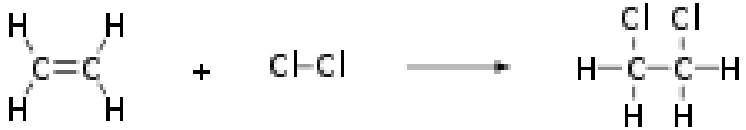
ADDITION REACTIONS

- A reaction in which one molecule combines with another to form a larger molecule with no other products
- A class of chemical reactions in which an atom or group of atoms is added to a molecule



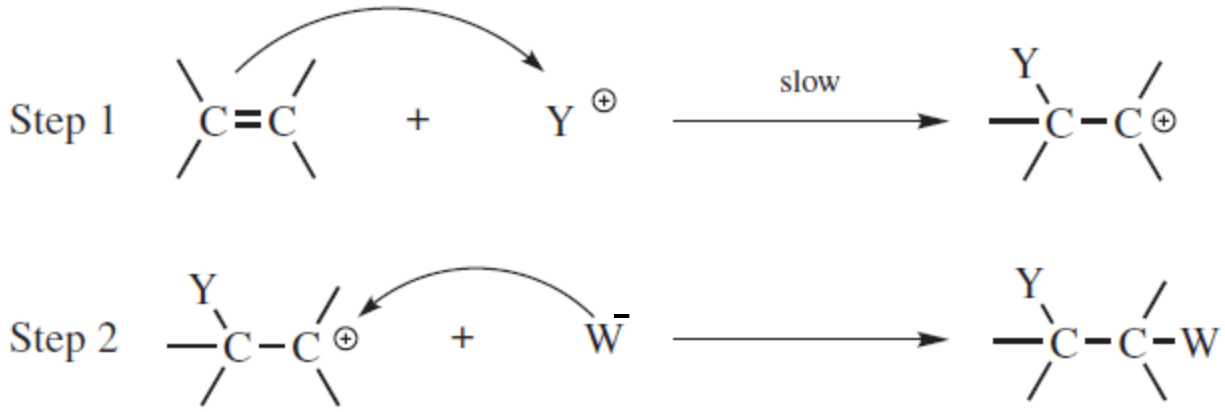
- Addition reactions are reverse of Elimination reactions

