



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE/  
NASIONALE SENIOR  
SERTIFIKAAT**

**GRADE/GRAAD 12**

**SEPTEMBER 2020**

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

**MARKS/PUNTE: 150**

---

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

---

**QUESTION/VRAAG 1**

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



## 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 A group of atoms whose bonding is the same from molecule to molecule with similar physical and chemical properties. ✓✓  
*'n Groep atome waarvan die binding van molekule tot molekule dieselfde is met soortgelyke fisiese en chemiese eienskappe.* ✓✓ (2)

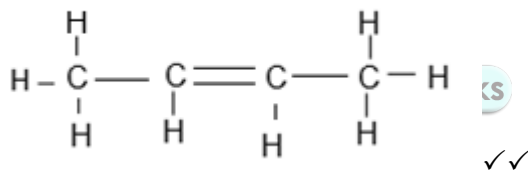
2.3 2.3.1 **E** ✓ (1)

2.3.2 **C** ✓ (1)

2.4 2.4.1 Butane/*Butaan* ✓✓ (2)

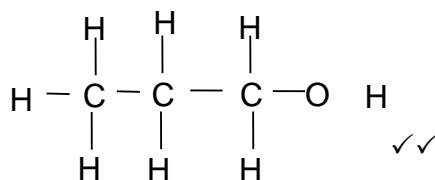
2.4.2 2-methylpropan-1-ol/ *2-metielpropan-1-ol* ✓✓  
**OR/OF**  
 2-methylpropanol/*2-metielpropanol* ✓✓ (2)

2.5 2.5.1



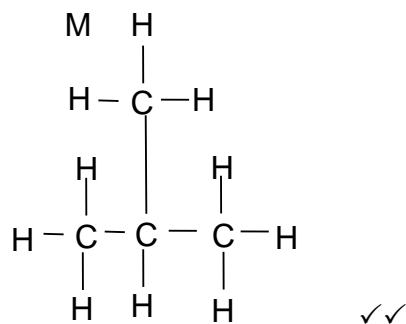
(2)

2.5.2



(2)

2.5.3



(2)

- 2.6 Positional isomers are organic molecules with the same molecular formula/ and same structural formula/ and same functional group, ✓ but differ from each other in the location (position) ✓ of the functional group in the carbon chain.

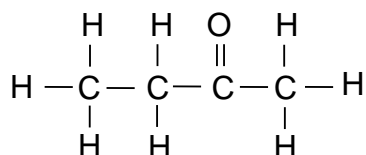
*Posisie-isomere is organiese molekules met dieselfde struktuurformule en dieselfde funksionele groep, ✓ maar verskillende posisie van die funksionele groep ✓ in die koolstofketting.*

(2)

- 2.7 Ketones/Ketoon ✓

(1)

- 2.8



✓✓

(2)  
[21]

**QUESTION/VRAAG 3**

3.1 It is a long chain of monomers, covalently bonded together (in a repeating patterns). ✓✓

*Dit is lang kettings van monomere wat kovalent verbind is (in 'n herhalende patroon).* ✓✓

(2)

3.2 Unsaturated ✓ Not all C-C bonds are single bonds ✓✓

**OR**

It contains C-C double bonds ✓✓

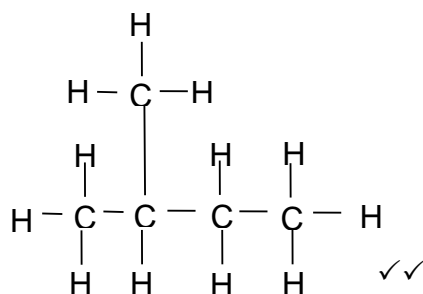
*Onversadigde ✓ Nie alle C-C binding is enkelbindings nie ✓✓*

**OF**

*Dit bevat C-C dubbelbindigs ✓✓*

(3)

3.3



(2)

- 3.4
- Destruction of indigenous forests (leading to global warming) ✓
  - Rubber is not biodegradable – disposal impacts negatively on environment ✓
  - Burning of rubber releases toxic gases ✓
  - *Verwoesting van inheemse woude (lei tot aardverwarming)* ✓
  - *Rubber is nie-bioafbreekbaar nie – wegdoening daarmee het 'n negatiewe impak op omgewing.* ✓
  - *Brand van rubber skei giftige gasse af* ✓

