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.**

## 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)

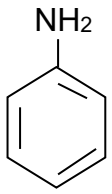
1.1.3 Saturated hydrocarbon.✓ It is only composed of single bonds.✓ (2)

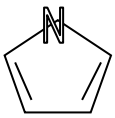
1.1.4 Radicals (1)

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.✓✓

$$Cl_2 \xrightarrow[\text{Light}]{} Cl^{\cdot} + Cl^{\cdot}$$ ✓✓✓ (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**

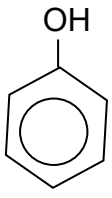
2.2.2 Base-induced elimination reactions generally give more highly substituted alkene products.
(2 × 2) (4)

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

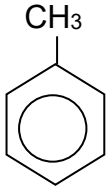
2.4 2.4.1 $CH_2 = CH – CH = CH – CH = CH_3$

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

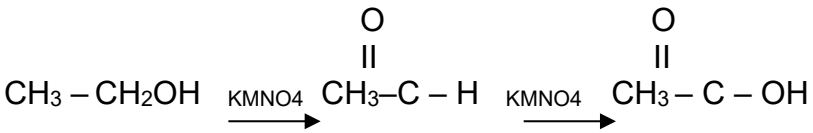
4.1 4.1.1 A Carboxylic acid
C Ester (2)

4.1.2 Ethanol (1)

4.1.3 1-Propanol (1)

4.1.4 Water (1)

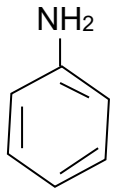
4.1.5




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

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

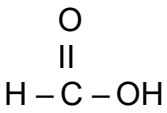
4.2.2



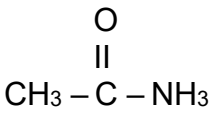

4.2.3
- Amines like ammonia are weak bases.
- They have unpleasant odours or smells.
- They are soluble in water.

(Any 2 × 1)
(3 × 2) (6)

4.3 4.3.1




4.3.2




(2 × 2) (4)
**[20]**

**TOTAL: 100**