TYPES OF ADDITION REACTIONS

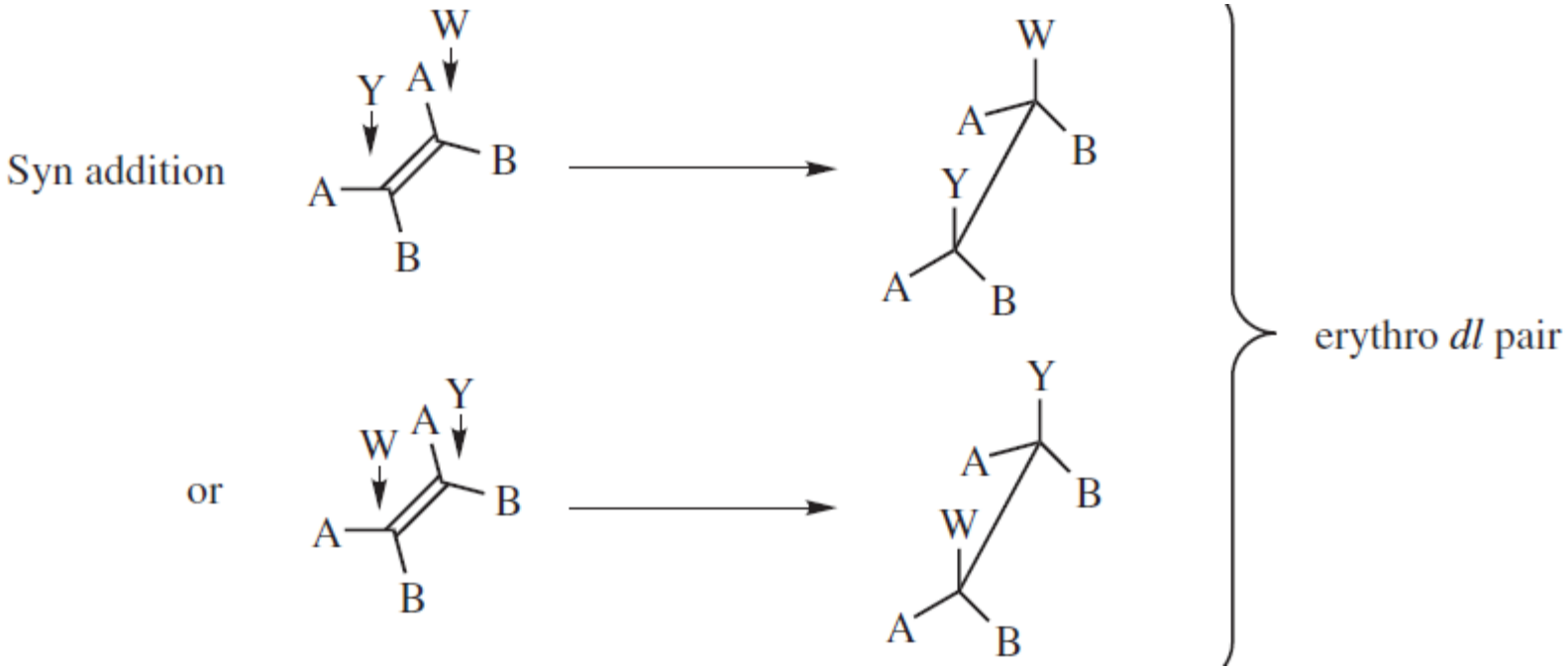
1. Addition to Carbon-Carbon Multiple Bonds
   - *(i) Electrophilic Addition*
   - *(ii) Nucleophilic Addition*
   - *(iii) Free Radical Addition*
   - *(iv) Concerted or Simultaneous Addition*
   - *Syn- vs anti- & 1,2- vs 1,4-Addtion*