**(Any/Enige 2)** (2)

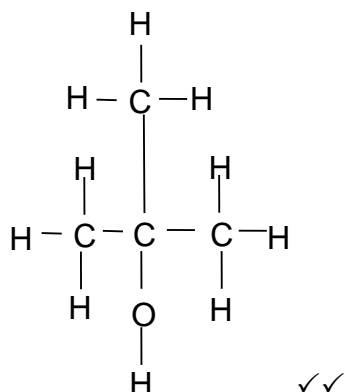
- 3.5
- Job creation ✓✓
  - Tyres for cars / gloves for medical industry / raincoats etc ✓✓
  - Protective devices – insulation ✓✓
  - *Werkskepping* ✓✓
  - *Bande vir motors / handskoene vir mediese industrie / reënjasse, ens* ✓✓
  - *Beskermende toestelle – insulasie* ✓✓

**(Any/Enige 2 x 2)** (4)**[13]**

## QUESTION/VRAAG 4

4.1 **D** ✓✓ (2)

4.2 4.2.1



(2)

4.2.2 **D** ✓✓ (2)

4.3 4.3.1 **C** ✓ (propan-1-ol/1-propanol)  
 Longest flow time / flows the slowest / most resistance to flow. ✓  
*Langste vloeityd / vloei die stadigste / meeste weerstand teen vloei.* ✓ (2)

4.3.2 Increase in chain length ✓ / molecular mass / molecular size /  
 surface area from A to **C**. ✓  
 Increase in strength of intermolecular / Van der Waals / Dispersion /  
 London forces. ✓  
*Toename in kettinglengte ✓ / molekulêre massa / molekulêre grootte*  
*/ oppervlakte vanaf A tot C.* ✓  
*Toename in sterkte van intermolekulêre / Van der Waals / Dispersie*  
*/ London kragte.* ✓ (3)

4.3.3 **C**. ✓ Since it is having strong intermolecular forces and the longest  
 chain length ✓ which contributes to its resistance to flow makes  
 propan-1-ol a best lubricant. ✓  
**C**. ✓ *Aangesien dit sterk intermolekulêre kragte en die langste*  
*kettinglengte het ✓ wat bydra tot die weerstand teen vloei, maak dit*  
*propan-1-ol die beste smeermiddel.* ✓ (3)

4.3.4 Vapour pressure is a measure of the tendency of a material to  
 change into a gaseous state. ✓✓  
*Dampdruk is 'n maatstaf van die neiging van 'n material om in 'n*  
*gasvormige toestand te verander.* ✓✓ (2)

4.4 **E** (butan-2-ol or 2-butanol) ✓

The more branched/more compact alcohol/**E** has a smaller surface area (over which the intermolecular forces act). ✓

Decrease in strength of intermolecular forces/  
reduced resistance to flow (and thus lower viscosity). ✓

**OR**

The straight-chain alcohol/**D** has a larger surface area/less compact (over which intermolecular forces act). ✓

Increase in strength in intermolecular forces.

Increased resistance to flow (and thus higher viscosity). ✓

**E** (butan-2-ol or 2-butanol) ✓

*Die meer vertakte/meer kompakte alkohol/**E** het 'n kleiner oppervlakte (waaroor die intermolekulêre kragte inwerk). ✓*

*Afname in sterkte van intermolekulêre kragte/verminderde weerstand teen vloei (en dus laer viskositeit). ✓*

**OF**

*Die reguitkettinglengte alkohol/**D** het 'n groter oppervlak/minder kompakte (waarop intermolekulêre kragte inwerk). ✓*

*Toename in sterkte van intermolekulêre kragte. Verhoog weerstand teen vloei (en dus hoër viskositeit). ✓*

(3)  
[19]



