Online Class

SEM-II (H)

Introduction to Elimination Reactions

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Introduction

Elimination reactions involve the loss of fragments or groups from a molecule to generate multiple bonds.

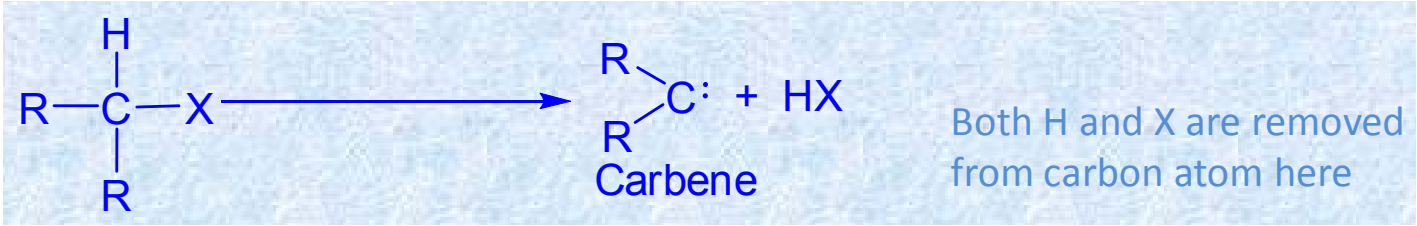
A generalized equation is shown below for 1,2-elimination wherein the X and Y from two adjacent carbon atoms are removed,

Objectives

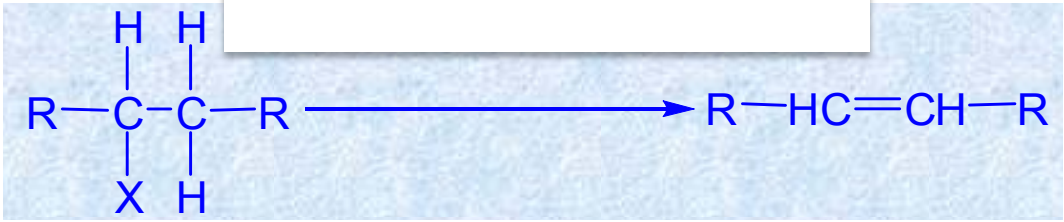
- ✓ beta-eliminations
- ✓ E1, E2 and E1cB mechanisms
- ✓ Stereochemical considerations of these reactions
- ✓ Examples of E1, E2 and E1cB reactions
- ✓ Alpha eliminations and generation of carbene

Three major types of elimination reactions are:

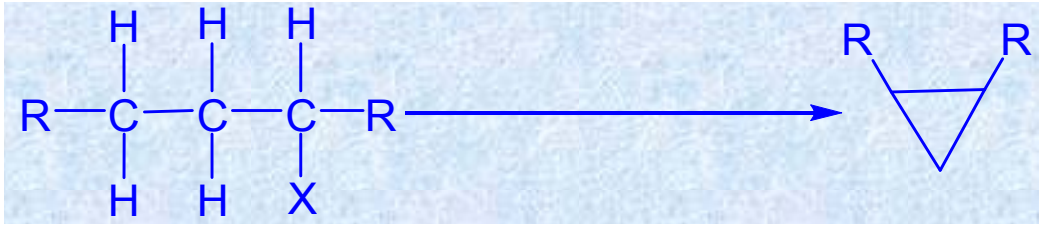
- **α-elimination:** Two atoms or groups are removed from the same atom. It is also known as 1,1-elimination.



- **β-elimination:** Loss of atoms or groups on adjacent atoms. It is also known as 1,2- elimination.



- **γ-elimination:** loss of atoms or groups from the 1st and 3rd positions as shown below. Generally such elimination reactions result in cyclic compounds.



