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CHE1502
OCTOBER/NOVEMBER 2014
GENERAL CHEMISTRY 1B

STUDENT NUMBER									

IDENTITY NUMBER											

FOR USE BY EXAMINATION INVIGILATOR

Question No.	Marks					
	Examiners					
	1	2	3	4	5	6
Total						

Subject

Number of paper

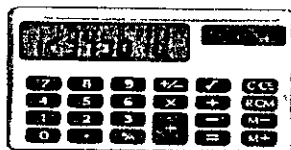
Date of examination

Examination centre

WARNING

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UNIVERSITY EXAMINATIONS



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of south africa

CHE1502

(489786)

October/November 2014

GENERAL CHEMISTRY IB

Duration 2 Hours

100 Marks

EXAMINERS

FIRST
SECOND

PROF CA SUMMERS
MR KGLL LESENYEHO

Use of a non-programmable pocket calculator is permissible

Closed book examination

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EXAMINATION PAPER UNIQUE NUMBER: 489786

The examination paper consists of 26 pages (a periodic table is on page 25) plus 5 pages for rough work (pp 27-31) plus instructions for completion of the mark reading sheet.

The examination paper consists of TWO parts:

SECTION A: 70 Marks

Consisting of 35 multiple choice questions which must be answered on a marking reading sheet. Each question is allocated TWO marks.

SECTION B: 30 Marks

This section consists of written questions which must be answered in spaces provided on the examination paper.

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 **35 MULTIPLE CHOICE QUESTIONS**.

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

Unique Number **489786**

- 1 Consider the following pair of structure

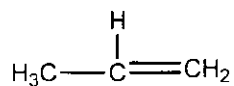


Predict which set has a carbon-oxygen bond has (A) the stronger bond and (B) the longer bond length?

- (1) (A) C=O , (B) C-O
- (2) (A) C-O , (B) C=O
- (3) (A) C=O , (B) C-O
- (4) (A) C-O , (B) C-O
- 2 Which of the following compounds can WILL NOT easily donate a pair of electrons?



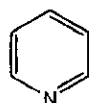
(2)



(3)



(4)

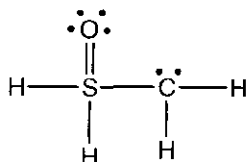


[TURN OVER]

3 Identify the INCORRECT statement below

- (1) A nucleophile is an electron-rich species
- (2) Heterolytic bond breakage occurs when both bonding electrons remain with one product fragment
- (3) The hydroxide ion, OH^- , can serve as an electrophile in chemical reaction
- (4) Homolytic bond breakage occurs when one bonding electron remains with each product fragment

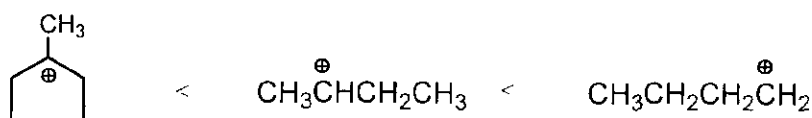
4 In the structure below, the NON-ZERO formal charges are



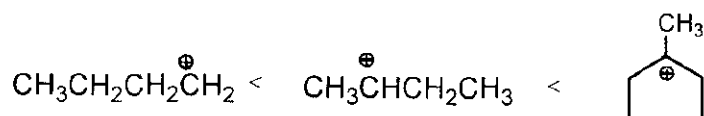
- (1) -1 on S and +1 on C
- (2) +1 on S and -1 on O
- (3) +1 on S and -1 on C
- (4) -1 on S and +1 on O

5 Which of the following set of carbocation represent an order of increasing stabilities, i.e. from the least stable to the most stable

(1)

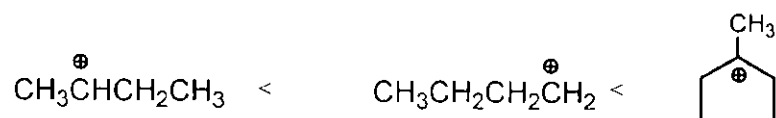


(2)

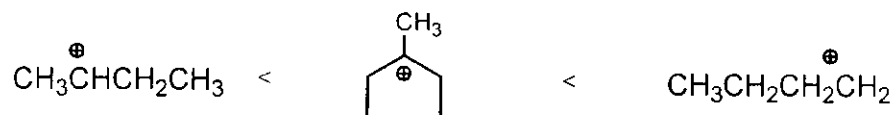


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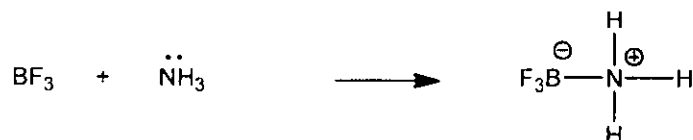
(3)



(4)



6 Consider the reaction below



Which of the following is CORRECT?

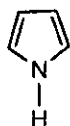
- (1) BF_3 is a nucleophile
- (2) This is a Lewis acid-base reaction
- (3) This is an Arrhenius acid-base reaction
- (4) This is a Lowry-Bronstedt acid-base reaction

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

(1)



(2)

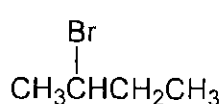


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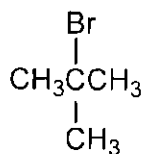


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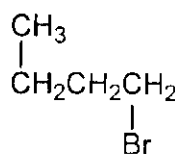
(4)

8 Which of the following compounds are constitutional isomers of $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$?

