



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE/  
NASIONALE SENIOR  
SERTIFIKAAT**

**GRADE/GRAAD 12**

**SEPTEMBER 2019**

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

**MARKS/PUNTE: 150**

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This marking guideline consists of 10 pages./  
*Hierdie nasienriglyn bestaan uit 10 bladsye.*

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**QUESTION/VRAAG 1**

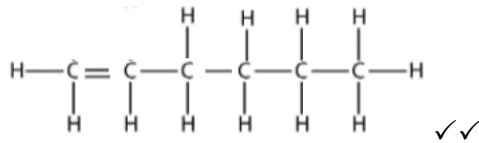
1.1	A	✓✓	(2)
1.2	A	✓✓	(2)
1.3	B	✓✓	(2)
1.4	C	✓✓	(2)
1.5	A	✓✓	(2)
1.6	B	✓✓	(2)
1.7	A	✓✓	(2)
1.8	C	✓✓	(2)
1.9	A	✓✓	(2)
1.10	B	✓✓	(2)
			<b>[20]</b>

## QUESTION/VRAAG 2

- 2.1 A series of organic molecules that can be described by the same general formula and where each member differs from the next by a  $\text{CH}_2$  group. ✓✓  
*’n Reeks organiese molekules wat beskryf kan word deur dieselfde algemene formule en waar een lid van die volgende met ’n  $\text{CH}_2$ -groep verskil.* ✓✓ (2)

- 2.2 2.2.1 Organic molecules with the same molecular formula, but different structural formula. ✓✓  
*Organiese molekules met dieselfde molekulêre formule maar verskillende strukturele formule.* ✓✓ (2)

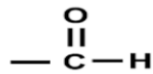
2.2.2



✓✓

(2)

2.2.3



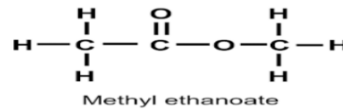
✓

Aldehydes/Aldehyde ✓

(2)

- 2.2.4 3-Chlorobut-1-ene/3-Chlorobut-1-een ✓✓ (2)

2.2.5



Methyl ethanoate

Metieletanoaat

Methyl part/Metiel gedeelte	1 mark/punt	✓
Ethanoate part (functional group)/ Etanoaat gedeelte (funksionele groep)	1 mark/punt	✓

(2)

- 2.3 2.3.1 Small organic molecules that can be covalently bonded to each other in a repeating pattern. ✓✓  
*Klein organiese molekules wat met mekaar kovalent in ’n herhalende patroon verbind is.* ✓✓ (2)

- 2.3.2 2-Ethene/2-Eteen ✓✓ (2)

- 2.3.3 Manufacturing of plastic bags / *Vervaardiging van plastiese sake.* ✓  
 Synthesis of bullet proof vests / *Sintese van koeëlvastehemde.* ✓  
 Manufacturing of plastic bottles / *Vervaardiging van plastiese bottels.* ✓  
 Manufacturing of cling wrap / *Vervaardiging van kleefplastiek.* ✓

(Any/Enige 2)

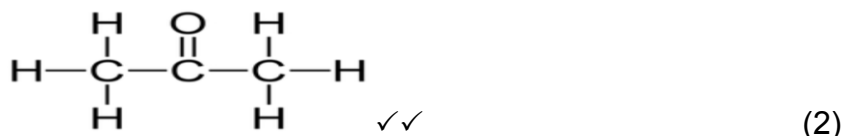
(2)

[18]

## QUESTION/VRAAG 3

3.1  $C_nH_{2n+2}$  ✓ (1)

3.2



3.3 Propanal ✓✓ (2)

3.4 3.4.1 Hydrogen bonds and London forces ✓  
*Waterstofbindings en London-kragte* ✓ (1)

3.4.2 Van der Waals forces (London forces) or Induced dipole force ✓  
**(Any one)**  
*Van der Waals-kragte (London-kragte) of Geïnduseerde dipoolkragte* ✓ **(Enige een)** (1)

3.5 As the strength of the intermolecular forces become stronger (increases) ✓ then the vapour pressure will become lower ✓ (decrease)

**OR**

As the strength of intermolecular forces become weaker, ✓ then the vapour pressure will become higher ✓ (increase).

