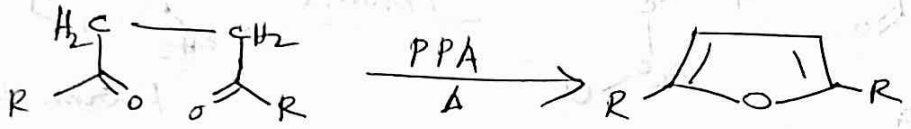
Furan

Synthesis

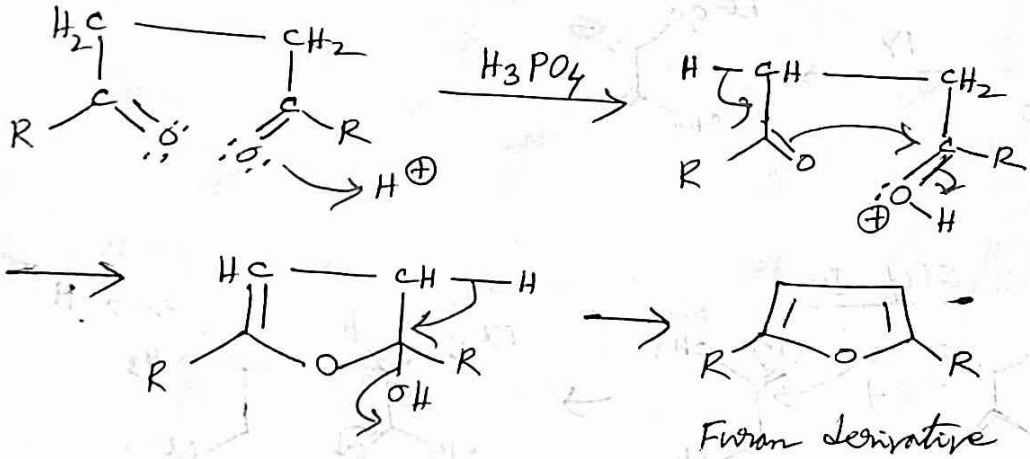
Paal-Knorr Synthesis

In Paal-Knorr Synthesis, an enolizable 1,4-dicarbonyl compound is dehydrated by using reagents such as H_2SO_4, P_2O_5 or H_3PO_4 to give furan derivative.



1,4-dicarbonyl compound — Furan derivative

Mechanism

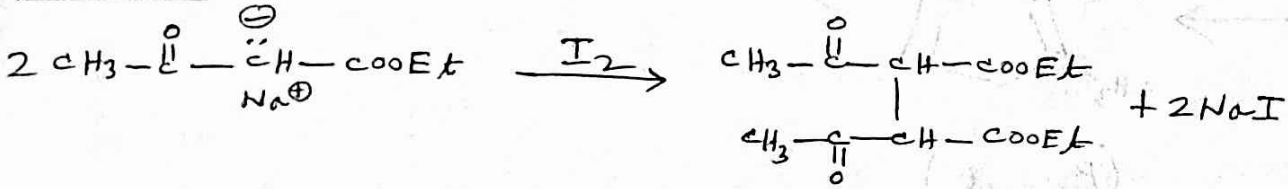


Example

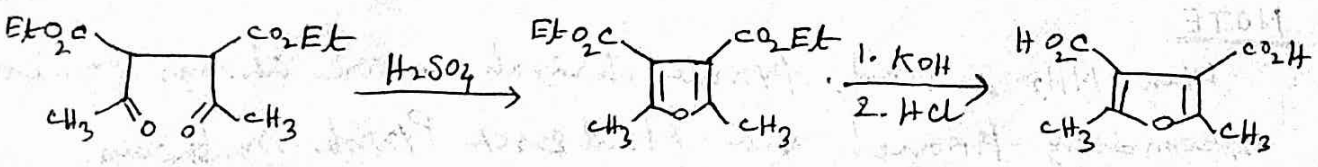
Step-I

EAA

Step-II

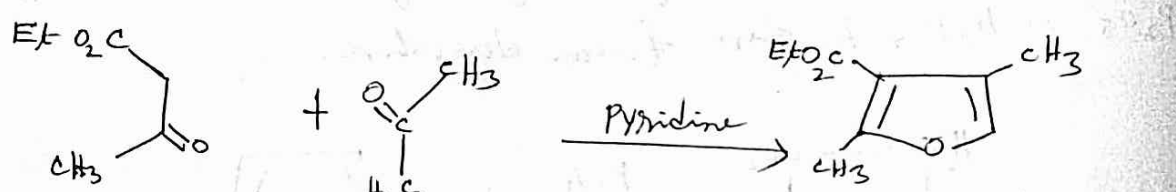


Step-III



Fiest-Benary Synthesis

Fiest-Benary synthesis involves the formation of furan from α-halo ketone or aldehyde and 1,3-dicarbonyl compound in the presence of a base such as pyridine.



