basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS/ *SENIORSERTIFIKAAT-EKSAMEN/ NASIONALE SENIORSERTIFIKAAT-EKSAMEN*

TECHNICAL SCIENCES P2/*TEGNIESE WETENSKAPPE V2*

MAY/JUNE/*MEI/JUNIE* 2025

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 75

These marking guidelines consist of 6 pages./
Hierdie nasienriglyne bestaan uit 6 bladsye.

DBE IM
1/06/2025

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QUESTION/*VRAAG* 1

1.1 B ✓✓ (2)

1.2 D ✓✓ (2)

1.3 C ✓✓ (2)

1.4 A ✓✓ (2)

1.5 C ✓✓ (2)
[10]

QUESTION/*VRAAG* 2

2.1 2-methyl ✓ but-1-ene ✓ / 2-methyl-1-butene/
2-metiel but-1-een / 2-metiel-1-buteen (2)

2.2 Organic molecules with the same molecular formula ✓ but different structural formulae.✓/*Organiese molekules met dieselfde molekulêre formule, maar verskillende struktuurformules.* (2)

2.3 B and/*en* C ✓ (1)

2.4.1 Ethanal ✓/*Etanal* (1)

2.4.2 Ethane ✓/*Etaan* (1)

2.4.3 Ethanoic acid ✓/*Etanoësuur* (1)

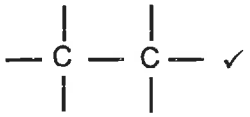
2.5.1 Small organic molecules that can be covalently bonded ✓ to each other in a repeating pattern. ✓/*Klein organiese molekules wat kovalent aan mekaar gebind kan word in 'n herhalende patroon.* (2)

2.5.2 Polymerisation ✓/*Polimerisasie* (1)

2.5.3 Manufacture plastics ✓ (Accept: plastic bottles; plastic bags; plastic containers; insulating electrical materials etc.)/*Vervaardig plastiek (Aanvaar: plastiekbottels, plastieksakke, plastiekhouers, Isolerende elektriese materiale, ens)* (1)
[12]

QUESTION/*VRAAG* 3

3.1.1 Alkanes ✓/*Alkane* (1)

3.1.2  (1)

3.2 London forces ✓/Induced dipole forces/Momentary dipole forces/Dispersion forces. /*Londonkragte/Geïnduseerde dipoolkragte/Momentêre dipoolkragte/ Dispersiekragte* (1)

3.3 Candle wax ✓/*Kerswas* (1)

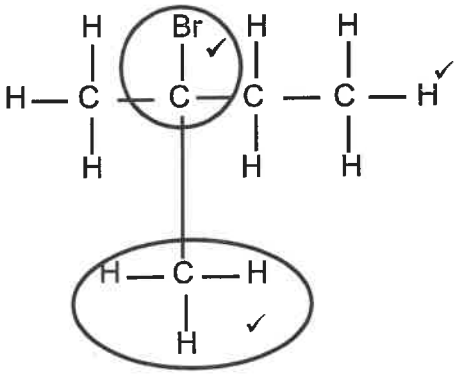
3.4 Petrol ✓ /*Petrol*

Has the weakest intermolecular forces/London forces ✓, thus the lowest amount of heat energy is needed to overcome them ✓ and therefore it has the lowest boiling point./*Het die swakste intermolekulêre kragte/Londonkragte, dus die laagste hoeveelheid hitte energie wat benodig word om hul te oorkom en daarom het hul die laagste kookpunt.* (3)
[7]

QUESTION/*VRAAG* 4

4.1 An organic compound in which the carbon atom to which the hydroxyl group is attached ✓, is bonded to three other carbon atoms.✓/*'n Organiese verbinding waarin die koolstofatoom waaraan die hidroksielgroep gekoppel is aan drie ander koolstofatome verbind is.* (2)

4.2.1 C_5H_{10} ✓ (1)

4.2.2 

Marking criteria/*Nasienkriteria*
- One mark for functional group/*Een punt vir funksionele groep*
- One mark for the methyl substituent/ *Een punt vir die metielsubstituent*
- One mark for the whole structure correct/*Een punt vir die volledige struktuur korrek*

