



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

CHEMISTRY N5

(15040015)

25 November 2022 (X-paper)
09:00–12:00

Drawing instruments may be used.

This question paper consists of 7 pages and 1 periodic table.

241Q1E2225

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. Use only a blue or black pen
 5. Write neatly and legibly.
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QUESTION 1

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 the answer.

1.1.1 Propyne is classified as a saturated compound.

1.1.2 Acyclic compounds are organic compounds in which the carbon atoms are arranged in ring structures.

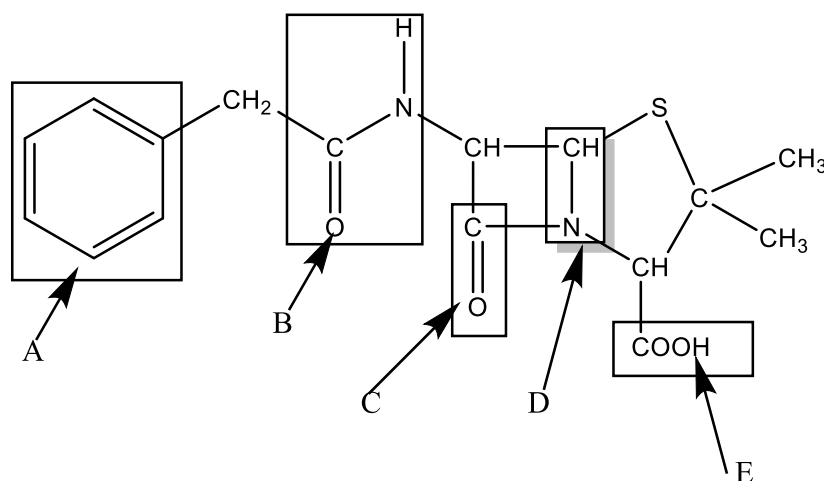
1.1.3 The carbon atom in methane has undergone a sp^3 hybridisation.

1.1.4 Acetone and propanal are isomers with molecular formula C_3H_6O .

1.1.5 Pentane has a higher boiling point than ethane.

(5 × 2) (10)

1.2 Given below is the molecular structure of penicillin (an antibiotic).





Penicillin

Identify the indicated functional groups by writing only the functional group next to the letter (A–E) in the ANSWER BOOK (e.g. F: Alcohol).


(5)
[15]


QUESTION 2: ALKANES

- 2.1 Consider the following compound: 4,4-diethyl-5-methyloctane.
- 2.1.1 Draw the structure the alkane above. (3)
- 2.1.2 Give the molecular formula of the alkane above. (1)
- 2.2 Draw the structures of the respective alkyls A and B formed when the indicated hydrogen atom is removed from the given alkane. 
- 2.2.1 $(\text{CH}_3)_2\text{CHCH}_2\text{---H}$ $\xrightarrow{\quad}$ A
Isobutyl
- 2.2.2 $(\text{CH}_3)_3\text{CCH}_2\text{---H}$ $\xrightarrow{\quad}$ B
Neopentyl
- (2 × 2) (4)
- 2.3 An alkyl halide can be reduced to an alkane via the hydrolysis of a Grignard reagent.
-  2.3.1 Using structural formula, indicate how 3-bromo-2,3-dimethylpentane forms a Grignard reagent. (3)
- 2.3.2 Write the hydrolysis reaction for the Grignard reagent in QUESTION 2.3.1. (2)
- 2.3.3 Name the alkane formed in QUESTION 2.3.2. (1)
- [14]**

QUESTION 3: ALKENES

- 3.1 Draw the structure of 6-ethyl-2,3-dimethyl-2-nonene. (3)
- 3.2 3.2.1 State Saytseff's rule. (3)
- 3.2.2 Write down the equation for the elimination reaction of 2-butanol in sulfuric acid. Apply Saytseff's rule and name the major and minor products. (4)
- [10]**

QUESTION 4: ALKYNES 

- 4.1 Give the structural formula of 1,1-dichloro-5-methyl-3-hexyne. (3)
-  4.2 Write a reaction for the preparation of 1-hexyne, using 1-bromobutane and sodium acetylide as starting material. (4)
- 4.3 Show, by means of a reaction equation, which alkyne is produced through the hydrolysis of calcium carbide. (Clearly name the alkyne in the reaction.) (4)

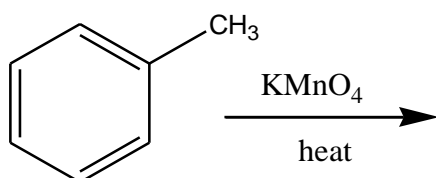
QUESTION 5: AROMATIC COMPOUNDS

5.1 Draw structures for the following aromatic compounds:

★ 5.1.1 m-bromochlorobenzene (2)

5.1.2 3,4-dinitrobenzoic acid (3)

5.2 Draw and name the structure of the product formed during the following reaction:



(2)

5.3 Name the reaction in which benzene reacts with nitric acid in the presence of sulfuric acid to give nitrobenzene. (2)

5.4 What is the hybridisation of the carbon atom in a benzene ring? (1)

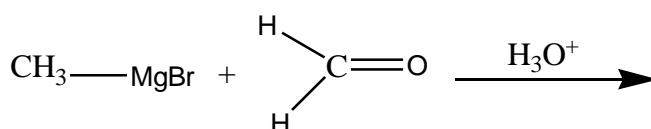
[10]