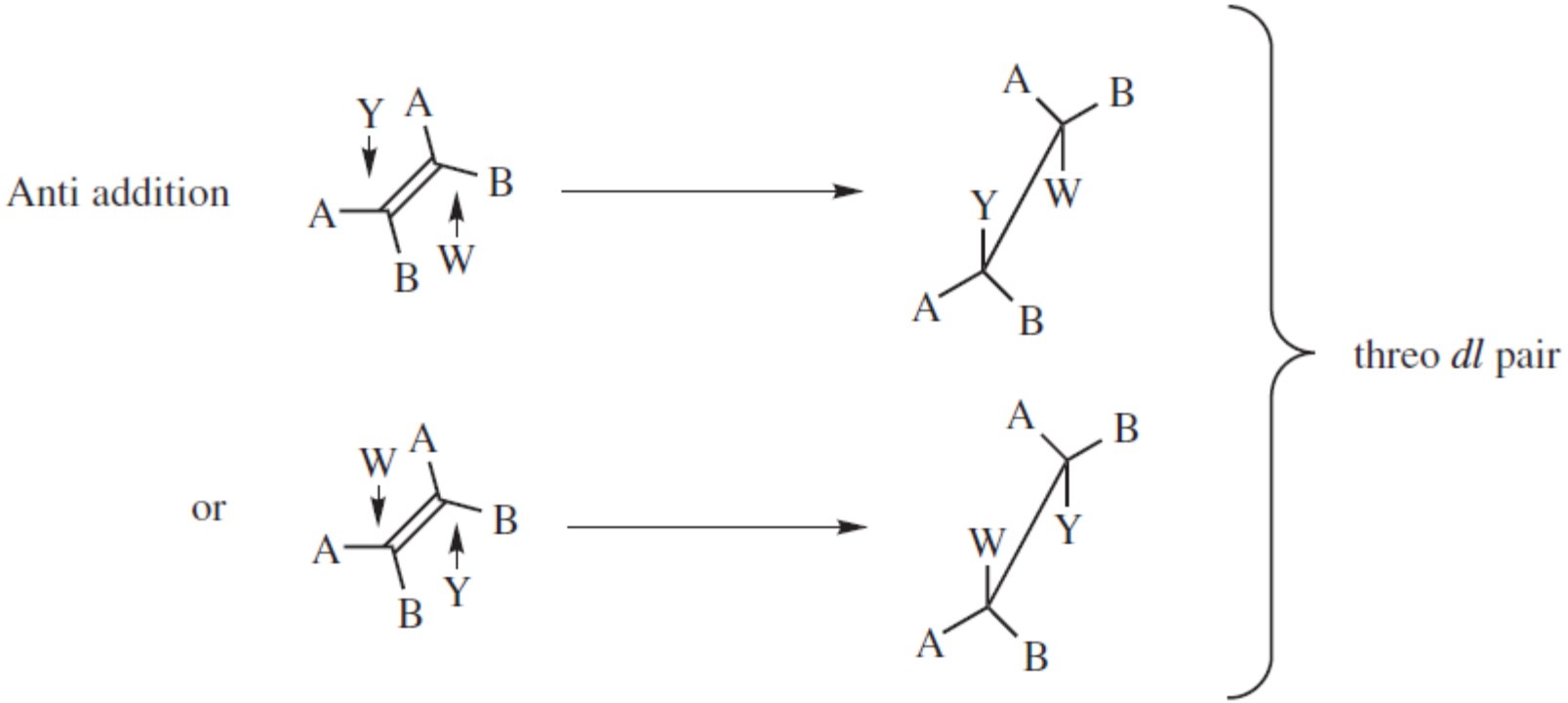
2. Addition to Carbon-Hetero Multiple Bonds
   - *Tetrahedral Mechanism*

