FINAL	%	

UNISA university of south africa

CHE1502

MAY/JUNE 2014

GENERAL CHEMISTRY 1B

STUDENT NUMBER									

IDENTITY NUMBER												

FOR USE BY EXAMINATION INVIGILATOR

Question No	Marks Examiners 1		2		3	
Total						

Subject

Number of paper

Date of examination

Examination centre

WARNING

1 A candidate who without authorisation takes into the examination venue any book, document or object which could assist him in the examination, and does not hand over such material to the invigilator before the official commencement of the examination, will be guilty of infringing the University's examination regulations and will be liable to punishment as determined by Council

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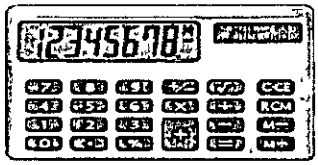
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

CHE1502 (477983) May/June 2014

GENERAL CHEMISTRY IB

Duration 2 Hours 100 Marks

EXAMINERS
FIRST PROF CA SUMMERS
SECOND MR LG LESENYEHO

Use of a non-programmable pocket calculator is permissible

Closed book examination

EXAMINATION PAPER UNIQUE NUMBER: 477983

The examination paper consists of 25 pages (a periodic table is on page 25) plus 5 pages for rough work (pp 26-30) plus instructions for completion of the mark reading sheet

The examination paper consists of two parts:

SECTION A: consists of 40 multiple choice questions –answer on marking reading sheet.

SECTION B: Written questions – answer in spaces provided on the examination paper.

SECTION A: Each question is allocated TWO marks- 80 marks

SECTION B: 20 marks

The multiple choice questions have four possible answers. In each case, provide only ONE answer to each question

The use of molecular models is permissible

ANSWER ALL QUESTIONS IN SECTION A AND SECTION B

SECTION A

This section consists of **40 MULTIPLE CHOICE QUESTIONS.**

Answer ALL **the questions in this section on the MARK READING SHEET**

Unique Number **477983**

1 What type of bonding is found in the carbonate ion (CO_3^{-2})?

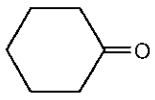
(1) nonpolar covalent

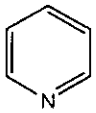
(2) ionic

(3) a mixture of covalent and ionic

(4) polar covalent

2 Which of the following compounds can easily accept a pair of electrons?

(1) 

(2) 

(3) CH_3OH

(4) BCl_3

3 Identify the INCORRECT statement below

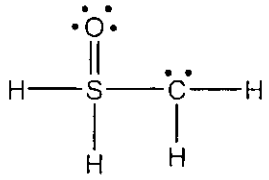
(1) A radical reaction is a process involving symmetrical bond breaking and bond making

(2) Heterolytic bond breakage occurs when both bonding electrons remain with one product fragment

(3) An electrophile is a species which have an electron rich site that can form a bond with an electron poor site

(4) Homolytic bond breakage occurs when one bonding electron remains with each product fragment

4 In the structure below, the NON-ZERO formal charges are



(1) +1 on S and -1 on C

(2) +1 on S and -1 on O

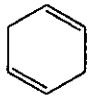
(3) -1 on S and +1 on C

(4) -1 on S and +1 on O

5 Which of the following is the CORRECT STRUCTURE of the compound 1,3-cyclohexadiene?

(1)

(2)



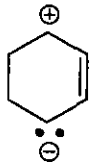
(3)

(4)

6 Which of the following is **NOT** a proper resonance form of 1,3-cyclohexadiene?

(1)

(2)



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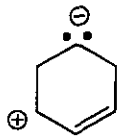

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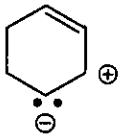
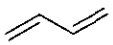


7 Which of the following species is **NOT** conjugated?

(1)



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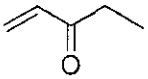

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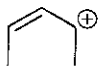
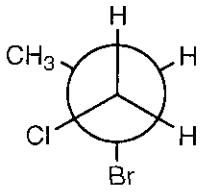


8 Which of the following pairs of compounds are constitutional isomers?

(1)



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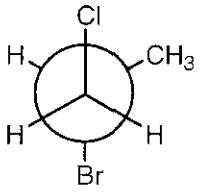

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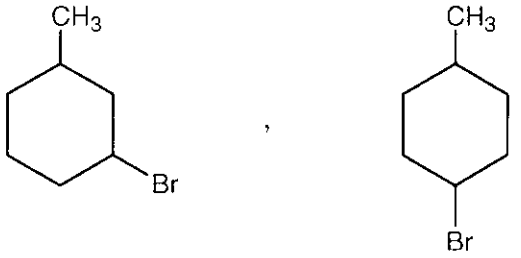

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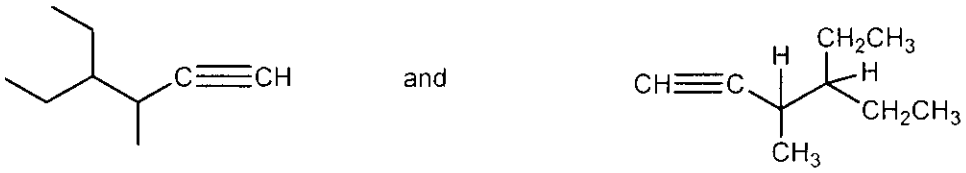
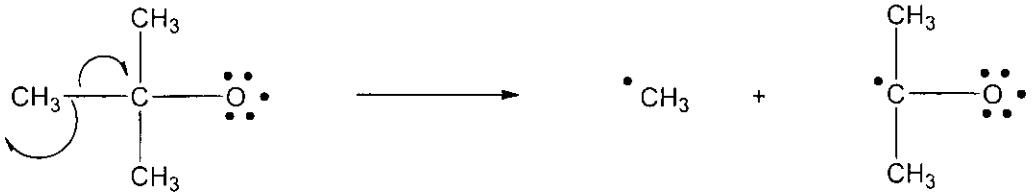


