Province of the
EASTERN CAPE
EDUCATION

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Provinsie van die Oos Kaap: Department van Onderwys
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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

SEPTEMBER 2025

TECHNICAL SCIENCES P2/*TEGNIESE WETENSKAPPE V2*
MARKING GUIDELINE/ *NASIENRIGLYN*
(AMENDED)

MARKS/*PUNTE*: 75

This marking guideline consists of 10 pages./
Hierdie nasienriglyn bestaan uit 10 bladsye.

QUESTION/*VRAAG* 1

1.1 D ✓✓ (2)

1.2 B ✓✓ (2)

1.3 A ✓✓ (2)

1.4 B ✓✓ (2)

1.5 C ✓✓ (2)

[10]

QUESTION/*VRAAG* 2

2.1 An atom or a group of atoms that determine the chemistry of a molecule. ✓✓
'n Atoom of 'n groep atome wat die chemie van 'n molekuul bepaal.

OR/*OF*

An atom or a group of atoms that determine(s) the physical and chemical properties of a group of organic compounds.
'n Atoom of 'n groep atome wat die fisiese en chemiese eienskappe van 'n groep organiese verbindings bepaal. (2)

2.2 2.2.1 Formyl group/*Formielgroep* ✓
(Accept: Carbonyl group at the end of chain.)
(Aanvaar: Karbonielgroep aan die einde van die ketting.) (1)

2.2.2 Carboxyl group/*Karboksielgroep* ✓ (1)

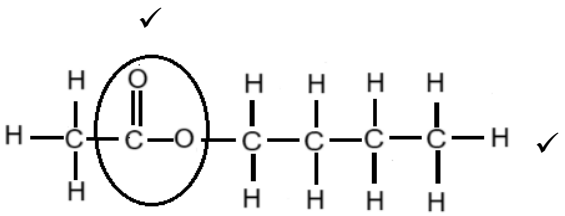
2.3 2.3.1 D ✓ (1)

2.3.2 H ✓ (1)

2.3.3 G ✓ (1)

2.4 3-bromo-4-methyl ✓ hexane ✓
3-bromo-4-metielheksaan (2)

2.5 2.5.1

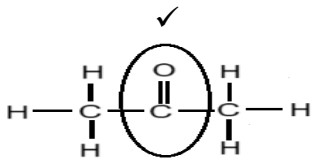


MARKING CRITERIA/NASIENKRITERIA:
- Correct functional group/ *Korrekte funksionele groep* ✓
- *Whole* structure correct/ *Hele struktuur korrek* ✓

NOTE: If a bond or hydrogen is missing 1/2
LET WEL: As 'n binding of waterstof ontbreek 1/2

(2)

2.5.2



✓ ✓

MARKING CRITERIA/NASIENKRITERIA:
- Correct functional group/ *Korrekte funksionele groep* ✓
- *Whole* structure correct/ *Hele struktuur korrek* ✓

NOTE: If a bond or hydrogen is missing 1/2
LET WEL: As 'n binding of waterstof ontbreek 1/2

(2)
[13]

QUESTION/*VRAAG* 3

3.1 The temperature at which the solid and liquid phases of a substance are at equilibrium. ✓✓
Die temperatuur waarby die vaste-en vloeistoffases van 'n stof in ewewig is. (2)

3.2 Carboxylic acids/*Karboksielsure* ✓ (1)

3.3 Chain length/*Kettinglengte* ✓

OR/*OF*

Number of carbon atoms/*Aantal koolstofatome*. (1)

3.4 Compound **P**/Ethanoic acid contain (London forces and) hydrogen bonds.✓
Compound **S/**Ethane contain only London forces/induced dipole forces/ dispersion forces ✓
Hydrogen bonds/intermolecular forces in compound **P**/
Ethanoic acid are stronger than London forces/intermolecular forces/induced dipole forces/ dispersion forces in compound **S**/Ethane.✓
More energy is needed to overcome the intermolecular forces/bonds in compound **P**/Ethanoic acid than in compound **S**/Ethane ✓

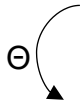
*Verbinding **P**/Etanoësuur bevat (London-kragte en) waterstofbindings.*
*Verbinding **S**/Etaan bevat slegs London-kragte/geïnduseerde dipoolkragte/dispersiekragte*
*Waterstofbindings/intermolekulêre kragte in verbinding **P**/Etanoësuur is sterker as London-kragte/intermolekulêre kragte/geïnduseerde dipoolkragte/dispersiekragte in verbinding **S**/Etaan.*
*Meer energie word benodig om die intermolekulêre kragte/bindings in verbinding **P**/Etanoësuur te oorkom as in verbinding **S**/Etaan*

