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**NATIONAL SENIOR CERTIFICATE/
NASIONALE SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

JUNE/JUNIE 2023

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

MARKS/PUNTE: 75

This marking guideline consists of 7 pages./
Hierdie nasienriglyn bestaan uit 7 bladsye.

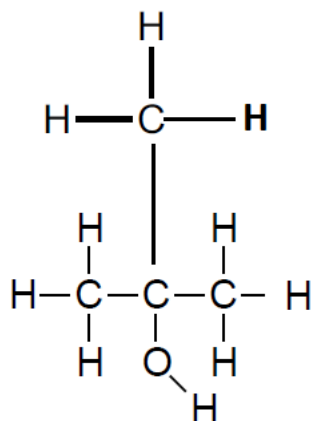
QUESTION/VRAAG 1

- 1.1 D ✓✓ (2)
- 1.2 B ✓✓ (2)
- 1.3 B ✓✓ (2)
- 1.4 A ✓✓ (2)
- 1.5 C ✓✓ (2)

[10]**QUESTION/VRAAG 2**

- 2.1 Hydrocarbons are organic compounds that consist of hydrogen and carbon only. ✓✓
Koolwaterstowwe is organiese verbindings wat slegs uit waterstof en koolstof bestaan. ✓✓ (2)
- 2.2 2.2.1 C ✓ (1)
- 2.2.2 B ✓ (1)
- 2.2.3 F ✓ and/en G ✓ (2)
- 2.2.4 A, B and/en D ✓ (1)
- 2.2.5 A and/en D (2)
- 2.3 2.3.1 Hex-3-ene / *Heks-3-een* ✓ (1)
- 2.3.2 Propanone / *Propanoon* ✓ (1)
- 2.3.3 Propyl propanoate / *Propielpropanoaat* ✓✓ (2)
- 2.4 2.4.1
- $$\begin{array}{ccccccc} & \text{H} & & \text{H} & & & \text{H} \\ & | & & | & & & | \\ \text{H} & - \text{C} & - & \text{C} & = & \text{C} & - \text{C} & - \text{H} \\ & | & & | & & | & | & \\ & \text{H} & & \text{H} & & \text{H} & \text{H} & \end{array}$$
- ✓✓ (2)
- 2.4.2
- $$\begin{array}{c} \diagup \quad \diagdown \\ \text{C} = \text{C} \\ \diagdown \quad \diagup \end{array}$$
- ✓ (1)
- 2.4.3 C₆H₁₄ ✓ (1)
- 2.4.4 Propanone / *Propanoon* ✓ (1)

2.4.5



✓✓

(2)
[20]**QUESTION/VRAAG 3**

- 3.1 Homologous series: A series of organic compounds that can be described by the same general formula and where each member differs from the next by a CH_2 group. ✓✓
Homoloë reeks: 'n Reeks organiese verbindings wat deur dieselfde algemene formule beskryf kan word en waar elke lid van die volgende lid deur 'n CH_2 -groep verskil. ✓✓ (2)
- 3.2 The greater the molecular mass of organic compounds/alkanes, the lower the vapour pressure. ✓✓
Hoe groter die molekulêre massa van organiese verbindings/alkane, hoe laer is die dampdruk. ✓✓ (2)
- 3.3 London forces/dispersion forces/dipole induced forces ✓
Londen-kragte/Dispersie kragte/dipool-geïnduseerde kragte ✓ (1)
- 3.4 3.4.1 Propane / Propaan ✓ (1)
- 3.4.2 Butane / Butaan ✓ (1)
- 3.4.3 Pentane / Pentaan ✓ (1)
- 3.5
- Compound **C** / pentane has 5 carbon atoms which makes it to have a longer chain / greater molecular mass than compound **B** / butane which has 4 carbon atoms which makes it to have a shorter chain/less molecular mass than compound **C**.
*Verbinding **C** / pentaan het 5 koolstofatome wat maak dat dit 'n langer ketting/groter molekulêre massa het as verbinding **B** (butaan) wat 4 koolstofatome het wat maak dat dit 'n korter ketting/minder molekulêre massa as verbinding **C** het.* ✓
 - The greater the molecular mass/longer the chain the stronger the intermolecular forces/London forces in compound **C** than in compound **B**, which are weaker. ✓
*Hoe groter die molekulêre massa/langer die ketting, hoe sterker is die intermolekulêre kragte/Londen-kragte in verbinding **C** as in verbinding **B** wat swakker is.* ✓

- More energy will be required to overcome intermolecular forces/London forces in compound **C** than in compound **B** where less energy will be required to overcome intermolecular forces. ✓
*Meer energie sal benodig word om intermolekulêre kragte/Londen kragte in verbinding **C** te oorkom as in verbinding **B** waar minder energie benodig sal word om intermolekulêre kragte te oorkom.* ✓
- Compound **C** / pentane will have lower vapour pressure than compound **B** / butane which will have a higher vapour pressure than compound **C**. ✓
*Verbinding **C** (pentaan) sal laer dampdruk hê as verbinding **B** (butaan) wat 'n hoër dampdruk as verbinding **C** sal hê.* ✓