Addition to Carbon-Carbon Multiple Bonds: *Electrophilic Addition*



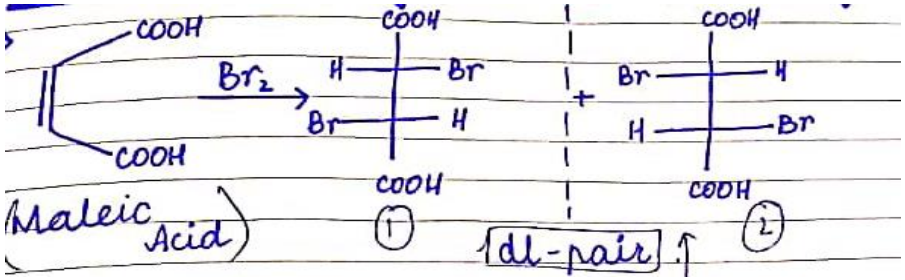
syn- vs anti-Addition

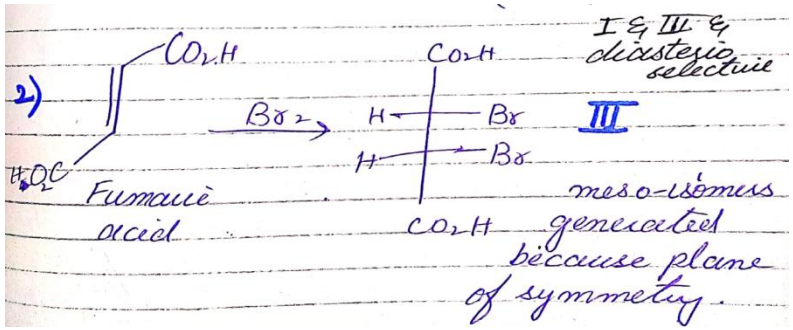



Anti addition
Y
A
B
A
B
W
A
B
Y
W
A
B
or
W
A
B
A
B
Y
A
B
W
Y
A
B
threo dl pair

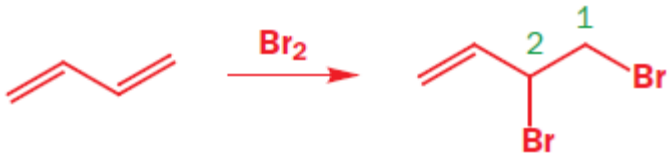
Example 1: Addition of Br_2

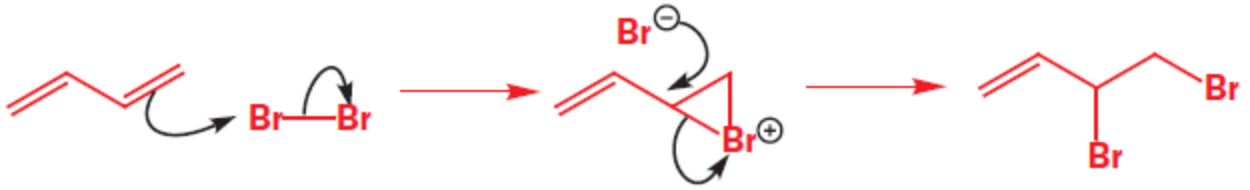
- *anti-Addition*



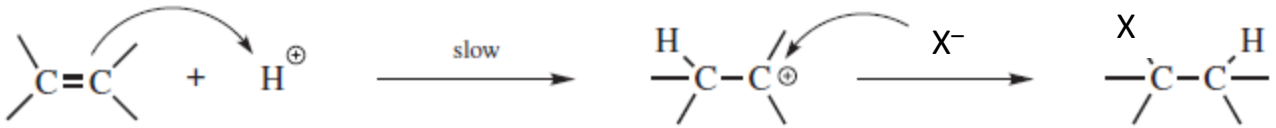


- *1,2- vs 1-4-Addtion*



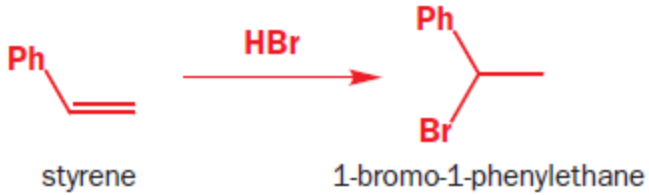


Example 2: Addition of HX



- stereochemistry of HX addition is varied.
  predominant syn, anti, and nonstereoselective addition.

