

Study Notes On Crossed Aldol Condensation Reaction



CROSSED ALDOL CONDENSATION

An aldol reaction occurring between two different carbonyl compounds is known as Crossed Aldol. It is also known as 'Mixed Aldol Reaction'. Here, both carbonyl compounds so involved must have an α -hydrogen each. It is a kind of condensation reaction in which up to four different products are formed.

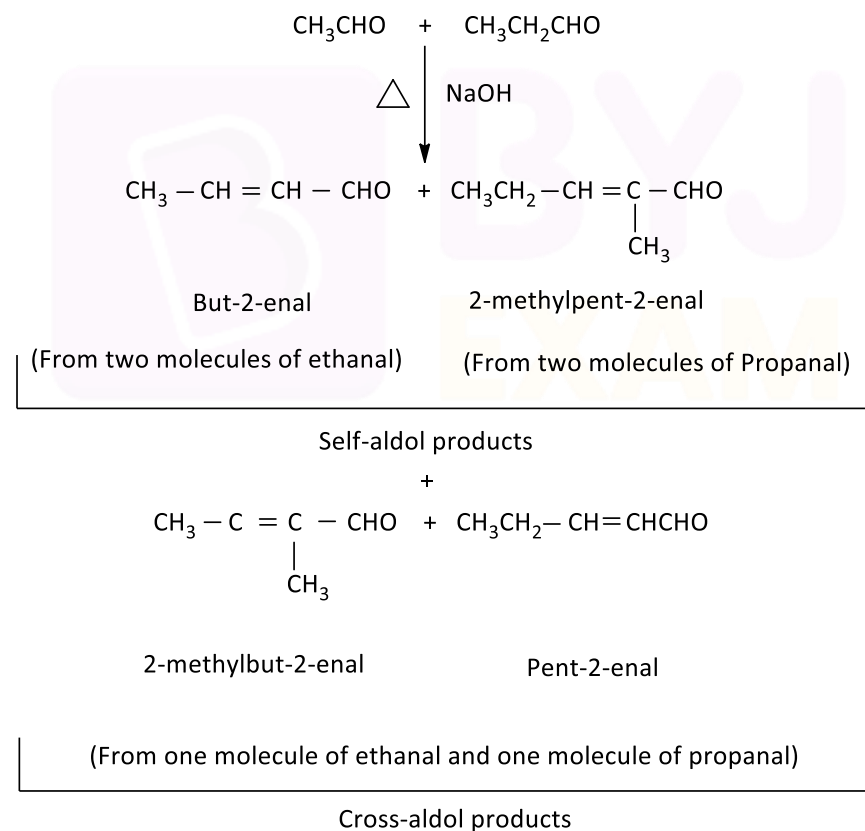
This reaction occurs in Protic solvent, such as water or alcohol.

Note: This reaction can be carried out in the following combinations to yield four products-

- (i). Between two different aldehydes
- (ii). Between two different ketones
- (iii). Between an aldehyde and a ketone.

Here, both reactants should have an α hydrogen.

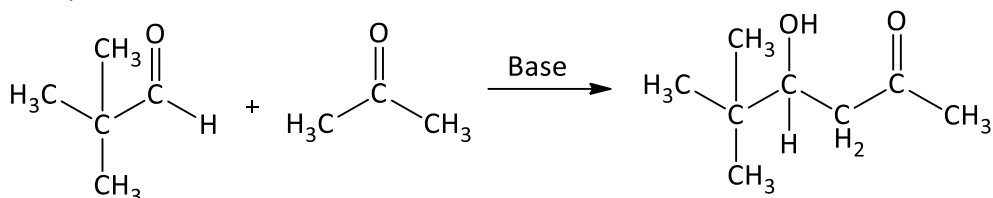
Example- Ethanal and propanal react to give four products.



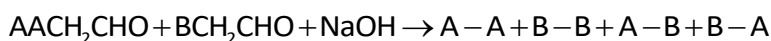
Note: Mixed aldol reaction occurs due to two factors-

1. Aldehydes are more reactive acceptor Electrophiles than ketones and formaldehyde is more reactive than other aldehydes, i.e., reactivity order is as follows-
Formaldehyde > aldehydes > ketones.

Example-



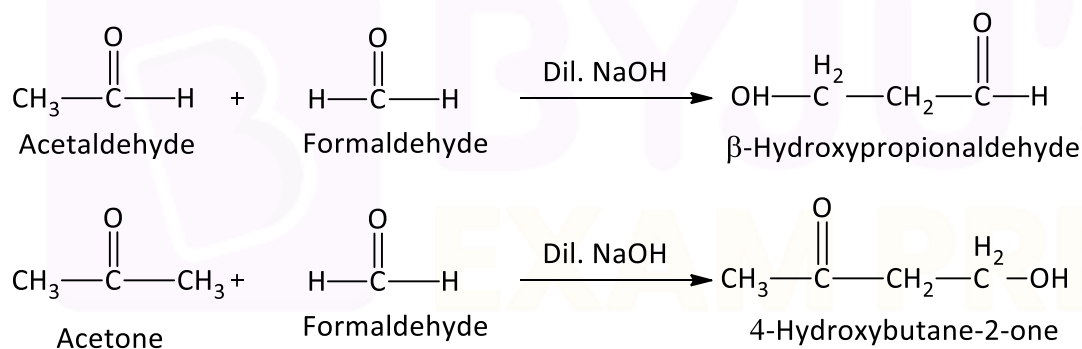
2. All aldehydes which do not possess α hydrogen can only act as acceptors and therefore the number of products so formed decreases. Whereas mixed aldols both having α hydrogen gives complex mixture of products thus it is not preferred until one reactant has no α -hydrogen. In such case, number of products can be calculated using this formula-



Note:

It is a useful synthetic reaction only if one of the aldehydes does not contain α -hydrogen atoms, such as formaldehyde, benzaldehyde etc.

(i) With formaldehyde



(ii) With benzaldehyde. It is known as the Claisen *Schmidt reaction*.

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