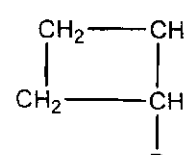
(I)



(II)



(III)



(IV)

- (1) (I) and (II)
 (2) (I), (II) and (III)
 (3) (I), (II), (III) and (IV)
 (4) (I) and (III)

9 Which of the following processes is a CORRECT representation of bond formation or bond breakage?

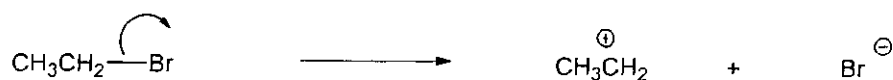
(1)



(2)

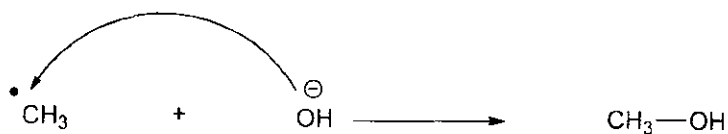


(3)

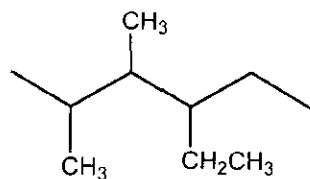


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(4)



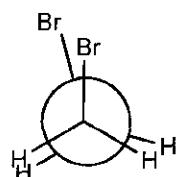
10 What is the IUPAC name of the molecule shown below?



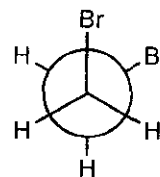
- (1) 3-ethyl-4,5-dimethylhexane
 (2) 4-ethyl-2,3-dimethylhexane
 (3) 3-ethyl-1,1,2-trimethylpentane
 (4) 2,3-dimethyl-4-ethylhexane

11 Which of the following pairs of drawings represent THE STAGGERED CONFORMATIONS of 1,2-dibromoethane?

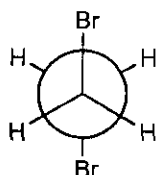
(1)



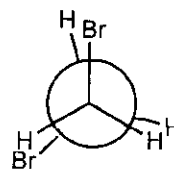
and



(2)

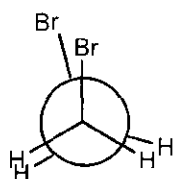


and

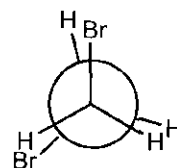


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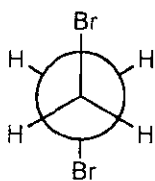
(3)



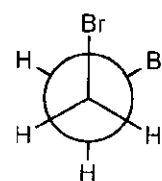
and



(4)

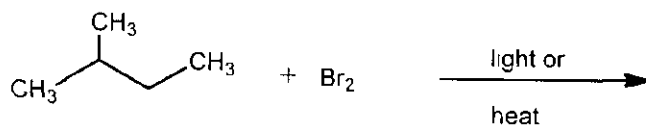


and



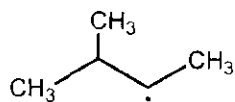
Use the information below to answer questions 12 and 13 below.

Consider the reaction

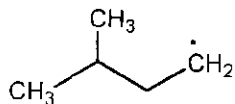


12 The MOST STABLE radical formed in the reaction is

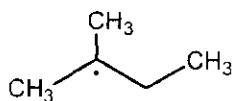
(1)



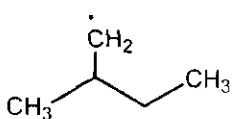
(2)



(3)



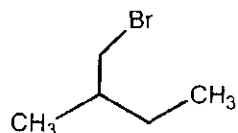
(4)



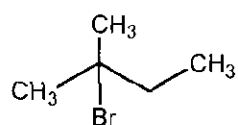
[TURN OVER]

13 What is the MAJOR monobrominated product formed in the reaction?

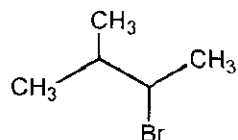
(1)



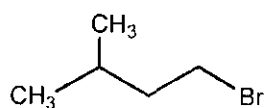
(2)



(3)

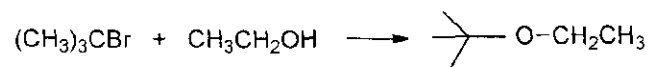


(4)

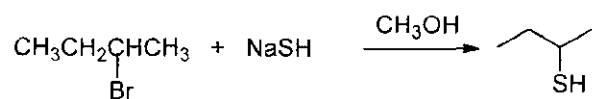


14 Which of the following reactions is more likely to proceed via an S_N1 reaction mechanism?

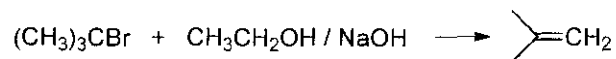
(1)



(2)



(3)



(4)



[TURN OVER]

15 The reaction in no 14 above proceed via an S_N1 reaction mechanism because

- (1) a stable radical intermediate is formed
- (2) a stable tertiary carbocation intermediate is formed
- (3) the reaction proceeds via a transition state
- (4) a primary carbocation intermediate is preferred

16 Consider the general reaction



Which example below will take place the SLOWEST?

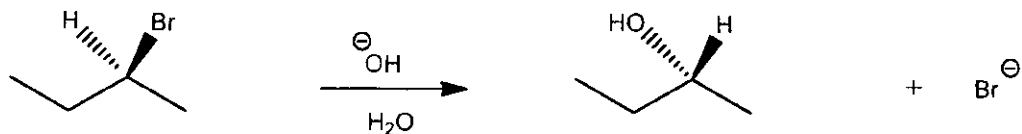
(1)



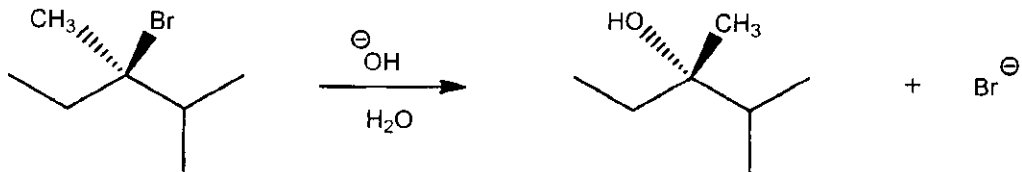
(2)