OR/*OF*

Compound **S/**Ethane contains only London forces/induced dipole forces/ dispersion forces.
Compound **P**/Ethanoic acid contains (London forces and) hydrogen bonds.
London forces/intermolecular forces/ induced dipole forces/dispersion forces in compound **S**/Ethane are weaker than hydrogen bonds /intermolecular forces in compound **P**/ Ethanoic acid.
Less is energy needed to overcome the intermolecular forces/bonds in compound **S**/ Ethane than in compound **P**/Ethanoic acid

*Verbinding **S**/Etaan bevat slegs London-kragte/geïnduseerde dipoolkragte/ dispersiekragte.*
*Verbinding **P**/Etanoësuur bevat (London kragte en) waterstofbindings.*
*London-kragte/intermolekulêre kragte/geïnduseerde dipoolkragte/ dispersiekragte in verbinding **S**/Etaan is swakker as waterstofbindings/intermolekulêre kragte in verbinding **P**/Etanoësuur.*
*Minder energie word benodig om die intermolekulêre kragte/bindings in verbinding **S**/Etaan te oorkom as in verbinding **P**/Etanoësuur* (4)

3.5 Compound **S**/Ethane
*Verbinding **S**/Etaan* ✓



Ethane has the lowest melting point/weakest intermolecular force.✓
Etaan het die laagste smeltpunt/swakste intermolekulêre krag. (2)
[10]

QUESTION/*VRAAG* 4

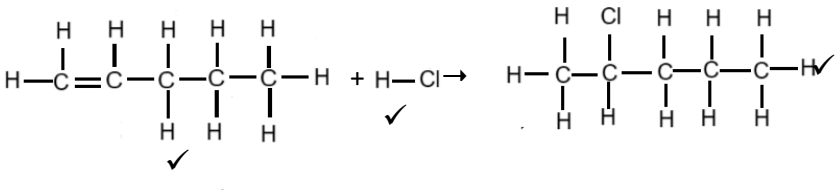
4.1 4.1.1 Addition/hydration ✓
Addisie/Hidrasie (1)

4.1.2 Substitution/ Hydrolysis (of haloalkanes) ✓
Substitusie/Hidrolise (van haloalkane) (1)

4.1.3 Addition/Hydrogenation ✓
Addisie/Hidrogenasie/Hidrogenering (1)

4.2. 4.2.1 No water must be present. ✓
Geen water moet teenwoordig wees nie.
(Accept : Anhydrous solution)
(Aanvaar: Anhidriese oplossing) (1)

4.2.2



MARKING CRITERIA/*NASIENKRITERIA*:
- 1 mark for each reactant /*1 punt vir elke reaktant* ✓
- 1 mark for the product /*1 punt vir die produk* ✓

(3)

4.3 4.3.1 Pentan ✓-2-ol ✓ Accept/*Aanvaar*: 2 - Pentanol (2)

4.3.2 H_2SO_4/H_3PO_4 ✓ (1)

4.4 $C_5H_{12} + 8O_2$ ✓$\rightarrow 5CO_2 + 6H_2O$ ✓ (Balancing/*Balansering*) ✓

MARKING CRITERIA/*NASIENKRITERIA*:
- 1 mark for the reactants/*1 punt vir die reaktante* ✓
- 1 mark for the products/*1 punt vir die produkte* ✓
- 1 mark for balancing/*1 punt vir balansering* ✓

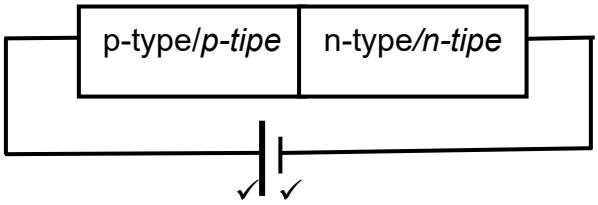
(3)
[13]

QUESTION/*VRAAG* 5

5.1 Doping ✓
Dotering/Doepatoevoeging (1)

5.2 N-type (semiconductor)/*N-tipe (halfgeleier)* ✓
Θ
Doping silicon with a group 5 element, (such as phosphorus)
will produce negative charge carriers(electrons) ✓
Dotering/Doepatoevoeging van silikon met 'n groep 5-element, (soos fosfor)
sal negatiewe ladingdraers (elektrone) produseer (2)

5.3



MARKING CRITERIA/*NASIENKRITERIA*:
- 1 mark for positive terminal of the cell/battery connected to the p-type semiconductor.
- 1 mark for negative terminal of the cell/battery connected to the n-type semiconductor.

