higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

CHEMISTRY N5

7 AUGUST 2019

This marking guideline consists of 5 pages.

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QUESTION 1: INTRODUCTION TO ORGANIC CHEMISTRY AND ALKANES

1.1 1.1.1 C2 : Sp^3 hybrid
C3 : Sp^3 hybrid (2)

1.1.2 C_nH_{2n} (1)

1.1.3 Saturated hydrocarbon.✓ It is only composed of single bonds.✓ (2)

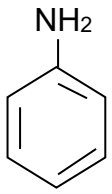
1.1.4 Radicals (1)

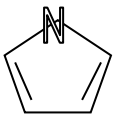
1.1.5 It is a type of bond cleavage that occurs in polar reactions where each fragment leaves with an unpaired electron of the bonding electrons.✓✓

$$C\ell : C\ell \xrightarrow[\text{Light}]{} C\ell^{\cdot} + C\ell^{\cdot} \quad ✓✓✓$$

(5)

1.2 1.2.1 $CH_3(CH_2)_3CH_3$

1.2.2 

1.2.3 

(3 × 2) (6)

1.3 1.3.1 Electrophile
1.3.2 Nucleophile
1.3.3 Nucleophile

(3 × 1) (3)
[20]

QUESTION 2: ALKENES, ALKYNES AND AROMATIC COMPOUNDS

2.1 2.1.1 C_6H_{12} (2)

2.1.2 Alkenes (2)

2.1.3 1-Methylcyclopentene (2)

2.1.4 The compound is insoluble in water because it is an alkene and all alkenes do not dissolve in water. (2)

2.1.5 **Major product**
1-Bromo-2-methylcylopentane
Minor product
1-Bromo-1-methylcyclopentane (2 × 2) (4)

2.1.6 During the addition of HX to an alkene, the H attaches to the carbon with fewer alkyl substituents and the X attaches to the carbon with more alkyl substituents. (2)

2.2 2.2.1 2-Butene✓
Major product
1-Butene✓
Minor product

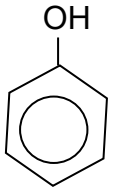
2.2.2 Base-induced elimination reactions generally give more highly substituted alkene products.
(2 × 2) (4)

2.3 $CH_3 – CH_2 – CH_2 – CH_2 – CH_3$
Pentane (2)

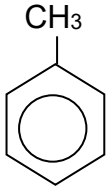
2.4 2.4.1 $CH_2 = CH – CH = CH – CH = CH_3$

2.4.2 1,2,3–Hexatriene
(2 × 3) (6)

2.5 2.5.1



2.5.2



(2 × 2) (4)
[30]

QUESTION 3: ALCOHOLS, ALDEHYDES AND KETONES

3.1 3.1.1 $C_6H_{12}O_6 \xrightarrow{\text{Yeast}} CH_3 - CH_2OH(aq) + CO_2(g)$ (3)

3.1.2
- Alcohols containing up to 12 carbon atoms are a liquid.
- The boiling point of alcohols increase with the increase in molecular mass.
- The high boiling points of alcohols result from hydrogen bonding.
- Methanol, ethanol and propanol are soluble in water at ordinary temperatures and pressures.
- Solubility in water decreases with the increase in molecular mass. (Any 3 × 1) (3)

3.1.3 $CO(g) + 2H_2(g) \xrightarrow{ZnO/CuO/\ Al2O3} CH_3OH(l)$ (3)

3.1.4 $CH_3CH_2OH(aq) + H_2O(\ell) \rightarrow CH_3CH_2O^-(aq) + H_3O^+(aq)$ (2)

3.2 3.2.1 2-Butanol

3.2.2 It is a secondary alcohol. The OH functional group is attached to a carbon atom with one hydrogen atom (-CHOH).

3.2.3 3-Butene

(3 × 2) (6)

3.3
$$CH_3 - \underset{\underset{O}{\|}}{C} - CH_2 - CH_3 \xrightarrow[2.H3O+]{1.CH3MgBr,\ ether} CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}} - CH_2 - CH_3 + HOMgBr$$
(4)

3.4 3.4.1
$$CH_3 - CH_2 - CH_2 - \underset{\underset{O}{\|}}{C} - H$$ (3)

3.4.2 $KMNO_4$
$K_2Cr_2O_7$ (2)

3.4.3 Butanal (2)

3.4.4 Aldehyde (1)

3.5
- Tollens' reagent
- A silver salt solution (Any 1 × 1) (1)

[30]

QUESTION 4: CARBOXYLIC ACIDS, ESTERS AND AMINES

4.1 4.1.1 A Carboxylic acid
C Ester (2)

4.1.2 Ethanol (1)

4.1.3 1-Propanol (1)

4.1.4 Water (1)

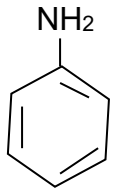
4.1.5

$$CH_3 - CH_2OH \xrightarrow{KMNO4} CH_3 - \overset{\overset{O}{\|}}{C} - H \xrightarrow{KMNO4} CH_3 - \overset{\overset{O}{\|}}{C} - OH$$

Alcohol **Aldehyde** **Carboxylic acid** (5)

4.2 4.2.1 $CH_3OH(aq) + NH_3(g) \rightarrow CH_3NH_2(aq) + H_2O(l)$

4.2.2



4.2.3
- Amines like ammonia are weak bases.
- They have unpleasant odours or smells.
- They are soluble in water.

(Any 2 × 1)
(3 × 2) (6)

4.3 4.3.1

$$H - \overset{\overset{O}{\|}}{C} - OH$$

4.3.2

$$CH_3 - \overset{\overset{O}{\|}}{C} - NH_3$$

(2 × 2) (4)
[20]

TOTAL: 100

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