higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

CHEMISTRY N5

(15040015)

4 December 2023
09:00–12:00

Drawing instruments and nonprogrammable calculators may be used.

This question paper consists of 6 pages and 1 periodic table.

241Q1G2304

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
CHEMISTRY N5
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Write neatly and legibly.

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QUESTION 1: GENERAL

1.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.1.1–1.1.5) in the ANSWER BOOK. Give a reason for each answer.

1.1.1 Propanol and ethyl methyl ether are isomers.

1.1.2 In a propanoic acid CH_3CH_2COOH, the functional group is the portion that is highly reactive.

1.1.3 Trichlorofluoromethane is a molecule that contains hydrogen in its structure.

1.1.4 Hydrogen and deuterium are isotopes.

1.1.5 The condensed formula of pentane is $CH_3(CH_2)_4CH_3$.

(5 × 2) (10)

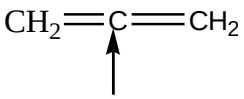
1.2 Convert the following condensed molecules into skeletal structures (shorthand structures):

1.2.1 $CH_3(CH_2)_4CH_3$

1.2.2 $CH_2{=}CH{-}CH_2Cl$

(2 × 2) (4)

1.3 Determine the hybridization around the indicated atom in the following molecule:



(1)
[15]

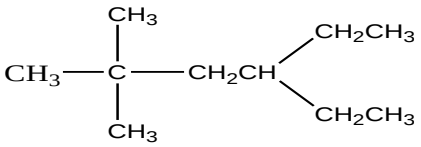
QUESTION 2: ALKANES

2.1 Draw the structure of the following alkane and give its molecular formula:

A cyclic alkane with 4 carbons (3)

2.2 During a laboratory experiment, Victor, an organic chemistry student notices that pentane dissolves in benzene, but it does not dissolve in water. Give a plausible explanation for the observation.
(Hint: consider the polarity of the compounds) (4)

2.3 Give the IUPAC name for the following compound:



(3)

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2.4 The halogenation of alkanes involves three distinctive steps. Name the THREE steps in order. (3)

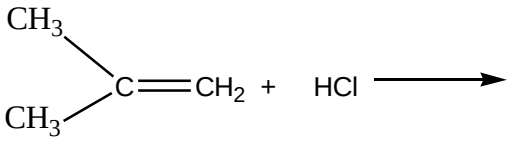
[13]

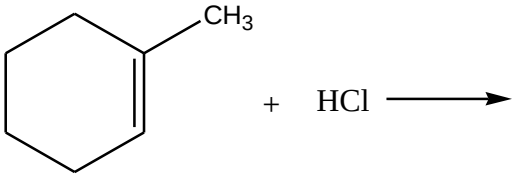
QUESTION 3: ALKENES

3.1 Name THREE isomers of an alkene with molecular formula C_4H_8. (3)

3.2 State Markovnikov's rule. (2)

3.3 Draw the products formed when the following alkenes are treated with HCl.

3.3.1 

3.3.2 

(2 × 2) (4)

3.4 Write down the equation for the elimination reaction of 2-pentanol in sulphuric acid. Apply the Saytseff rule and identify the major and minor products. (4)

[13]

QUESTION 4: ALKYNES

4.1 Draw the structural formula of 5,6-dimethyl-2-heptyne and give the molecular formula for this compound. (3)

4.2 Name and draw the structure of the alkyne formed in the following reaction:



(3)

4.3 Using propyne as the starting material, outline a method for the conversion of propyne to 2-butyne. Use chemical equations to answer. (4)

[10]

QUESTION 5: AROMATIC COMPOUNDS

5.1 Draw structures for the following aromatic compounds:

5.1.1 p-amino toluene

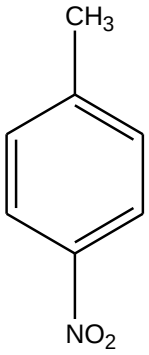
5.1.2 m-methyl aniline

(2 × 2) (4)

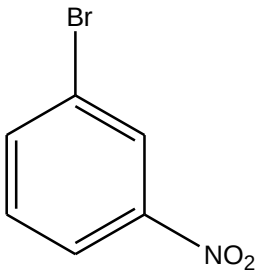
5.2 Using structural formulae, write down the reaction equation for the halogenation of benzene with bromine gas in the presence of Lewis acid. Name the product formed. (4)

5.3 Name the following aromatic compounds:

5.3.1



5.3.2



(2 × 2) 42)

[12]

QUESTION 6: ALCOHOLS

6.1 Name the following alcohols and classify each of them as primary, secondary or tertiary alcohols:

6.1.1 $CH_3CH_2CHOHCH_3$

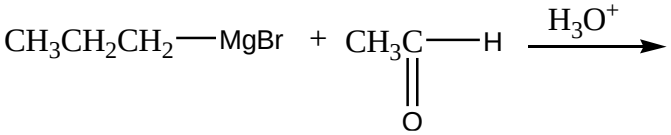
6.1.2 $CH_3CH_2COH(CH_3)_2$

6.1.3 $CH_3CH_2CH_2OH$

(3 × 2) (6)

6.2 Write down a balance reaction equation for the preparation of methanol from carbon monoxide and hydrogen. (3)

6.3 Draw and name the structure of the alcohol formed in the following reaction:



(2)

[11]

QUESTION 7: ALDEHYDES AND KETONES

7.1 Draw the structures of the following compounds:

7.1.1 2-methoxyhexanal (3)

7.1.2 2-ethylcyclopentanone (3)

7.2 Name two types of organic compounds with a carbonyl group that can be formed when primary alcohols are oxidised. (2)

[8]

QUESTION 8: AMINES

8.1 Draw structures for each of the following compounds and classify each of them as a primary, secondary, or tertiary amines:

8.1.1 o-bromoaniline

8.1.2 Ethyl propylamine

(2 × 2) (4)

8.2 Using chemical equations, outline a method for the preparation of butyl amine from butyl chloride and ammonia. (4)

[8]

QUESTION 9: CARBOXYLIC ACIDS

9.1 Name the following compounds:

9.1.1 C_6H_5COOH

9.1.2 $CH_3(CH_2)_6COOH$

9.1.3 $CH_3CH_2CHClCOOH$

(3 × 2) (6)

9.2 The reaction between butanol and ethanoic acid form an ester. Use a reaction to illustrate the answer and name the ester formed in the product. (4)

[10]

TOTAL: 100

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PERIODIC TABLE

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