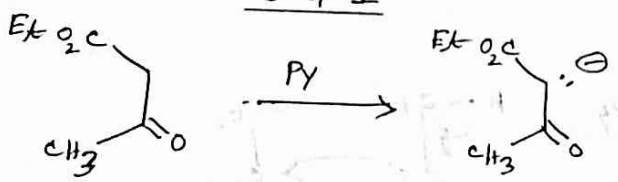
EAA
(1,3-dicarbonyl compound)

α-halo ketone

Furan derivative

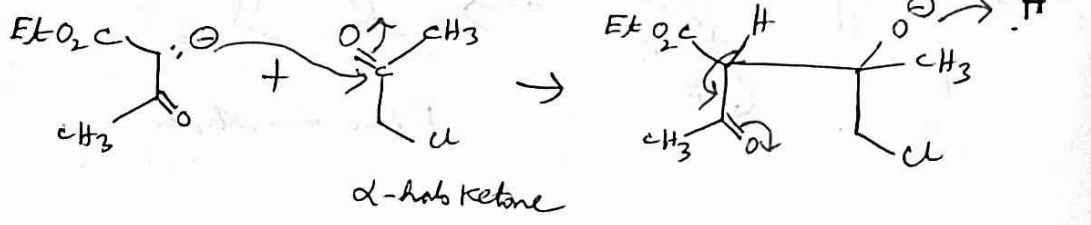
Mechanism

Step-I

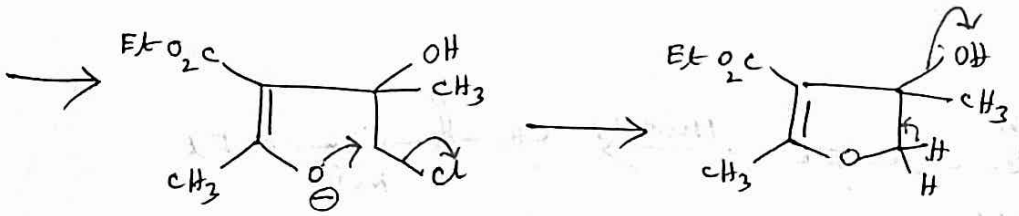


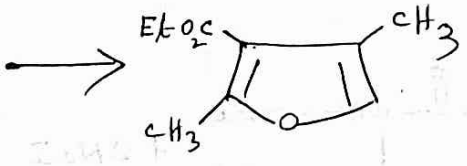
EAA

Step-II



α-halo ketone





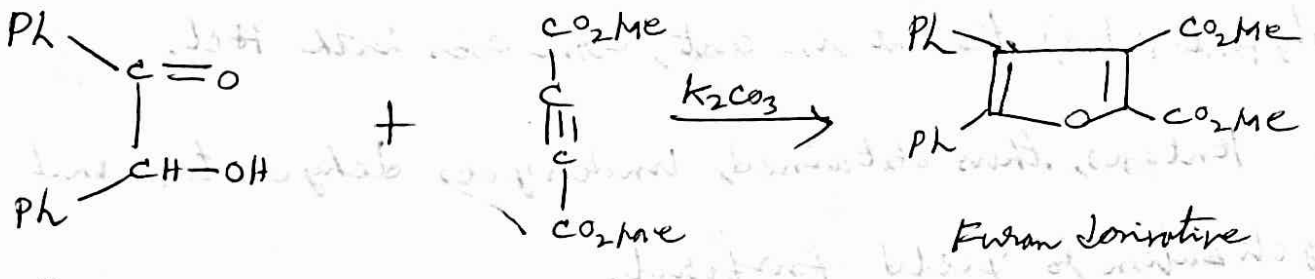
(Product)

NOTE

When NH_3 is used, pyrrole derivatives are always formed as secondary products via Hantzsch Pyrrole synthesis.

