



202 2015 1 b - Tutorial Letter 202 Semester 1

Chemistry B (University of South Africa)

# Tutorial letter 202/1/2015

General Chemistry 1B  
**CHE1502**

**Semester 1**

**Department of Chemistry**

**This Tutorial Letter Contains The Answers  
To The Written Questions In Assignment**

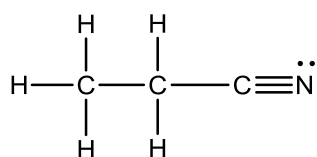
BAR CODE

## FIRST SEMESTER: KEY TO ASSIGNMENT 2 PART A

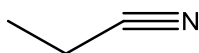
- Due Date: 26 March 2015
- Unique number: 594305

1. Consider the compound,  $\text{CH}_3\text{CH}_2\text{CN}$ .

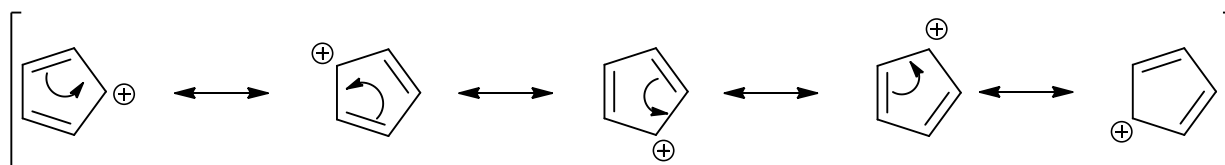
(a) The Lewis structures for the compound:



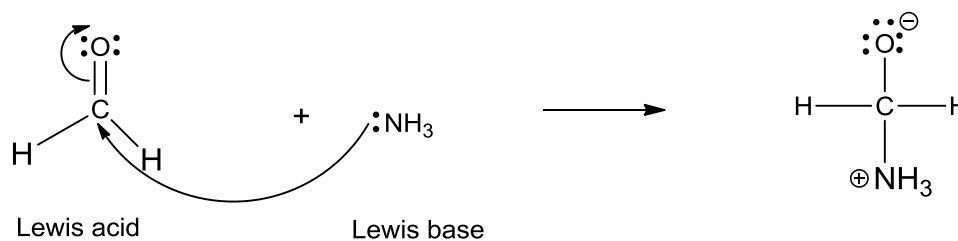
(b) Draw a line-angle formula for the compound:



2. The resonance delocalization takes place as follows:



3.

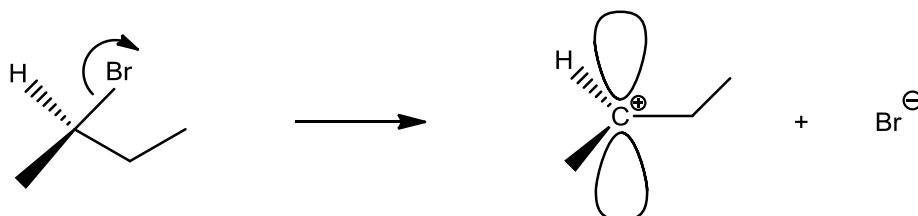


4 (a) Water is a poor nucleophile which promotes nucleophilic substitution via an

S<sub>N</sub>1 reaction mechanism.

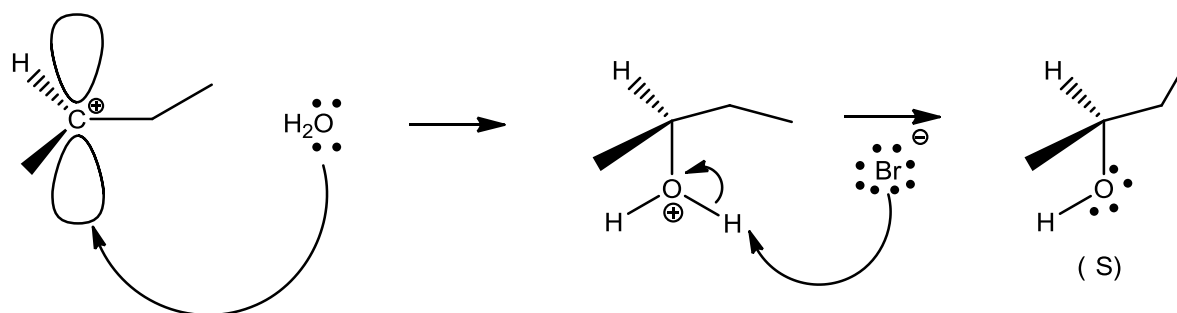
The mechanism for the reaction of (R)-2-bromobutane with water:

Carbocation formation:



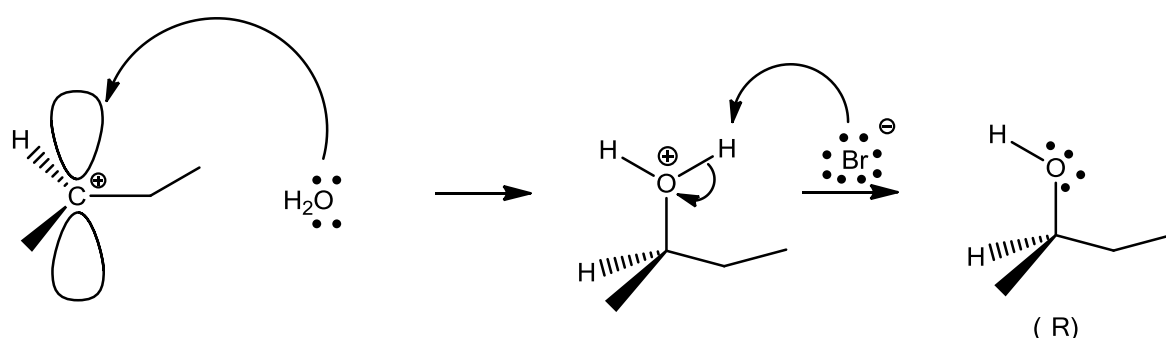
The carbocation is planar and the nucleophile can attack from either side of the carbocation.

The nucleophile attack from the bottom:



The nucleophilic attack is followed by removal a proton from the oxonium ion by bromide ion to give the alcohol. The S-isomer is formed, namely (S)butan-2-ol

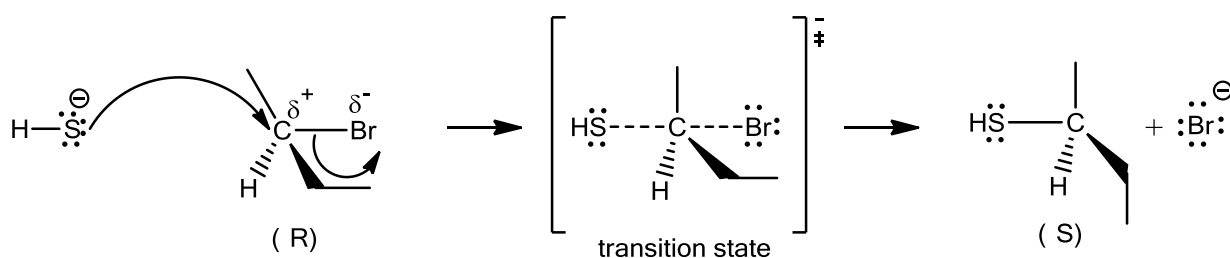
The nucleophile attack from the top:



The nucleophilic attack is followed by removal a proton from the oxonium ion by bromide ion to give the alcohol. Attack from the top gives the R-isomer, namely (R) butan-2-ol

(b) The <sup>-</sup>SH is a strong nucleophile which promotes nucleophilic substitution via

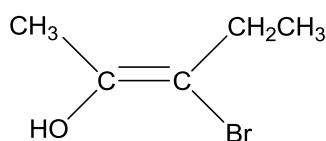
a S<sub>N</sub>2 reaction mechanism.



The reaction occurs with inversion of configuration.

