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 2023

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 D ✓✓ (2)

1.5 B ✓✓ (2)

[10]

QUESTION/*VRAAG* 2

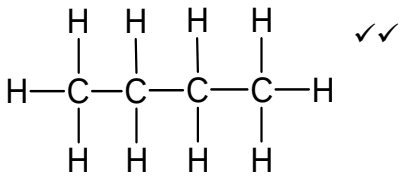
2.1 Molecules containing carbon atoms. ✓✓
Molekule wat koolstofatome bevat. (2)

2.2.1 B ✓ (1)

2.2.2 C and/*en* D ✓✓ **NOTE/*LET WEL*:** 2 marks or/*of* 0 (2)

2.2.3 A ✓ or/*of* B (1)

2.3.1

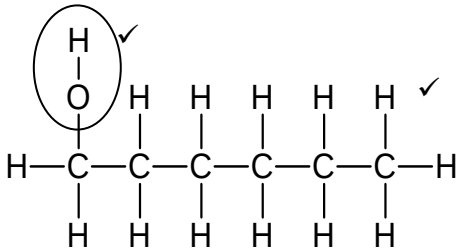


✓✓

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

(2)

2.3.2



Marking criteria/*Nasienkriteria*:
- Correct functional group/*Korrekte funksionele groep*
- The whole structure correct/*Volledige struktuur korrek*
- If a bond or hydrogen is missing/*Indien 'n binding of waterstof ontbreek* ½

(2)

2.4 Organic compounds that have the same molecular formula✓ but different functional groups. ✓
Organiese molekule met dieselfde molekulêre formule, maar verskillende funksionele groepe. (2)

2.5 ✓ ✓
Propanal / *Propanaal* (2)

2.6 Ketone ✓/*Ketoon* (1)

[15]

QUESTION/*VRAAG* 3

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

3.2
- Compound **A**/Propane and compound **B**/Butane both contain London forces/induced dipole forces/dispersion forces. ✓/
*Verbinding **A**/Propaan en verbinding **B**/Butaan besit beide Londonkragte/geïnduseerde dipoolkragte/dispersiekragte.*
- Chain length/molecular mass/surface area of compound **B/**Butane is longer/larger than that of compound **A**/Propane. ✓/
*Kettinglengte/molekulêre massa/oppervlakarea van verbinding **B**/ Butaan is langer/groter as dié van verbinding **A**/Propaan.*
- London forces/intermolecular forces/induced dipole forces/ dispersion forces in compound **B/**Butane are stronger than that in compound **A/** Propane. ✓/
*Londonkragte/intermolekulêre kragte/geïnduseerde dipoolkragte/ dispersiekragte in verbinding **B**/Butaan is sterker as dié in verbinding **A**/Propaan.*

OR/*OF*

- Compound **A**/Propane and compound **B**/Butane both contain London forces/induced dipole forces/dispersion forces./
*Verbinding **A**/Propaan en verbinding **B**/Butaan besit beide Londonkragte/geïnduseerde dipoolkragte/dispersiekragte.*
- Chain length/molecular mass/surface area of compound **A/**Propane is shorter/smaller than that of compound **B/**Butane./
*Kettinglengte/molekulêre massa/oppervlakarea van verbinding **A**/ Propaan is korter/kleiner as dié van verbinding **B**/Butaan.*
- London forces/intermolecular forces/induced dipole forces/ dispersion forces in compound **A/**Propane are weaker than that in compound **B/** Butane.
*Londonkragte/intermolekulêre kragte/geïnduseerde dipoolkragte/ dispersiekragte in verbinding **A**/Propaan is swakker as dié in verbinding **B**/Butaan.* (3)

3.3.1 Yes ✓/*Ja*

Only one independent variable ✓ used during the investigation. *(Accept: Both have the same chain length/number of carbon atoms).*
Slegs een onafhanklike veranderlike word gebruik tydens die ondersoek. (Aanvaar: Beide het dieselfde kettingslengte/aantal koolstofatome). (2)

3.3.2

Marking criteria/*Nasienkriteria*:
- Relevant dependent and independent variables./*Toepaslike afhanklike en onafhanklike veranderlikes.*

Examples/*Voorbeelde*:
What is the relationship between type of functional groups/homologous series and melting point? ✓✓
Wat is die verhouding tussen die tipe funksionele groepe/homoloë reeks en smeltpunt?