*Soos die sterkte van die intermolekulêre kragte toeneem ✓ sal die dampdruk afneem ✓*

**OF**

*Soos die sterkte van die intermolekulêre kragte afneem ✓ sal die dampdruk toeneem ✓* (2)

3.6 Ethanoic acid. ✓ Ethanoic acid has stronger intermolecular forces than Propan-1-ol hence a lower vapour pressure ✓ thus more energy will be required to overcome the intermolecular forces in ethanoic acid than in Propan-1-ol. ✓ The lower the vapour pressure, the higher the boiling point. ✓  
*Etanoësuur. ✓ Etanoësuur het sterker intermolekulêre kragte as propan-1-ol en dus laer dampdruk, ✓ dus word meer energie benodig om die intermolekulêre kragte te oorkom in etanoësuur as in propan-1-ol. ✓ Hoe laer die dampdruk, hoe hoër is die kookpunt. ✓* (4)

[13]

## QUESTION/VRAAG 4

4.1 Addition (reaction) Hydration ✓  
Addisie (reaksie) Hidrasie ✓ (1)

4.2 Add sodium hydroxide or potassium hydroxide ✓  
Heat the reaction mixture ✓  
Voeg natriumhidroksied of kaliumhidroksied by ✓  
Verhit die reaksiemengsel ✓ (2)

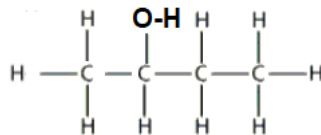
4.3 2-bromo ✓butane ✓ / 2-bromo ✓butaan ✓ (2)

4.4



One mark for each reactant ✓✓ and product ✓  
Een punt vir elke reaktant ✓✓ en produk ✓ (3)

4.5



✓✓

Butan-2-ol ✓ (3)

4.6  $\text{C}_4\text{H}_8 + 6\text{O}_2 \rightarrow 4\text{CO}_2 + 4\text{H}_2\text{O}$  ✓ balance/balanseer ✓ (3)

4.7 Hydrolysis / Hidrolise ✓✓ (2)

[16]

**QUESTION/VRAAG 5**

5.1 An electrolyte is a substance of which the aqueous solution contains ions. ✓✓

**OR**

A substance that dissolves in water to give a solution that conducts electricity. ✓✓

**OR**

A substance that forms free ions when melted. ✓✓

*'n Elektroliet is 'n stof waarvan die oplossing ione bevat.* ✓✓

**OF**

*'n Stof wat in water oplos sodat die oplossing elektrisiteit kan gelei.* ✓✓

**OF**

*'n Stof wat vrye ione vorm indien dit gesmelt word.* ✓✓ (2)

5.2 Temperature / *Temperatuur*: 298 K or 25 °C ✓  
Concentration / *Konsentrasie*: 1 mol.dm<sup>-3</sup> ✓ (2)

5.3 5.3.1  $2 \text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$  ✓✓ (2)

5.3.2  $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$  ✓✓ (2)

5.4 Electrolytic cell – Converts electrical energy to chemical energy. ✓✓  
*Elektrolitiese sel – Elektriese energie word omgesit na chemiese energie.* ✓✓ (2)

5.5 **Q** ✓ Reduction takes place / *Reduksie vind plaas.* ✓ (2)

5.6 5.6.1 Cu is a stronger reducing agent ✓ than Cl<sup>-</sup> ions.  
Cu will be oxidised to Cu<sup>2+</sup> ions ✓ resulting in the plate becoming eroded. ✓  
*Cu is 'n sterker reduseermiddel ✓ as Cl ione.*  
*Cu sal na Cu<sup>2+</sup> geoksideer ✓ word wat sal veroorsaak dat die plaat weggevreet is.* ✓ (3)