(4)

9 Which of the following reactions is a correct example of heterolysis?

(1)

(2)



(3)

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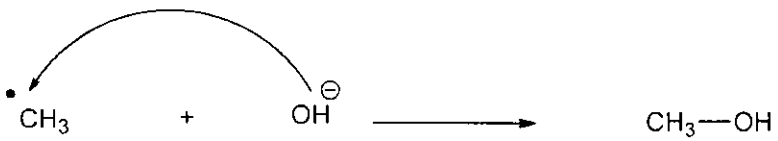
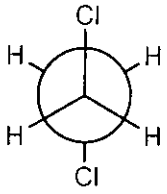
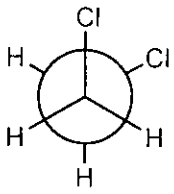


10 Which of the following pairs of drawings represent THE IDENTICAL CONFORMATIONS OF THE SAME COMPOUND?

(1)



and



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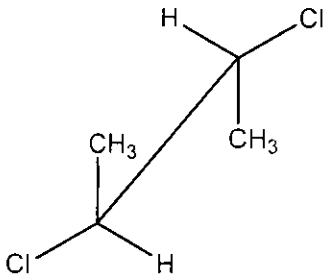
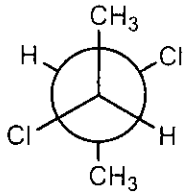


and



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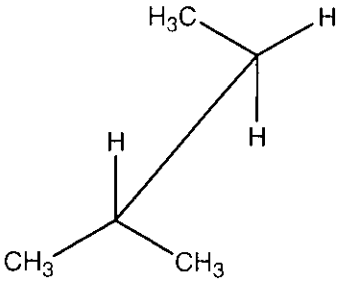
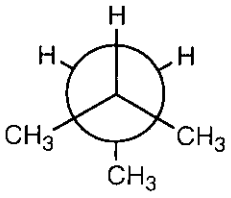


and



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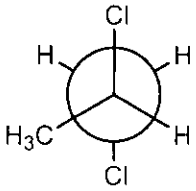
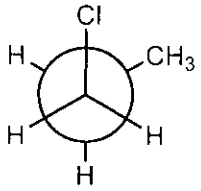
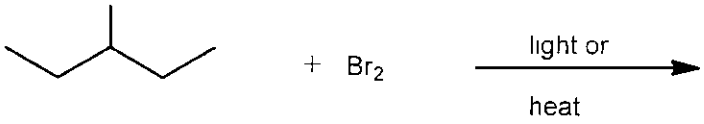


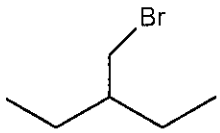
and



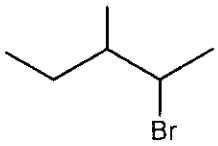
11 What is the MAJOR monobrominated product formed in the following reaction?



(1)



(2)



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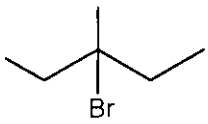

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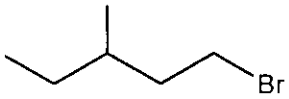
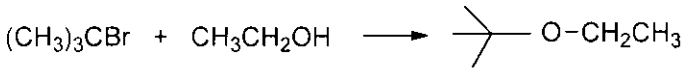


12 The reaction of bromine with butane gives primarily 2-bromobutane as the reaction product Which of the following is the main reason for the outcome of the reaction?

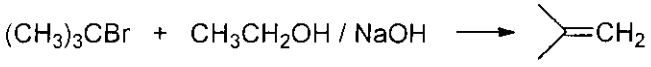
(1) secondary free radicals have a higher stability than primary free radicals
(2) butane easily forms free radicals
(3) bromine reacts faster with butane than any other alkane
(4) bromine forms reactive free radicals

13 Which of the following reactions is an elimination reaction?

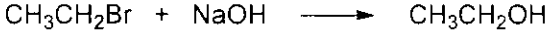
(1)



(2)



(3)



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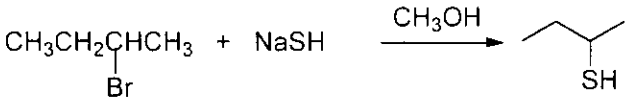
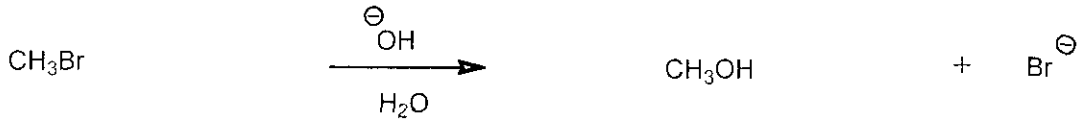
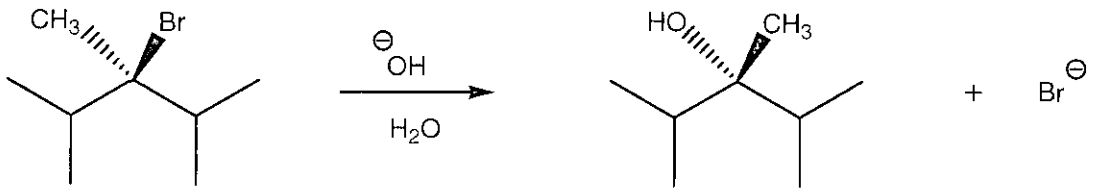


