



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

**TECHNICAL SCIENCES: P2
TEGNIJSE WETENSKAPPE: V2**

EXEMPLAR/MODEL 2018

MARKING GUIDELINES/NASIERIGLYNE

MARKS/PUNTE: 150

**These marking guidelines consist of 11 pages.
*Hierdie nasienriglyne bestaan uit 11 bladsye.***

QUESTION 1/VRAAG 1

- 1.1 A ✓✓ (2)
- 1.2 B ✓✓ (2)
- 1.3 C ✓✓ (2)
- 1.4 C ✓✓ (2)
- 1.5 D ✓✓ (2)
- 1.6 D ✓✓ (2)
- 1.7 A ✓✓ (2)
- 1.8 B ✓✓ (2)
- 1.9 D ✓✓ (2)
- 1.10 B ✓✓ (2)
- [20]**

QUESTION 2/VRAAG 2

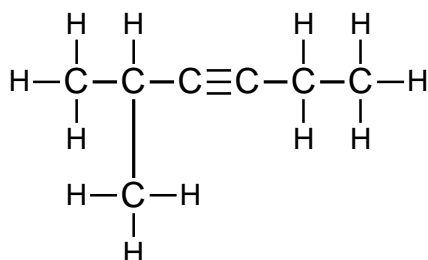
- 2.1 A series of compounds that have the same general formula and where each member differs from the next by $-CH_2$ ✓✓
'n Reeks verbindings wat dieselfde algemene formule het en waar elke lid van die volgende met $-CH_2$ verskil ✓✓ (2)
- 2.2
- 2.2.1 Ketone/Ketoon ✓ (1)
- 2.2.2 Haloalkane (Alkyl halide) ✓/Haloalkaan (Alkielhalied) ✓ (1)
- 2.2.3 Alkanes ✓/Alkane ✓ (1)
- 2.2.4 Alcohol ✓/Alkohol ✓ (1)
- 2.3
- 2.3.1 D ✓ (1)
- 2.3.2 C ✓ (1)
- 2.3.3 E ✓ (1)

2.4

2.4.1 C_5H_{12} ✓✓

(2)

2.4.2



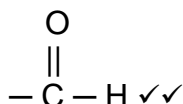
(3)

Marking criteria/Nasienriglyne	
Methyl on second carbon/Metiel op tweede koolstof	✓
Correct functional group/Korrekte funksionele groep	✓
The whole structure is correct./Die hele struktuur korrek.	✓

2.4.3 2-bromo✓-1-chloro✓ propane ✓ (If hyphens omitted, max $\frac{2}{3}$)2-bromo✓-1-chloro✓ propaan✓ (Indien koppelteken uitgelaat is, maks $\frac{2}{3}$)

(3)

2.4.4



(2)

[19]

QUESTION 3/VRAAG 3

3.1

3.1.1 Long chains of monomers covalently bonded together (in a repeating pattern) ✓✓Lang kettings van monomere wat kovalent gebonde is (in 'n herhalende patroon) ✓✓

(2)

3.1.2 Manufacturing of plastic bags/squeeze bottles/cling wrap/bullet-proof vests. ✓

Vervaardiging van plastieksakke, drukbottels, kleefplastiek, koeëlvaste baadjies.✓

(1)

3.2

3.2.1 London forces (induced dipole) in alkanes ✓/London-kragte (geïnduseerde dipool) in alkane✓

London forces✓ and hydrogen bonds in alcohols✓/London-kragte✓ en waterstofbindings in alkohole ✓

(3)

3.2.2 **OPTION 1/OPSIE 1**

- Molar mass/chain length increases from pentane to heptane. ✓
- The strength of intermolecular force increases with an increase in chain length/molar mass ✓
- More energy is required to overcome the intermolecular forces to allow molecules to evaporate, thus fewer molecules evaporate. ✓

OR

- The stronger the intermolecular force, the lower the vapour pressure.
- Molêre massa/kettinglengte neem toe van pentaan na heptaan. ✓
- Die sterkte van die intermolekulêre krag vergroot met 'n toename in kettinglengte/molêre massa. ✓
- Meer energie word benodig om die intermolekulêre kragte te oorkom om die molekule te laat verdamp, dus verdamp minder molekule. ✓

OF

- Hoe sterker die intermolekulêre krag, hoe laer die dampdruk.