- *1 punt vir positiewe terminaal van die sel/battery aan die p-tipe halfgeleier gekoppel.*
- *1 punt vir negatiewe terminaal van die sel/battery aan die n-tipe halfgeleier gekoppel.*

(2)
[5]

QUESTION/*VRAAG 6*

6.1 An electrochemical cell that converts electrical energy to chemical energy. ✓✓
'n Elektrochemiese sel waarin elektriese energie na chemiese energie omgeskakel word. (2)

6.2 **X** ✓ (1)

6.3 6.3.1 $CuC\ell_2$ ✓ (1)

6.3.2 Chlorine/*Chloor*/$C\ell_2$ ✓ (1)

6.3.3 $2C\ell^-_{(aq)} \rightarrow C\ell_{2(g)} + 2e^-$ ✓✓

MARKING CRITERIA/*NASIENKRITERIA*:

$2C\ell^- \rightarrow C\ell_{2(g)} + 2e^-$ $^2/_2$ $2C\ell^- \rightleftharpoons C\ell_2 + 2e^-$ $^1/_2$

$C\ell_2 + 2e^- \rightarrow 2C\ell^-$ $^0/_2$ $C\ell_2 + 2e^- \rightleftharpoons 2C\ell^-$ $^0/_2$

NOTE/*LET WEL:*

- Do not penalise if the phases are omitted.
  Moenie penaliseer as die fases uitgelaat word nie
- Ignore if charge on electron is omitted.
  Ignoreer as lading op elektron uitgelaat is.

(2)

6.3.4 Cu^{2+} ✓ (1)

6.4 Increase/*Toeneem* ✓
Θ

Reduction occurs at electrode X/cathode. ✓✓
Reduksie vind by elektrode X/katode plaas.

OR/*OF*

Cu^{2+} is reduced to Cu.
Cu^{2+} word tot Cu gereduseer.

OR/*OF*

Electrode X is connected to the negative terminal of the battery.
Elektrode X is aan die negatiewe terminaal van die battery gekoppel.

(Accept : Electrode X gains electrons.)
(Aanvaar: Elektrode X ontvang elektrone.)

OR/*OF*

(Accept: Cu is formed on electrode X that increases its mass.)
(Aanvaar: Cu is gevorm op elektrode X wat die massa vermeerder.) (3)

[11]

QUESTION/*VRAAG 7*

7.1 SPONTANEOUS/ *SPONTAAN* ✓
Θ
EMF (E^{θ}_{cell}) is positive/*EMK* (E^{θ}_{sel}) *is positief* ✓

OR/*OF*

No external power source is required/ *Geen eksterne kragbron word benodig nie*

OR/*OF*

Chemical energy is converted to electrical energy/ *Chemiese energie word na elektriese energie omgeskakel*

OR/*OF*

Exothermic reaction/ *Eksotermiese reaksie* (2)

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

7.3 **OPTION/*OPSIE* 1**

$E^{\theta}_{cell/sel} = E^{\theta}_{cathode/katode} - E^{\theta}_{anode}$ ✓
$0{,}63 = -0{,}13 - E^{\theta}_{(X)}$ ✓
$E^{\theta}_{(X)} = -0{,}76\ V$ ✓
X is Zinc/*Sink (Zn)* ✓

OPTION/*OPSIE* 2

$X \rightarrow X^{2+} + 2e^-$
$Pb^{2+} + 2e^- \rightarrow Pb$ } ✓
$E^{\theta}_{(X)} = -0{,}76\ V$ ✓
$E^{\theta}_{cathode/katode} = -0{,}13\ V$
$E^{\theta}_{cell/sel} = 0{,}63\ V$ } ✓
X is Zinc/*Sink (Zn)*✓

Marking guideline/*Nasienriglyn*
- Accept any other correct formula from the data sheet.
  Aanvaar enige ander korrekte formule uit die datablad.
- Penalise with one mark for using unconventional or incomplete formula.
  Penaliseer met een punt vir die gebruik van onkonvensionele of onvolledige formule.

(4)

7.4 7.4.1 $Pb^{2+}_{(aq)} + 2e^- \rightarrow Pb_{(s)}$ ✓✓

MARKING CRITERIA/*NASIENKRITERIA*:

$Pb^{2+} + 2e^- \rightarrow Pb$ $^{2}/_{2}$ $Pb^{2+} + 2e^- \rightleftharpoons Pb$ $^{1}/_{2}$

$Pb \rightarrow Pb^{2+} + 2e^-$ $^{0}/_{2}$ $Pb \rightleftharpoons Pb^{2+} + 2e^-$ $^{0}/_{2}$

NOTE/*LET WEL:*

- Do not penalise if the phases are omitted.
  Moenie penaliseer as die fases uitgelaat word nie.
- Ignore if charge on electron is omitted.
  Ignoreer as lading op elektron uitgelaat is.

(2)

7.4.2 $Zn_{(s)} \mid Zn^{2+}_{(aq)}$ ✓ ‖ ✓ $Pb^{2+}_{(aq)} \mid Pb_{(s)}$ ✓

MARKING CRITERIA/*NASIENKRITERIA*:

- Do not penalise if phases/*concentrations are omitted*.
  Moenie penaliseer as fases/*konsentrasies uitgelaat word nie.*

(3)

[13]

TOTAL/*TOTAAL*: 75