14 Which reaction will take place THE FASTEST?

(1)



(2)



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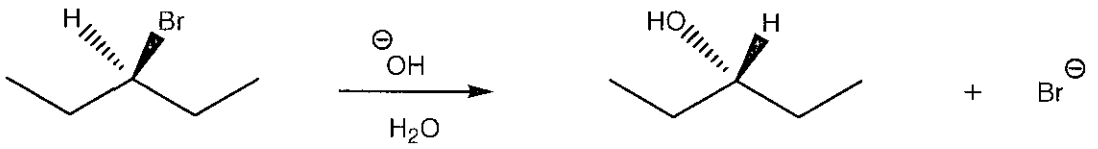

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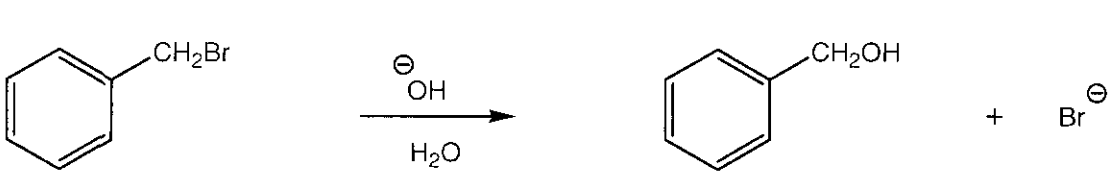
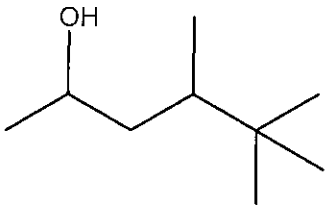


15 What is the IUPAC name of the molecule shown below?



(1) 2,2,3-trimethylhexan-5-ol

(2) 4,5,5-trimethylhexan-2-ol

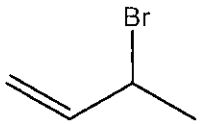
(3) 1,1,1,2-tetramethylpentan-4-ol

(4) 4,5,5,5-tetramethylpentan-2-ol

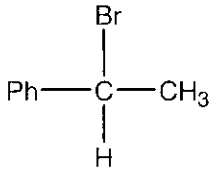
16 Alkyl halides may undergo nucleophilic substitution reaction according to the following reaction

Which compound is the MOST REACTIVE under these conditions?

(1)



(2)



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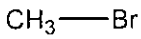

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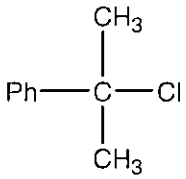
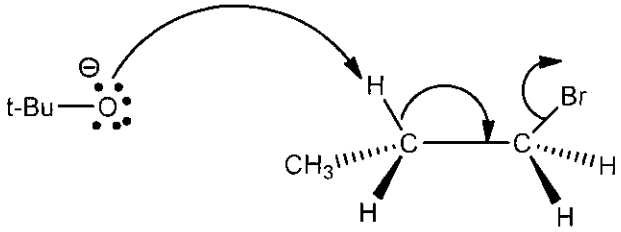


17 The mechanism for the E2 reaction of 1-bromopropane with methoxide anion in the presence of heat is

(1)



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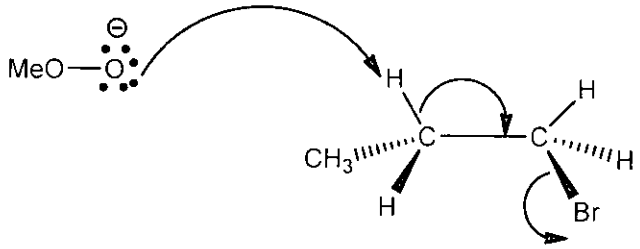

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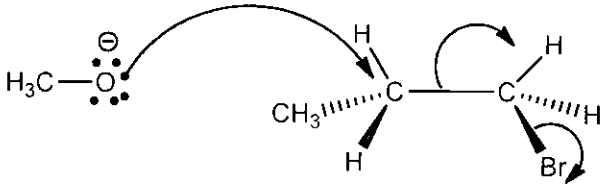

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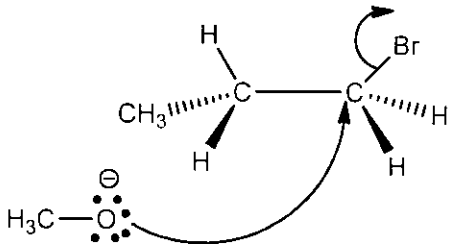
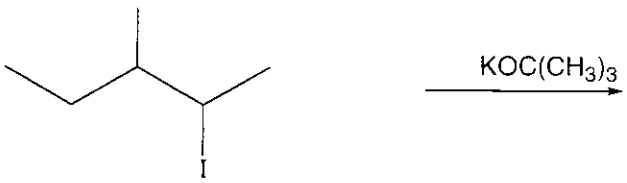
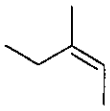


18 What is the major product formed in the following reaction?



(1)



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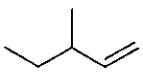

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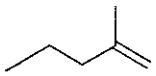

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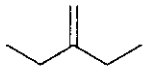
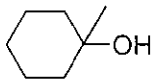
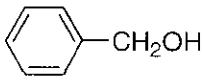