OR/*OF*

How will the type of functional groups/homologous series influence the melting point?
Hoe sal die tipe funksionele groepe/homoloë reeks die smeltpunt beïnvloed? (2)

3.3.3 Functional groups ✓/Type of homologous series/Compounds
Funksionele groepe/Tipe homoloë reeks/Verbindings (1)

3.3.4 Lower than ✓/*Laer as* (1)

3.3.5 The melting point of compound **A/**Propane is lower than that of compound **C**/Propan-1-ol. ✓✓
*Die smeltpunt van verbinding **A**/Propaan is laer as dié van verbinding **C**/Propan-1-ol.*

OR/*OF*

The melting point of compound **C/**Propan-1-ol is higher than that of compound **A/**Propane.
*Die smeltpunt van verbinding **C**/Propan-1-ol is hoër as dié van verbinding **A**/Propaan.*

OR/*OF*

The intermolecular forces of compound **A**/Propane are weaker than that of compound **C**/Propan-1-ol.
*Die intermolekulêre kragte van verbinding **A**/Propaan is swakker as dié van verbinding **C**/Propan-1-ol.*

OR/*OF*

The intermolecular forces of compound **C/**Propan-1-ol are stronger than that of compound **A**/Propane
*Die intermolekulêre kragte van verbinding **C**/Propan-1-ol is sterker as dié van verbinding **A**/Propaan.* (2)

[13]

QUESTION/*VRAAG* 4

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

4.1.2 Substitution ✓/Halogenation/Bromination
Substitusie/Halogenasie/Halogenering/Bromogenering (1)

4.2 $C_3H_6 + H_2$ ✓ ⟶ C_3H_8 ✓
(Balanced ✓/ *Gebalanseerd*)

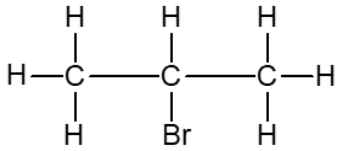
Marking criteria/*Nasienkriteria*:
- 1 mark for the reactants/ *1 punt vir reaktanse*
- 1 mark for product/*1 punt vir produkte*
- 1 mark for balancing/*1 punt vir balansering*

NOTE/*LET WEL*: Penalise 1 mark if incorrect formulae (e.g. structural/condensed structural) is used./ Penaliseer met 1 punt indien verkeerde formules (bv. struktuur/gekondenseerde struktuurformule) gebruik word.

(3)

4.3 2-bromopropane / *2-bromopropaan* / C_3H_7Br / $CH_3CHBrCH_3$

OR/*OF*



Marking criteria/*Nasienkriteria*:
- 1 mark for 2-bromo *(or 1-bromo)* / *1 punt vir 2-bromo (of 1-bromo)*
- 1 mark for propane/ *1 punt vir propaan*

Accept / *Aanvaar:*
1-bromopropane / *1-bromopropaan*

OR/*OF*

$CH_3CH_2CH_2Br$

OR/*OF*

(2)

Mild heat ✓/*Matige hitte*
4.4 (1)

4.5.1 A molecule that consists of a large number of atoms. ✓✓
'n Molekuul wat 'n groot aantal atome bestaan. (2)

4.5.2 A chemical reaction in which monomer molecules join✓ to form a polymer.✓
'n Chemiese reaksie waarin monomeermolekule verbind om 'n polimeer te vorm. (2)

[12]