(3)

OPTION 2/OPSIE 2

- Molar mass/chain length decreases from heptane to pentane. ✓
- The strength of intermolecular force decreases with an decrease in chain length/molar mass ✓
- Less energy is required to overcome the intermolecular forces to allow molecules to evaporate, thus more molecules evaporate. ✓

OR

- The weaker the intermolecular forces, the higher the vapour pressure.

- Molêre massa/kettinglengte neem af van heptaan na pentaan. ✓
- Die sterkte van die intermolekulêre krag verklein met 'n afname in kettinglengte/molêre massa. ✓
- Minder energie word benodig om die intermolekulêre kragte te oorkom om die molekule te laat verdamp, dus verdamp meer molekule. ✓

OF

- Hoe swakker die intermolekulêre kragte, hoe hoër die dampdruk.

3.2.3 Ethanoic acid ✓/Etanoësuur

(1)

- 3.2.4
- Ethanoic acid has a lower vapour pressure than propan-1-ol thus stronger intermolecular forces ✓; thus more energy will be required to overcome intermolecular forces in ethanoic acid than propan-1-ol. ✓
 - The lower the vapour pressure, the higher the boiling point. ✓

OR

- The stronger the intermolecular forces, the higher the boiling point.

OR

- Ethanoic acid has two sides to form hydrogen bonds while propan-1-ol has one, thus stronger intermolecular forces than propan-1-ol.

- Etanoësuur het 'n laer dampdruk as propan-1-ol, dus sterker intermolekulêre kragte ✓, dus is meer energie nodig om die intermolekulêre kragte te oorkom in etanoësuur as in propan-1-ol. ✓
- Hoe laer die dampdruk, hoe hoër die kookpunt. ✓

OF

- Hoe sterker die intermolekulêre kragte, hoe hoër die kookpunt.

OF

- Etanoësuur het twee kante om waterstofbindinge te vorm terwyl propan-1-ol een kant het, dus sterker intermolekulêre kragte as in propan-1-ol.

(3)
[13]

QUESTION 4/VRAAG 4

Marking criteria/Nasienriglyne	
Correct reactants/Korrekte reaktanse	✓
Correct products/Korrekte produkte	✓
Correct balancing/Korrekte balansering	✓

(3)

(Do not penalise correct products if the energy is not written./Moenie korrekte produkte penaliseer indien die energie nie neergeskryf is nie.)

4.2

4.2.1 Addition (Hydration) ✓✓/Addisie (Hidrasie) ✓✓ (2)

4.2.2 Substitution (Halogenation/Chlorination) ✓✓
Substitusie (Halogenering/Chlorering) ✓✓ (2)

4.2.3 Addition (Hydrogenation) ✓✓/Addisie (Hidrogenering) ✓✓ (2)

4.2.4 Sodium hydroxide/Potassium hydroxide ✓/
Natriumhidroksied/Kaliumhidroksied✓

(Penalise if chemical formula is written./Penaliseer indien chemiese formule geskryf is).

(1)

4.2.5 A dilute strong base ✓ and mild heat ✓
'n Verdunde sterk basis ✓ en matige hitte ✓

(Penalise if only heat is written./Penaliseer indien slegs hitte geskryf is.)

(2)

[12]**QUESTION 5/VRAAG 5**

5.1 To protect a buried iron pipe from corrosion (rust). ✓
Om 'n ysterpyp wat begrawe is, teen korrosie (roes) te beskerm. ✓ (1)

5.2 • Zinc is a stronger reducing agent than iron and it will be oxidised easier than iron. ✓✓

(Accept: Zinc loses electrons more readily than iron, thus preventing the iron from oxidising.)

OR

• Iron ions are stronger oxidising agent than zinc ions, and it will be reduced easier than zinc ions.