19 Which of the following alcohols CANNOT be oxidized by chromic acid?

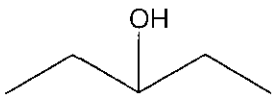
(1)



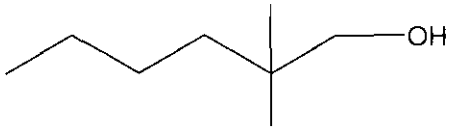
(2)



(3)



(4)

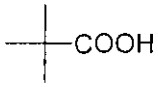


20 Which of the following molecules has a chiral (asymmetric) carbon atom?

(1)

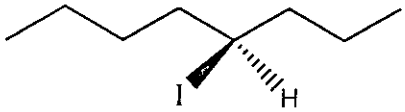
(2) $CH_3CH_2CHFCH_3$

(3)



(4)

21 The absolute configuration of a chiral carbon is defined as R- or S- according to the Cahn-Ingold-Prelog rules What is the name for the following compound?



(1) (R)-1-iodo-1-propylpentane
(2) (R)-4-iodooctane
(3) (S)-4-iodooctane
(4) (S)-1-iodo-1-propylpentane

22 Which of the following amines is most soluble in water?

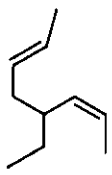
(1) $PhNH_2$
(2) $(CH_3)_3N$
(3) $CH_3CH_2NH_2$
(4) $(CH_3CH_2CH_2)_2NH$

23 Identify the secondary amine(s) in question 22 above

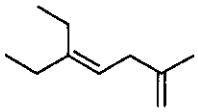
(1) (1) and (3)
(2) (4) only
(3) none of the options is a secondary amine
(4) (2) only

24 Which of the following structures contains ONLY *trans* double bonds?

(1)

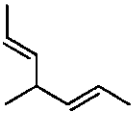


(2)

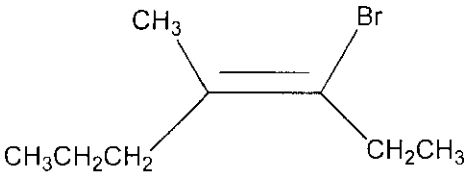


(3)

(4)



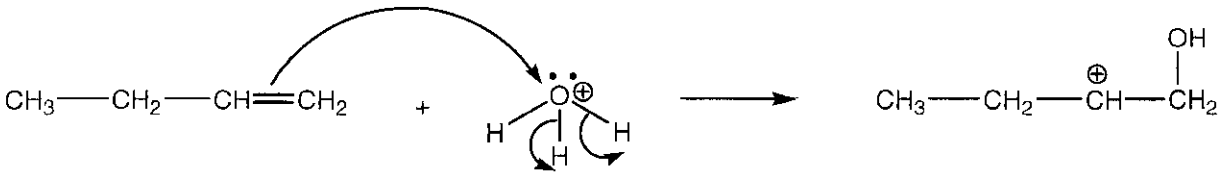
25 Name the following compound according to the IUPAC rules



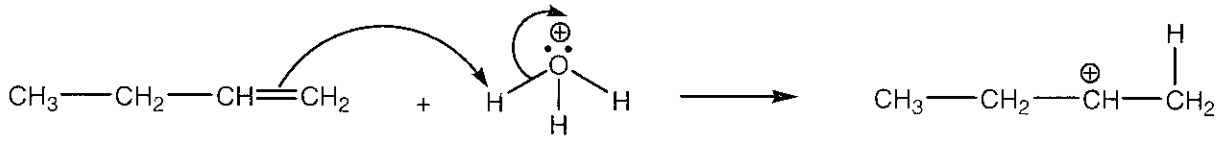
(1) (Z)-3-bromo-4-methylhept-3-ene
(2) (E)-1-bromo-1-ethyl-2-methylpent-1-ene
(3) (E)-3-bromo-4-methylhept-3-ene
(4) (Z)-3-bromo-2-propylpent-2-ene

26 Which of the following mechanism best describes the reaction between 1-butene and H_3O^+ ?

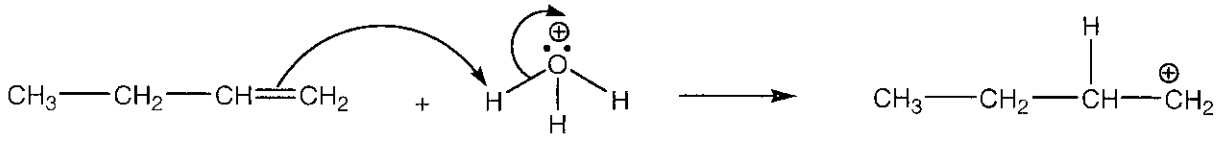
(1)



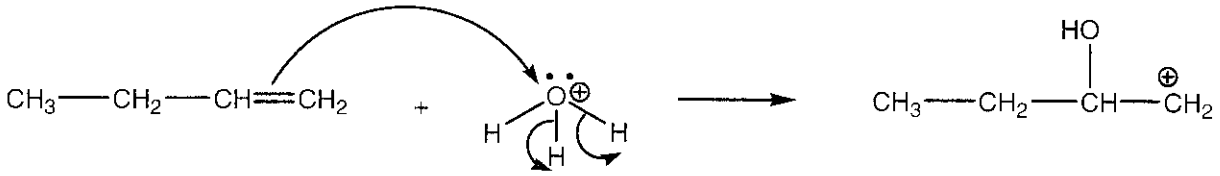
(2)



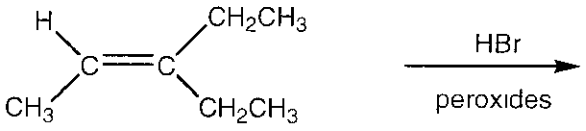
(3)



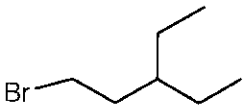
(4)



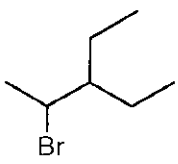
27 Alkenes react with hydrogen halides to give alkyl halides as products What is the MAJOR organic product formed in the following reaction?