- *Markovnikoff's Rule*



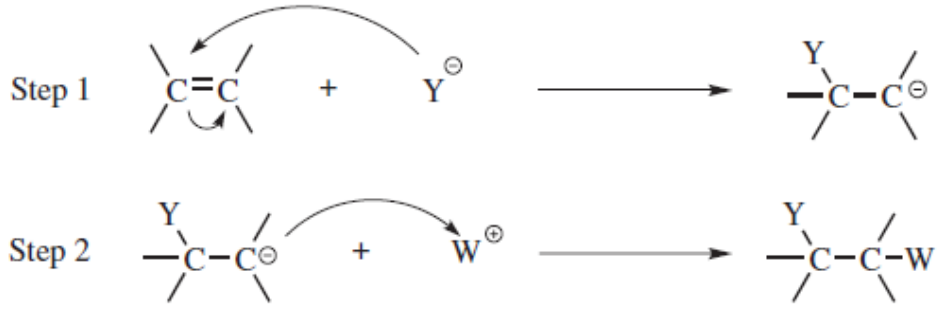
styrene — 1-bromo-1-phenylethane

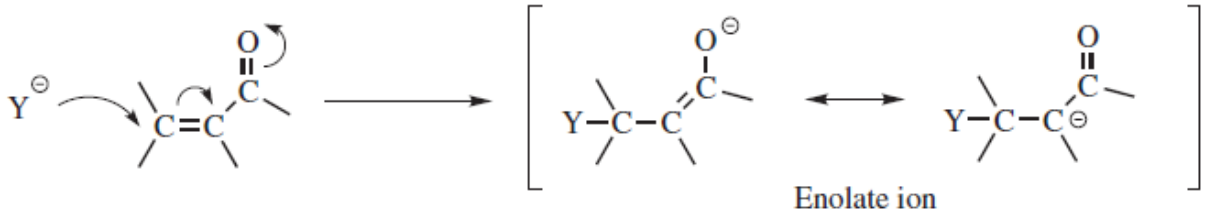
isobutene — *t*-butyl bromide

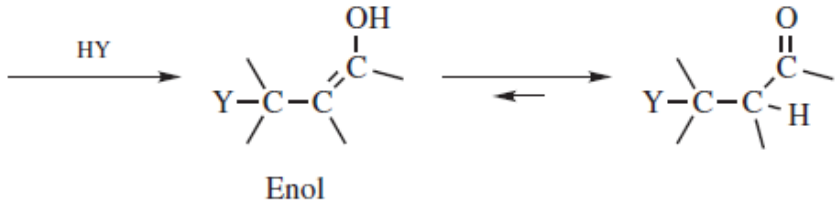
- *1,2- vs 1-4-Addtion*

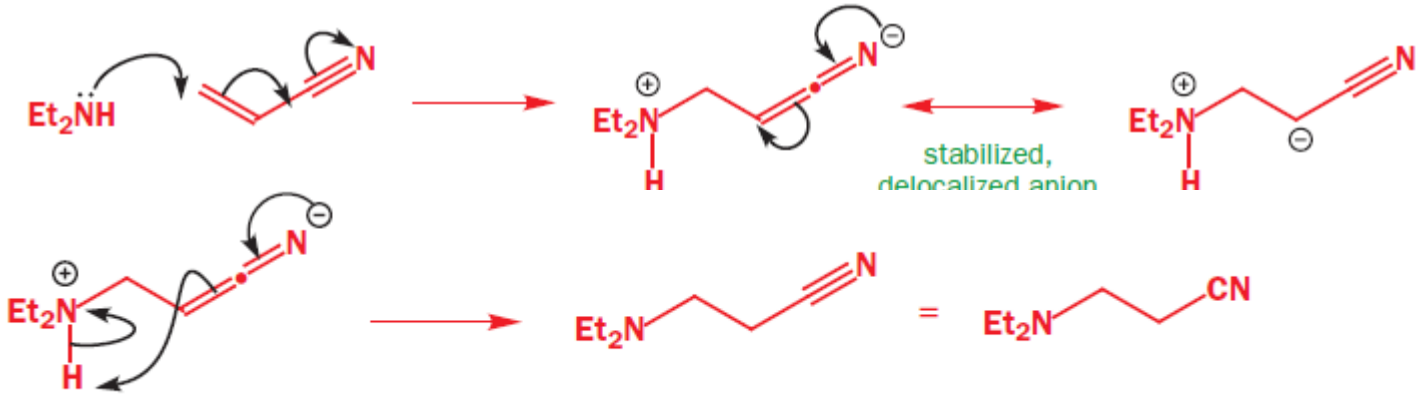
isoprene — prenyl bromide

Addition to Carbon-Carbon Multiple Bonds: *Nucleophilic Addition*

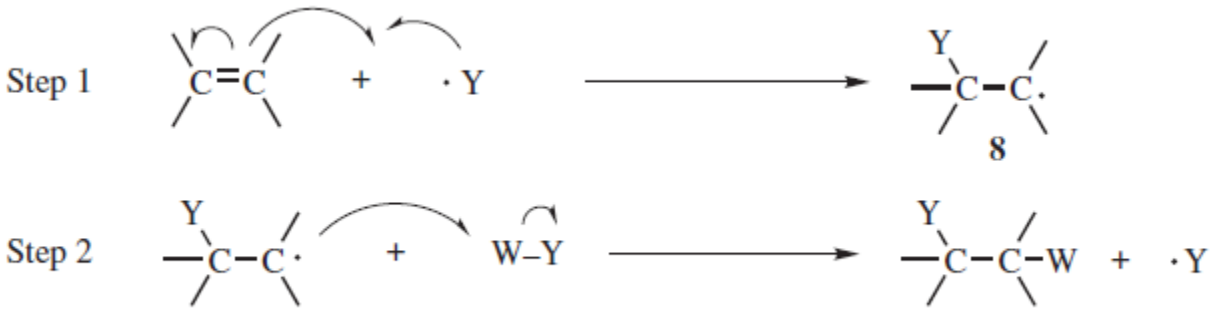




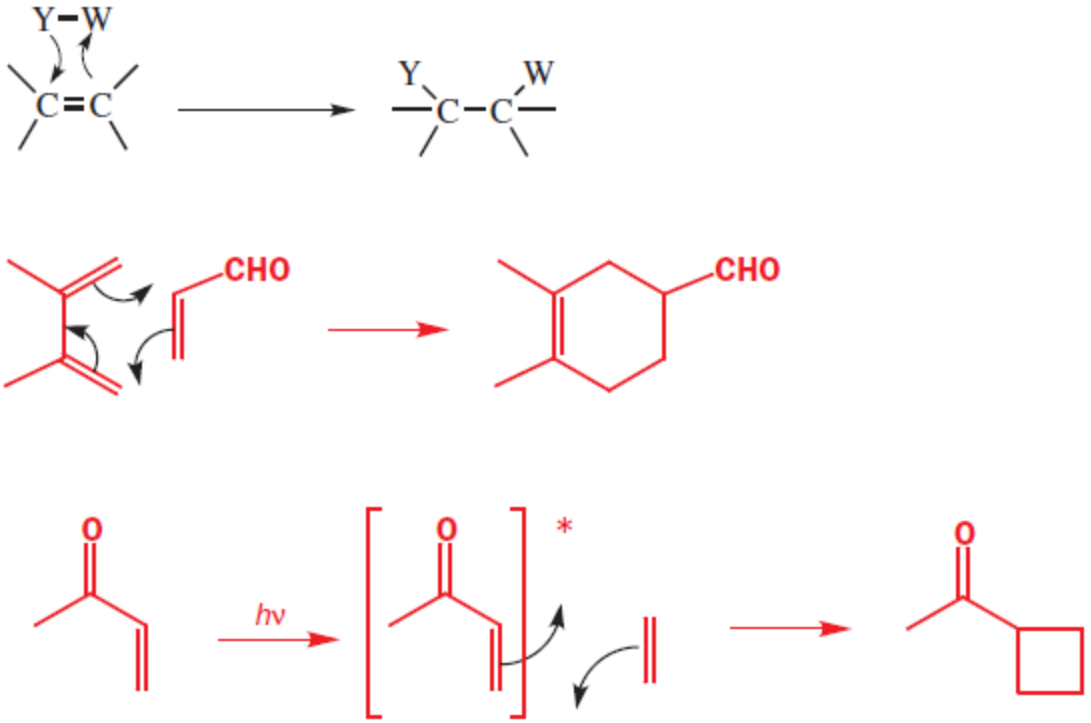




Addition to Carbon-Carbon Multiple Bonds: *Free-Radical Addition*



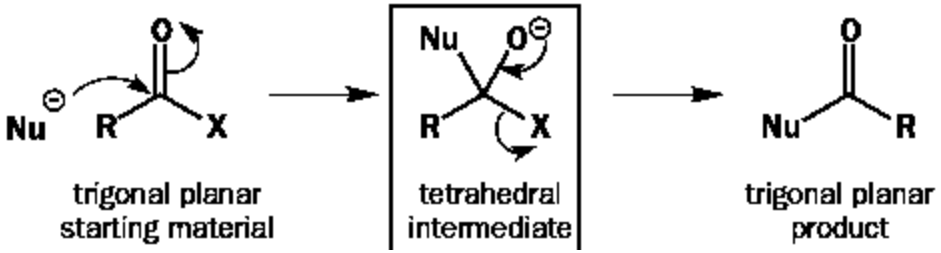
Addition to Carbon-Carbon Multiple Bonds: *Concerted Addition*



Addition to Carbon-Hetero Bonds: *The Tetrahedral Mechanism*

Nucleophilic Substitution at C=O bond

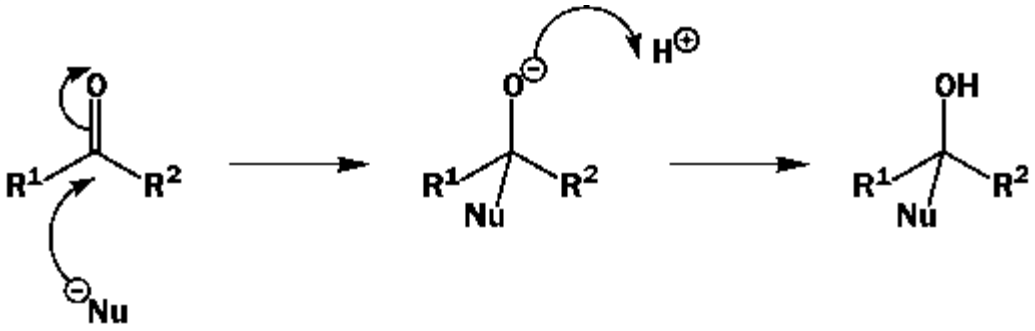