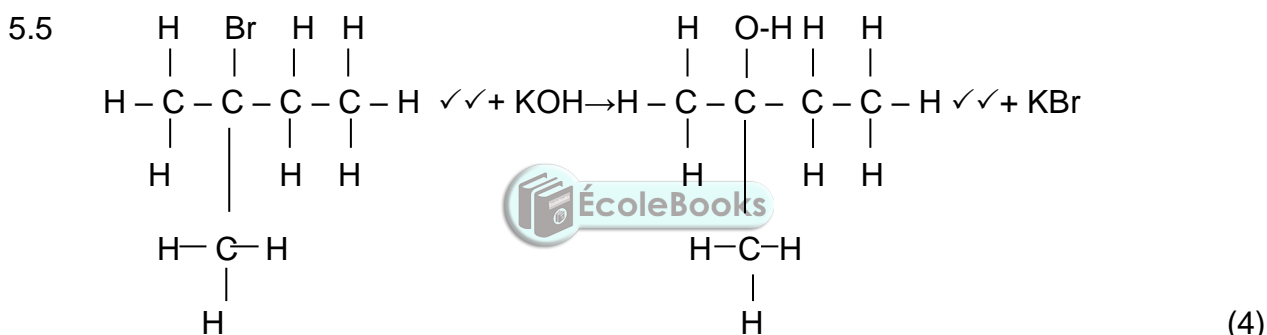
## QUESTION/VRAAG 5

5.1 Addition (reaction) / Addisie (reaksie) ✓✓ (2)

5.2 Add acidic reagent HBr/Voeg suurreagent y HBr b✓  
At room temperatures **OR** 25 °C/By kamertemperatuur **OF** 25 °C ✓ (2)



5.4 H<sub>2</sub>O ✓✓ **OR/OF** Water ✓✓ (2)



5.6 Addition (reaction) / Addisie (reaksie) ✓✓ (2)

5.7 5.7.1 Water ✓ and Carbon Dioxide ✓ Water ✓ en Koolstof dioksied ✓ (2)

5.7.2  $2 \text{C}_6\text{H}_{14} \checkmark + 19 \text{O}_2 \checkmark \rightarrow 12 \text{CO}_2 + 14 \text{H}_2\text{O} \checkmark$   
(✓ balancing is 1 mark/balansering is 1 punt) (4)

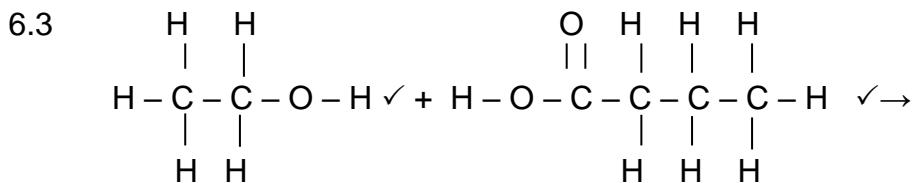
[20]



**QUESTION/VRAAG 6**

6.1 Ethanol/*Etanol* ✓✓ (2)

6.2 It acts as a catalyst/*Dit dien as 'n katalisator* ✓✓ (2)



6.4 The contents of the mixture are flammable/*Die inhoud van die mengsel is vlambaar.* ✓✓ (2)

6.5 They are used to flavour foods and sweets./*Dit word gebruik om kos en lekkers smaak te gee.* ✓✓ (2)

**[12]**

**QUESTION/VRAAG 7**

- 7.1 1. Transverse / *Transversale* ✓✓  
2. Waves are carried by the medium./*Golwe word deur die medium gedra.* ✓✓  
**OR/OF**  
Waves travel through a medium/*Golwe beweeg deur 'n medium.* ✓✓  
3. Wavelength ( $\lambda$ ) per the period (T) of a wave/*Golflengte ( $\lambda$ ) per periode (T) van 'n golf.* ✓✓ (6)
- 7.2 7.2.1 Incident ray / *Invalstraal* ✓ (1)  
7.2.2 Refracted ray / *Brekingstraal* ✓ (1)  
7.2.3 Normal / *Normaal* ✓ (1)  
7.2.4 Refracted angle/*Brekingshoek* ✓ (1)
- 7.3 Refraction is the bending of light when it passes from one incident ray from one optical medium to another. ✓✓  
*Die breking van lig is die buiging van lig wanneer dit van een optiese medium na ander.* ✓✓ (2)
- [12]**



