Ketones

Physical properties of aldehydes and ketones

1- Physical state: All aldehydes and ketones are liquids at temperature Room except formaldehyde, which is a colorless gas.

2- Boiling point: The polarity of the carbonyl group makes aldehydes and ketones Highly polar compounds, and this property creates attractive forces between themMolecules or what is called the attraction between the negative partial charge onThe oxygen of the carbonyl group of a molecule and the positive partial charge on the carbon

The carbonyl group of another molecule. Because of this polarity, it has degrees Boiling higher than the boiling points of hydrocarbons and their corresponding ethers in

Molecular weight, but lower than the boiling points of their corresponding alcohols

Molecular weight due to its inability to form hydrogen bonds between... Its molecules.

3- Solubility (miscibility): Low-weight aldehydes and ketones mix

Molecular molecules are highly soluble in water due to their ability to form bonds hydrogen atom with the hydrogen atom in the water molecule, and the solubility decreases with increasing The molecular weight and length of the hydrocarbon chain of the aldehyde molecule Ketone.

Chemical properties of aldehydes and ketones

First: oxidation

Aldehydes are easily oxidized to give carboxylic acids containing the same number

Carbon atoms, while ketones are not oxidized except under special conditions

...because their oxidation requires

.To break the C-C bond

,The oxidizing agents used for the oxidation of aldehydes are: hot 3HNO KMnO, and Jones's reagent, which is 3CrO in aqueous solution4

For sulfuric acid, and Tollen’s reagent (silver oxide O2Ag in

(.Aqueous ammonia solution $O_2OH.H_4NH$

Ketones are not oxidized under normal conditions, but their oxidation requires special conditions

It can be oxidized by strong oxidizing agents such as 4KMnO alkali or acid

Chromic or concentrated nitric acid to give carboxylic acids with carbon atoms Less than the ketone itself.

Second: Reduction

Hydrogen is added to the carbonyl group, forming primary alcohols and secondary alcohols

This is done using the following agents in the presence of hydrogen: (4), (LiAlH4(NaBH(Ni, Pt or Pd). The reducing agents (4), (LiAlH4(NaBH) do not affect (the C-C bonds

Multiple. Sodium hydride reduces the formyl group only and does not reduce the formyl group

Nitro as The formyl group can be reduced to a methylene group -2CH- using... Clemmensen reduction reagent, which is used with compounds that...

It is affected by bases because it is done in an acidic environment. Wolff's reagent can also be used-

Wolff-Kishner reduction is used with vehicles that are affected

With acids because it is done in a basic medium where 4H2HydrazineN is added and then the base.

Third: Addition interactions

In addition to the high polarity of the carbonyl group as well as the ease of displacement

Its π electrons, the carbonyl group creates an electrophilic center (atom.(

Carbon carrying a positive molecular charge (to react with nucleophilic reagents to give

Addition products:

- Adding alcohol to aldehydes and ketones

For aldehydes: When an alcohol is added to an aldehyde, an equilibrium occurs between them and a product is formed

Unstable is called hemi acetal or hemi acetal

The presence of a catalyst HCl, and with the increase of alcohol, acetal is formed.

For ketones: When alcohol is added to a ketone, an unstable product is formed called It converts to a more stable compound in the presence of an excess of Hemi Ketal ketal Alcohol is called ketal

Addition of Grignard compounds: This reaction was previously explained in detail in the preparation

Alcohols.

HCN when adding hydrogen cyanide: HCN • Adding hydrogen cyanide

Which can be converted to the primary amine Cyanohydrin of the aldehyde or ketone produced

Or carboxylic acid as follows:

Addition of sodium hydrogen sulfite to aldehydes and ketones:

NaHSO aldehydes and methyl ketones react with a saturated aqueous solution of 3 To give salts as products of addition that separate from solutions, and these salts can It hydrolyzes in acidic or basic media to give carbonyl compounds again. So the Forming such salts and then hydrating them is a good way to purify compounds Carbonyls and their separation from other compounds.

Fourth: Condensation reactions (the release of a water molecule: O2H:(1-Reaction with hydroxylamine OH2NH: Aldoxime is formed in a state Aldehydes and ketooximes in the case of ketones.

2- Interaction with hydrazine and its derivatives: Hydrazone and its derivatives are formed.

3- Aldol condensation: Due to the presence of two aldehyde and alcohol groups in the product

This reaction gave the name Aldol to the compounds whose structure includes:

β-Hydroxy aldehyde This reaction is considered important in organic manufacturing Because it

is a suitable way to bind small molecules and form larger molecules containing...
It consists of two functional groups, and in order for this reaction to occur, it must contain
One of the two compounds reacts on hydrogen - α and this reaction can take place In the basal medium as follows:
This condensation occurs with peripheral ketones of any type when they interact with...

An aqueous solution of 3Sodium bisulfate NaHSO in which ketones do not react Huge due to steric hindrance of alkyl groups.
Any aldehyde that does not contain an alpha hydrogen is different from the rest of the aldehydes in this
The reaction is that when it is treated with sodium hydroxide, part of it is oxidized
At the expense of another molecule to give an alcohol and a carboxylic acid, and this is known
The reaction is the Cannizaro reaction.