) ✓
Addisie/hidrasie (reaksie) (1)

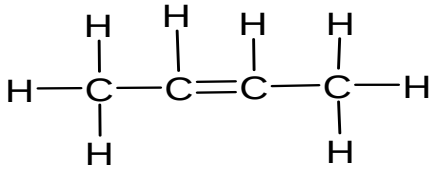
4.1.2 Substitution (reaction). ✓
Substitusie (reaksie) (1)

4.2



But - 1 – ene/1 – butene
But - 1 – een/1 – buteen

OR/*OF*

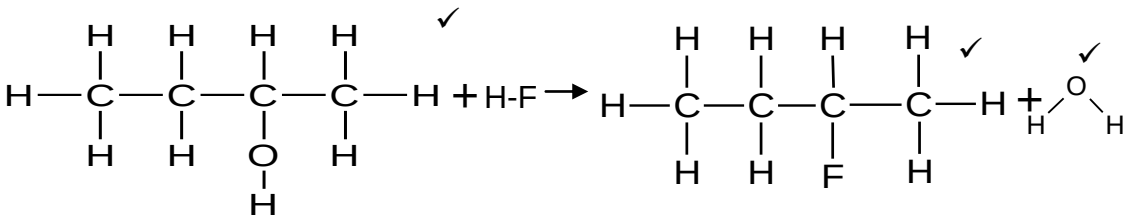


But - 2 - ene/2- butene
But - 2 – een/2-buteen

Marking criteria (Structure)/*Nasienkriteria (Struktuur)*:	**Marking criteria (IUPAC name)/ *Nasienkriteria (IUPAC-naam)*:**
• Correct functional group • The whole structure is correct. • If a bond or hydrogen is missing ½ • *Korrekte funksionele groep* • *Die hele struktuur is korrek* • *As verbinding of waterstof uitgelaat is ½*	• Correct functional group and the stem • Correct position of the functional group • If a hyphen is missing ½ • *Korrekte funksionele groep en die stam* • *Korrekte posisie van die funksionele groep* • *As 'n koppelteken uitgelaat is ½*

(4)

4.3



Marking criteria/
***Nasienkriteria*:**
- 2-florobutane 1 mark
- Water 1 mark
- Reactants 1 mark
- If a bond is missing, penalise 1 mark.

- *2-florobutaan 1 punt*
- *Water 1 punt*
- *Reaktanse 1 punt*
- *Indien 'n binding weggelaat is, penaliseer 1 punt.*

(3)

4.4
- Excess water ✓/*Oormaat water*
- Acid catalyst/*Suurkatalisator*/H_2SO_4 (Sulphuric acid)/*H_2SO_4 (Swawelsuur)*/ H_3PO_4 (Phosphoric acid)/*H_3PO_4 (Fosforsuur)* ✓ (2)

[11]

QUESTION/*VRAAG* 5

5.1.1 An electrode where oxidation takes place.✓✓
'n Elektrode waar oksidasie plaasvind.

Marking criteria)/*Nasienkriteria*:
- When 'electrode' is omitted: $\frac{1}{2}$
- If 'oxidation' is omitted: $\frac{0}{2}$
- *Wanneer 'elektrode' weggelaat is:* $\frac{1}{2}$
- *As 'oksidasie' weggelaat is:* $\frac{0}{2}$

(2)

5.1.2 The decomposition of a substance when an electric current is passed through it. ✓✓
Die opbreking (ontbinding) van 'n stof wanneer 'n elektriese stroom daardeur gaan.

OR/*OF*

The chemical process in which electrical energy is converted to chemical energy.
Die chemiese proses waar elektriese energie in chemiese energie omgeskakel word.