(Accept: Iron ions gain electrons more readily than zinc ions, thus preventing the zinc ions from reducing.)

- Sink is 'n sterker reduseermiddel as yster en sal makliker as yster geoksideer word. ✓✓

(Aanvaar: Sink verloor elektrone makliker as yster, dus verhinder sink die yster om te oksideer.)

OF

- Yster is 'n sterker oksideermiddel as sink en sal makliker as sink gereduseer word.

(Aanvaar: Yster wen makliker elektrone as sink, dus verhinder yster die sink om te oksideer.)

(2)

5.3

5.3.1 Ce^{4+} ✓ (Accept/Aanvaar: cesium(IV) ions/-ione). (1)

5.3.2 Cathode✓/Katode ✓ (1)

5.3.3 Ce^{4+} will readily gain electrons (e^-)/undergo reduction/is reduced ✓✓
 Ce^{4+} sal elektrone wen/ondergaan reduksie/word gereduseer. ✓✓

(Accept/Aanvaar: Reduction takes place at the cathode./Reduksie vind by die katode plaas.)

(2)

5.3.4 $2\text{I}^- + 2\text{Fe}^{3+} \rightarrow \text{I}_2 + 2\text{Fe}^{2+}$ reagents✓/reagense ✓; products✓/produkte ✓;
balancing✓/balansering ✓ (3)

5.4

5.4.1 Is a cell that converts electrical energy into chemical energy. ✓✓
Is 'n sel wat elektriese energie na chemiese energie omskakel. ✓✓ (2)

5.4.2 Impure copper✓/Onsuiwer koper ✓ (1)

5.4.3 Oxidation✓/Oksidasie ✓ (1)

5.4.4 $\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Cu}(\text{s})$ ✓ (2)

5.4.5 Copper sulphate/Copper nitrate ✓
Kopersulfaat/Kopernittraat ✓

(Accept/Aanvaar: CuCl_2 , CuSO_4 , $\text{Cu}(\text{NO}_3)_2$.)

(1)

[17]

QUESTION 6/VRAAG 6

6.1

6.1.1 Galvanic/Voltaic cell ✓/Galvaniese/Voltaïese sel ✓ (1)

6.1.2 From chemical energy to electrical energy ✓✓/Van chemiese energie na elektriese energie ✓✓ (2)

- 6.1.3
- Provides medium to allow for mobility of charge, i.e. allows charge to move through the cell effectively. ✓
 - Maintains electrical neutrality in the cell. ✓
 - It completes the circuit ✓
 - *Verskaf medium om elektriese ladings te gelei, m.a.w. om ladings effektief deur sel te laat beweeg. ✓*
 - *Handhaaf elektriese neutraliteit in die sel. ✓*
 - *Dit voltooi stroombaan ✓* (Any two/Enige twee) (2)

6.1.4 From the zinc (electrode) ✓ to the copper (electrode) ✓/Van sink (elektrode) ✓ na koper (elektrode) ✓

OR/OF

From anode ✓ to cathode ✓/Van anode ✓ na katode. ✓

(Accept/Aanvaar: From negative to positive electrode/Van negatiewe na positiewe elektrode.) (2)

6.1.5 BaSO₄ will form a precipitate ✓ and prevent the movement of ions ✓ between the two half-cells.

BaSO₄ vorm 'n neerslag ✓ en voorkom die beweging van ione ✓ tussen die twee halfselle. (2)

6.2

6.2.1 $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$ ✓ (2)

6.2.2 Concentration (of electrolyte) = 1 mol·dm⁻³ ✓
Temperature = 25° C/298 K ✓

Konsentrasie (van elektroliet) = 1 mol·dm⁻³ ✓
Temperatuur = 25° C/298 K ✓ (2)