5.6.2 Non-spontaneous / *Nie-spontaan* ✓ (1)

**[16]**

**QUESTION/VRAAG 6**

- 6.1 Galvanic Cell: Chemical energy is converted to electrical energy. ✓✓  
*Galvaniese sel: Chemiese energie word na elektriese energie omgesit.* ✓✓ (2)
- 6.2 External circuit ✓✓ **or** through the voltmeter. ✓✓  
*Eksterne stroombaan ✓✓ of deur die voltmeter.* ✓✓ (2)
- 6.3 It maintains electrical neutrality / *Dit behou elektriese neutraliteit.* ✓✓  
**OR / OF**  
 It separates the two compartments so that they do not mix. ✓✓  
*Dit skei die twee elektroliete sodat hulle nie meng nie.* ✓✓ (2)
- 6.4  $Zn \rightarrow Zn^{2+} + 2e^-$  ✓✓ (2)
- 6.5 from Zn to Cu / *van Zn na Cu* ✓ (1)
- 6.6  $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$  ✓✓ (3)
- 6.7  $E^{\theta}_{cell/sel} = E^{\theta}_{cathode/katode} - E^{\theta}_{anode/anode}$  ✓  
 $= 0,34 - (-0,76)$  ✓  
 $= 1,1V$  ✓ (4)
- 6.8 It means they did not take the measurements at standard conditions ✓ where temperature is 298 K or 25 °C ✓ and concentration of 1 mol.dm<sup>-3</sup>. ✓  
*Dit beteken dat hulle nie die metings by standaard toestande geneem het nie ✓ waar die temperatuur 298 K of 25 °C is en die konsentrasie 1 mol.dm<sup>-3</sup> is.* ✓ (3)
- 6.9 6.9.1 During solar construction, the following are identified as environmental threats:  
 • a release of greenhouse gases ✓  
 • pollution of drinking pure water ✓  
*Tydens die konstruksie van sonpanele is die volgende as bedreigings vir die omgewing geïdentifiseer:*  
 • die vrylating van kweekhuysgasse ✓  
 • die besoedeling van suiwer drinkwater ✓ (2)
- 6.9.2 Lowers the electricity bill / *Verlaag die elektrisiteitrekening* ✓  
 Increases home resale value / *Verhoog huis se herverkoop-waarde* ✓  
 Takes advantage of tax credits from the government / *Kry voordeel uit belastingkorting van die regering* ✓  
 Net metering allows reselling of excess electricity to the utility company / *Netto meter lesing kan beteken dat oormaat elektrisiteit terug aan die energieverkoper verkoop kan word* ✓  
 (Any/Enige 2) (2)

[23]

**QUESTION/VRAAG 7**

- 7.1 The incident ray, the reflected ray and the normal to the surface all lie in the same plane and the angle of reflection  $\theta_r =$  angle of incidence  $\theta_i$ . ✓✓  
*Die invalstraal, weerkaatste straal en die normaal op die oppervlak lê in dieselfde vlak en die weerkaatsingshoek ( $\Theta_r$ ) = invalshoek ( $\Theta_i$ ). ✓✓* (2)
- 7.2 7.2.1 Total internal reflection / *Totale interne weerkaatsing* ✓ (1)
- 7.2.2 Refraction / *Ligbreking (Refraksie)* ✓ (1)
- 7.3 In the medical field / *In die mediese veld* ✓  
 In telecommunications / *In telekommunikasie* ✓  
 In submarines / *In duikbote* ✓ (Any/Enige 2) (2)
- 7.4 Light must travel from a more dense optical medium to a less dense optical medium / *Lig moet van 'n opties digter medium na 'n minder opties digte medium beweeg.* ✓  
 The incident angle must be greater than the critical angle / *Die invalshoek moet groter wees as die grenshoek.* ✓ (2)
- 7.5 7.5.1 It is an angle of incidence in the denser medium such that the refracted rays just passes through the surface of separation of the two medium. ✓✓  
*Dit is die hoek in die digter medium sodat die brekingshoek net deur die oppervlakte wat die twee mediums skei, sal beweeg.* ✓✓ (2)
- 7.5.2  $24^\circ$  ✓✓ (2)
- 7.6 A ✓  
 Because of the phenomenon of total internal reflection, the cut will glow brighter than that of B ✓.  
*As gevolg van die verskynsel van totale interne weerkaatsing sal die snit helderder gloei as die by B.* ✓ (2)
- 7.7 7.7.1 Dispersion is when white light spreads into its component colours. ✓✓  
*Dispersie is wanneer wit lig in sy samestellende kleure opgebreek word.* ✓✓ (2)
- 7.7.2 Violet (blue region / *blou gebied*) ✓✓ (1)
- 7.7.3 It has a higher frequency. ✓ The higher the frequency, the less the degree of refraction. ✓  
*Dit het 'n hoër frekwensie. ✓ Hoe hoër die frekwensie, hoe laer is die graad van breking.* ✓ (2)