(3)

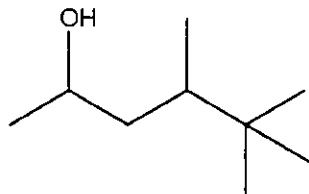


(4)



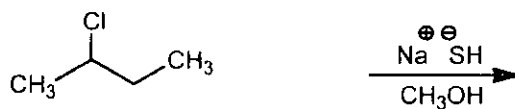
[TURN OVER]

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

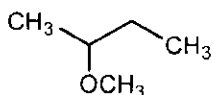


- (1) 2,2,3-trimethylhexan-5-ol
 (2) 4,5,5-trimethylhexan-2-ol
 (3) 1,1,1,2-tetramethylpentan-4-ol
 (4) 4,5,5,5-tetramethylpentan-2-ol

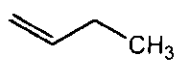
18 Alkyl halides may undergo nucleophilic substitution reactions. Which of the following reaction products is obtained in the following reaction?



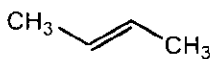
(1)



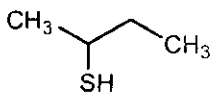
(2)



(3)



(4)



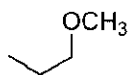
[TURN OVER]

19 The MAJOR PRODUCT formed in the E2 reaction of 1-bromopropane with methoxide is

(1)



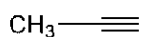
(2)



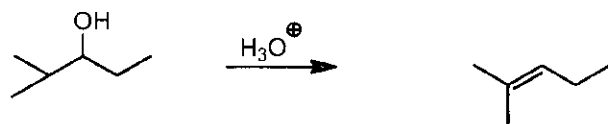
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(4)

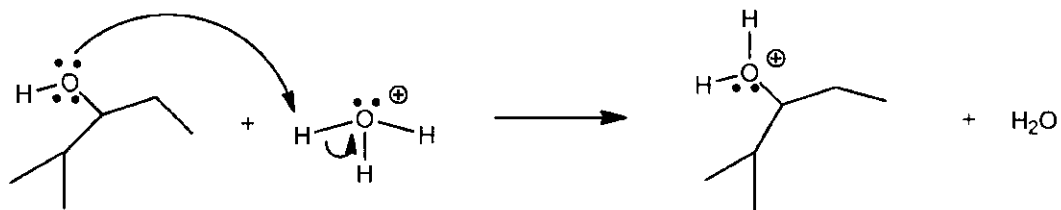


20 Consider the following reaction

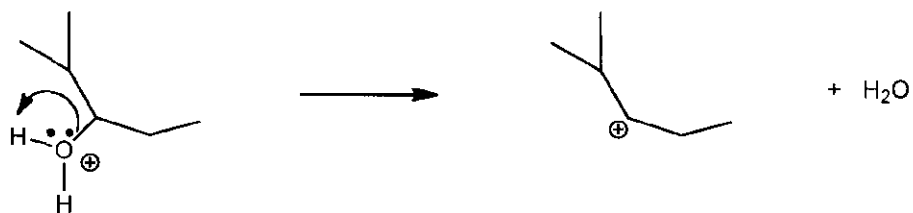


Which step is LEAST LIKELY to occur in the reaction mechanism?

(1)

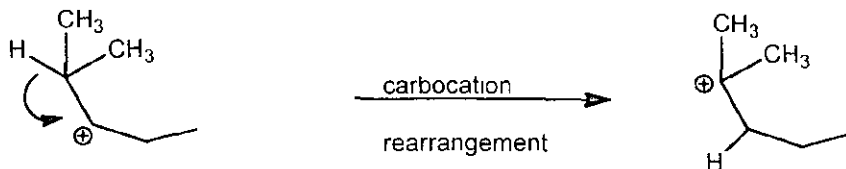


(2)

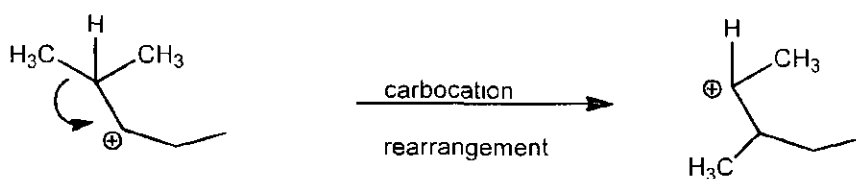


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(3)



(4)



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

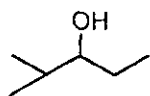
(1)



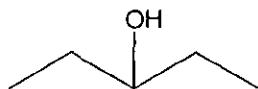
(2)



(3)

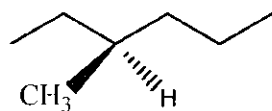


(4)



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

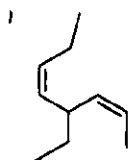
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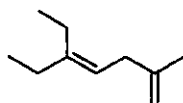
- (1) (R)-2-ethylpentane
- (2) (R)-3-methylhexane
- (3) (S)-2-ethylpentane
- (4) (S)-3-methylhexane

23 Identify the structure that contains the MOST *cis* double bonds?

(1)



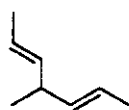
(2)



(3)



(4)



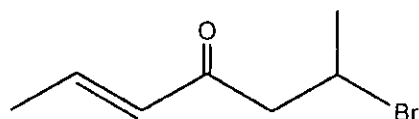
24 Ethyl amine is more soluble in water than triethyl amine because

- (1) Triethyl amine has more electron donating groups
- (2) Ethyl amine is a non-polar molecule
- (3) Ethyl amine forms more hydrogen bonds with water than triethyl amine
- (4) Ethyl amine cannot form hydrogen bonds

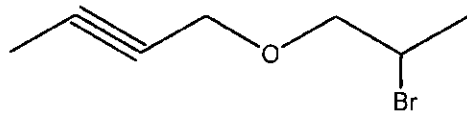
[TURN OVER]

25 What is the correct structure of 6-bromohept-2-yn-4-one?

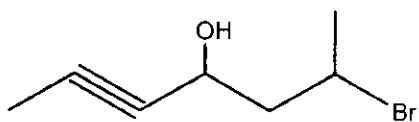
(1)



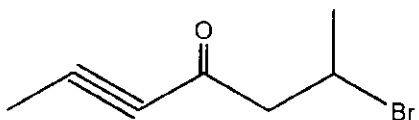
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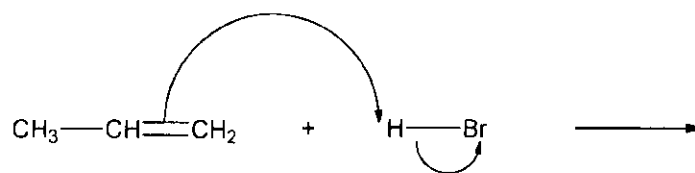
(3)



(4)



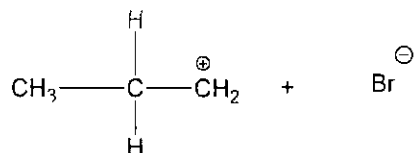
26 Consider the following process



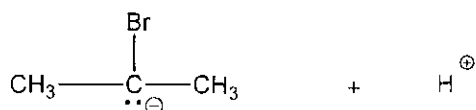
The correct species that is MAINLY formed in the above process is

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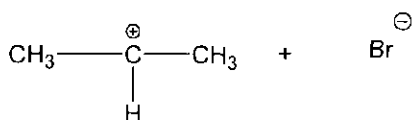
(1)



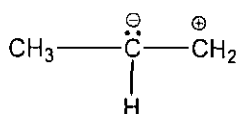
(2)



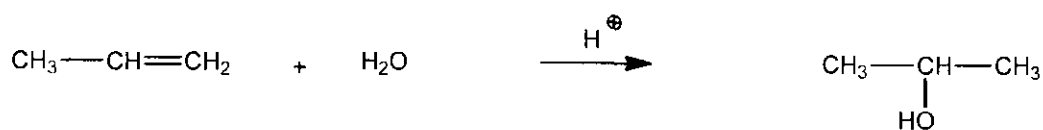
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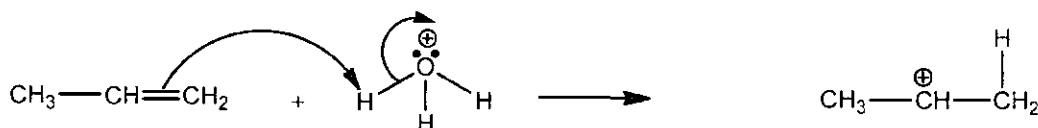
(4)



27 Which of the following mechanism best describes THE FORMATION OF THE INTERMEDIATE of the following reaction

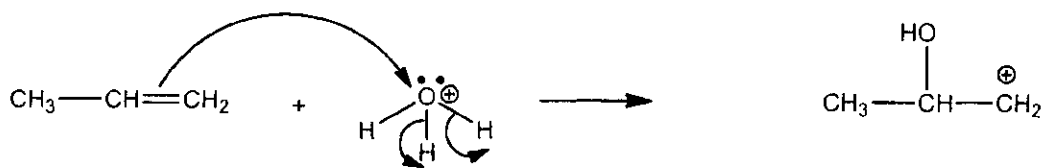


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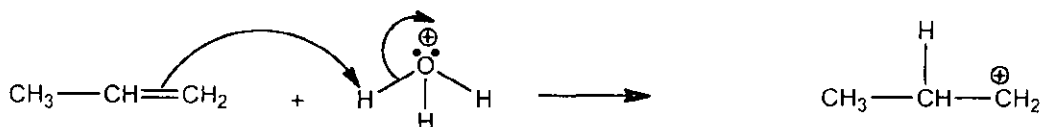


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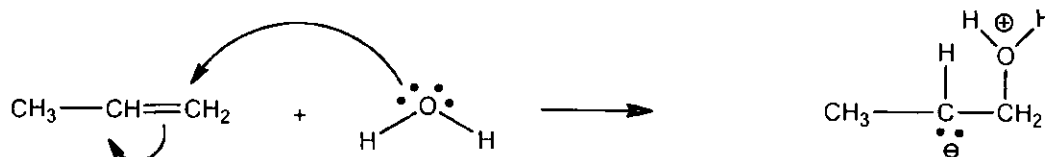
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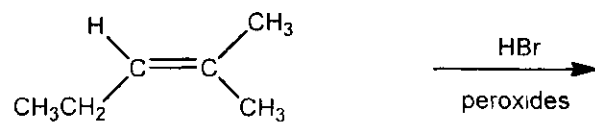
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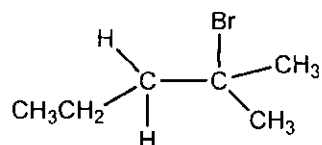
(4)



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

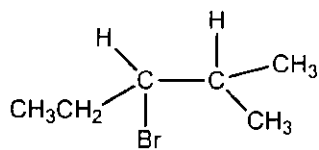


(1)

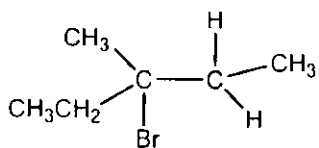


[TURN OVER]

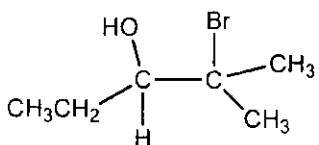
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(3)

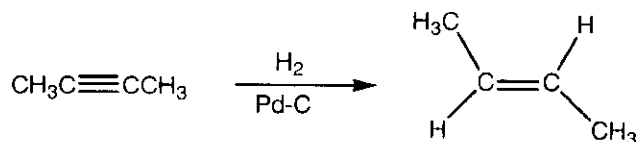


(4)

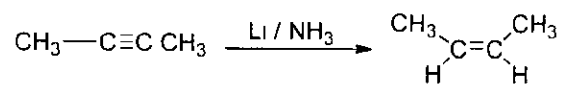


29 Which of the following reactions yields the final product as shown?

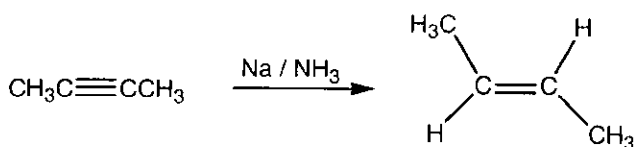
(1)



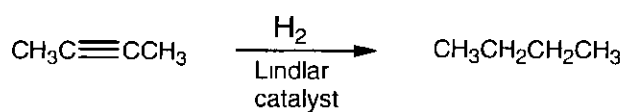
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(3)



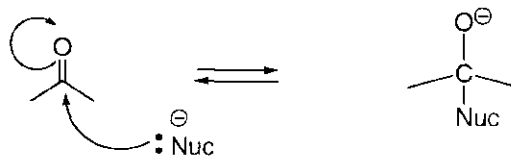
(4)



[TURN OVER]

30 Consider the carbonyl group and its reactivity Which process below is INCORRECT?

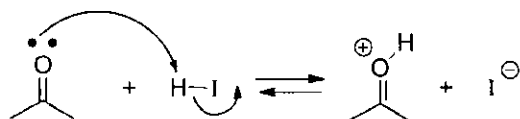
(1)



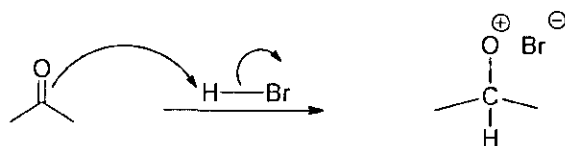
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(3)

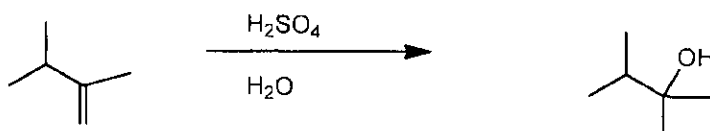


(4)

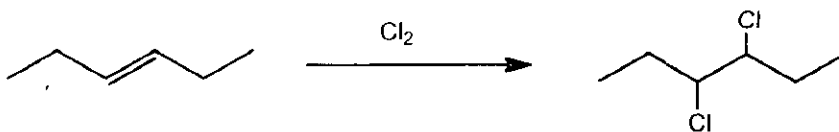


31 Which of the following reactions does NOT produce the MAJOR PRODUCT as shown?

(1)



(2)

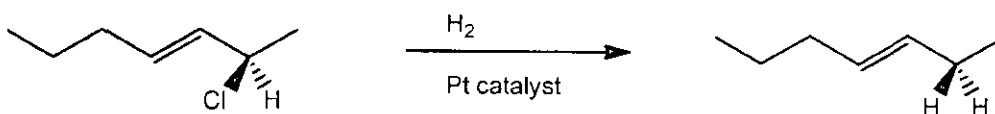


[TURN OVER]

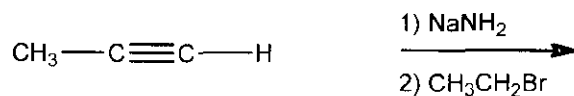
(3)



(4)

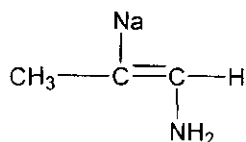


Consider the following reaction sequence TO ANSWER questions 32 and 33 below

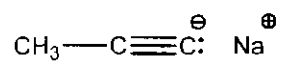


32 What is the structure of the major organic species formed in STEP 1?

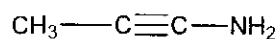
(1)



(2)



(3)



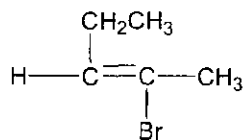
(4)



[TURN OVER]

33 What is the structure of the major organic product in the reaction sequence?

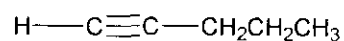
(1)



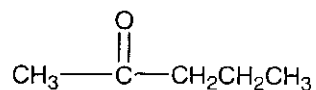
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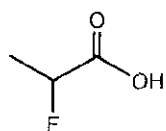
(3)



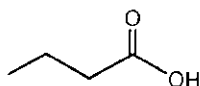
(4)



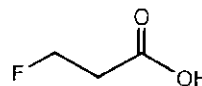
34 Identify the WEAKEST acid in the series below



A



B



C

(1) A

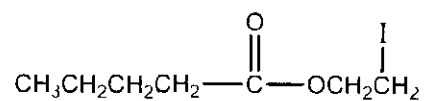
(2) C

(3) B

(4) A and C

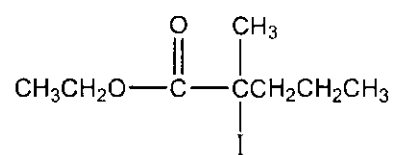
35 The structure of ethyl 2-iodopentanoate is

(1)

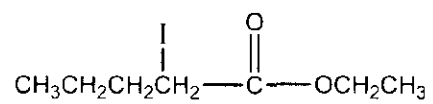


[TURN OVER]

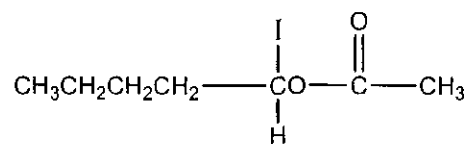
(2)



(3)



(4)



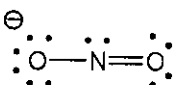
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SECTION B

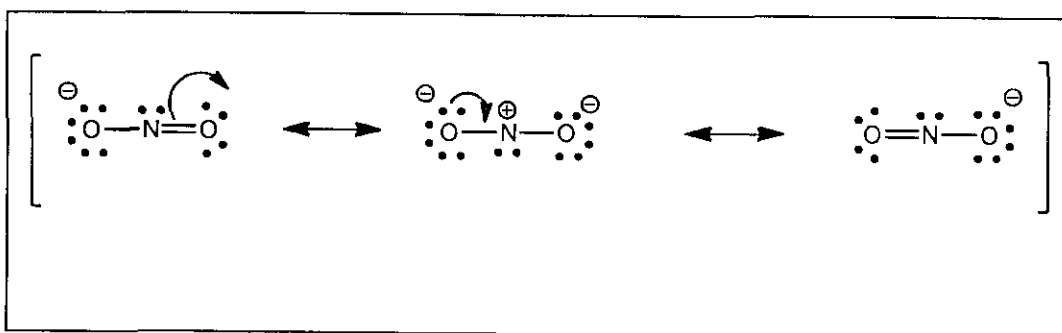
Answer ALL the questions this section in the SPACE PROVIDED AFTER EACH QUESTION.

Question 1 [15]

- 1.1 With the aid of curved arrows write the appropriate resonance structures for the following species



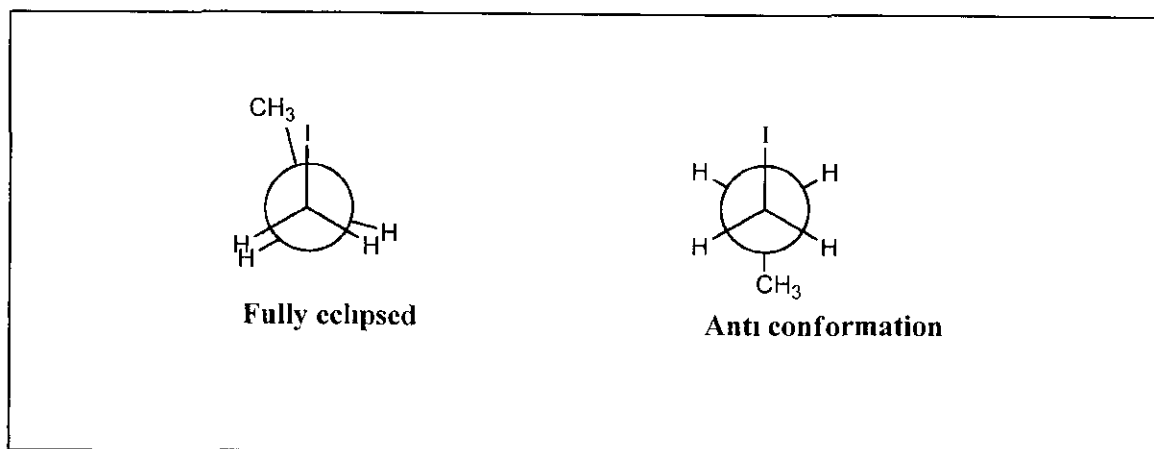
(4)



- 1.2 Draw Newman projections of the anti- and fully eclipsed conformations of the following compound viewing along the C1-C2 bond. Clearly label the conformations



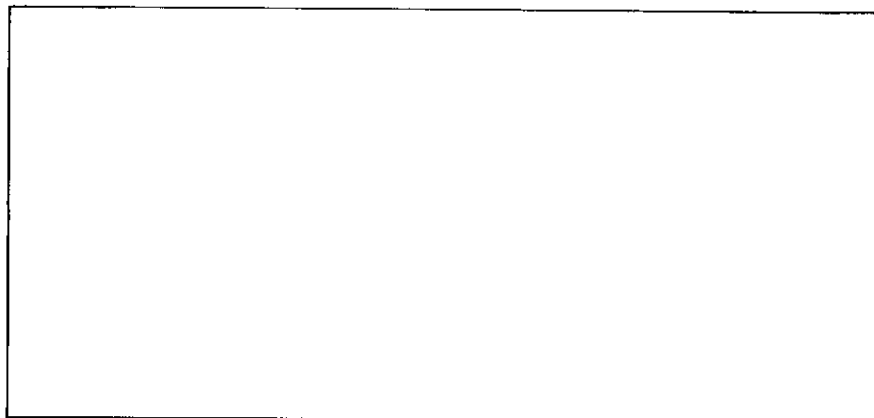
(4)



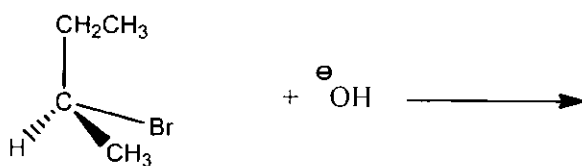
[TURN OVER]