From acetylene dicarboxylic ester

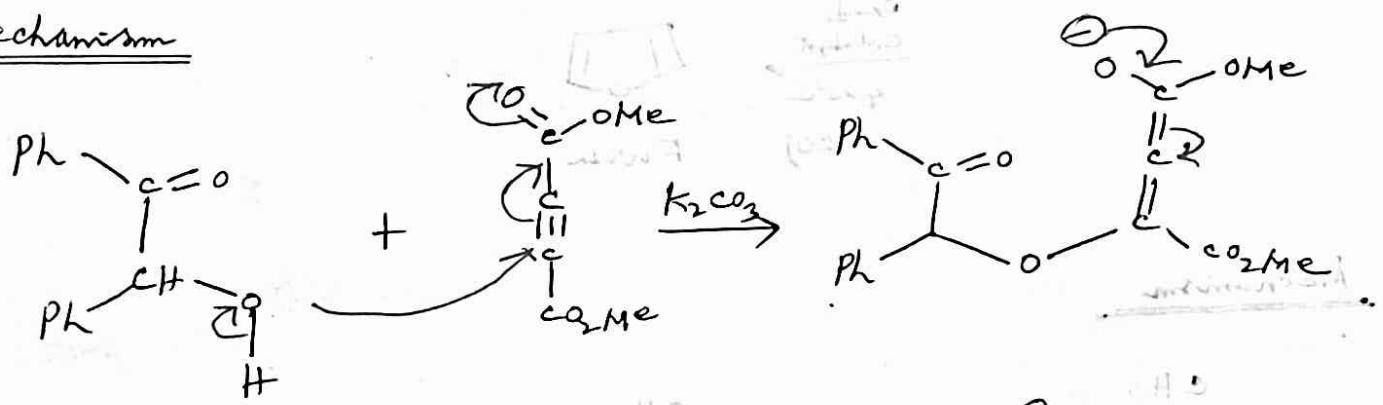
α-hydroxyketone reacts with acetylene dicarboxylic ester to form furan derivative.

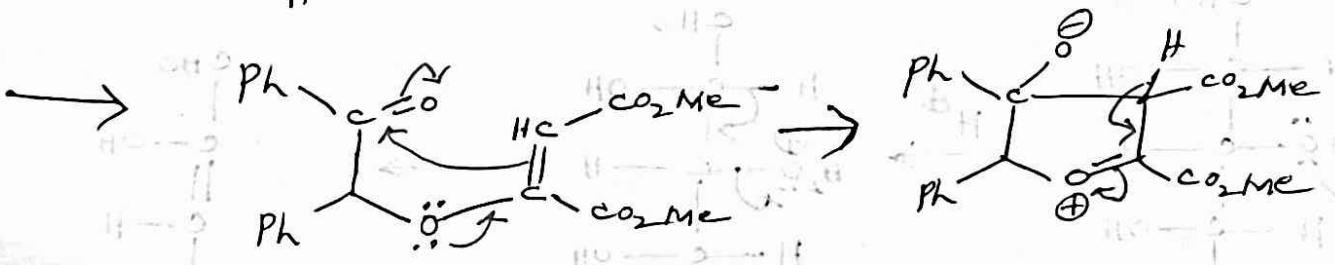


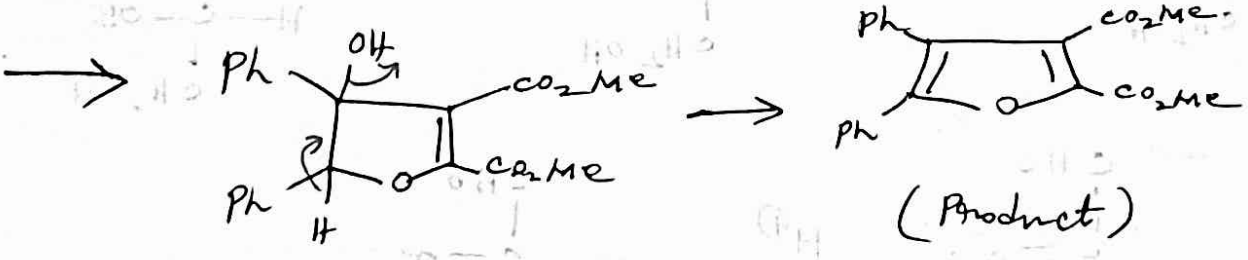
Benzoin
(α-hydroxyketone)

Furan derivative

Mechanism





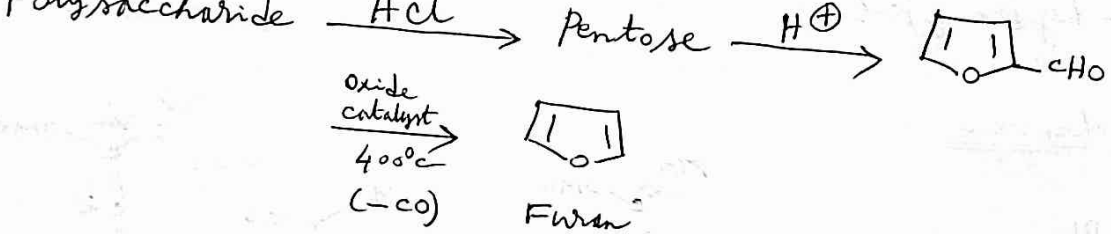


(Product)