QUESTION 6: ALCOHOLS

6.1 The bulk of commercial ethanol is produced by the hydration of ethylene. In the process, sulfuric acid is added to ethylene, and the resulting ethyl hydrogen sulphate is hydrolysed to ethanol. Write down the reaction equation for the complete preparation of ethanol. (5)

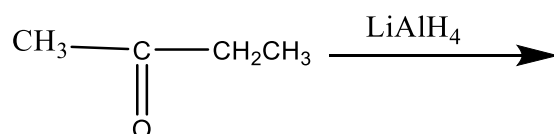
6.2 Draw and name the structures of the alcohols formed in the following reactions:

★ 6.2.1



(3)

6.2.2




(3)

[11]

QUESTION 7: ALDEHYDES AND KETONES

7.1 The simplest ketone has the molecular formula CH_3COCH_3 . What is its trivial name? (1)

7.2 Draw structures for the following compounds: 

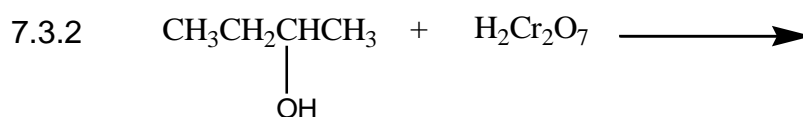
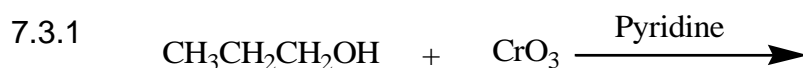
7.2.1 Ethyl methyl ketone

7.2.2 2-bromobutanal

(2 × 2)

(4)

7.3 Give the name of the ketone/aldehyde formed during the oxidation of the following alcohols:



(2 × 2)

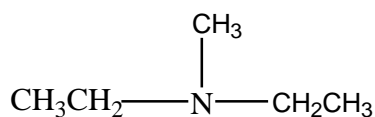
(4)

[9]**QUESTION 8: AMINES**

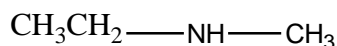
8.1 Name the following compounds and classify each of them as primary, secondary or tertiary amines:



8.1.2



8.1.3



(3 × 2)

(6) 

8.2 Write the reaction equation for the reaction between ammonia and chloropropane to form an alkylammonium salt, followed by the reaction of the salt with sodium hydroxide. (4)

8.3 Why can amines be classified as Lewis bases? (2)

[12]

QUESTION 9: CARBOXYLIC ACIDS

9.1 Draw the structures of the following compounds:

9.1.1 Propanoic acid

9.1.2 4-methylpentanoic acid

9.1.3 m-nitrobenzoic acid

(3 × 2)

(6)

9.2 Name the ester formed by the reaction of methanol and formic acid.

(2)

[8]

TOTAL:

100



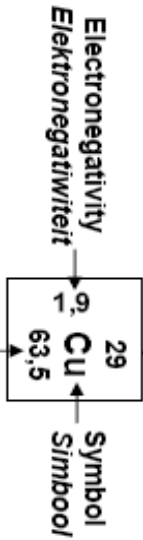
PERIODIC TABLE

THE PERIODIC TABLE OF ELEMENTS
DIE PERIODIEKE TABEL VAN ELEMENTE

1 (I) 2 (II) 3 4 5 6 7 8 9 10 11 12 13 (III) 14 (IV) 15 (V) 16 (VI) 17 (VII) 18 (VIII)

1 1 H	2 4 He	3 3 Li	4 9 Be	5 11 B	6 12 C	7 14 N	8 16 O	9 17 F	10 18 Ne								
19 8 K	20 20 Ca	21 21 Sc	22 48 Ti	23 51 V	24 52 Cr	25 55 Mn	26 56 Fe	27 59 Co	28 59 Ni	29 63.5 Cu	30 65 Zn	31 70 Ga	32 73 Ge	33 75 As	34 79 Se	35 80 Br	36 84 Kr
37 8 Rb	38 88 Sr	39 45 Y	40 91 Zr	41 92 Nb	42 96 Mo	43 96 Tc	44 101 Ru	45 103 Rh	46 106 Pd	47 108 Ag	48 112 Cd	49 115 In	50 119 Sn	51 122 Sb	52 128 Te	53 127 I	54 131 Xe
55 7 Cs	56 137 Ba	57 139 La	72 179 Hf	73 181 Ta	74 184 W	75 186 Re	76 190 Os	77 192 Ir	78 195 Pt	79 197 Au	80 201 Hg	81 204 Tl	82 207 Pb	83 209 Bi	84 209 Po	85 209 At	86 210 Rn
87 7 Fr	88 226 Ra	89 Ac															

KEY / SLEUTEL Atomic number
Atoomgetal



Approximate relative atomic mass
Benaderde relatiewe atoommassa

58 140 Ce	59 141 Pr	60 144 Nd	61 Pm	62 150 Sm	63 152 Eu	64 157 Gd	65 159 Tb	66 163 Dy	67 165 Ho	68 167 Er	69 169 Tm	70 173 Yb	71 175 Lu
90 232 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr