FINAL	%	

UNISA University of South Africa

CHE1502 (474468)

OCTOBER/ NOVEMBER 2017

GENERAL CHEMISTRY IB

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

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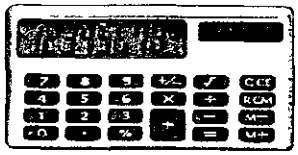

UNIVERSITEITSEKSAMENS

UNISA university of south africa

CHE1502 (474468) October/November 2017

GENERAL CHEMISTRY IB

Duration 2 Hours 100 Marks

EXAMINERS

FIRST PROF CA SUMMERS
SECOND PROF GJ SUMMERS

Use of a non-programmable pocket calculator is permissible

Closed book examination

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EXAMINATION PAPER UNIQUE NUMBER **474468**

The examination paper consists of 25 pages 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 30 multiple choice questions answer on a marking reading sheet
Each question is allocated TWO marks

SECTION B Written questions answer in spaces provided on the examination paper
40 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 30 MULTIPLE CHOICE QUESTIONS

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

Unique Number **474468**

1 Identify the CORRECT statement below

(1) There are 3 distinct s orbitals exist in the second electron shell, where n = 3

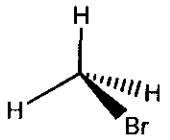
(2) The electron configuration of carbon is $1s^2 2s^2 2p^2$

(3) A carbon-hydrogen bond (C-H) is polar

(4) A carbon-bromine bond (C-Br) is non-polar

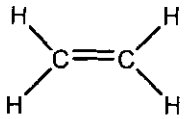
2 Which of the following DOES NOT represent the appropriate hybridization state of the carbon atoms in the structures shown below?

(1)



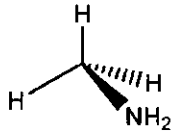
, sp^2 hybridized

(2)



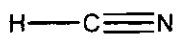
, sp^2 hybridized

(3)



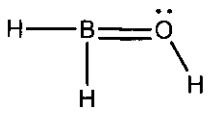
, sp^3 hybridized

(4)



, sp hybridized

3 In the structure below, the formal charges are



(1) +1 on B and 0 on O

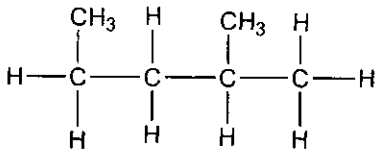
(2) -1 on B and 0 on O

(3) -1 on B and +1 on O

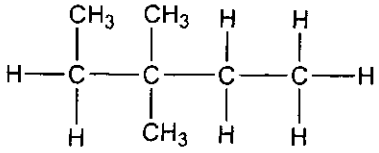
(4) +1 on B and -1 on O

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

(1)



and



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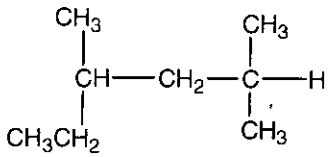

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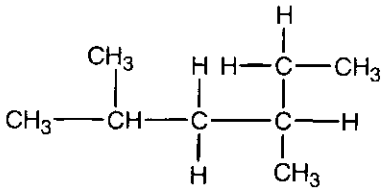

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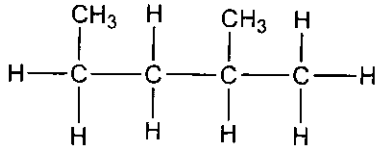

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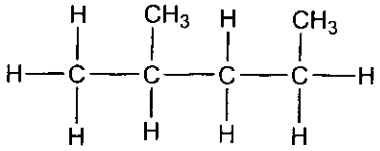

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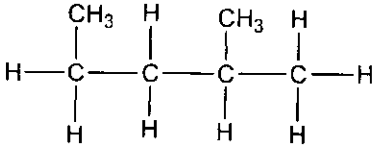

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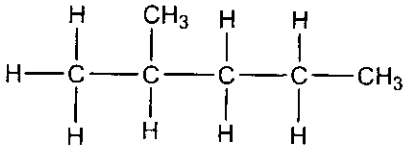
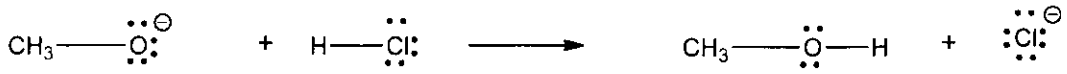
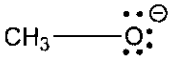


For questions 5 and 6, consider the following reaction:

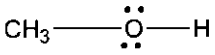


5 The structure of the Lewis base (nucleophile) in the reaction is

(1)



(2)



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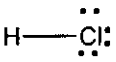
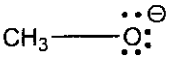


(4)

6 The structure of the conjugate base in the reaction is

(1)



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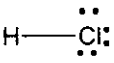

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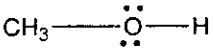
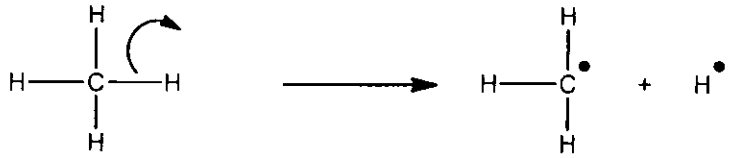


(4)

7 Which of the following processes is the correct representation of heterolysis / heterolytic bond breaking?

(1)



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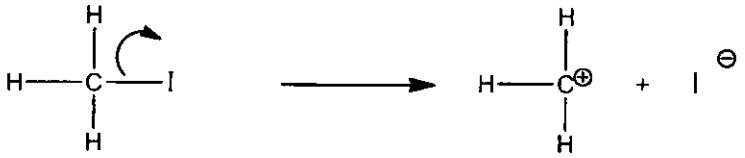

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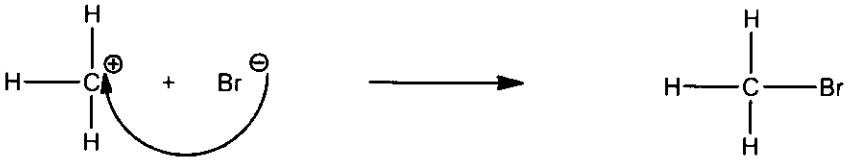

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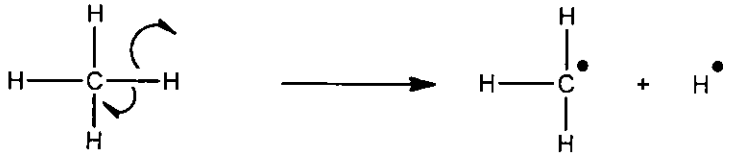
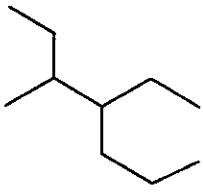


8 What is the IUPAC name of the molecule shown below?



(1) 4-ethyl-4-methylhexane

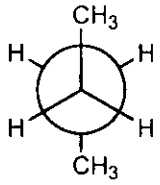
(2) 4-ethyl-3-methylheptane

(3) 3-methyl-4-ethylheptane

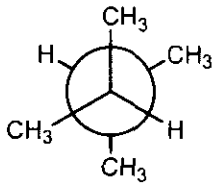
(4) 2,3-diethylpentane

9 Which of the following structures is NOT a conformation of the compound, $CH_3CH_2CH_2CH_3$?

(1)



(2)



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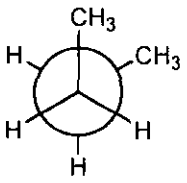

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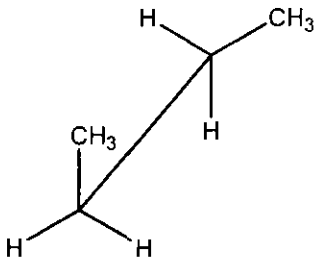
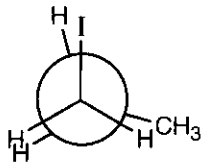
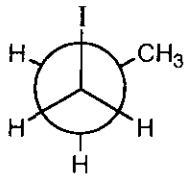


10 Which of the following conformations of 2-iodo-propane, $CH_3CH_2CH_2I$, the represents the ANTI- conformation?

(1)



(2)



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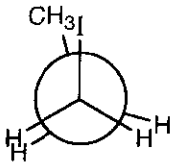

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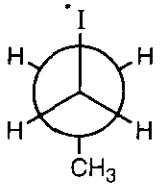


11 Consider the compounds, $(CH_3)_2NH$ and $CH_3CH_2CH_3$ Which statement is CORRECT?

(1) $CH_3CH_2CH_3$ can form hydrogen bonds with water

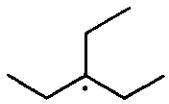
(2) $(CH_3)_2NH$ is not capable of undergoing hydrogen bonding with water

(3) $(CH_3)_2NH$ is insoluble in water

(4) $(CH_3)_2NH$ is more soluble in water than $CH_3CH_2CH_3$

12 Identify the MOST STABLE carbon radical

(1)



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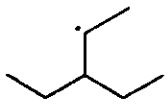

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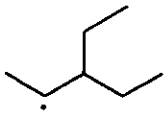

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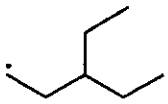


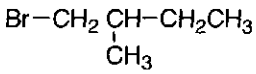
13 What is the major organic product formed in the following reaction?

$$(CH_3)_2CH\,CH_2\,CH_3 + Br_2 \xrightarrow{light}$$

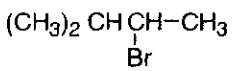
(1)

$(CH_3)_2$ CH CH_2CH_2Br

(2)



(3)



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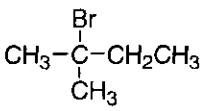
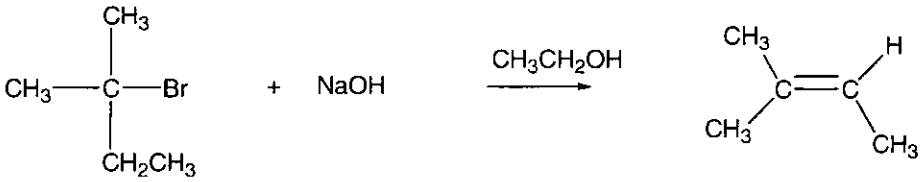


14 Which of the following reactions is an example of an elimination reaction?

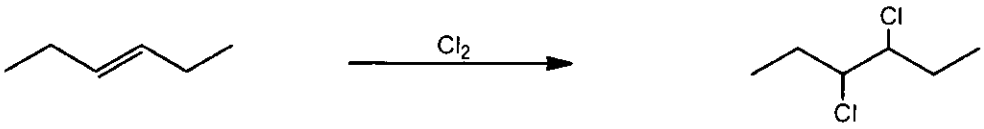
(1)

(2)

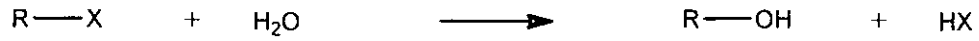


(3)

(4)

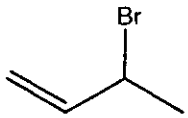


15 Alkyl halides may undergo nucleophilic substitution reaction according to the following reaction

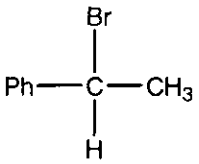


Which compound is the LEAST REACTIVE under these conditions?

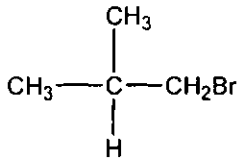
(1)



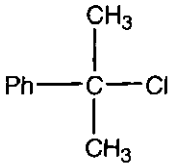
(2)



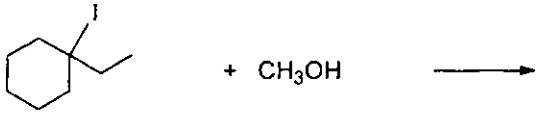
(3)



(4)

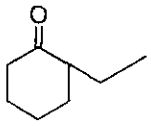


16 Consider the following reaction

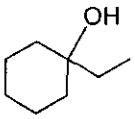


What is the major product formed in the reaction?

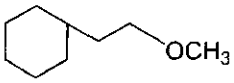
(1)



(2)



(3)



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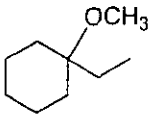
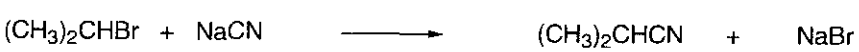


17 Which of the following reactions DOES NOT proceed via an S_N2 reaction mechanism?

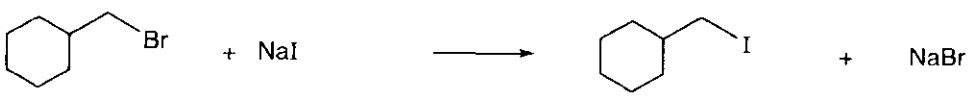
(1)

(2)

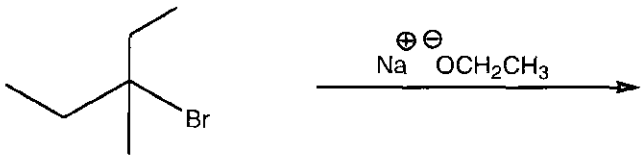
(3)



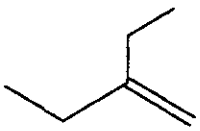
(4)



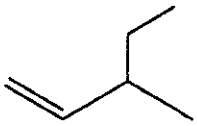
18 What is the major product formed in the following reaction?



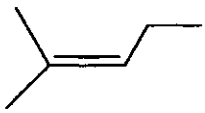
(1)



(2)



(3)



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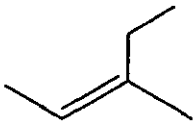
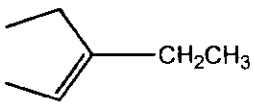
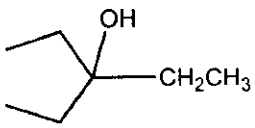


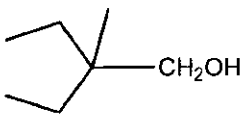
19 Which of the following alcohols is produced by the acid catalyzed hydration of the following compound?



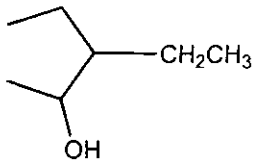
(1)



(2)



(3)



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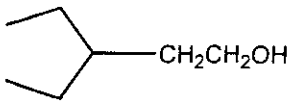
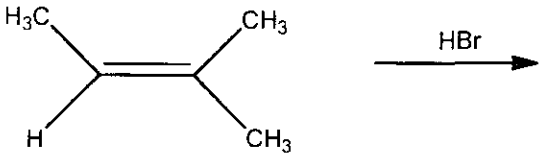
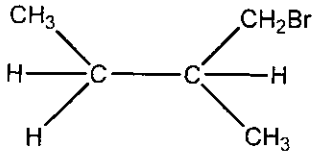


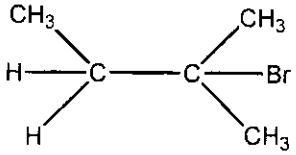
20 What is the major product formed in the following reaction?



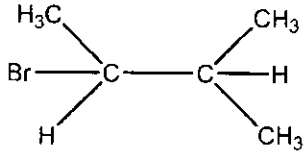
(1)



(2)



(3)



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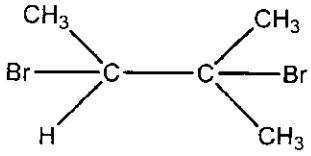
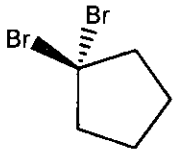
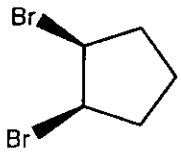


21 Alkenes undergo addition reactions in the presence of bromine What is the MAJOR product formed in the following reaction?

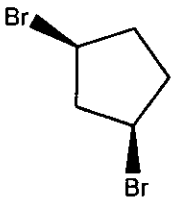
(1)



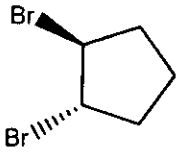
(2)



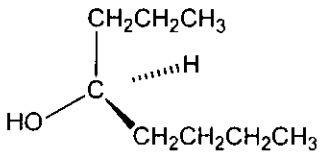
(3)



(4)

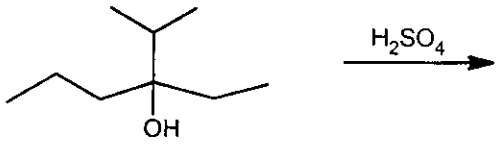


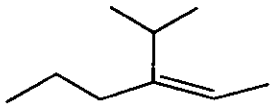
22 The absolute configuration of a chiral carbon is defined as R- or S- according to the Cahn-Ingold-Prelog rules What is the IUPAC name for the following compound?

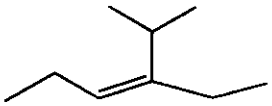


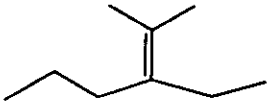
(1) (S) octan-5-ol
(2) (R) octan-4-ol
(3) (R) octan-5-ol
(4) (S) octan-4-ol

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



(1)


(2)


(3)


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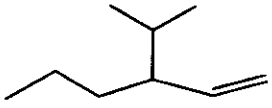
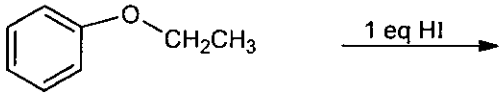
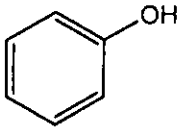


24 What are the major products formed in the following reaction?

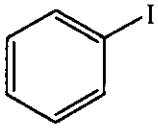


(1)



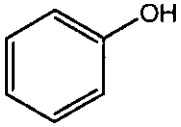
+ CH_3CH_2OH

(2)



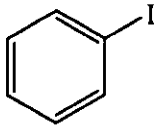
+ CH_3CH_2OH

(3)



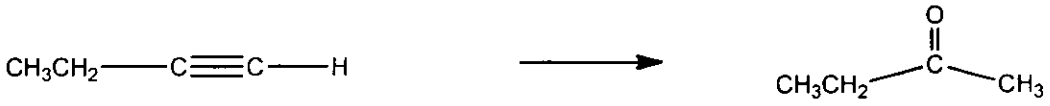
+ CH_3CH_2I

(4)



+ CH_3CH_2I

25 What reagents can be used for the following conversion?



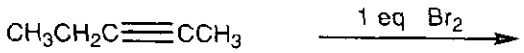
(1) I H_2, Ni, II $Na_2Cr_2O_7$, H_2SO_4

(2) Hg^{2+}, H_2SO_4, H_2O

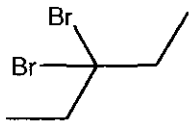
(3) I CH_3MgBr, II CO_2

(4) I O_3, II $(CH_3)_2S$

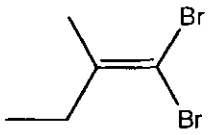
26 What is the MAJOR product in the following reaction?



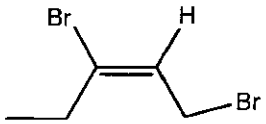
(1)



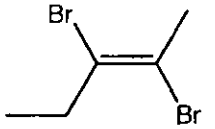
(2)



(3)

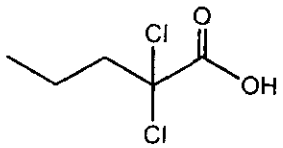


(4)

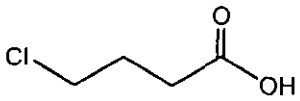


27 Which of the following compounds is the WEAKEST acid?

(1)



(2)



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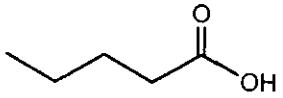

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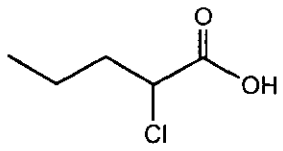
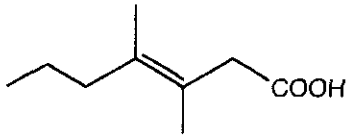


28 What is the correct structure of (Z)-3,4-dimethylhept-3-enoic acid?

(1)



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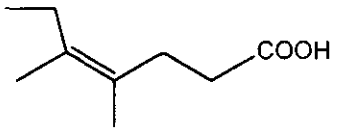
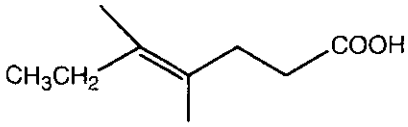
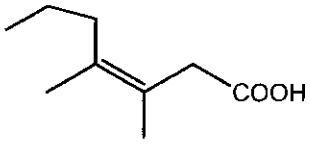


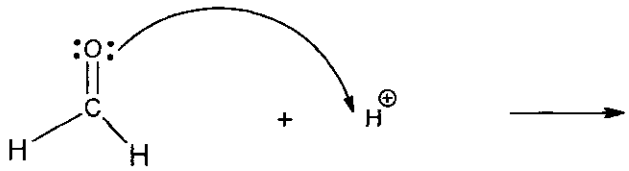
(3)



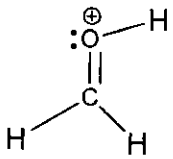
(4)



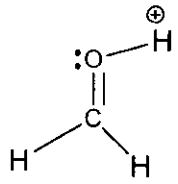
29 Which species is formed in the following process?