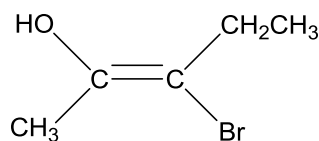
- 5 Task: to draw the geometric isomers (E or Z) of  $\text{CH}_3(\text{OH})\text{C}=\text{C}(\text{Br})\text{CH}_2\text{CH}_3$  and give the IUPAC name of each isomer.

Geometric isomers:



**A**

(Z)-3-bromopent-2-en-2-ol

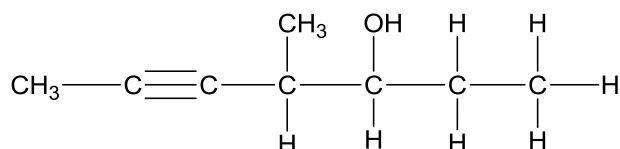


**B**

(E)-3-bromopent-2-en-2-ol

- 6 Consider the compound 4-methylhept-5-ol-2-yn.

- (a) The structure of the compound from the name given above:



- (b) The numbering is from the wrong side of the molecule. The compound is an alcohol and the numbering should take place to give the position of the OH group the lowest possible number. The ending of the name is incorrect and the name should end with '–ol' not '–yn' and should have been indicated as '3-ol'. The carbon-carbon triple bond should be indicated before the ending of the name

and the number of the carbon where the carbon-carbon triple bond starts is C-5 not C-2 and should have been indicated as '4-yn'.

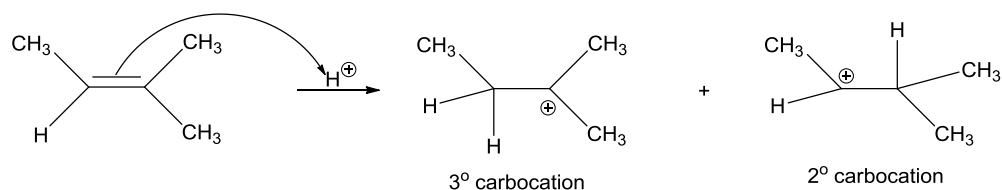
The correct IUPAC name for compound is: 4-methylhept-5-yn-3-ol

7. The reaction is represented as follows:

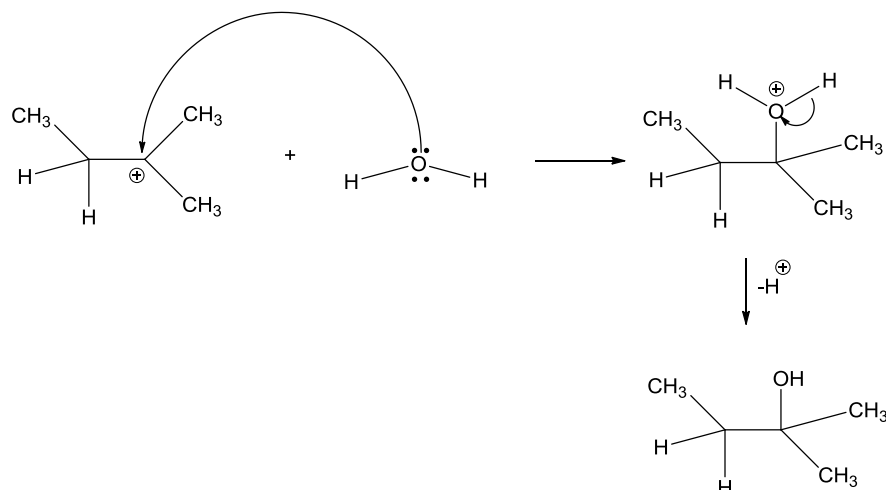


### The reaction mechanism

The first step in the acid catalyzed hydration of 2-methyl-2-butene is:



The most stable carbocation is the tertiary carbocation which is lower in energy than the secondary carbocation and is mainly formed. The reaction of the tertiary carbocation will give the predominant / major product.



[Explanation: The nucleophilic water molecule attacks the electrophilic carbocation, i.e. O contains a lone pair of electrons which are donated to the  $C^+$  to form a bond].

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