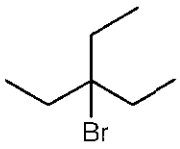
(1)



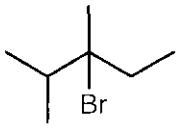
(2)



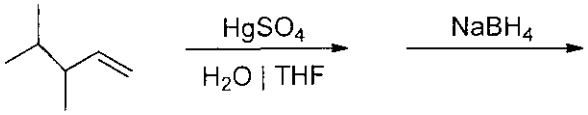
(3)



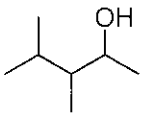
(4)



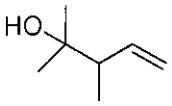
28 What is the major organic product formed in the following reaction?



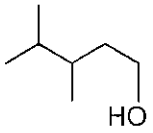
(1)



(2)



(3)



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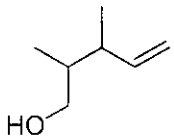
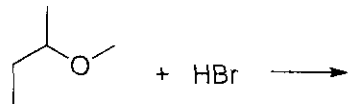
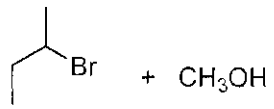


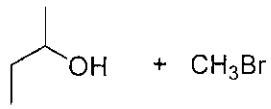
29 Ethers undergo cleavage reaction in the presence of acids What are the MAJOR products formed in the following reaction?



(1)



(2)



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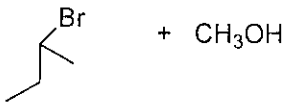

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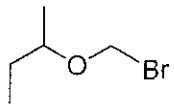
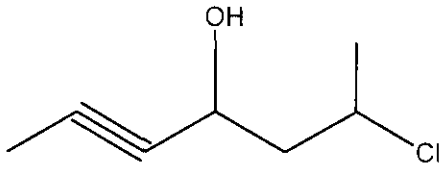


30 In *cis*-hept-4-en-2-yne the shortest carbon-carbon bond is between carbons

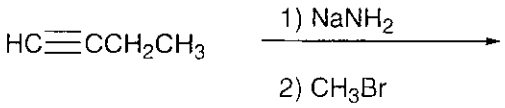
(1) 2 and 3
(2) 4 and 5
(3) 3 and 4
(4) 1 and 2

31 Name the following compound according to the IUPAC rules

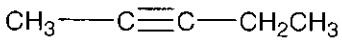


(1) 2-chloro-4-hydroxy-5-heptene
(2) 6-chlorohept-2-yn-4-ol
(3) 2-chlorohept-5-yn-4-ol
(4) 2-chloro-4-hydroxy-5-heptyne

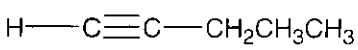
32 What is the structure of the major organic product(s) in the reaction sequence below?



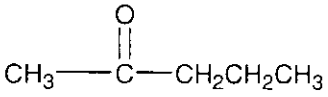
(1)



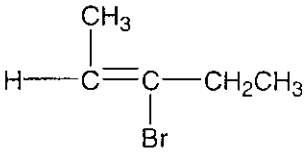
(2)



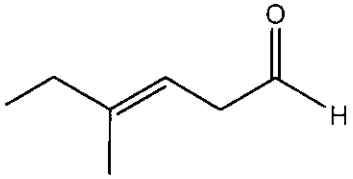
(3)



(4)



33 What is the IUPAC name for the following compound?



(1) 5-methylhept-4-enone

(2) 4-methylhex-3-en-1-one

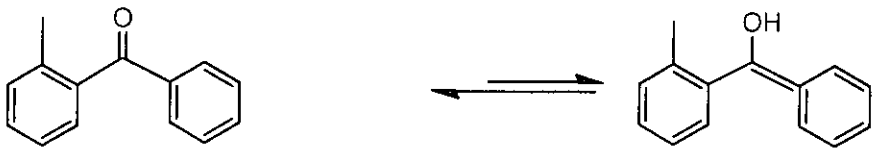
(3) 4-methylhex-3-enal

(4) 4-methyl-1-oxohex-3-ene

34 Which of the following represents keto-enol tautomerism?

(1)

(2)



(3)

(4)

35 Consider the compounds, diethyl ether ($CH_3CH_2OCH_2CH_3$) and 1-butanol ($CH_3CH_2CH_2CH_2OH$) Which of the following statements is **CORRECT**?

(1) Butan-1-ol has the lower boiling point

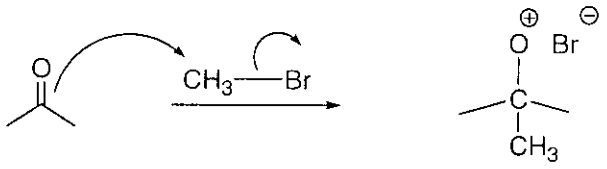
(2) Molecules of diethyl ether form hydrogen bonds with each other

(3) Molecules of butan-1-ol are not capable of undergoing hydrogen bonding with each other

(4) Diethyl ether has the lower boiling point

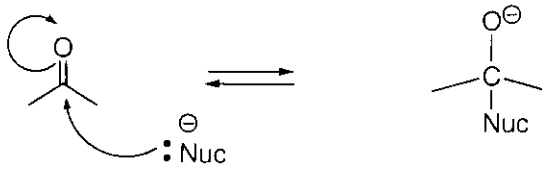
36 Consider the carbonyl group and its reactivity Which of the following processes is INCORRECT?