6.2.3 $\text{Zn (s)} \mid \text{Zn}^{2+} (1 \text{ mol} \cdot \text{dm}^{-3}) (\text{aq}) \parallel \text{Cu}^{2+} (1 \text{ mol} \cdot \text{dm}^{-3}) (\text{aq}) \mid \text{Cu (s)}$ ✓
(Accept/Aanvaar: $\text{Zn (s)} \mid \text{Zn}^{2+} (\text{aq}) \parallel \text{Cu}^{2+} (\text{aq}) \mid \text{Cu (s)}$ ✓
(Do not penalise if phases are not included./Moenie penaliseer indien fases nie ingesluit is nie.) (3)

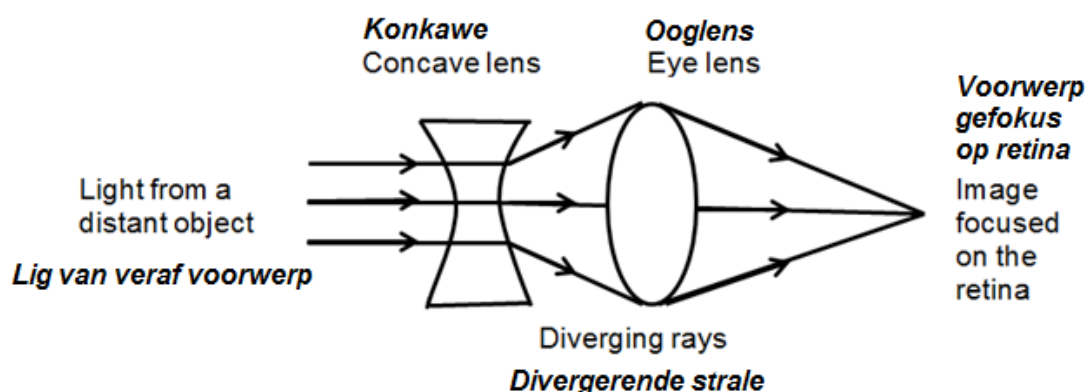
- 6.3
- 6.3.1 CO₂, CO, NO, NO₂, SO₂ (ANY 2 gases/ENIGE 2 gasse) ✓✓ (2)
- 6.3.2 It does not produce harmful substances✓./Dit lewer geen skadelike verbindings nie. ✓ (1)
- 6.3.3 A car can travel a maximum of 250 km (before refilling). ✓/n Motor kan 'n maksimum van 250 km reis (voordat hervulling plaasvind). ✓ (1)
- [20]**

QUESTION 7/VRAAG 7

- 7.1 Reflection/Refleksie ✓ (1)
- 7.2 The surface is made up of an opaque substance✓✓./Die oppervlak is gemaak uit 'n ondeursigtige stof. ✓✓ (2)
- 7.3
- Angle of incidence must be equal to angle of reflection ✓
 - Normal, incidence and reflected rays must lie in the same plane ✓
 - Invalshoek moet gelyk aan die weerkaatsingshoek wees. ✓
 - Normaal, inval- en weerkaatste strale moet in dieselfde vlak wees. ✓ (2)
- 7.4
- A: Incidence ray✓/Invallende straal ✓
- B: Reflected ray✓/Weerkaatste straal ✓
- C: Normal✓/Normaal ✓ (3)
- 7.5
- 7.5.1 Angle of incidence✓/Invalshoek ✓; 70°✓ (2)
- 7.5.2 Angle of reflection✓/Weerkaatsingshoek ✓; 70°✓ (2)
- 7.6
- 7.6.1 Dispersion (of light) ✓/Dispersie (van lig) ✓ (1)
- 7.6.2 Red✓/Rooi ✓ (1)
- 7.6.3 It has the longest wavelength ✓; The longer the wavelength, the more the degree of refraction ✓
- Dit het die langste golflengte✓; hoe langer die golflengte, hoe groter die mate van refraksie/breking✓. (2)
- [16]**

