



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 species are classified as nucleophiles? Choose the correct answer and only write the letter next to the number in the ANSWER BOOK. (3)
 - A carbanion
 - B ammonium ion
 - C radicals
 - D hydroxyl ion
 - 1.3.2 Define an *electrophile*. (2)

[25]

QUESTION 2

- 2.1
- $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 - \text{C} = \text{CH} - \text{CH}_3 \end{array}$$
- 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]

QUESTION 3

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

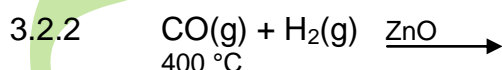
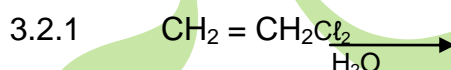
3.1.1 Briefly explain why butane has a much lower boiling point than butanol. (2)

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:



(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]

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.

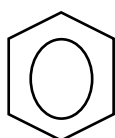
4.1.8 A common name of an aromatic amine.

4.1.9 C_2H_5ON

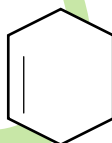
4.1.10 The product that is formed when ammonia reacts with methanol.

(10 × 1) (10)

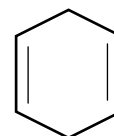
4.2 Consider the following compounds:



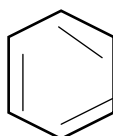
A



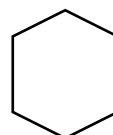
B



C



D



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)

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

Name the products that are obtained.

(5)
[25]

TOTAL: 100



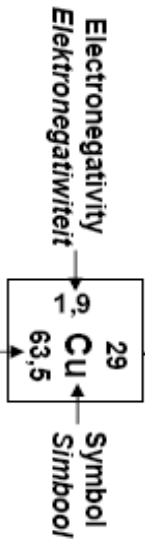
PERIODIC TABLE

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 H	2 He											11 B	12 C	13 N	14 O	15 F	16 Ne																																																																																																																																																																																																				
3 Li	4 Be	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr																																																																																																																																																																																																		
5 Li	6 Be	7 Na	8 Mg	9 Al	10 Si	11 P	12 S	13 Cl	14 Ar	15 K	16 Ca	17 Sc	18 Ti	19 V	20 Cr	21 Mn	22 Fe	23 Co	24 Ni	25 Cu	26 Zn	27 Ga	28 Ge	29 As	30 Se	31 Br	32 Kr																																																																																																																																																																																										
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr																																																																																																																																																																																												
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe																																																																																																																																																																																		
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	55 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu																																																																																																																																																																																			
87 Fr	88 Ra	89 Ac	90 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	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og	119 Uu	120 Uub	121 Uut	122 Uuq	123 Uur	124 Uus	125 Uuq	126 Uur	127 Uus	128 Uuq	129 Uur	130 Uus	131 Uuq	132 Uur	133 Uus	134 Uuq	135 Uur	136 Uus	137 Uuq	138 Uur	139 Uus	140 Uuq	141 Uur	142 Uus	143 Uuq	144 Uur	145 Uus	146 Uuq	147 Uur	148 Uus	149 Uuq	150 Uur	151 Uus	152 Uuq	153 Uur	154 Uus	155 Uuq	156 Uur	157 Uus	158 Uuq	159 Uur	160 Uus	161 Uuq	162 Uur	163 Uus	164 Uuq	165 Uur	166 Uus	167 Uuq	168 Uur	169 Uus	170 Uuq	171 Uur	172 Uus	173 Uuq	174 Uur	175 Uus	176 Uuq	177 Uur	178 Uus	179 Uuq	180 Uur	181 Uus	182 Uuq	183 Uur	184 Uus	185 Uuq	186 Uur	187 Uus	188 Uuq	189 Uur	190 Uus	191 Uuq	192 Uur	193 Uus	194 Uuq	195 Uur	196 Uus	197 Uuq	198 Uur	199 Uus	200 Uuq	201 Uur	202 Uus	203 Uuq	204 Uur	205 Uus	206 Uuq	207 Uur	208 Uus	209 Uuq	210 Uur	211 Uus	212 Uuq	213 Uur	214 Uus	215 Uuq	216 Uur	217 Uus	218 Uuq	219 Uur	220 Uus	221 Uuq	222 Uur	223 Uus	224 Uuq	225 Uur	226 Uus	227 Uuq	228 Uur	229 Uus	230 Uuq	231 Uur	232 Uus	233 Uuq	234 Uur	235 Uus	236 Uuq	237 Uur	238 Uus	239 Uuq	240 Uur	241 Uus	242 Uuq	243 Uur	244 Uus	245 Uuq	246 Uur	247 Uus	248 Uuq	249 Uur	250 Uus	251 Uuq	252 Uur	253 Uus	254 Uuq	255 Uur	256 Uus	257 Uuq	258 Uur	259 Uus	260 Uuq	261 Uur	262 Uus	263 Uuq	264 Uur	265 Uus	266 Uuq	267 Uur	268 Uus	269 Uuq	270 Uur	271 Uus	272 Uuq	273 Uur	274 Uus	275 Uuq	276 Uur	277 Uus	278 Uuq	279 Uur	280 Uus	281 Uuq	282 Uur	283 Uus	284 Uuq	285 Uur	286 Uus	287 Uuq	288 Uur	289 Uus	290 Uuq	291 Uur	292 Uus	293 Uuq	294 Uur	295 Uus	296 Uuq	297 Uur	298 Uus	299 Uuq	300 Uur

KEY / SLEUTEL
Atomic number
Atoomgetal



Approximate relative atomic mass
Benaderde relatiewe atoommassa

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
140	141	144	144	150	152	157	159	163	165	167	169	173	175
90 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
232	232	238	238	244	244	250	259	263	267	271	275	283	287