**[19]**



**QUESTION/VRAAG 8**

- 8.1 Refraction is the bending of light when it passes from one optical medium to another. ✓✓  
*Die breking van lig is die buiging van lig wanneer dit van een optiese medium na 'n ander beweeg.* ✓✓ (2)
- 8.2 Incident ray / *Invalstraal* ✓  
Refracted ray / *Brekingstraal* ✓ (2)
- 8.3 8.3.1 20° ✓ (1)  
8.3.2 41° ✓✓ (2)
- 8.4 8.4.1 Real Image / *Reële beeld* ✓  
Inverted / *Omgekeerd* ✓  
Enlarged Image / *Vergrote beeld* ✓ (3)
- 8.4.2 Used in film projectors/*Gebruik in filmprojektors*  
Used in microscopes/*Gebruik in mikroskope*  
Used in photographic zoom lens/*Gebruik in fotografiese teleskopiese ('zoom') lense* (Any/*Enige 2*) (2)

**[12]**

**QUESTION/VRAAG 9**

9.1 It is a wave with a changing magnetic and electric field perpendicular to each other in the direction of propagation of the wave. ✓✓  
*Dit is 'n golf met veranderende magnetiese en elektriese velde loodreg tot mekaar in die rigting van voortplanting van die golf.* ✓✓ (2)

9.2 Lifting of heavy objects / *Oplig van swaar voorwerpe* ✓  
 In music equipment (loudspeakers) / *In klanktoerusting (luidsprekers)* ✓  
 In transmission of signals / *In uitsending van seine* ✓  
 In communication systems / *In kommunikasiestelsels* ✓  
 (Any/Enige 3) (3)

9.3 They have a penetrating ability into the skin that can cause skin cancer. ✓✓  
*Hulle het 'n deurdringingsvermoë in die vel en dit kan tot velkanker lei.* ✓✓ (2)

9.4 **OPTION / OPSIE 1:**

$$\begin{aligned}
 c &= f\lambda \\
 3 \times 10^8 \checkmark &= f \times 650 \times 10^{-9} \checkmark \\
 \therefore f &= \frac{3 \times 10^8}{650 \times 10^{-9}} \checkmark \\
 &= 4,62 \times 10^{14} \text{Hz} \\
 E &= hf \\
 &= 6,63 \times 10^{-34} \times 4,62 \times 10^{14} \checkmark \\
 &= 3,06 \times 10^{-19} \text{J} \checkmark
 \end{aligned}$$

**OPTION / OPSIE 2:**

$$\begin{aligned}
 E &= \frac{hc}{\lambda} \checkmark \\
 &= \frac{6,63 \times 10^{-34} \checkmark \times 3 \times 10^8 \checkmark}{650 \times 10^{-9} \checkmark} \\
 &= 3,06 \times 10^{-19} \text{J} \checkmark
 \end{aligned}$$

(5)

9.5 SMALLER THAN / *KLEINER AS* ✓ (1)

**[13]**

**TOTAL/TOTAAL: 150**