Penalise 1 mark if a H or a bond is omitted./*Penaliseer 1 punt indien 'n H of verbinding weggelaat is.* (3)

4.2.3 2-methyl butan-2-ol / 2-methyl-2-butanol
2-metiel butan-2-ol / 2-metiel-2-butanol (2)

4.3 Substitution✓/*Substitusie* **OR/*OF*** Hydrolysis/*Hidrolise* (1)

4.4
- Excess water/Use dilute potassium hydroxide (KOH)✓ /Sodium hydroxide (NaOH)/Strong base./*Oormaat water/Gebruik verdunde kaliumhidroksied (KOH)/ Natriumhidroksied (NaOH)/Sterk basis*
- Mild heat ✓/*Matige hitte* (2)

[11]

QUESTION/*VRAAG* 5

5.1 (An intrinsic semiconductor) is a pure semiconductor.✓✓ */('n Intrinsieke halfgeleier) is 'n suiwer halfgeleier.* (2)

5.2 Graphite ✓/C(s)/Diamond /*Grafiet/C(s)/Diamant*
Silicon/Si /*Silikoon/Si*
Germanium/Ge /*Germanium/Ge*
Tin/Sn /*Tin/Sn* (ANY ONE/*ENIGE EEN*) (1)

5.3 Reverse biased ✓/*Teenvoorspannend* (1)

5.4 The positive terminal of the battery is connected to the cathode, ✓ and the negative terminal is connected to the anode. ✓/*Die positiewe terminaal van die battery is gekoppel aan die katode, en die negatiewe terminaal is gekoppel aan die anode.*

OR/*OF*

The positive terminal of the battery is connected to the n-type semiconductor, and the negative terminal is connected to the p-type semiconductor./*Die positiewe terminaal van die battery is gekoppel aan die n-tipe halfgeleier, en die negatiewe terminaal is gekoppel aan die p-tipe halfgeleier.* (2)

5.5 Graph/*Grafiek* **B** ✓ (1)

5.6 As the applied voltage across the ends of the p-n junction diode is increased: /*Soos die toegepaste spanning oor die punte van die p-n-verbindingsdiode verhoog:*

- The diffusion current increases slowly. ✓/*Die diffusiestroom neem stadig toe.*
- The resistance decreases slowly. ✓/*Die weerstand neem stadig af.*
- At the breakdown voltage of (0,69 V) the current increases exponentially.✓/*Die stroom neem eksponensieel toe by die afbreekspanning van (0,69 V).* (3)

[10]

QUESTION/*VRAAG* 6

6.1 It is the gain of electrons. ✓✓/*Dit is die wins van elektrone.* (2)

6.2.1 Copper(II)chloride / $CuCl_2(aq)$ ✓ /*Koper(II)chloried/*$CuCl_2(aq)$ (1)

6.2.2 Copper/Cu(s) ✓/*Koper/Cu(s)* (1)

6.2.3 Chlorine (gas) ✓ /$Cl_2(g)$/*Chloor(gas)/*$Cl_2(g)$ (1)

6.2.4 Cu^{2+}(ions) ✓/Cu^{2+}*(ione)* **OR/*OF*** Copper(II)ions/*Koper(II)ione* (1)

6.3 $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ ✓✓

Marking criteria/*Nasienriglyne*:
- $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$ 0/2
- $Cu(s) \longleftarrow Cu^{2+}(aq) + 2e^-$ 2/2
- $Cu^{2+}(aq) + 2e^- \rightleftharpoons Cu(s)$ 1/2
- $Cu(s) \rightleftharpoons Cu^{2+}(aq) + 2e^-$ 0/2

Please note/*Let wel*: Do not penalise if phases are omitted./*Moenie penaliseer indien fases weggelaat word nie.*

(2)
[8]