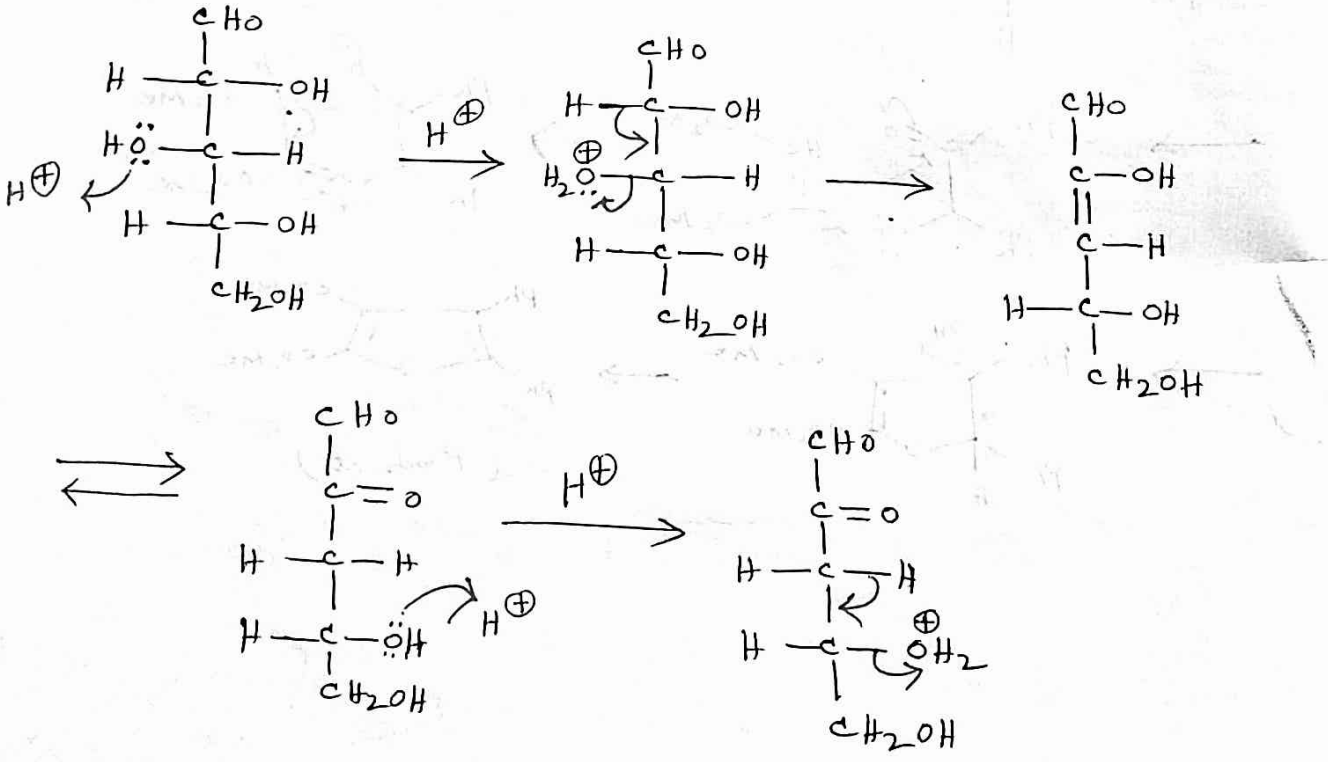
From Carbohydrates

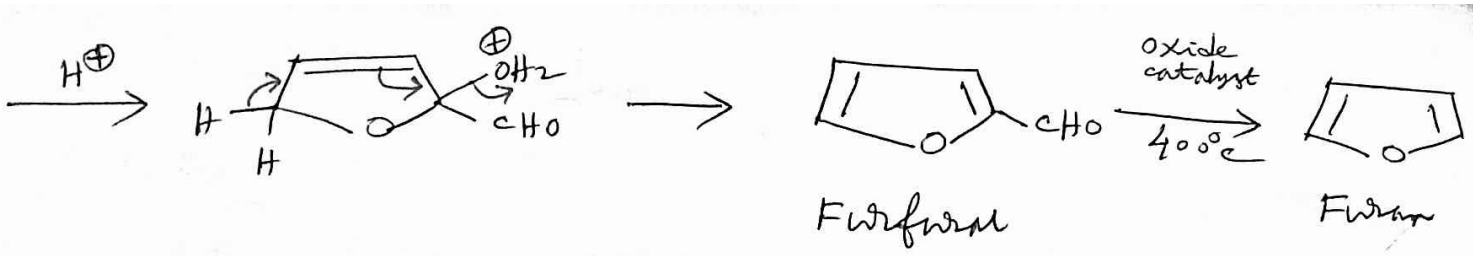
Furan is commercially prepared by decarbonylation of 2-furancarboxyaldehyde (furfural), which in turn is obtained by the treatment of the polysaccharides (usually polypentosides) present in oat, corn cobs with HCl.

Pentoses, thus obtained, undergoes dehydration and cyclization to yield furfural.



Mechanism





Furfural

Furan