1 3 Draw the correct Lewis structure of 2-propanol

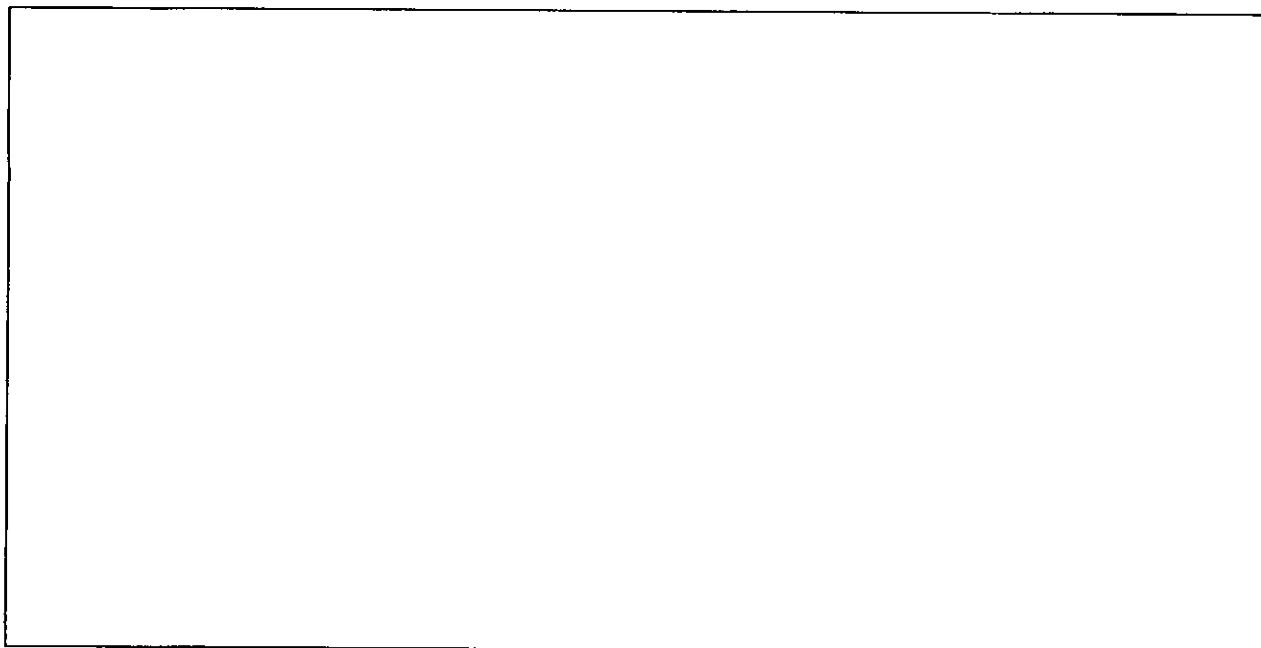
(3)



1 4 Propose a reaction mechanism for the following reaction



(4)

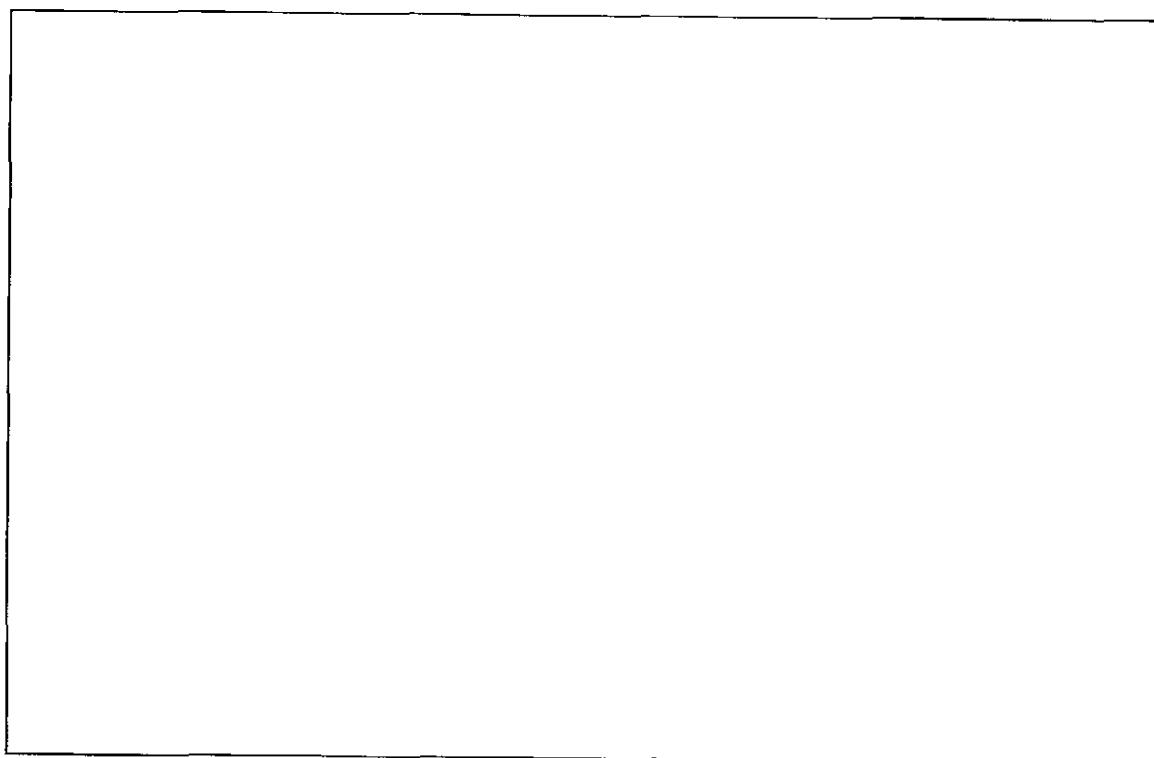


[TURN OVER]

Question 2 [15]

