Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

SEPTEMBER 2021

TECHNICAL SCIENCES P2/*TEGNIESE WETENSKAPPE V2*
MARKING GUIDELINE/*NASIENRIGLYN*

MARKS/*PUNTE*: 75

This marking guideline consists of 7 pages/
Hierdie nasienriglyn bestaan uit 7 bladsye.

QUESTION/*VRAAG* 1

1.1 C ✓✓ (2)
1.2 C ✓✓ (2)
1.3 D ✓✓ (2)
1.4 C ✓✓ (2)
1.5 D ✓✓ (2)
[10]

QUESTION/*VRAAG* 2

2.1 Functional group/*Funksionele groep* ✓ (1)

2.2 Macromolecule/*Makromolekule* ✓ (1)

2.3 Semiconductor/*Halfgeleier* ✓ (1)

2.4 Electrolysis/*Elektrolise* ✓ (1)
[4]

QUESTION/*VRAAG* 3

3.1 Doping is the process of adding impurities to an intrinsic semiconductor to improve its conductivity. ✓✓
Doktering is die proses waardeur onsuiwerhede by 'n intrinsieke halfgeleier gevoeg word om sy geleidingsvermoë te verbeter. ✓✓ (2)

3.2 Silicon is a pure semiconductor, as impure atoms must be added to improve conductivity. ✓✓
Silicon is 'n suiwer halfgeleier want onsuiwer atome moet bygevoeg word om sy geleidingsvermoë te verbeter. ✓✓

OR/*OF*

A pure semiconductor which is undoped. ✓✓
'n Suiwer halfgeleier wat ongedokteer is. ✓✓ (2)

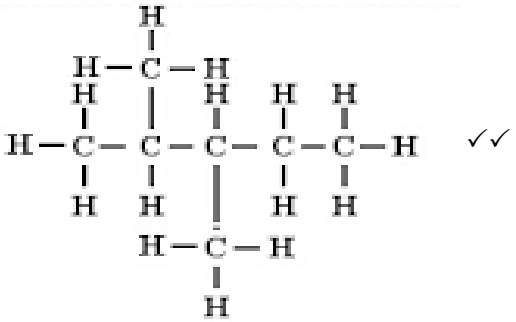
3.3 3.3.1 P-type semiconductor/*P-tipe halfgeleier* ✓ (1)

3.3.2 A diode allows the current to flow in one direction **only**. ✓
*'n Diode laat die ladings om **slegs** in een rigting te vloei.* ✓ (1)
[6]

QUESTION/*VRAAG* 4

4.1 4.1.1 C ✓ **OR**/***OF*** G ✓ (1)
4.1.2 A ✓ (1)
4.1.3 A **AND**/**EN** E ✓✓ (2)
4.1.4 B ✓ (1)
4.1.5 E ✓ (1)

4.2



✓✓ (2)

4.3 4.3.1 Addition/*Addisie* ✓ (1)

4.3.2 HBr ✓ (1)

4.4 Pentanoic Acid ✓ and Ethanol ✓
Pentanoësuur ✓en Etanol ✓ (2)
[12]

QUESTION/*VRAAG* 5

5.1 A series of organic molecules that is defined by the same general formula and where each member differs from the next by a CH_2 group. ✓✓
'n Reeks verbindings wat dieselfde algemene formule het, maar elke lid verskil van die volgende deur 'n CH_2-groep. ✓✓ (2)

5.2 An increase in the number of branched chains results in a decrease in the boiling point. ✓
Vermeerderde aantal vertakte kettings sal 'n afname in die kookpunt veroorsaak. ✓

OR/*OF*

Straight chain alkanes have a higher boiling point compared to their corresponding branched chains. ✓
Alkane met reguit kettings het 'n hoër kookpunt in vergelyking met ooreenstemmende vertakte kettings. ✓ (1)

5.3 Straight-chained molecules can get closer to one another than branched molecules and have larger surface area in contact for intermolecular forces to form, ✓ therefore the Van der Waals forces/london forces are stronger. ✓ hence more energy is required to overcome intermolecular forces between the straight chain molecules compared to branched chains. ✓ therefore, straight-chained molecules have a higher boiling point. ✓
Reguit-ketting molekules kom nader aan mekaar beweeg as vertakte-ketting molekules en het groot oppervlak areas in kontak met mekaar sodat sterker intermolekulêre kragte kan vorm, ✓ dus is die Van der Waalskragte/ Londonkragte sterker. Dus word meer energie benodig om die intermolekulêre kragte te breek tussen reguit-ketting molekules vergeleke met vertakte kettings. ✓ reguit-ketting molekules het dus 'n hoër kookpunt. ✓

OR/*OF*

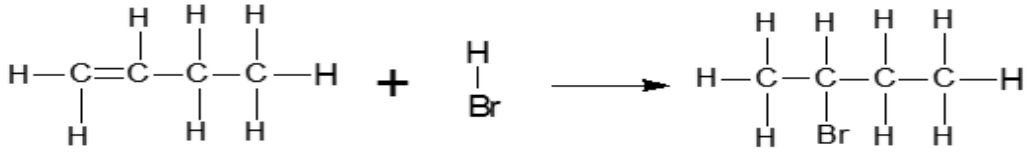
Branched chains form molecules that are more spherical with fewer points of contact for intermolecular forces. ✓ Therefore, the Van der Waals forces / London forces are weaker. ✓ Hence less energy is required to overcome intermolecular forces between the branched chains compared to straight chains, ✓ thus a lower boiling point. ✓
Vertakte kettings vorm molekules wat meer sferiese ("rond") is met minder punte vir kontak vir intermolekulêre kragte. ✓ dus is die Van der Waalskragte/Londonkragte swakker. ✓ Minder energie word dus benodig om die intermolekulêre kragte tussen die vertakte ketting te breek vergeleke met die reguit ketting, ✓ en daarom het hulle 'n laer kookpunt. ✓ (4)

5.4 **The learner should**:
Avoid direct heating with an open flame.
Work in a well-ventilated area.
Use a fume hood.
} Any one ✓
Reason: Alkanes are fuels and are highly flammable ✓

Die leerder moet:
Vermy verhitting oor 'n oop vlam.
Werk in 'n goed geventileerde area.
Gebruik 'n damp-kap.
} *Enige een ✓*
***Rede**: Alkane is brandstowwe en is hoogs vlambaar. ✓* (2)
[9]

QUESTION/*VRAAG* 6

6.1

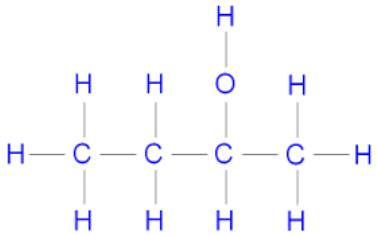


(4)

MARKING CRITERIA / *MERK KRITERIA*		
Correct structure of reactants. *Korrekte struktuur van die reaktante.*	✓✓	(2)
Correct structure of the product/*Korrekte struktuur van die produk*	✓✓	(2)

6.2 Hydrohalogenation/addition. ✓
Hidrohalogenasie/addisie. ✓ (1)

6.3



Butan-2-ol (2-butanol) ✓ (3)

6.4 Hydrolysis/*Hidrolise* ✓ (1)

6.5 6.5.1 Water ✓ (1)

6.5.2 H_2SO_4 / HCℓ / H_3PO_4 ✓ (1)

6.5.3 Hydration ✓ (Accept: Addition)
Hidrolise ✓ *(Aanvaar: Addisie)* (1)

6.6 Manufacturing of plastic bags/
Vervaardiging van plastieksakke
Synthesis of bullet proof vests/
Sintese van koeëlvaste baadjies
Manufacturing of squeeze bottles/
Vervaardiging van spuitwaterbottels
(Any one ✓)
(*Enige een ✓)*
Manufacturing of cling wrap/*Vervaardiging van kleefplastiek* (1)
[13]

QUESTION/*VRAAG* 7

7.1 An electrolyte is a substance of which the aqueous solution contains ions. ✓✓
'n Elektroliet is 'n stof waarvan die waterige oplossing ione bevat. ✓✓

OR/*OF*

A substance that dissolves in water to give a solution that conducts electricity.✓✓
'n Stof wat in water oplos om 'n oplossing te vorm wat elektrisiteit kan gelei. ✓✓

OR/*OF*

A substance that forms free ions when melted.✓✓
'n Stof wat vry ione vorm wanneer dit smelt. ✓✓ (2)

7.2 Electrolytic cell/*Elektrolietiese sel* ✓ (1)

7.3 7.3.1 $Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)$ ✓ (1)

7.3.2 $2Cl^{-}(aq) \rightarrow Cl_2(g) + 2e^{-}$ ✓ (1)

7.4 Chlorine/*Chloor* ✓ (1)

7.5 Conversion of electrical energy to chemical energy. ✓
Omskakeling van elektriese energie na chemiese energie. ✓ (1)
[7]

QUESTION/*VRAAG* 8

8.1 Salt bridge. ✓ It maintains electrical neutrality. ✓
Soutbrug. ✓ *Dit behou elektriese neutraliteit.* ✓

OR/*OF*

It separates the two compartments so that they do not mix. ✓
Dit skei die twee kompartemente sodat hulle nie meng nie. ✓ (2)

8.2 Chemical energy is converted into electrical energy. ✓
Chemiese energie word na elektriese energie omgesit. ✓ (1)

8.3 It is a non-spontaneous reaction. ✓ (1)
Dit is 'n nie-spontane reaksie. ✓

8.4 8.4.1 $E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{Anode}$ ✓
$= \underline{-0,74 - (-0,76)}$ ✓
$= 0,02$ V ✓

OR/OF

$Cr^{3+} + 3e^- \rightarrow Cr$ $E^{\theta} = -0,74$ ✓
$Zn \rightarrow Zn^{2+} + 2e^-$ $E^{\theta} = +0,76$ ✓
$E^{\theta}_{cell} = 0,02$ *V* ✓ (3)

8.4.2 Decreases/*Neem af.* ✓ (1)

8.5 Measurements are not done under standard conditions of temperature at 25 °C ✓ and concentration of electrolytes of 1 mol·dm^{-3} ✓ (2)
Die metings word nie gedoen onder standaardtoestande van temperatuur by 25 ˚C en konsentrasie van die elektroliete van 1 mol·dm^{-3} nie. ✓

8.6 8.6.1 Fuel cell/*Brandstofsel* ✓ (2)
Photovoltaic cell/*Fotovoltaïse sel* ✓

8.6.2 It increases energy security, improves the quality of air and the environment. (ANY ONE ✓)
Dit verhoog energie-sekuriteit, verbeter die kwaliteit van die lug en die omgewing. (ENIGE EEN ✓) (1)

8.6.3 More expensive than petroleum.
Not suitable for use in low temperatures.
Could harm rubber hoses of some engines.
Can contribute to food shortage. (Any one) ✓
Duurder as petroleum.
Nie geskik vir lae temperature nie
Kan die rubberpype van sommige enjins beskadig.
Kan bydra tot voedseltekort. *(Enige een)* ✓ (1)

[14]

TOTAL/*TOTAAL*: 75