OR/OF

- Compound **B** / butane has 4 carbon atoms which makes it to have a shorter chain / lesser molecular mass than compound **C** / pentane which has 5 carbon atoms which makes it to have a longer chain/greater molecular mass than compound **B**. ✓
*Verbinding **B** / butaan het 4 koolstofatome wat dit 'n korter ketting maak/kleiner molekulêre massa het as verbinding **C** (pentaan) wat 5 koolstofatome het wat veroorsaak dat dit 'n langer ketting/groter molekulêre massa as verbinding **B** het.* ✓
- The lesser the molecular mass / shorter the chain the weaker the Intermolecular forces / London forces in compound **B** than in compound **C** which are stronger. ✓
*Hoe kleiner die molekulêre massa/korter die ketting hoe swakker is die Intermolekulêre kragte/Londen-kragte in verbinding **B** as in verbinding **C** wat sterker is.* ✓
- Compound **B** / butane will have higher vapour pressure than compound **C** / pentane which will have lower vapour pressure than Compound **B**. ✓
*Verbinding **B** (butaan) sal hoër dampdruk hê as verbinding **C** (pentaan) wat 'n laer dampdruk as verbinding **B** sal hê.* ✓ (4)

3.6 3.6.1 C ✓ (1)

3.6.2 A ✓ (1)

3.6.3 C ✓ (1)

[15]

QUESTION/VRAAG 4

4.1 **A** / butane/butaan ✓ (1)

4.2 It is a gas at room temperature / at 25 °C.
Dit is 'n gas by kamertemperatuur / by 25 °C. ✓✓ (2)

4.3 Lower than/Laer as: ✓

2-methylpropane/2-metielpropaan:

- More branching/Molecules more compact /Smaller surface area (over which the intermolecular forces act.) ✓
- Meer vertakking/Molekules meer kompak/Kleiner oppervlakte (waaroor die intermolekulêre kragte inwerk.) ✓
- Weaker/less intermolecular forces. ✓
- Swakker/minder intermolekulêre kragte. ✓
- Less energy needed to overcome intermolecular forces.
- Minder energie benodig om intermolekulêre kragte te oorkom.

OR/OF

Lower than/Laer as: ✓

Compound **A**/butane / *Verbinding A*/butaan:

- Is less branched/has less compact molecules/has larger surface area (over which intermolecular forces act). ✓
- Is minder vertak/het minder kompakte molekules/het groter oppervlakte (waaroor intermolekulêre kragte inwerk). /
- Stronger/more intermolecular forces. ✓
- Sterker/meer intermolekulêre kragte
- More energy needed to overcome intermolecular forces. ✓
- Meer energie benodig om intermolekulêre kragte te oorkom. (4)

4.4 Butane and 2-methylpropane are chain isomers ✓ because they have the same molecular formula, but different types of chains. ✓
Butaan en 2-metielpropaan is ketting-isomere ✓ omdat hulle dieselde molekulêre formule het, maar verskillende tipes kettings. ✓ (2)

4.5 4.5.1

- Compound **B** has weaker dipole-dipole intermolecular forces whereas compound **C** has a stronger hydrogen bond. ✓
- *Verbinding B* het swakker dipool-dipool intermolekulêre kragte terwyl *verbinding C* 'n sterker waterstofbinding het.
- Compound **B** contains a carbonyl group/O atom (bonded to C atom) and is a polar (molecule)/dipole whereas compound **C** has one site for hydrogen bonding. ✓
- *Verbinding B* bevat 'n karbonielgroep/O-atoom (gebind aan C-atoom) en is 'n polêre (molekule)/dipool, terwyl *verbinding C* een plek vir waterstofbinding het.

- More energy will be required to overcome stronger hydrogen bond in compound **C** whereas less energy will be required to overcome weaker dipole-dipole intermolecular forces in compound **B**. ✓
- *Meer energie sal benodig word om sterker waterstofbinding in verbinding **C** te oorkom, terwyl minder energie benodig sal word om swakker dipool-dipool intermolekulêre kragte in verbinding **B** te oorkom.*
- Therefore, compound **C** will have a lower vapour pressure than compound **B**. ✓
- *Daarom sal verbinding **C** 'n laer dampdruk as verbinding **B** hê.* (4)

4.5.2 B ✓ (1)

4.5.3 C ✓ (1)

4.5.4 B ✓ (1)

[16]

QUESTION/VRAAG 5

5.1 5.1.1 Addition reaction/hydrohalogenation ✓
Addisiereaksie/hidrohalogenering ✓ (1)

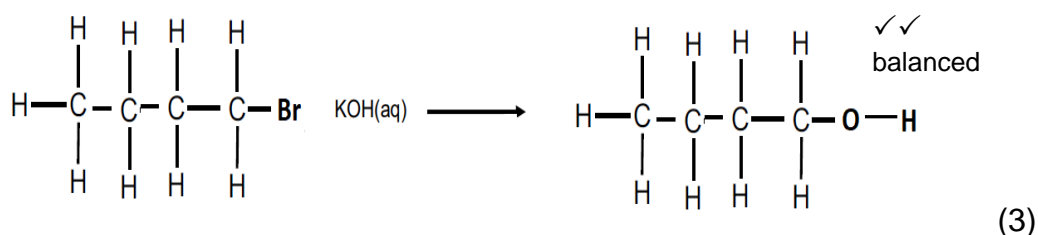
5.1.2 Substitution reaction/hydrolysis ✓
Substitusiereaksie/hidrolise ✓ (1)

5.1.3 Addition reaction/hydration ✓
Addisiereaksie/hidrasie ✓ (1)

5.2 5.2.1 Alcohol / *Alkohol* ✓ (1)

5.2.2 Mild heat / *Ligte/matige hitte* ✓ (1)

5.2.3



5.3



QUESTION/VRAAG 6

- 6.1 6.1.1 p-type material / *p-tipe materiaal* ✓ (1)
- 6.1.2 n-type material / *n-tipe materiaal* ✓ (1)
- 6.1.3 Free holes that are positively charged. ✓
Vry holtes wat positief gelaai is . (1)
- 6.1.4 Free electrons that are negatively charged.
Vry elektrone wat negatief gelaai is. ✓ (1)
- [4]**

TOTAL/TOTAAL: 75