higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T360**(E)**(A2)T

NATIONAL CERTIFICATE

CHEMISTRY N5

(15040015)

2 August 2018 (X-Paper)
09:00–12:00

This question paper consists of 7 pages and a periodic table of elements.

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. Sketches must be large, neat and fully labelled.
5. Write neatly and legibly.

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QUESTION 1

1.1 A saturated hydrocarbon with FOUR carbon atoms has reference:

1.1.1 Write the molecular formula of the compound. (1)

1.1.2 What is the homologous series of the compound? (1)

1.1.3 Explain why the compound is more soluble in hexane than in water. (2)

1.1.4 Draw the structure of TWO possible structural isomers and name them. (4)

1.1.5 Define the term *isomer*. (2)

1.2 When chlorine react with propane, a homolytic splitting of the bond between the chlorine atoms occurs.

1.2.1 What does the term *homolytic* splitting refer to? (2)

1.2.2 Name the products that are formed by the homolytic bond splitting of the halogen molecules. (1)

1.2.3 Use the hybridisation theory to explain the orbital overlap that occurs in a propane molecule. (3)

1.2.4 Write a balanced equation for the reaction. (4)

1.3 Nucleophiles are electron rich and electrophiles are electron poor.

1.3.1 Which of the following spices are classified as nucleophiles? Choose the correct answer and only write the letter next to the number in the ANSWER BOOK.

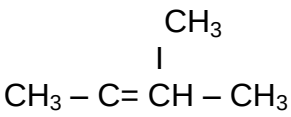
A carbanion
B ammonium ion
C radicals
D hydroxyl ion (3)

1.3.2 Define an *electrophile*. (2)

[25]

QUESTION 2

2.1



2.1.1 What is the general formula of the compound? (1)

2.1.2 Is the compound polar or nonpolar? (1)

2.1.3 Name the major product that is formed when this compound reacts with hydrogen chloride in the presence of ether. (3)

2.1.4 Draw the structure of a minor product after the reaction mentioned in QUESTION 2.1.3 above. (3)

2.1.5 State *Markovnikov's* rule. (2)

2.2 An elimination reaction is used to prepare an alkene from 2-bromo-3 methylbutane.

2.2.1 Name the reagents that are used for the reagents.

2.2.2 State *Zaitsev's* rule.

2.2.3 Apply *Zaitsev's* rule and name both the major and the minor products that are formed from the reaction.

(3 × 2) (6)

2.3 A conjugate polyene with FIVE carbon atoms has reference:

2.3.1 Draw the structure of the conjugate polyene. (3)

2.3.2 Write the IUPAC name of the compound. (2)

2.4 Write a balanced reaction equation for the complete combustion of 2-butyne in oxygen. (4)

[25]

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QUESTION 3

3.1 Alcohols are compounds that have a hydroxyl group bonded to saturated sp^3-hybridised carbon atoms.

3.1.1 Briefly explain why butane has a much lower boiling point than butanol. (2)

3.1.2 Write a reaction equation for the dissociation of methanol in water. (3)

3.1.3 Write the K_a expression of the reaction. (2)

3.1.4 Will the K_a expression be big or small? Explain your answer. (2)

3.2 Complete and balance the following equations that act as sources of simple alcohols:

3.2.1 $CH_2 = CH_2C\ell_2 \xrightarrow[H_2O]{}$

3.2.2 $CO(g) + H_2(g) \xrightarrow[400\ °C]{ZnO}$

(2 × 3) (6)

3.3



3.3.1 Write the IUPAC name of the compound. (2)

3.3.2 Write the general formula the compound belongs to. (1)

3.3.3 Draw and name the product that is formed when this compound reacts to methyl magnesium bromide. (3)

3.3.4 State the name of a reagent that is used to achieve the reaction in QUESTION 3.3.3 above. (1)

3.3.5 Classify the product obtained as primary, secondary or tertiary alcohol. (1)

3.4 Draw a structure of acetaldehyde. (2)

[25]

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QUESTION 4

4.1 Give ONE word/term for each of the following descriptions. Write only the word/term next to the question number (4.1.1–4.1.10) in the ANSWER BOOK.

