basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT

GRADE/*GRAAD* 12

TECHNICAL SCIENCES P2
TEGNIESE WETENSKAPPE V2

NOVEMBER 2021

MARKING GUIDELINES
NASIENRIGLYNE

MARKS/*PUNTE*: 75

These marking guidelines consist of 7 pages.
Hierdie nasienriglyne bestaan uit 7 bladsye.

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QUESTION/*VRAAG* 1

1.1 B ✓✓ (2)

1.2 D ✓✓ (2)

1.3 D ✓✓ (2)

1.4 C ✓✓ (2)

1.5 A ✓✓ (2)

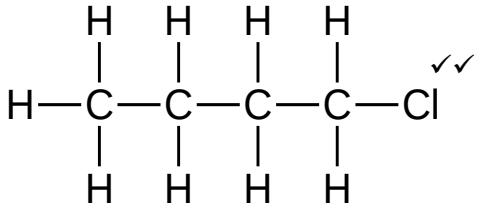
[10]

QUESTION/*VRAAG* 2

2.1 Hydrocarbon is an organic compound containing only carbon (atoms) and hydrogen (atoms). ✓✓

Waterstof is 'n organiese verbinding wat slegs koolstofatome en waterstofatome bevat. (2)

2.2.1

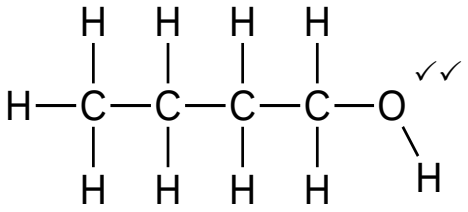


Marking criteria/*Nasienkriteria*:
- Correct functional group
- The whole structure correct
- If a bond or hydrogen is missing ½

- *Korrekte funksionele groep*
- *Die hele struktuur korrek*
- *As 'n verbinding of waterstof uitgelaat is ½*

(2)

2.2.2



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(2)

2.3 Methyl✓ ethanoate ✓ / *Metieletanoaat* (2)

2.4.1 Alkane ✓ / *Alkaan* (1)

2.4.2 Ester ✓ (1)

2.5.1 Structural isomers are organic molecules with the same molecular formula, ✓ but different structural (formulae). ✓
Struktuurisomere is organiese molekule met dieselfde molekulêre formule, ✓ *maar verskillende struktuurformules*. ✓ (2)

2.5.2 Functional (isomer) ✓ / *Funksionele (isomeer)* (1)

[13]

QUESTION/*VRAAG* 3

3.1.1 London/Dispersion/Induced Dipole (forces)✓
London/Dispersie-/Geïnduseerde dipool (kragte) (1)

3.1.2 **A** ✓ (1)

3.1.3
- **A** is a straight chain/unbranched/has larger surface area/less spherical/has a longer chain length than **B** ✓✓
  OR
- **B** has a branch/has a smaller surface area /more spherical/has a shorter chain length than **A**

- ***A** is 'n reguitketting/onvertakte/het 'n groter oppervlakarea/is minder sferies/het 'n langer kettinglengte as **B**.* ✓✓
  OF
- ***B** het 'n vertakking/het 'n kleiner oppervlakarea/is meer sferies/het 'n korter kettinglengte as **A**.* (2)

3.2.1 **A** and **C** have the same chain length/number of carbon atoms/there is only one independent variable/they only differ in terms of fuctional group/homologous series ✓✓
***A** en **C** het dieselfde kettinglengte/aantal koolstofatome/daar is slegs een onafhanklike veranderlike/hulle kan verskil ten opsigte van funksionele groep/homoloë reeks* ✓✓ (2)

3.2.2 **C** ✓ (1)

3.2.3
- **A** contains London/dispersion/induced dipole forces only, and **C** (in addition to London and dipole-dipole forces) contains hydrogen bonds. ✓
- Hydrogen bonds are stronger than London forces / Intermolecular forces of **C** are stronger than those of **A**/Intermolecular forces of **A** are weaker than those of **C**. ✓
  OR
  London/dispersion/Induced dipole forces are weaker than hydrogen bonds.
- More energy is needed to overcome stronger hydrogen bonds than weak London forces/More energy is needed to overcome stronger intermolecular forces in **C** than in **A**.✓
  OR
  Less energy is required to overcome weaker London forces than strong hydrogen bonds/Less energy is required to overcome weaker intermolecular forces in **A** than in **C**.

- ***A** bevat slegs London-/dispersie-/geïnduseerde kragte en **C** (bykomend tot London- en dipool-dipool-kragte) bevat waterstofverbindings.*
- *Waterstofverbindings is sterker as London-kragte/Intermolekulêre kragte van **C** is sterker as dié van **A**/intermolekulêre kragte van **A** is swakker as dié van **C**.* ✓

OF
London-/Dispersie-/Geïnduseerde dipoolkragte is swakker as waterstofverbindings

- *Meer energie is nodig om sterker waterstofverbindings te oorkom as swak London-kragte/Meer energie word benodig om sterker intermolekulêre kragte in **C** as in **A** te oorkom.*
  OF
  *Minder energie is nodig om swakker London-kragte te oorkom as sterk waterstofverbindings/Minder energie is nodig om swakker intermolekulêre kragte in **A** te oorkom as in **C**.* (3)

3.3 **B**, **A**, **C** and/*en* **D**. ✓✓ (2 or/*of* 0) (2)
[12]

QUESTION/*VRAAG* 4

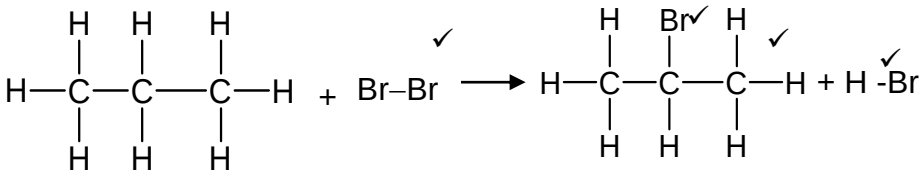
4.1.1 Addition/Hydrogenation ✓ /*Addisie/Hidrogenerasie* (1)

4.1.2 Substitution ✓ /*Substitusies/Vervangings* (1)

4.2.1 Platinum/Pt ✓
OR/*OF*
Palladium/Pd
OR/*OF*
Nickel/Ni /*Nikkel/Ni* (1)

4.2.2 (Mild) heat/Sunlight/UV light *(Matige) hitte/Sonlig/UV lig* ✓
No water/*Geen water* (1)

4.3.1



Marking criteria/*Nasienkriteria*:
- 1 mark for the reactants
- 1 mark for functional group (Br), i.e., if 1- bromopropane is given as a product - 1 mark.
- 2 marks for 2 - Bromopropane
- 1 mark for hydrogen Bromide

NOTE: Penalise 1 mark if condensed structural/molecular for propane is given.

- *1 punt vir die reaktante*
- *1 punt vir funksionele groep (Br), d.i. as 1-bromopropaan as 'n produk gegee word – 1 punt*
- *2 punte vir 2 – Bromopropaan*
- *1 punt vir waterstof-bromied*

***LET WEL:** Penaliseer 1 punt as gekonsenseerde struktuur-/molekulêre vir propaan gegee is.* (4)

4.3.2
- Carbon dioxide ✓ /*Koolstofdioksied*
- Water ✓

OR/*OF*

- CO_2
- H_2O (2)

4.4.1 Doping ✓ / *Doktering* (1)

4.4.2 Intrinsic semiconductor is a <u>pure semiconductor</u> ✓✓
Intrinsieke halfgeleier is 'n suiwer halfgeleier (2)

4.4.3
- An N-type semiconductor is a semiconductor with excess <u>electrons/negative charge carriers</u>, ✓✓/ it is formed when an intrinsic semiconductor is doped with <u>pentavalent impurity</u>
- A p-type semiconductor is a semiconductor with <u>positive hole/charge carriers</u>, ✓✓/ it is formed when an intrinsic semiconductor is <u>doped</u> with a <u>trivalent impurity</u>.

- *'n N-tipe halfgeleier is 'n halfgeleier met oormaat <u>elektrone/negatiewe ladingdraers</u>, dit word gevorm wanneer 'n intrinsieke halfgeleier word met <u>pentavalente onsuiwerheid</u>*
- *'n P-tipe halfgeleier is 'n halfgeleier met <u>positiewe holte/ladingdraers</u>, dit word gevorm wanneer 'n intrinsieke halfgeleier word met 'n <u>trivalente onsuiwerheid gedokteer word</u>* (4)

[17]

QUESTION/*VRAAG* 5

5.1.1 Copper(II) ions ✓ / *Koper(II)ione* (1)

5.1.2 Chloride ions ✓ / *Chloriedione* (1)

5.2.1 Positive (electrode) ✓ / *Positiewe (elektrode)* (1)

5.2.2 Negative (electrode) ✓ / *Negatiewe (elektrode)* (1)

5.3 Oxidation is the loss of electrons ✓✓/ an increase in oxidation number
Oksidasie is die verlies van elektrone (2)

5.4 $2C\ell^-(aq) \rightarrow C\ell_2 + 2e^-$ ✓✓

<u>Marking criteria/*Nasienkriteria*</u>:
$C\ell_2(g) + 2e^- \leftarrow 2C\ell^-(aq)$ (2/2) $2C\ell^-(aq) \rightleftharpoons C\ell_2(g) + 2e^-$ (½)
$2C\ell^-(aq) + 2e^- \rightleftharpoons C\ell_2(g)$ (0/2) $2C\ell^-(aq) \leftarrow C\ell_2(g) + 2e^-$ (0/2)
NOTE: Do not penalise if the phases are not included or an electron charge is omitted.
Penalise 1 mark if the charge on the chloride ion is omitted
LET WEL: *Moet nie penaliseer as die fases nie ingesluit is nie of 'n elektronlading uitgelaat is.*
Penaliseer 1 punt as die lading op die chloriedioon uitgelaat is.