Details about β-eliminations

β-eliminations can be further subdivided into three categories depending upon the mechanistic pathway. The important aspect is to establish the number of molecules taking part in the elimination step (molecularity of the reaction)

The types of β-eliminations are

1) E2: Elimination bimolecular
2) E1: Elimination unimolecular
3) E1cB: Elimination unimolecular conjugate base

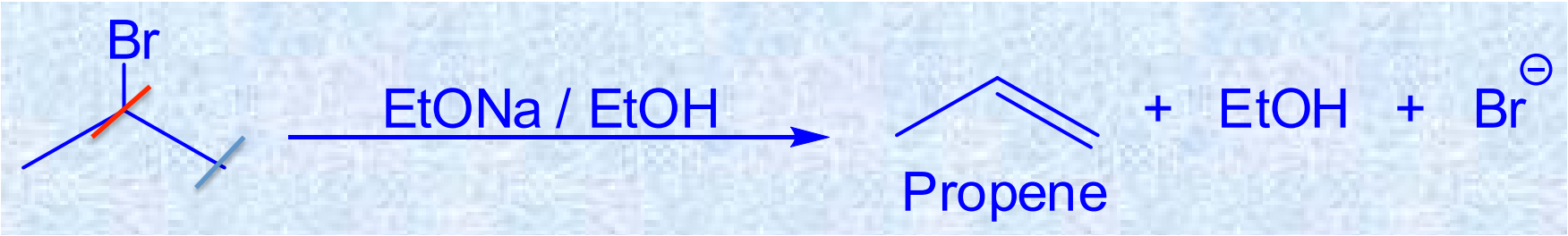
Most Important points:

- Elimination reactions widely used for the generation of double and triple bonds in compounds from a saturated precursor molecule.
- The presence of a good leaving group is a prerequisite in most elimination reactions.
- Traditional classification of elimination reactions, in terms of the molecularity of the reaction is employed.

E2 Eliminations

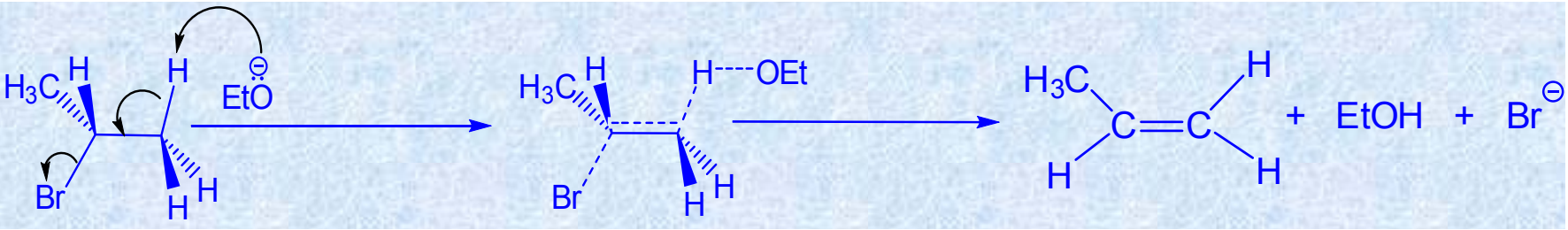
Key mechanistic features:

- **Two groups depart simultaneously**
- **Involves one step (in other words, no intermediates are involved)**
- **Bimolecular reaction i.e., both substrate and nucleophile participate in a single step**
- **The base abstracts the β hydrogen and leaving group simultaneously leaves such that it forms a multiple bond between α and β carbon atoms.**



In the example given above, sodium ethoxide acts as the base, abstracting beta-hydrogen. Bromine is the leaving group.

Illustration



The sequence of events involved are,

(i) The attack of ethoxide on β hydrogen and its abstraction as a proton is the first event. This will leave two electrons of the C-H bond available for the formation of a new double bond between the carbon atoms.

(ii) As the new double bond is created, the C-Br bond begins to break away (leaving group). This will result in the departure of the bromide ion.

THANK YOU

Continued……