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 2022

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 75

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

QUESTION/*VRAAG* 1

1.1 C ✓✓ (2)

1.2 C ✓✓ (2)

1.3 A ✓✓ (2)

1.4 B ✓✓ (2)

1.5 D ✓✓ (2)

[10]

QUESTION/*VRAAG* 2

2.1 A series of organic compounds that are described by the same general formula ✓ and where each member differs from the next by a CH_2 group. ✓

'n Reeks organiese verbindings wat deur dieselfde algemene formule beskryf kan word en waar elke lid van die volgende verskil deur 'n CH_2-groep. (2)

2.2.1 A ✓ (1)

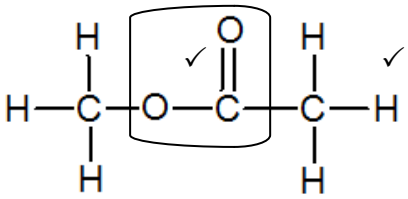
2.2.2 B and/*en* C ✓✓ (**NOTE/*LET WEL*:** 2 or/*of* 0. Both letters should be indicated/*Beide letters moet aangedui word*) (2)

2.2.3 D ✓ (1)

2.2.4 F ✓ (1)

2.3 Butane/*Butaan* ✓✓ (**NOTE/*LET WEL*:** 2 or/*of* 0) (2)

2.4.1

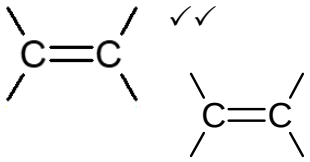


✓ ✓

Marking criteria/*Nasienkriteria*:
- Correct functional group
- Whole structure correct
- If a bond or hydrogen is missing ½
- *Korrekte funksionele groep*
- *Volledige struktuur korrek*
- *Indien binding of waterstof uitgelaat is, ½*

(2)

2.4.2



✓✓ (2)

[13]

QUESTION/*VRAAG* 3

3.1 The temperature at which the vapour pressure is equal to the atmospheric pressure. ✓✓

Die temperatuur waar die dampdruk aan die atmosferiese druk gelyk is. ✓✓ (2)

3.2 C ✓ (1)

3.3.1 Propanoic acid/*Propanoësuur* ✓

3.3.2 Propan-1-ol/*Propaan-1-ol* ✓

3.3.3 Propanal/*Propanaal* ✓ (3)

3.4
- Both propanoic acid and propan-1-ol/compounds **A** and **B** contain hydrogen bonds *(in addition to London and dipole-dipole forces).* ✓
- Propanoic acid/Compound **A** has (two sites) to form stronger intermolecular forces/hydrogen bonds than propan-1-ol (compound **B**) which has (only one site). ✓
- More energy is needed to overcome (stronger) hydrogen bonds/ intermolecular forces in propanoic acid/compound **A** than the (weaker) hydrogen bonds/intermolecular forces in propan-1-ol (compound **B**). ✓
- Thus, propanoic acid/compound **A** has a lower vapour pressure than propan-1-ol (compound **B**). ✓

- *Beide propanoësuur en propaan-1-ol/verbindings **A** en **B** bevat waterstofbindings (bykomend tot London- en dipool-dipool-kragte).*
- *Propanoësuur/Verbinding **A** het (twee gebiede om) sterker intermolukulêre kragte/waterstofbindings (te vorm) as propaan-1-ol (verbinding **B**) (wat net een gebied het).*
- *Meer energie word benodig om (sterker) waterstofbindings/intermolekulêre kragte in propanoësuur/verbinding **A** te oorkom as die (swakker) waterstofbindings/intermolekulêre kragte in propaan-1-ol (verbinding **B**).*
- *Dus, propanoësuur/verbinding **A** het 'n laer dampdruk as propaan-1-ol (verbinding **B**).*

OR/*OF*

- Both propanoic acid and propan-1-ol/compounds **A** and **B** contain hydrogen bonds *(in addition to London and dipole-dipole forces).*
- Propan-1-ol/Compound **B** has (only one site) to form weaker intermolecular forces/hydrogen bonds than propanoic acid (compound **A**) which has (two sites).
- Less energy is needed to overcome (weaker) hydrogen bonds/intermolecular forces in propan-1-ol/compound **B** than the (stronger) hydrogen bonds/intermolecular forces in propanoic acid (compound **A**).
- Thus, propan-1-ol/compound **B** has a higher vapour pressure than propanoic acid (compound **A**).

- *Beide propanoësuur en propaan-1-ol/verbindings **A** en **B** bevat waterstofbindings (bykomend tot London- en dipool-dipool-kragte).*
- *Propaan-1-ol/Verbinding **B** het (slegs een gebied) om swakker intermolukulêre kragte/waterstofbindings te vorm as propanoësuur (verbinding **A**), wat (twee gebiede het).*
- *Minder energie word benodig om (swakker) waterstofbindings/ intermolekulêre kragte in propaan-1-ol/verbinding **B** te oorkom as die (sterker) waterstofbindings/intermolekulêre kragte in propanoësuur (verbinding **A**).*
- *Dus, propaan-1-ol/verbinding **B** het 'n hoër dampdruk as propanoësuur (verbinding **A**).* (4)

3.5 A ✓ (1)
[11]

QUESTION/*VRAAG* 4

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

4.1.2 Substitution/*Substitusie (Vervanging)* / Halogenation/*Halogenering* / Chlorination/*Chlorogenering* (1)

4.2 $C_2H_4 + H_2 \rightarrow C_2H_6$ (balancing/*balansering* ✓) (3)