Substitutions at trigonal carbonyl groups go through a tetrahedral intermediate and then on to a trigonal product.



Examples with different substrates e.g. carboxylic acids and their derivatives etc.

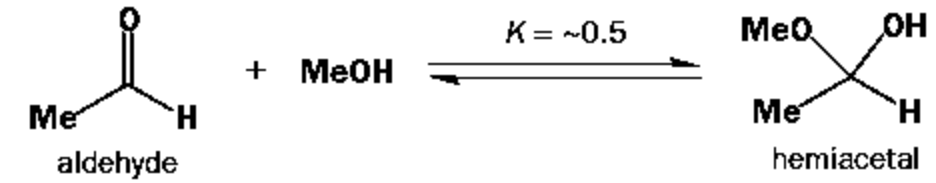
Nucleophilic Addition at C=O bond

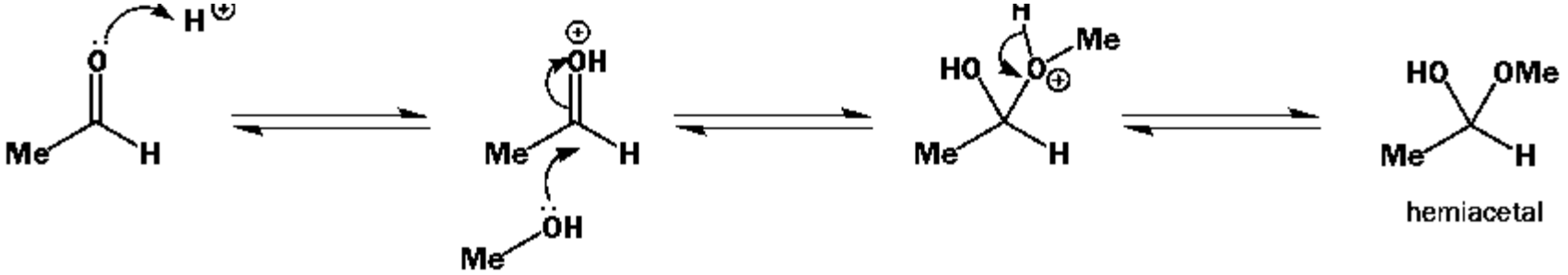
Nucleophiles add to carbonyl groups to give compounds in which the trigonal carbon atom of the carbonyl group has become tetrahedral.



