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# 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.***

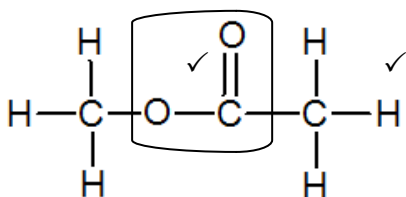
### QUESTION/VRAAG 1

- 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<sub>2</sub> group. ✓  
*'n Reeks organiese verbindings wat deur dieselfde algemene formule beskryf kan word en waar elke lid van die volgende verskil deur 'n CH<sub>2</sub>-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

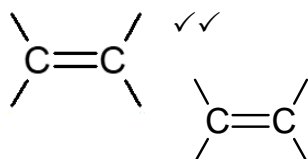


**Marking criteria/Nasienkriteria:**

- 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 intermolekulêre 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 intermolekulêre 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 ✓)

**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)

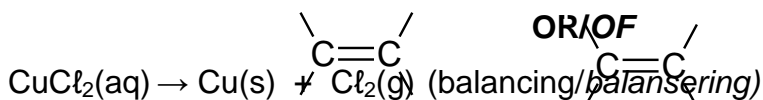
5.3 Endothermic/Endotermies ✓ (1)

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  $\text{Cu}^{2+}(\text{aq}) + 2\text{Cl}^{-}(\text{g}) \rightarrow \text{Cu}(\text{s}) + \text{Cl}_2(\text{g})$  ✓ (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  $\text{CuCl}_2$ , ions are able to move freely. ✓✓  
*In gesmelte  $\text{CuCl}_2$  is ione instaat om vrylik te beweeg. ✓✓*

**Accept/Aanvaar:** Molten  $\text{CuCl}_2$  will conduct electricity (while a solid will not).

*Gesmelte  $\text{CuCl}_2$  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*:  $1 \text{ mol} \cdot \text{dm}^{-3}$  ✓  
Temperature/*Temperatuur*:  $25 \text{ }^\circ\text{C}$  ✓ / 298 K (2)

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

6.4.1 Negative/*Negatief* ✓ (1)

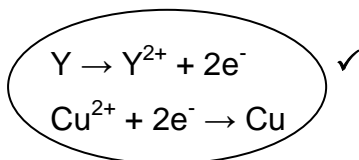
6.4.2 Positive/*Positief* ✓ (1)

6.5  $E^\theta_{\text{cell/SEL}} = E^\theta_{\text{cathode/katode}} - E^\theta_{\text{anode/anode}}$  ✓  
 $1,10 \text{ } \checkmark = 0,34 \text{ } \checkmark - E^\theta_{(Y)}$   
 $E^\theta_{(Y)} = -0,76 \text{ V } \checkmark$   
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**



$E^\theta_{(Y)} = -0,76 \text{ V } \checkmark$

$E^\theta_{\text{cathode/katode}} = 0,34 \text{ (V) } \checkmark$

$E^\theta_{\text{cell/SEL}} = 1,10 \text{ (V) } \checkmark$

Y is Zinc (Zn) / *Y is sink (Zn)* ✓

(5)  
[12]

**TOTAL/TOTAAL: 75**