(1)

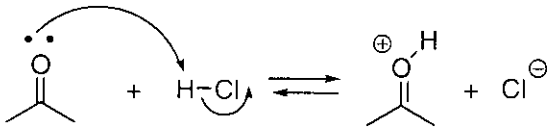


(2)

(3)



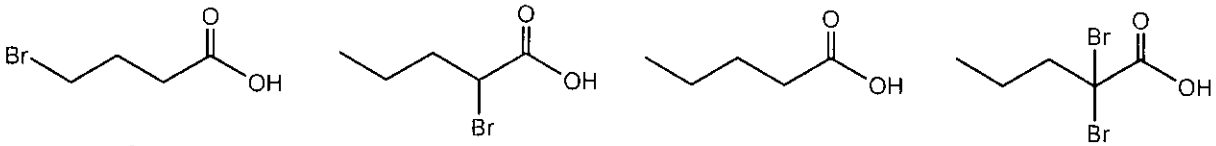
(4)



37 What reagent can be used to convert 2-methylbutan-1-ol into 2-methylbutanoic acid?

(1) $LiAlH_4$
(2) PCC
(3) H_2/Pd , C
(4) $Na_2Cr_2O_7$

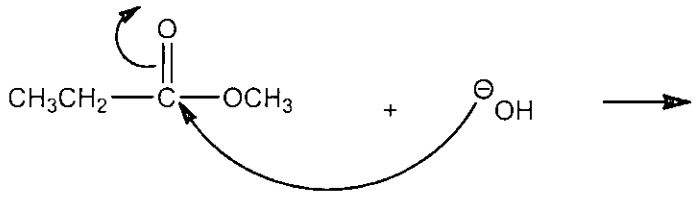
38 List the following weak acids in order of increasing acidity (from lowest to highest)



A **B** **C** **D**

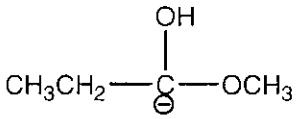
(1) C < A < B < D
(2) D < C < B <A
(3) B <C < A < D
(4) D < A < B < C

39 Consider the following step in the reaction of methyl propanoate with base?

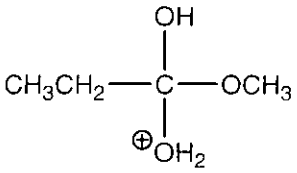


The species formed in the above step is

(1)



(2)



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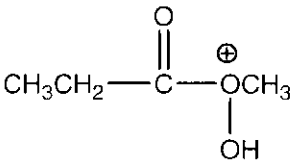

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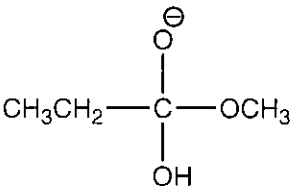
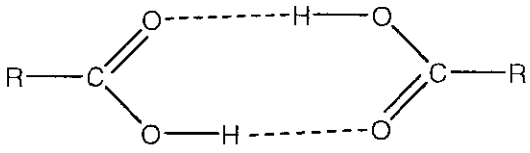
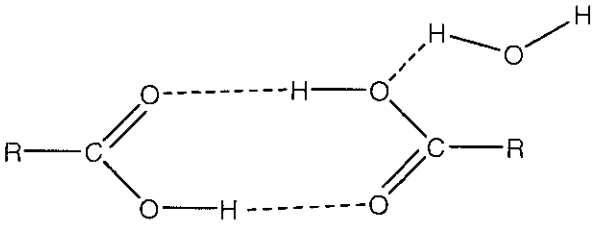


40 Carboxylic acid molecules tend to form hydrogen-bonds with one another

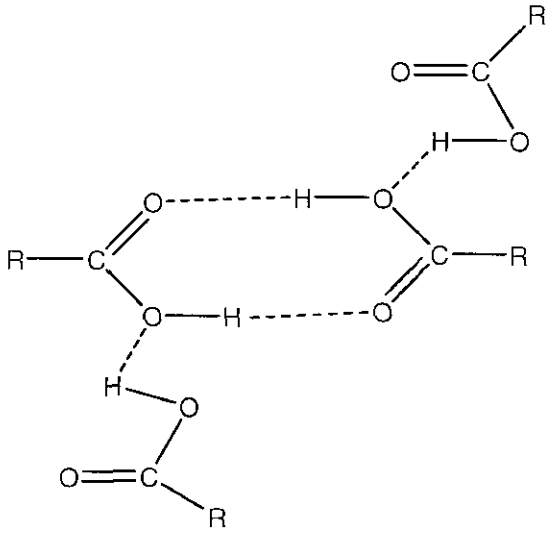
Which representation shown below **CORRECTLY** explains it?



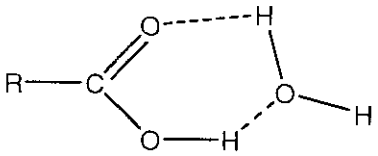
(2)



(3)



(4)



[80]

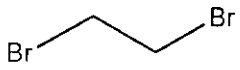
SECTION B

Answer ALL the questions in this section.

Answer this section in the SPACE PROVIDED AFTER EACH QUESTION.