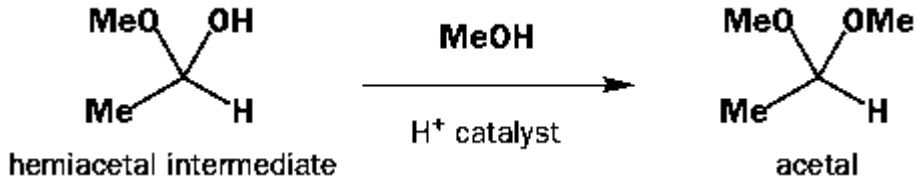
Example 1

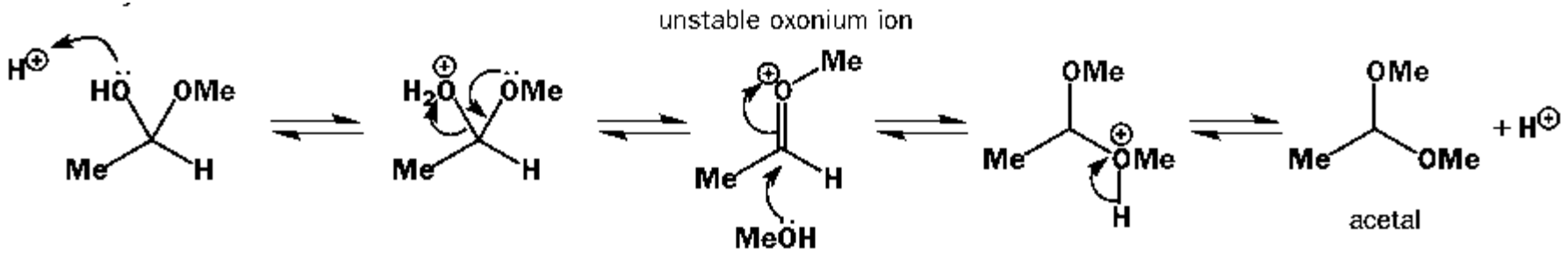
I



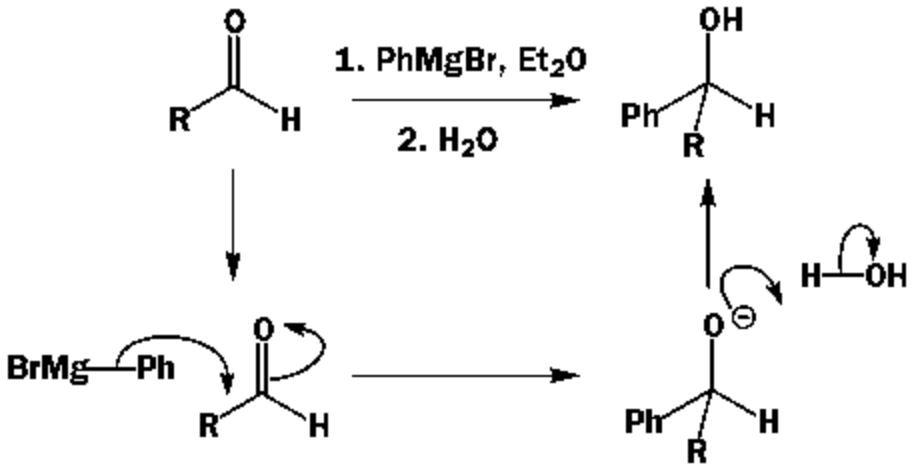


II





Example 2



Example 3