QUESTION/*VRAAG* 7

7.1 An (electrochemical) cell that converts chemical energy to electrical energy.✓✓/*'n (Elektrochemiese) sel wat chemiese energie na elektriese energie omskakel.* (2)

7.2
- Completes the circuit. ✓/*Voltooi die stroombaan.*
- Maintains electrical neutrality ✓ (through the movement of ions)./ *Handhaaf elektriese neutraliteit (deur die beweging van ione).* (2)

7.3 Zn to/*na* Cu ✓ (1)

7.4

Option/*Opsie* 1

$E^{\ominus}_{cell/sel} = E^{\ominus}_{cathode/katode} - E^{\ominus}_{anode/anode}$
$E^{\ominus}_{cell/sel} = E^{\ominus}_{reduction/reduksie} - E^{\ominus}_{oxidation/oksidasie}$
$E^{\ominus}_{cell/sel} = E^{\ominus}_{oxidising\ agent/oksideermiddel} - E^{\ominus}_{reducing\ agent/reduseermiddel}$ ✓ any one/ *enige een*
$= 0,34$ ✓$- (-0,76)$ ✓
$= 1,10$ V ✓

Option/*Opsie* 2

✓ $Zn \longrightarrow Zn^{2+} + 2e^-$	$E^{\ominus}_{cathode/katode}$	$= + 0,34$ ✓
$Cu^{2+} + 2e^- \longrightarrow Cu$	$E^{\ominus}_{anode/anode}$	$= - (-076)$ ✓
$Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$	$E^{\ominus}_{cell/sel}$	$= 1,10$ V ✓

(4)

7.5 The reaction did not take place under standard conditions. ✓✓/*Die reaksie het nie onder standaardtoestande plaasgevind nie.*

OR/*OF*

The temperature of the electrolyte was not 25 °C./ The concentration of the electrolyte was not 1 mol·dm^{-3}./*Die temperatuur van die elektroliet was nie 25 °C nie./Die konsentrasie van die elektroliet was nie 1 mol·dm^{-3} nie.* (2)

7.6 Diagram/*Diagram* **B** ✓ (1)

7.7 Releasing greenhouse gases ✓✓ (as a result of smoke emission during burning of coal). /*Vrystelling van kweekhuisgasse (as gevolg van rook wat vrygestel word tydens die verbranding van steenkool).*

OR/*OF*

Contributes to air pollution/global warming/climate change/acid rain formation (as a result of smoke emission during burning of coal)./Dra by tot besoedeling/aardverwarming/klimaatsverandering/vorming van suurreën *(as gevolg van rook wat vrygestel word tydens die verbranding van steenkool).*

OR/*OF*

Ecological damage (due to the removal of plantation)./*Ekologiese skade (as gevolg van die verwydering van plantasie).*

OR/*OF*

Coal is a non-renewable resource and the coal reserves will be depleted./ *Steenkool is 'n nie-hernubare bron en die steenkoolreserwes sal uitgeput word.*

OR/*OF*

Large volumes of water (which is a scarce resource), are used during the production of electric power./*Groot hoeveelhede water (wat 'n skaars bron is), word gebruik tydens die produksie van elektriese krag.*

(ANY CORRECT ONE/*ENIGE KORREKTE EEN*) (2)

7.8 South Africa is generally sunny ✓✓ (and therefore solar energy can be harnessed easily)./*Suid-Afrika is oor die algemeen sonnig (en dus kan sonenergie maklik ingespan word).*

OR/*OF*

Large open spaces available (for the installation of solar panel equipment/ establishment of solar farms./*Groot oop spasies beskikbaar (vir die installering van sonpaneeltoerusting/stigting van sonkragplase).* (2)

7.9
- Wind (energy) ✓/*Wind(energie)*
- Water (energy)/Hydropower/Hydro-energy *Water (energie)/Hidrokrag/Hidro-energie*
- Nuclear (energy)/*Kern(energie)*
- Biodiesel/*Bio-diesel*

(ANY CORRECT ONE/*ENIGE KORREKTE EEN*) (1)

[17]

TOTAL/*TOTAAL*: 75