Question 1 [10]

(a) Draw the Newman projections of the different conformations of the following compound



Identify the most stable and least stable conformation

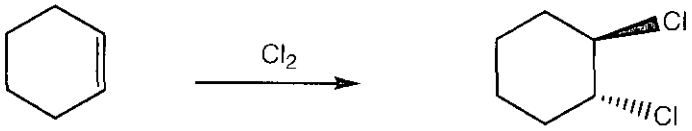
(6)

(b) Draw the structure of any ketone Give the IUPAC name of the compound

(4)

Question 2 [10]

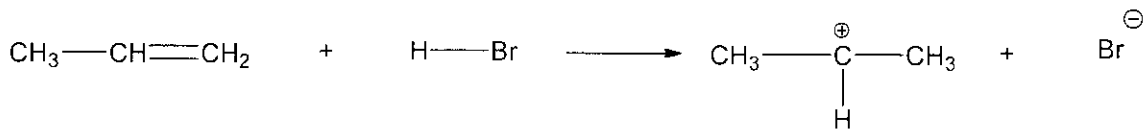
(a) Write the detailed mechanism of the following reaction



(6)

(b) Draw the correct structure of 2-methylbutanoyl chloride (2)

(c) Use curved arrows to show how the bond(s) break or form in the following process



(2)

TOTAL MARKS [100]

Periodic Table of Elements

1 1A																		18 VIIIA
1 H 1 008	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA		2 He 4 003
3 Li 6 941	4 Be 9 012											5 B 10 81	6 C 12 01	7 N 14 01	8 O 16 00	9 F 19 00		10 Ne 20 18
11 Na 22 99	12 Mg 24 31	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIIIB	9 VIIIB	10 VIIIB	11 IB	12 IIB	13 Al 26 98	14 Si 28 09	15 P 30 97	16 S 32 07	17 Cl 35 45		18 Ar 39 95
19 K 39 10	20 Ca 40 08	21 Sc 44 96	22 Ti 47 88	23 V 50 94	24 Cr 52 00	25 Mn 54 94	26 Fe 55 85	27 Co 58 93	28 Ni 58 69	29 Cu 63 55	30 Zn 65 39	31 Ga 69 72	32 Ge 72 59	33 As 74 92	34 Se 78 96	35 Br 79 90		36 Kr 83 80
37 Rb 85 47	38 Sr 87 62	39 Y 88 91	40 Zr 91 22	41 Nb 92 91	42 Mo 95 94	43 Tc (98)	44 Ru 101 1	45 Rh 102 9	46 Pd 106 4	47 Ag 107 9	48 Cd 112 4	49 In 114 8	50 Sn 118 7	51 Sb 121 8	52 Te 127 6	53 I 126 9		54 Xe 131 3
55 Cs 132 9	56 Ba 137 3	57 La* 138 9	72 Hf 178 5	73 Ta 180 9	74 W 183 8	75 Re 186 2	76 Os 190 2	77 Ir 192 2	78 Pt 195 1	79 Au 197 0	80 Hg 200 6	81 Tl 204 4	82 Pb 207 2	83 Bi 209 0	84 Po (210)	85 At (210)		86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac** (227)	104 Unq (257)	105 Unp (260)	106 Unh (263)	107 Uns (262)	108 Uno (265)	109 Une (266)										

*Lanthanides	58 Ce 140 1	59 Pr 140 9	60 Nd 144 2	61 Pm (147)	62 Sm 150 4	63 Eu 152 0	64 Gd 157 3	65 Tb 158 9	66 Dy 162 5	67 Ho 164 9	68 Er 167 3	69 Tm 168 9	70 Yb 173 0	71 Lu 175 0
**Actinides	90 Th 232 0	91 Pa (231)	92 U 238 0	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (254)	103 Lw (257)

1 H 1 008 — Atomic number / Symbol / Atomic weight

ROUGH WORK

ROUGH WORK

ROUGH WORK

ROUGH WORK

UNIVERSITY OF SOUTH AFRICA UNISA university of south africa UNIVERSITEIT VAN SUID-AFRIKA

EXAMINATION MARK READING SHEET EKSAMEN-MERKLEESBLAD

PART 1 (GENERAL/ALGEMEEN) DEEL 1

STUDY UNIT e.g PSY100-X
STUDIE EENHEID bv PSY100 X

1

INITIALS AND SURNAME
VOORLETTERS EN VAN 3

DATE OF EXAMINATION
DATUM VAN EKSAMEN 4

PAPER NUMBER
VRAESTELNOMMER 2

EXAMINATION CENTRE (E G PRETORIA)
EKSAMENSENTRUM (BV PRETORIA) 5

STUDENT NUMBER
STUDENTENOMMER

6

c0 c0 c0 c0 c0 c0 c0 c0
c1 c1 c1 c1 c1 c1 c1 c1
c2 c2 c2 c2 c2 c2 c2 c2
c3 c3 c3 c3 c3 c3 c3 c3
c4 c4 c4 c4 c4 c4 c4 c4
c5 c5 c5 c5 c5 c5 c5 c5
c6 c6 c6 c6 c6 c6 c6 c6
c7 c7 c7 c7 c7 c7 c7 c7
c8 c8 c8 c8 c8 c8 c8 c8
c9 c9 c9 c9 c9 c9 c9 c9