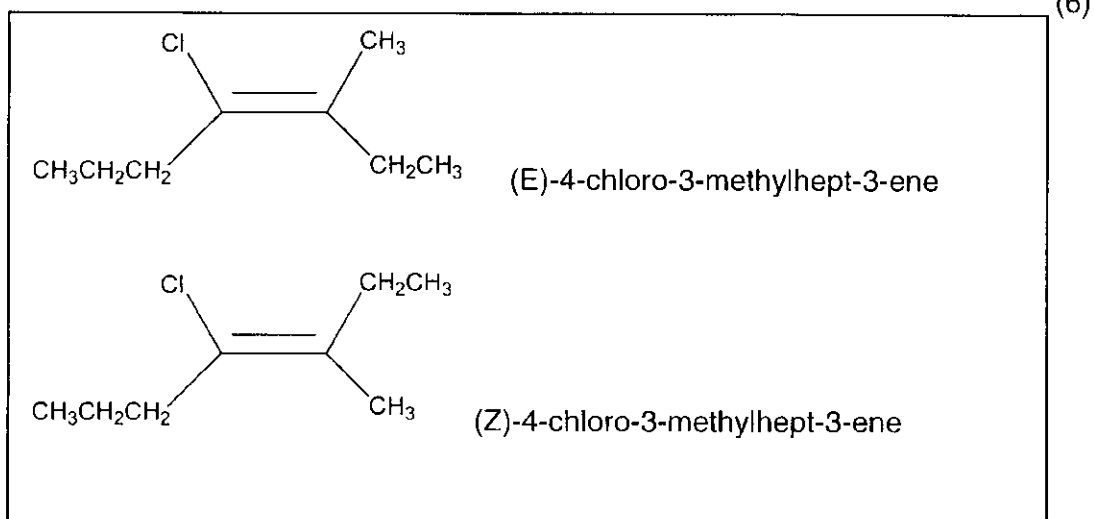
- 2.1 Give the complete reaction mechanism for the formation of the MAJOR PRODUCT in the reaction of $\text{CH}_3\text{CH}=\text{CH}_2$ with HBr

(3)



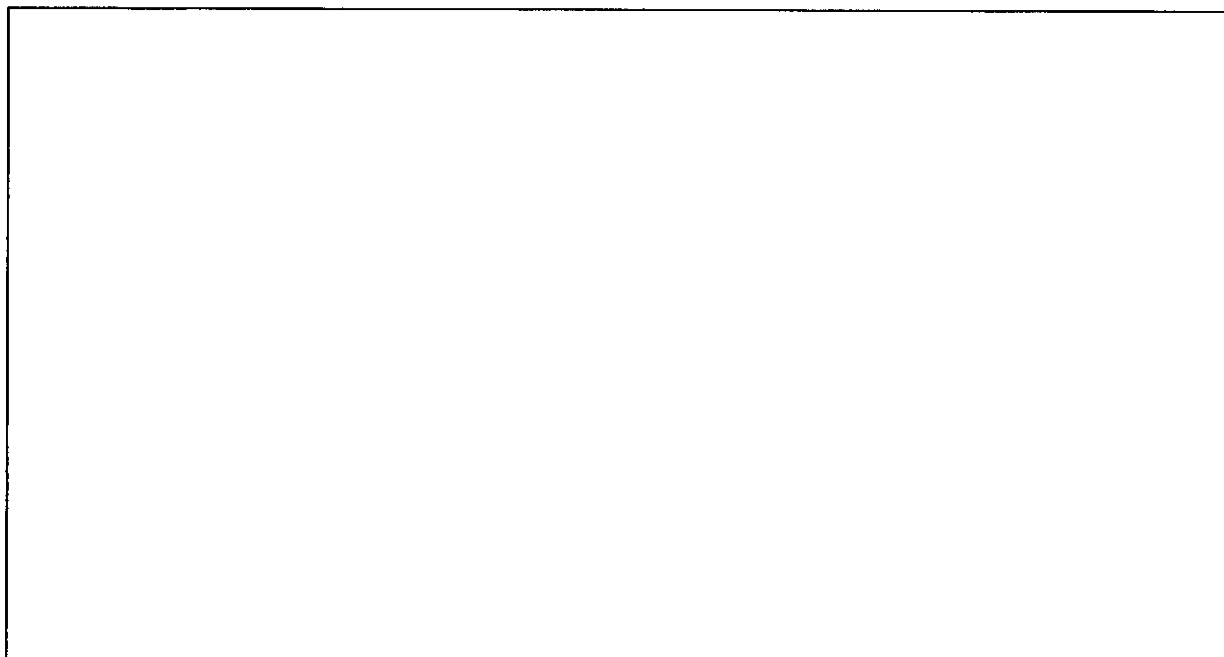
[TURN OVER]

- 2 2 Draw the geometric isomers (E or Z) of $\text{CH}_3\text{CH}_2\text{CH}_2\text{ClC}=\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_3$. Give the IUPAC name of each isomer



- 2 3 Draw the structural formulas for three constitutional / structural isomers for a compound having a molecular formula of C_5H_{10}

(6)



TOTAL MARKS [100]

[TURN OVER]

ROUGH WORK

[TURN OVER]

ROUGH WORK

[TURN OVER]

ROUGH WORK

[TURN OVER]

ROUGH WORK

[TURN OVER]

PART 1 (GENERAL/ALGEMEEN) DEEL 1

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

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PAPER NUMBER
VRAESTELNOMMER

STUDENT NUMBER
STUDENTENOMMER

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09	09	09	09	09	09	09	09	09	09

INITIALS AND SURNAME
VOORLETTERS EN VAN

DATE OF EXAMINATION
DATUM VAN EKSAMEN

EXAMINATION CENTRE (E.G. PRETORIA)
EKSAMENSENTRUM (BY PRETORIA)

UNIQUE PAPER NO.
UNIEKE VRAESTEL NR

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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 GEBUIK 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

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124	01	01	01	01	01	01	01	01	01
125	01	01	01	01	01	01	01	01	01
126	01	01	01	01	01	01	01	01	01
127	01	01	01	01	01	01	01	01	01
128	01	01	01	01					