**QUESTION/VRAAG 8**

- 8.1 Total internal reflection/*Totale interne weerkaatsing* ✓ (1)
- 8.2 It is when the incident ray completely reflects back to the optical denser medium. ✓✓  
*Dit is wanneer die invalstraal heeltemal na die optiese digter medium weerkaats word.* ✓✓ (2)
- 8.3 Light must travel from a denser optical medium to a less dense optical medium. ✓/  
*Lig moet van 'n medium beweeg wat opties meer dig is na 'n medium wat opties minder dig is.* ✓  
The incident angle must be greater than the critical angle ✓/  
*Die invalshoek moet groter as die grenshoek wees.* ✓ (2)
- 8.4 In medicine / In *medisyne* ✓  
In submarines / In *duikbote* ✓  
In telecommunications / In *telekommunikasie* ✓  
In cameras / In *kameras* ✓ (Any/ *Enige 2*) (2)
- 8.5 It is an angle of incidence in the denser medium such that the refracted ray just passes through the surface of separation of the two mediums. ✓✓  
*Dit is 'n invalshoek in die digter medium sodat die gebreekte straal deur die skeidings oppervlak van die twee mediums beweeg.* ✓✓ (2)
- 8.6 The incident ray, the reflected ray and the normal to the surface all lie in the same plane and the angle of reflection  $\Theta_r$  equals the angle of incidence  $\Theta_i$ . ✓✓  
*Die invalstraal, weerkaatste straal en normaal moet in dieselfde vlak wees en weerkaatsingshoek  $\Theta_r$  moet gelyk aan die invalshoek wees  $\Theta_i$ .* ✓✓ (2)
- 8.7 8.7.1 Dispersion/*Dispersie* ✓ (1)
- 8.7.2 It is the spreading of the white light when entering an optical denser medium into its primary colours. ✓✓  
*Dit is die verspreiding van die wit lig wanneer dit deur 'n optiese digter medium in sy primêre kleure verprei word.* ✓✓ (2)
- 8.8 8.8.1 Convex/*Konvekse* ✓ **OR/OF** Converging/*Konvergerende* ✓ (1)
- 8.8.2 It is the distance between the centre of a lens and its focus. ✓✓  
*Dit is die afstand tussen die middel van 'n lens en die fokus.* ✓✓ (2)
- 8.8.3 Virtual image / *Nie-reële beeld* ✓  
Upright / *Regop* ✓  
Enlarged / *Vergroot* ✓ (3)

**[20]**

**QUESTION/VRAAG 9**

9.1 Radio waves / Radiogolwe  
 Microwaves / Microgolwe  
 Infrared / Infrarooi  
 Visible light / Sigbare lig  
 Ultraviolet rays / Ultraviolet strale  
 X-rays / X-strale  
 Gamma rays / Gamma strale ✓✓ (2)

9.2 Gamma rays / Gamma strale ✓ (1)

9.3 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)

9.4 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 veranderde magnetiese en elektriese veld wat loodreg opmekaar in die rigting van voortgeplante golf is. ✓✓* (2)

9.5 **Option / OPSIE 1**  $c = f\lambda$

$$3 \times 10^8 \checkmark = f \times 540 \times 10^{-9} \checkmark$$

$$f = \frac{3 \times 10^8}{540 \times 10^{-9}}$$

$$\approx 5,56 \times 10^{14} \text{ Hz} \checkmark$$

$$E = hf$$

$$= 6,63 \times 10^{-34} \times 5,56 \times 10^{14} \checkmark$$

$$= 3,69 \times 10^{-19} \text{ J} \checkmark$$
**Option 2/ OPSIE 2**

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

$$= \frac{6,63 \times 10^{-34} \checkmark \times 3 \times 10^8 \checkmark}{540 \times 10^{-9} \checkmark}$$

$$= 3,69 \times 10^{-19} \text{ J} \checkmark$$

(5)

9.6 GREATER THAN / GROTER AS ✓ (1)  
**[13]**

**TOTAL/TOTAAL: 150**