7

UNIQUE PAPER NO
UNIEKE VRAESTEL NR

8

c0 c0 c0 c0 c0 c0
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c2 c2 c2 c2 c2 c2
c3 c3 c3 c3 c3 c3
c4 c4 c4 c4 c4 c4
c5 c5 c5 c5 c5 c5
c6 c6 c6 c6 c6 c6
c7 c7 c7 c7 c7 c7
c8 c8 c8 c8 c8 c8
c9 c9 c9 c9 c9 c9

9

For use by examination invigilator
Vir gebruik deur eksamenopsiener

IMPORTANT

1 USE ONLY AN HB PENCIL TO COMPLETE THIS SHEET
2 MARK LIKE THIS
3 CHECK THAT YOUR INITIALS AND SURNAME HAS BEEN FILLED IN CORRECTLY
4 ENTER YOUR STUDENT NUMBER FROM LEFT TO RIGHT
5 CHECK THAT YOUR STUDENT NUMBER HAS BEEN FILLED IN CORRECTLY
6 CHECK THAT THE UNIQUE NUMBER HAS BEEN FILLED IN CORRECTLY
7 CHECK THAT ONLY ONE ANSWER PER QUESTION HAS BEEN MARKED
8 DO NOT FOLD

BELANGRIK

1 GEBRUIK SLEGS N HB POTLOOD OM HIERDIE BLAD TE VOLTOOI
2 MERK AS VOLG
3 KONTROLEER DAT U VOORLETTERS EN VAN REG INGEVUL IS
4 VUL U STUDENTENOMMER VAN LINKS NA REGS IN
5 KONTROLEER DAT U DIE KORREKTE STUDENTENOMMER VERSTREK HET
6 KONTROLEER DAT DIE UNIEKE NOMMER REG INGEVUL IS
7 MAAK SEKER DAT NET EEN ALTERNATIEF PER VRAAG GEMERK IS
8 MOENIE VOU NIE

PART 2 (ANSWERS/ANTWOORDE) DEEL 2

10

1	c1 c2 c3 c4 c5	36	c1 c2 c3 c4 c5	71	c1 c2 c3 c4 c5	106	c1 c2 c3 c4 c5
2	c1 c2 c3 c4 c5	37	c1 c2 c3 c4 c5	72	c1 c2 c3 c4 c5	107	c1 c2 c3 c4 c5
3	c1 c2 c3 c4 c5	38	c1 c2 c3 c4 c5	73	c1 c2 c3 c4 c5	108	c1 c2 c3 c4 c5
4	c1 c2 c3 c4 c5	39	c1 c2 c3 c4 c5	74	c1 c2 c3 c4 c5	109	c1 c2 c3 c4 c5
5	c1 c2 c3 c4 c5	40	c1 c2 c3 c4 c5	75	c1 c2 c3 c4 c5	110	c1 c2 c3 c4 c5
6	c1 c2 c3 c4 c5	41	c1 c2 c3 c4 c5	76	c1 c2 c3 c4 c5	111	c1 c2 c3 c4 c5
7	c1 c2 c3 c4 c5	42	c1 c2 c3 c4 c5	77	c1 c2 c3 c4 c5	112	c1 c2 c3 c4 c5
8	c1 c2 c3 c4 c5	43	c1 c2 c3 c4 c5	78	c1 c2 c3 c4 c5	113	c1 c2 c3 c4 c5
9	c1 c2 c3 c4 c5	44	c1 c2 c3 c4 c5	79	c1 c2 c3 c4 c5	114	c1 c2 c3 c4 c5
10	c1 c2 c3 c4 c5	45	c1 c2 c3 c4 c5	80	c1 c2 c3 c4 c5	115	c1 c2 c3 c4 c5
11	c1 c2 c3 c4 c5	46	c1 c2 c3 c4 c5	81	c1 c2 c3 c4 c5	116	c1 c2 c3 c4 c5
12	c1 c2 c3 c4 c5	47	c1 c2 c3 c4 c5	82	c1 c2 c3 c4 c5	117	c1 c2 c3 c4 c5
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14	c1 c2 c3 c4 c5	49	c1 c2 c3 c4 c5	84	c1 c2 c3 c4 c5	119	c1 c2 c3 c4 c5
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19	c1 c2 c3 c4 c5	54	c1 c2 c3 c4 c5	89	c1 c2 c3 c4 c5	124	c1 c2 c3 c4 c5
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22	c1 c2 c3 c4 c5	57	c1 c2 c3 c4 c5	92	c1 c2 c3 c4 c5	127	c1 c2 c3 c4 c5
23	c1 c2 c3 c4 c5	58	c1 c2 c3 c4 c5	93	c1 c2 c3 c4 c5	128	c1 c2 c3 c4 c5
24	c1 c2 c3 c4 c5	59	c1 c2 c3 c4 c5	94	c1 c2 c3 c4 c5	129	c1 c2 c3 c4 c5
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28	c1 c2 c3 c4 c5	63	c1 c2 c3 c4 c5	98	c1 c2 c3 c4 c5	133	c1 c2 c3 c4 c5
29	c1 c2 c3 c4 c5	64	c1 c2 c3 c4 c5	99	c1 c2 c3 c4 c5	134	c1 c2 c3 c4 c5
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31	c1 c2 c3 c4 c5	66	c1 c2 c3 c4 c5	101	c1 c2 c3 c4 c5	136	c1 c2 c3 c4 c5
32	c1 c2 c3 c4 c5	67	c1 c2 c3 c4 c5	102	c1 c2 c3 c4 c5	137	c1 c2 c3 c4 c5
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34	c1 c2 c3 c4 c5	69	c1 c2 c3 c4 c5	104	c1 c2 c3 c4 c5	139	c1 c2 c3 c4 c5
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