QUESTION 8/VRAAG 8

- 8.1 The bending of light when it moves from one medium to another ✓✓
(of different optical density)
Wanneer lig gebuig word wanneer dit van een medium na ander beweeg ✓✓
(van 'n ander optiese digtheid) (2)
- 8.2 Total internal reflection. ✓/Totale interne weerkaatsing. ✓ (1)
- 8.3
- 8.3.1 Surface A ✓/Oppervlak A ✓ (1)
- 8.3.2 When light moves from a more dense optical medium to a less dense optical medium, it is reflected away from the normal ✓✓
Wanneer lig van 'n meer digte optiese medium na 'n minder digte optiese medium beweeg, word dit weg van die normale gebuig. ✓✓ (2)
- 8.4
- 8.4.1 At Diagram 2 ✓/By Diagram 2 ✓ (1)
- 8.4.2 It is the diagram where the incident angle has an angle of refraction of 90^0 ✓✓
Dit is die diagram waar die invalshoek 'n refraksiehoek van 90^0 het. ✓✓ (2)
- 8.5
- 8.5.1
- Light must travel from a more dense optical medium to a less dense optical medium. ✓
 - Incident angle must be greater than critical angle. ✓
 - *Lig moet van 'n medium beweeg wat opties meer dig is na 'n medium wat opties minder dig is. ✓*
 - *Invalshoek moet groter as die grenshoek wees. ✓* (2)
- 8.5.2 Telecommunication ✓/Telekommunikasie ✓
Medicine ✓/Medisyne ✓ (2)
- 8.6



Marking criteria/Nasienriglyne	
Parallel rays from a distant object./ <i>Parallele strale van 'n verafgeleë voorwerp.</i>	✓
Concave lens/ <i>Konkawe lens</i>	✓
Diverging rays between the concave lens and the eye lens./ <i>Divergerende strale tussen konkawe lens en die oog lens.</i>	✓
Middle ray going straight through the lens/ <i>Middelste straal beweeg dwarsdeur die lens</i>	✓
Rays converging on the retina/ <i>Strale konvergeer op die retina</i>	✓

(5)
[18]**QUESTION 9/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 'n verandering in magnetiese en elektriese velde wat loodreg op mekaar in die voortplantingsrigting van die golf is. ✓✓

(2)

9.2

9.2.1

Radio waves <i>Radiogolwe</i>	Micro waves <i>Mikrogolwe</i>	Infrared <i>Infrarooi</i>	Visible light <i>Sigbare lig</i>	Ultra-violet	X-rays <i>X-strale</i>	Gamma rays <i>Gamma-strale</i>
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Marking criteria/Nasienriglyne	
Radio waves have the lowest frequency and gamma rays have the highest frequency <i>Radiogolwe het die laagste frekwensie en gammastrale het die hoogste frekwensie</i>	✓
Middle five radiations in the correct order of increasing frequency <i>Middelste vyf frekwensies in die korrekte volgorde van toenemende frekwensie</i>	✓

(2)

- 9.2.2 Gamma rays✓/*Gammastrale* ✓

(1)

- 9.2.3 It has the highest frequency ✓; according to the formula $E = hf$, the higher the frequency, the higher the energy of a photon ✓

Dit het die hoogste frekwensie✓; volgens die formule $E = hf$, hoe hoër die frekwensie, hoe hoër die energiewaarde van die foton. ✓

(2)

9.3

OPTION 1/OPSIE 1

$$c = f \lambda$$

$$3 \times 10^8 \checkmark = 470 \times 10^{-9} \checkmark$$

$$f = 6,38 \times 10^{14} \text{ Hz}$$

$$E = hf$$

$$= 6,63 \times 10^{-34} \cdot 6,38 \times 10^{14} \checkmark$$

$$= 4,23 \times 10^{-19} \text{ J} \checkmark$$

OPTION 2/OPSIE 2

$$E = \frac{hc}{\lambda} \checkmark$$

$$= \frac{6,63 \times 10^{-34} \times 3 \times 10^8 \checkmark}{470 \times 10^{-9} \checkmark}$$

$$= 4,23 \times 10^{-19} \text{ J} \checkmark$$

(5)

9.4 SMALLER THAN. ✓/KLEINER AS ✓

(1)

9.5

9.5.1 X-rays✓/X-strale ✓

(1)

9.5.2 Ultraviolet light✓/Ultraviolet lig✓

(1)

[15]

TOTAL/TOTAAL:
150