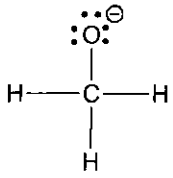
(1)



(2)



(3)



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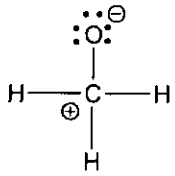
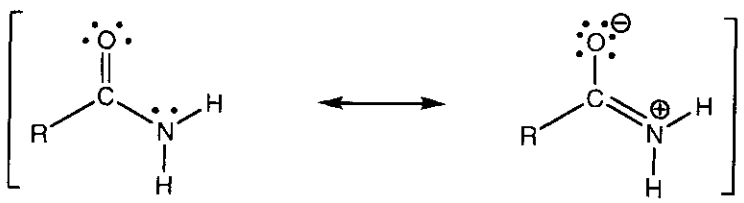


30 In the reaction of an amide with a strong acid, protonation takes place at the oxygen instead of the nitrogen atom because

(1) Oxygen is less electronegative than nitrogen
(2) H^+ only becomes attached to an O and never to a N atom
(3) The non-bonding electrons on nitrogen is more available
(4) The following occurs



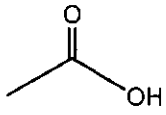
[60]

SECTION B

Answer ALL the questions in the SPACE PROVIDED AFTER EACH QUESTION

Question 1 [20]

(a) Draw the Lewis structure of the following compound

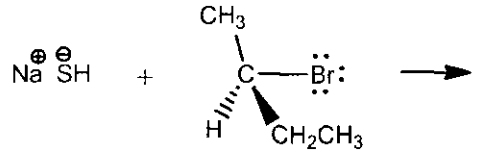


(3)

(b) The compound shown in (a) above can undergo resonance delocalization Show the resonance delocalization with all the possible resonance forms of the compound Show the movement of electrons with curved arrows

(5)

(c) Formulate a detailed mechanism of the following nucleophilic substitution reaction

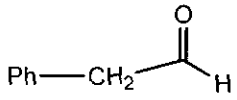


(6)

(d) Draw the structure of butan-2-ol and indicate whether or not the molecule has a chiral (asymmetric) carbon atom Explain your answer

(4)

(e) Draw the enol form of the following compound



(2)

Question 2 [20]

(a) Draw the structure of a diene with a trans double bond and a cis double bond

(2)

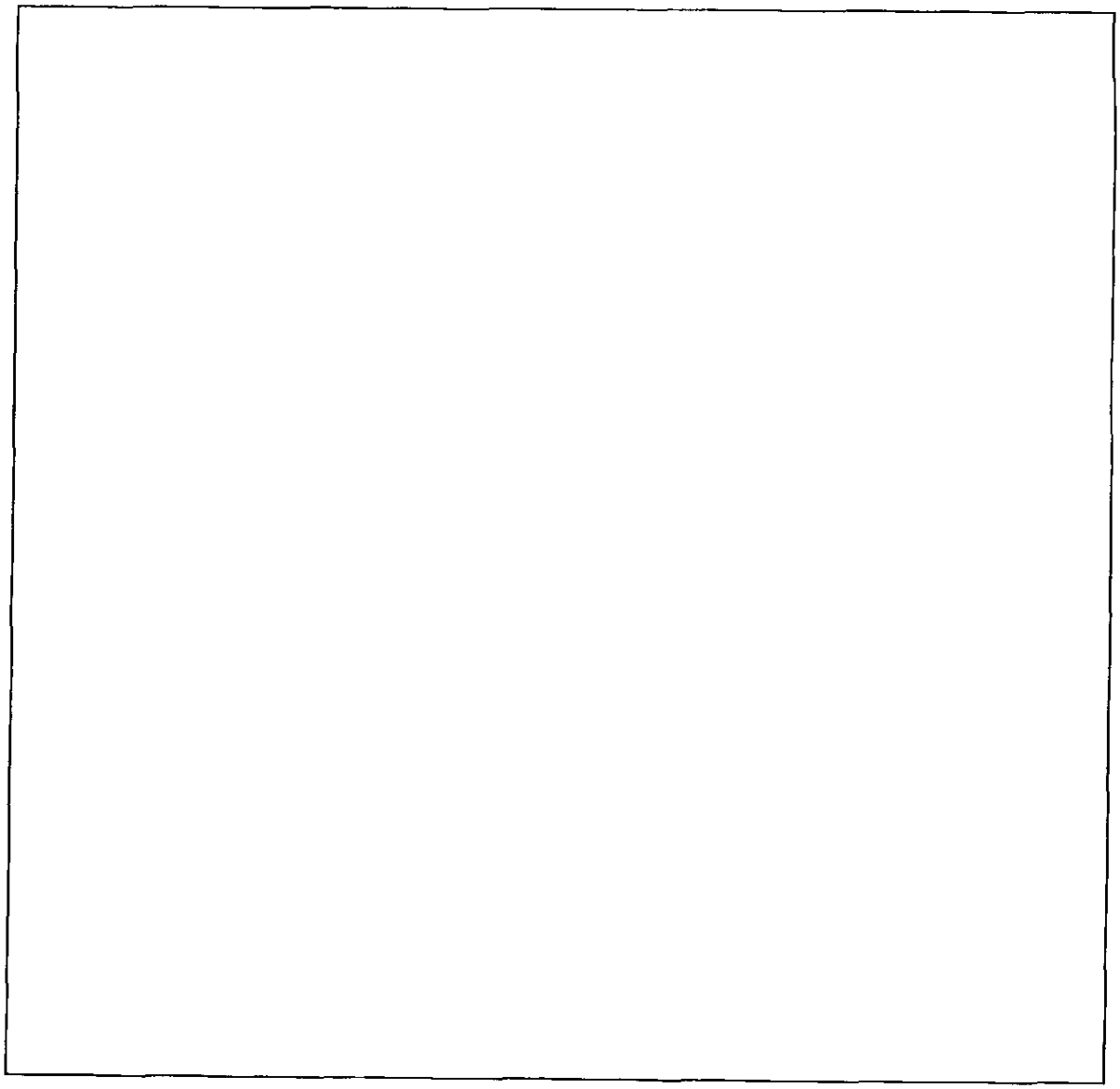
(b) Consider the compound with the proposed name 1,1-dimethyl-2-chlorohex-3-ene

(i) Draw the structure of the compound that is consistent with the proposed name given above

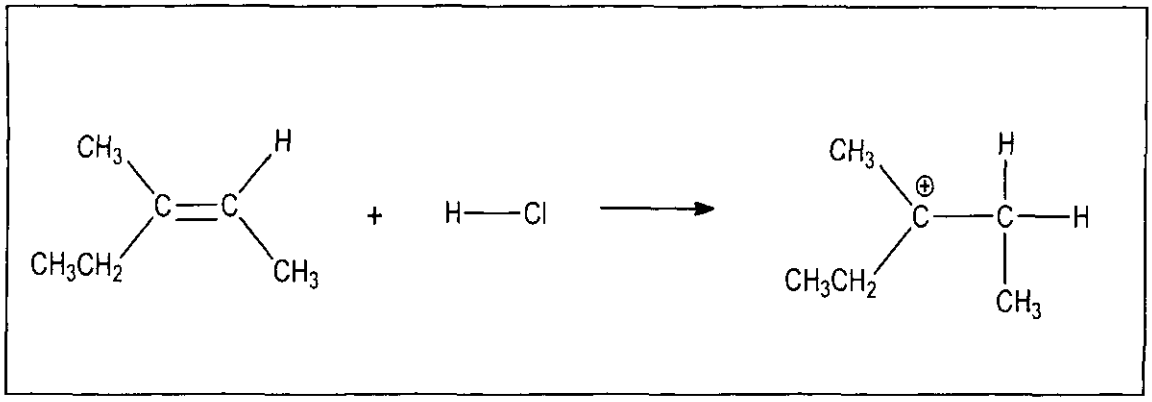
(2)

(ii) Explain what is wrong with the name provided (state each violation of the IUPAC nomenclature rules) and give the correct IUPAC name for the compound

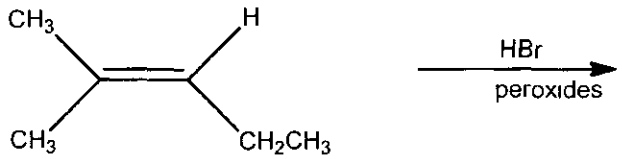
(4)



(c) Use curved arrows to show how bond(s) break and/or form in the process shown below (2)

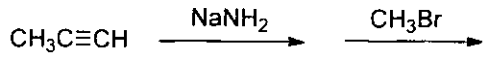


(d) Draw the structure of the MAJOR product formed in the following reaction



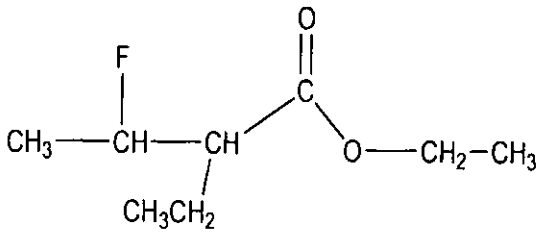
(2)

(e) Draw the complete mechanism for the following reaction sequence by showing the conversion of the starting alkyne to the formation of the final product



(6)

(f) Name the following compound according to the IUPAC nomenclature rules



(2)

[40]

TOTAL MARKS [100]

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

UNIQUE PAPER NO
UNIEKE VRAESTEL NR — 8

For use by examination invigilator
Vir gebruik deur eksamenopsiener

7 — 9

IMPORTANT

1. USE ONLY AN HB PENCIL TO COMPLETE THIS SHEET
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3. CHECK THAT YOUR INITIALS AND SURNAME HAS BEEN FILLED IN CORRECTLY
4. ENTER YOUR STUDENT NUMBER FROM LEFT TO RIGHT
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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
13	c1 c2 c3 c4 c5	48	c1 c2 c3 c4 c5	83	c1 c2 c3 c4 c5	118	c1 c2 c3 c4 c5
14	c1 c2 c3 c4 c5	49	c1 c2 c3 c4 c5	84	c1 c2 c3 c4 c5	119	c1 c2 c3 c4 c5
15	c1 c2 c3 c4 c5	50	c1 c2 c3 c4 c5	85	c1 c2 c3 c4 c5	120	c1 c2 c3 c4 c5
16	c1 c2 c3 c4 c5	51	c1 c2 c3 c4 c5	86	c1 c2 c3 c4 c5	121	c1 c2 c3 c4 c5
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25	c1 c2 c3 c4 c5	60	c1 c2 c3 c4 c5	95	c1 c2 c3 c4 c5	130	c1 c2 c3 c4 c5
26	c1 c2 c3 c4 c5	61	c1 c2 c3 c4 c5	96	c1 c2 c3 c4 c5	131	c1 c2 c3 c4 c5
27	c1 c2 c3 c4 c5	62	c1 c2 c3 c4 c5	97	c1 c2 c3 c4 c5	132	c1 c2 c3 c4 c5
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
30	c1 c2 c3 c4 c5	65	c1 c2 c3 c4 c5	100	c1 c2 c3 c4 c5	135	c1 c2 c3 c4 c5
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
33	c1 c2 c3 c4 c5	68	c1 c2 c3 c4 c5	103	c1 c2 c3 c4 c5	138	c1 c2 c3 c4 c5
34	c1 c2 c3 c4 c5	69	c1 c2 c3 c4 c5	104	c1 c2 c3 c4 c5	139	c1 c2 c3 c4 c5
35	c1 c2 c3 c4 c5	70	c1 c2 c3 c4 c5	105	c1 c2 c3 c4 c5	140	c1 c2 c3 c4 c5

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❶ Write your paper code in these eight squares, for instance

P	S	Y	1	0	0	-	X

❷ The paper number pertains only to first-level courses consisting of two papers

WRITE | 0 | 1 | for the first paper and | 0 | 2 | for the second If only one paper, then leave blank

❸ Fill in your initials and surname

❹ Fill in the date of the examination

❺ Fill in the name of the examination centre

❻ WRITE the digits of your student number HORIZONTALLY (from left to right) Begin by filling in the first digit of your student number in the first square on the left, then fill in the other digits, each one in a separate square

❼ In each vertical column mark the digit that corresponds to the digit in your student number as follows [-]

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NB Your unique paper number appears at the top of your examination paper and consists only of digits (e g 403326)

❾ In each vertical column mark the digit that corresponds to the digit number in your unique paper number as follows [-]

❿ Question numbers 1 to 140 indicate corresponding question numbers in your examination paper The five spaces with digits 1 to 5 next to each question number indicate an alternative answer to each question The spaces of which the number correspond to the answer you have chosen for each question and should be marked as follows [-]

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Examination period

Student number

Surname

First Names

Subject

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