OR/*OF*

The use of electrical energy to produce a chemical change.
Die gebruik van elektriese energie om 'n chemiese verandering te veroorsaak. (2)

5.2.1 $2C\ell^-(aq) \rightarrow C\ell_2(g)+2e^-$ ✓✓

Marking criteria/*Nasienkriteria*:
$C\ell_2(g)+ 2e^- \leftarrow 2C\ell^-(aq)$ $(\frac{2}{2})$ $2C\ell^-(aq) \rightleftharpoons C\ell_2(g) + 2e^-$ $(\frac{1}{2})$
$2C\ell^-(aq) + 2e^- \rightleftharpoons C\ell_2(g)$ $(\frac{0}{2})$ $2C\ell^-(aq) \leftarrow C\ell_2(g) + 2e^-$ $(\frac{0}{2})$
NOTE: Do not penalise if the phases are not included.
LET WEL: *Moenie penaliseer as die fases nie ingesluit is nie.*

(2)

5.2.2 Reduction ✓/*Reduksie* (1)

5.3.1 Copper (II) ions ✓/*Koper(II)ione*

OR/*OF*

Cu^{2+} (1)

5.3.2 Chloride ions ✓/*Chloriedione*

OR/*OF*

$C\ell^-$ (1)

5.4 Chlorine (gas) ✓/*Chloor(gas)* (1)

[10]

QUESTION/*VRAAG* 6

6.1.1 Chemical (energy) to electrical (energy).✓✓
Chemiese (energie) na elektriese (energie). (2)

6.1.2
- Temperature of 25 °C/298 K/*temperatuur van* 25 °C/298 K✓
- Concentration of an electrolyte is 1 mol·dm^{-3} /
Konsentrasie van elektroliet is 1 mol·dm^{-3} ✓ (2)

6.2.1 $Ag^+(aq) + e^- \longrightarrow Ag(s)$ ✓✓

Marking criteria/*Nasienkriteria*:

$Ag(s) \leftarrow Ag^+(aq) + e^-$ $(\frac{2}{2})$ $Ag^+(aq) + e^- \rightleftharpoons Ag(s)$ $(\frac{1}{2})$

$Ag(s) \rightleftharpoons Ag^+(aq) + e^-$ $(\frac{0}{2})$ $Ag^+(aq) + e^- \leftarrow Ag(s)$ $(\frac{0}{2})$

NOTE: Do not penalise if the phases are not included.
LET WEL: *Moenie penaliseer as die fases nie ingesluit is nie.* (2)

6.2.2 $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$ ✓✓

Marking criteria/*Nasienkriteria*:

$Cu^{2+}(aq) + 2e^- \leftarrow Cu(s)$ $(\frac{2}{2})$ $Cu(s) \rightleftharpoons Cu^{2+}(aq) + 2e^-$ $(\frac{1}{2})$

$Cu^{2+}(aq) + 2e^- \rightleftharpoons Cu(s)$ $(\frac{0}{2})$ $Cu(s) \leftarrow Cu^{2+}(ag) + 2e^-$ $(\frac{0}{2})$

NOTE: Do not penalise if the phases are not included.
LET WEL: *Moenie penaliseer as die fases nie ingesluit is nie.* (2)

6.3 **Apply positive marking from QUESTIONS 6.2.1 and 6.2.2./**
***Pas positiewe nasien vanaf VRAAG 6.2.1 en 6.2.2 toe*.**

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
$E^\theta_{cell/sel} = E^\theta_{cathode/katode} - E^\theta_{anode}$ ✓ $= 0,80$ ✓ - (+0,34) ✓ $= 0,46$ V ✓	$Cu \rightarrow Cu^{2+} + 2e^-$ -(+0,34) ✓ $Ag^+ + e^- \rightarrow Ag$ (0,80)✓ $Ag + Cu^{2+} \rightarrow Ag^+ + Cu^{2+}$✓ (0,46 V) ✓

The cell is spontaneous. ✓/*Die sel is spontaan.*

NOTE: Penalise if unconventional abbreviations are used.
LET WEL: *Penaliseer as onkonvensionele afkortings gebruik is.* (5)

6.4 **Apply positive marking from QUESTION 6.3./**
***Pas positiewe nasien vanaf VRAAG 6.3 toe*.**

(Calculated value of) emf/E^θ_{cell} is positive. ✓
(Berekende waarde van) emk/E^θ_{sel} *is positief.* (1)
[14]

TOTAL/*TOTAAL*: 75