(2)

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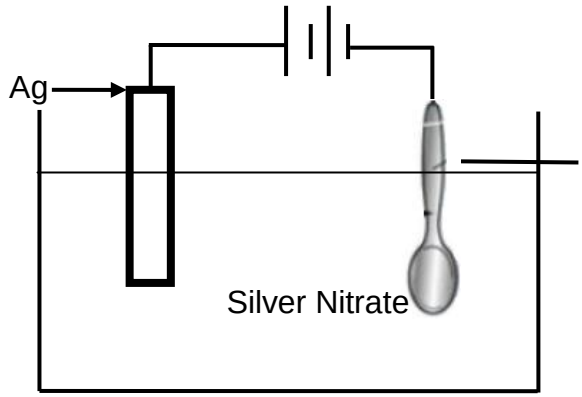
5.5 Reducing agent is a substance that is oxidised/loses electrons. ✓✓
Accept: Reducing agent is a substance that undergoes oxidation.

Reduseermiddel is 'n stof wat geoksideer is/elektrone verloor.
Aanvaar: *Reduseermiddel is 'n stof wat oksidasie ondergaan.*

(2)

5.6



Marking criteria/*Nasienkriteria*:

- Correct electrolyte use (silver nitrate or silver acetate) ✓
- Ag electrode connected to the anode and a spoon (to be electroplated) connected to the cathode ✓
- Battery (Accept if a cell is drawn) correctly drawn ✓

- *Korrekte elektroliet gebruik (silwernitraat of silwerasetaat)*
- *Ag-elektrode aan die anode verbind en 'n lepel (wat geëlektroplateer moet word) aan die katode verbind*
- *Battery (Aanvaar indien 'n sel geteken is) korrek geteken*

(3)
[13]

QUESTION/*VRAAG* 6

6.1.1 Galvanic /voltaic (cell)✓ / *Galvaniese sel/voltaïese sel* (1)

6.1.2 $Zn(s) + Cu^{2+}(aq)$✓ ⟶ $Zn^{2+}(aq) + Cu(s)$ ✓

NOTE: Do not penalise if phases are omitted
LET WEL: *Moenie penaliseer as fases uitgelaat is nie* (2)

6.1.3

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
$E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$ ✓ $= 0,34$ ✓$- (- 0,76)$ ✓ $= 1,10$ V ✓	$Zn \rightarrow Zn^{2+} + 2e^-$ -(-0,76) ✓ $Cu^{2+} + 2e^- \rightarrow Cu$ (0,34)✓ $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ ✓ (1,10 V) ✓

ACCEPT any other relevant formula on the data sheet
Penalise 1 mark if unconventional abbreviation is used or there is omission in the formula.

AANVAAR enige ander relevante formule op die datablad
Penaliseer 1 punt as onkonvensionele afkorting gebruik word of as daar iets uit die formule gelaat is (4)

6.2.1 Reaction/*Reaksie* **A** ✓ (1)

6.2.2 Magnesium is a stronger reducing agent than zinc ions ✓ therefore it will reduce zinc ions to zinc ✓
OR
Zinc ions are weaker reducing agent that magnesium, therefore magnesium will reduce zinc ions to zinc (metal).
OR
Nickel is a weaker reducing agent than zinc ions therefore it will NOT reduce zinc ions to zinc.
OR
Zn ions are stronger reducing agent than nickel, therefore nickel will not reduce zinc ions to zinc (metal).
OR
Magnesium is a stronger reducing agent than nickel, therefore magnesium will reduce zinc ions to zinc and nickel will not.

Magnesium is 'n sterker reduseermiddel as sinkione ✓daarom sal dit sinkione na sink reduseer ✓
OF
Sinkione is 'n swakker reduseermiddel as magnesium, daarom sal magnesium sinkione tot sink (metaal) reduseer.
OF
Nikkel is 'n swakker reduseermiddel as sinkione daarom sal dit NIE sinkione tot sink reduseer nie.
OF
Zn-ione is 'n sterker reduseermiddel as nikkel, daarpm sal nikkel nie sinkione tot sink (metaal) reduseer nie.
OF
Magnesium is 'n sterker reduseermiddel as nikkel, daarom sal magnesium sinkione tot sink reduseer en nikkel sal nie. (2)
[10]

TOTAL/*TOTAAL*: 75

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