Marking criteria/*Nasienkriteria*:
- One mark for reactants / *Een punt vir reaktanse*
- One mark for product/ *Een punt vir produk*
- One mark for balancing/ *Een punt vir balansering*

Note/*Let wel*: One mark for balancing when structural or condensed structural formulae used / *Een punt vir balansering indien struktuurformule of gekondenseerde struktuurformule gebruik word.*

4.3.1 Combustion/*Verbranding* ✓ / Oxidation/*Oksidasie* (1)

4.3.2 Carbon dioxide/*Koolstofdioksied* ✓✓ / CO_2
Accept/*Aanvaar*: Carbon(IV)oxide / *Koolstof(IV)oksied* (2)

4.4.1 Substitution/*Substitusie (Vervanging)* ✓ / Hydrolysis/*Hidrolise* (1)

4.4.2 Mild heat/*Matige hitte* ✓
Diluted strong base/*Verdunde sterk basis* ✓ **OR/*OF*** Excess water/ *Oormatige water*
Accept/*Aanvaar*: Diluted/*Verdunde* NaOH / KOH (2)

4.4.3 Ethanol/*Etanol* ✓✓ (2)

4.5.1 Semiconductors/*Halfgeleiers* ✓ / Metalloids/*Metalloïde* / Semimetals/*Halfmetale* (1)

4.5.2 The process of adding impurities to intrinsic semiconductors. ✓✓
Die proses om onsuiwerhede by intrinsieke halfgeleiers te voeg. (2)

4.5.3 Forward bias/*Meevoorspanning* ✓ (1)
[17]

QUESTION/*VRAAG* 5

5.1 +2 ✓ (1)

5.2 The decomposition of a substance ✓ when electric current is passing through it. ✓
Die ontbinding van 'n stof ✓ wanneer elektriese stroom daardeur beweeg. ✓
OR/*OF*
The chemical process in which electrical energy is converted to chemical energy.
Die chemiese proses waar elektriese energie na chemiese energie omgeskakel word.
OR/*OF*
The use of electrical energy to produce a chemical change.
Die gebruik van elektriese energie om chemiese verandering teweeg te bring. (2)

5.3 Endothermic/*Endotermies* ✓ (1)

5.4 Q ✓ (1)

5.5.1 Bubbles form/*Borrels vorm* ✓ / Effervescence/*Opbruising* (1)

5.5.2 Mass increases/*Massa neem toe* ✓ / Reddish brown deposit (copper) forms / *Rooibruin neerslag (koper) vorm* ✓ (1)

5.6 $Cu^{2+}(aq) + 2C\ell^-(g) \rightarrow Cu(s) + C\ell_2(g)$ ✓✓ ✓ *(*balancing/*balansering* ✓*)*

OR/*OF*

$CuC\ell_2(aq) \rightarrow Cu(s) + C\ell_2(g)$ ✓✓ ✓ (balancing/*balansering)*

Marking criteria/*Nasienkriteria*:
- One mark for reactants / *Een punt vir reaktanse*
- One mark for product/ *Een punt vir produk*
- One mark for balancing/ *Een punt vir balansering*

Note/*Let wel:* Do NOT penalise when phases are omitted, but penalise when incorrect phases are indicated. / *MOENIE penaliseer indien fases uitgelos word nie, maar penaliseer indien verkeerde fases aangedui word.*

(3)

5.7 In molten $CuC\ell_2$, ions are able to move freely. ✓✓
In gesmelte $CuC\ell_2$ *is ione instaat om vrylik te beweeg.* ✓✓

Accept/*Aanvaar*: Molten $CuC\ell_2$ will conduct electricity (while a solid will not).
Gesmelte $CuC\ell_2$ *sal elektrisiteit gelei (terwyl 'n vaste stof dit nie sal doen nie).* (2)
[12]

QUESTION/*VRAAG* 6

6.1 Phase boundary/*Fasegrens* ✓ / Interphase/*Tussenfase*
Accept/*Aanvaar*: phase separator/*faseskeier* (1)

6.2 Concentration/*Konsentrasie*: 1 mol·dm^{-3} ✓
Temperature/*Temperatuur*: 25 ^{o}C ✓ / 298 K (2)

6.3 Copper (II) ions/*Koper(II)ione* ✓✓ / Cu^{2+} (2)

6.4.1 Negative/*Negatief* ✓ (1)

6.4.2 Positive/*Positief* ✓ (1)

6.5 $E^{\theta}_{cell/sel} = E^{\theta}_{cathode/katode} - E^{\theta}_{anode/anode}$ ✓
1,10 ✓ = 0,34 ✓ - $E^{\theta}_{(Y)}$
$E^{\theta}_{(Y)}$ = - 0,76 V ✓
Y is Zinc (Zn)/*Y is Sink* ✓

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

OR/*OF*

$Y \rightarrow Y^{2+} + 2e^-$ ✓
$Cu^{2+} + 2e^- \rightarrow Cu$

$E^{\theta}_{(Y)}$ = - 0,76 V ✓
$E^{\theta}_{cathode/katode}$ = 0,34 (V) ✓
$E^{\theta}_{cell/sel}$ = 1,10 (V) ✓

Y is Zinc (Zn) / *Y is sink (Zn)* ✓ (5)
[12]

TOTAL/*TOTAAL*: 75