4.1.1 An alcohol used to prepare octylbutanoate.

4.1.2 It is used to test for aldehydes.

4.1.3 An amide that is the major waste product found in urine.

4.1.4 Carboxylic acid used to prepare propylmethanoate.

4.1.5 General formula of esters.

4.1.6 Common name of ethanoic acid.

4.1.7 The first member of the aldehyde functional group.

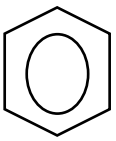
4.1.8 A common name of an aromatic amine.

4.1.9 C_2H_5ON

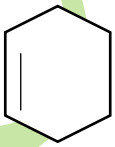
4.1.10 The product that is formed when ammonia reacts with methanol.

(10 × 1) (10)

4.2 Consider the following compounds:



A



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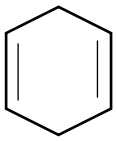

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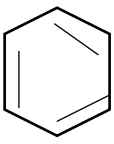

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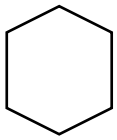

E

4.2.1 Write the names of compounds A, B, C and E. (4)

4.2.2 Which compounds are classified as aromatic? (2)

4.2.3 To what homologous series does compound B belong to? (2)

4.2.4 Which compound can be used to prepare benzoic acid? (2)

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4.3 Write a balanced equation for the reaction of methanol with methyl amine.

Name the products that are obtained. (5)
[25]

TOTAL: 100

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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)
																	2,1 **H** 1 1
0,7 **Fr** 87	0,9 **Ra** 226	**Ac** 89															
0,7 **Cs** 133	0,9 **Ba** 137	1,2 **La** 139	1,6 **Hf** 179	**Ta** 181	1,8 **W** 184	1,9 **Re** 186	2,2 **Os** 190	2,2 **Ir** 192	2,2 **Pt** 195	1,9 **Au** 197	1,7 **Hg** 201	1,8 **Tℓ** 204	1,8 **Pb** 207	1,9 **Bi** 209	2,0 **Po**	2,5 **At**	**Rn** 86
0,8 **Rb** 86	1,0 **Sr** 88	1,2 **Y** 89	1,4 **Zr** 91	1,6 **Nb** 92	1,8 **Mo** 96	1,9 **Tc**	2,2 **Ru** 101	2,2 **Rh** 103	2,2 **Pd** 106	1,9 **Ag** 108	1,7 **Cd** 112	1,7 **In** 115	1,8 **Sn** 119	1,9 **Sb** 122	2,1 **Te** 128	2,5 **I** 127	**Xe** 131
0,8 **K** 39	1,0 **Ca** 40	1,3 **Sc** 45	1,5 **Ti** 48	1,6 **V** 51	1,6 **Cr** 52	1,5 **Mn** 55	1,8 **Fe** 56	1,8 **Co** 59	1,8 **Ni** 59	1,9 **Cu** 63,5	1,6 **Zn** 65	1,5 **Aℓ** 27	1,8 **Si** 28	2,1 **P** 31	2,5 **S** 32	3,0 **Cℓ** 35,5	**Ar** 40
0,9 **Na** 23	1,2 **Mg** 24											2,0 **B** 11	2,5 **C** 12	3,0 **N** 14	3,5 **O** 16	4,0 **F** 19	**Ne** 20
1,0 **Li** 7	1,5 **Be** 9																**He** 4
2,1 **H** 1																	

KEY / *SLEUTEL*

Atomic number *Atoomgetal*

Electronegativity *Elektronegatiwiteit*

29
1,9 **Cu**
63,5

Symbol *Simbool*

Approximate relative atomic mass *Benaderde relatiewe atoommassa*

58 **Ce** 140	59 **Pr** 141	60 **Nd** 144	61 **Pm**	62 **Sm** 150	63 **Eu** 152	64 **Gd** 157	65 **Tb** 159	66 **Dy** 163	67 **Ho** 165	68 **Er** 167	69 **Tm** 169	70 **Yb** 173	71 **Lu** 175
90 **Th** 232	91 **Pa**	92 **U** 238	93 **Np**	94 **Pu**	95 **Am**	96 **Cm**	97 **Bk**	98 **Cf**	99 **Es**	100 **Fm**	101 **Md**	102 **No**	103 **Lr**

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