QUESTION/*VRAAG* 5

5.1 A solution/liquid/dissolved substance that conducts electricity✓ through the movement of ions. ✓
'n Oplossing/vloeistof/opgeloste stof wat elektrisiteit deur die beweging van ione gelei. (2)

5.2 Electrical (energy) to chemical (energy). ✓✓
Elektriese (energie) na chemiese (energie). (2)

5.3
- Non-spontaneous ✓/*Nie-spontaan*

- The power source/battery/cell provides energy ✓ so that the reaction can take place./*Die kragbron/battery/sel voorsien energie sodat die reaksie kan plaasvind.* (2)

5.4.1 Reduction ✓ *Reduksie* (1)

5.4.2 $Ag \rightarrow Ag^+ + e^-$ ✓✓

Marking criteria/*Nasienkriteria*:
$Ag^+ + e^- \leftarrow Ag$ $(^2/_2)$ $Ag \rightleftharpoons Ag^+ + e^-$ $(^1/_2)$
$Ag^+ + e^- \rightleftharpoons Ag$ $(^0/_2)$ $Ag^+ + e^- \rightarrow Ag$ $(^0/_2)$
NOTE/*LET WEL*: *Do not penalise if the phases are omitted./ Moenie penaliseer indien fases weggelaat word nie.*

(2)

5.5
- Prevents corrosion/rusting. ✓/Voorkom korosie/roes.
- Increases the value. ✓/Verhoog die waarde.
- Durability / Duursaamheid (2)

5.6
- Easy to use✓/*Maklik om te gebruik*
- Reduces pollution✓/Lowers exhaust emissions/ Environmentally friendly / *Verminder besoedeling/Verlaag uitlaatgasse/ Omgewingsvriendelik*
- Non-toxic/*Nie-toksies*
- Slightly cheaper than petroleum diesel/*Effens goedkoper as petroleumdiesel.*
- Safer to handle than petroleum diesel/*Veiliger om te hanteer as petroleumdiesel.*
- It is renewable/*Dit is herwinbaar*
- Economic advantages in agricultural sector/Ekonomiese voordele in die landbousektor.

(ANY TWO/*ENIGE TWEE*) (2)
[13]

QUESTION/*VRAAG* 6

6.1 The loss of electrons. ✓✓ / Increase in oxidation number.
Die verlies aan elektrone. / Toename in oksideergetal (2)

6.2 Cu ✓/Copper/*Koper* (1)

6.3 Cu to/*na* Ag ✓ (1)

6.4 A layer of silver ✓ is formed/deposited. (Accept: Increase in mass)
'n Dun lagie silwer word gevorm/gedeponeer. (Aanvaar: Toename in massa) (1)

6.5 $Cu(s)$ / $Cu^{2+}(aq)$(1 mol·dm^{-3}) ✓ //✓ $Ag^{+}(aq)$(1 mol·dm^{-3}) / $Ag(s)$ ✓

Marking criteria/*Nasienkriteria*:
NOTE/*LET WEL:* Do not penalise if phases/concentration are omitted./*Moenie penaliseer indien fases/konsentrasie weggelaat word nie.*

6.6 $E^{\theta}_{cell/sel} = E^{\theta}_{cathode/katode} - E^{\theta}_{anode/anode}$ ✓
$= 0,80 - 0,34$ ✓
$= 0,46$ V ✓

(0,46 V < 2,5 V)

Thus, bulb will NOT glow. ✓
Dus, gloeilamp sal NIE brand nie.

Accept/*Aanvaar*: No/*Nee* (4)

Marking criteria/*Nasienkriteria*:
- Penalise once if unconventional or incomplete formula is used./*Penaliseer eenmalig indien nie-konvensionele of onvolledige formule gebruik is.*
- *Accredit any of the relevant formulae taken from the data sheet./Krediteer enige van die toepaslike formules geneem vanuit die gegewensblad.*

[12]

TOTAL/*TOTAAL*: 75