

welcome everyone i am Shubhada Gawandi
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and today we are going to learn Perkin
condensation
with the mechanism in module number 10.
so i have divided my topic in three
sections
first is Perkin condensation the
reaction
second is the mechanism and third is the
example that's it
so at the end of the video you are going
to recall
the reactants needed and the product
formed
in the Perkin condensation we are going
to summarize the various steps
involved in the mechanism of Perkin
condensation
and you are going to find the Perkin
condensation product
for suitable examples
so let us start with Perkin
condensation
what is a Perkin condensation? it is
an organic chemical reaction of
aromatic aldehyde with an aliphatic
acid anhydride in the presence of
alkali salt of an acid and the acid
anhydride
so the product that you are going to get
in the reaction
is an alpha beta unsaturated
acid. now the carbon
that is next to carbonyl carbon is an
alpha carbon
and the next carbon is the beta carbon
and since there is a double bond that is
unsaturation
between alpha and beta carbon this
system is termed as alpha beta
unsaturated
acid so this reaction
was developed by William Henry Perkin
who was an English chemist in the year
1968.
this is an example of aldol condensation
reaction

and is generally used to make the substituted cinnamic acids so this is the reaction of Perkin condensation so we are going to study the reaction and we are going to study the reaction with respect to benzaldehyde which is our aromatic aldehyde so what we do is we take benzaldehyde we react it with acetic anhydride in presence of sodium acetate and we heat this reaction mixture to get cinnamic acid which is alpha beta unsaturated aromatic acid so let us start with the mechanism part of this first of all the sodium acetate will dissociate as acetate ions and Na^+ acetate ion. CH_3COO^- are acetate ions so in step one there is abstraction of alpha hydrogen of acid anhydride by base now this is our alpha hydrogen and it is acidic in nature and is easily abstracted by the base now this acetate ions act as the base. when it abstracts this hydrogen the pair of electrons shift onto this carbon so we get carbon anion and acetic acid so let us see the next step in step two there is attack of carbon anion on carbonyl carbon of benzaldehyde now carbonanion as we all know is an electron rich species so since it is electron rich it will try to attack electron deficient center which is there on this carbon which is the carbonyl carbon. Now why this

carbon carbonyl carbon is electron deficient because it is attached to the oxygen which is electronegative and hence it will try to pull the electron cloud towards itself making the carbon electron deficient so once there is attack of carbonanion on this carbonyl carbon of benzaldehyde we get this species which is an alkoxide ion

in step 3 there is a formation of cyclic intermediate and also there is intra molecular acetyl shift so what happens is the negative charge on the oxygen will go and attack on the carbonyl carbon of the acidic anhydride group and the the pair of electrons which is there in the pi bond will shift on to the oxygen so we get a six membered cyclic intermediate so soon what will happen is the negative charge on the oxygen will come back to restore the carbonyl carbon and since the tetra valency of this carbon is restored the bond between this carbon and this oxygen breaks and there is opening of the ring so we get this species.

let's see what happens in the fourth step in this step there is loss of acetate ion from beta carbon so the acetate ions that are present in the reaction mixture will try to abstract the alpha hydrogen which is acidic in nature and the pair of electrons shifts back onto the alpha carbon you can see this which is the alpha carbon and which one is the beta carbon so soon what happens is the negative

charge that is the pair of electrons will shift between alpha and the beta carbon and as this happens the tetra valency of beta carbon is restored. So the bond between carbon and oxygen breaks and there is a loss of acetate ion so we get a sodium salt of cinnamic acid which on acidifying will give us cinnamic acid which is the product in the Perkin condensation so this is all about the mechanism so here are few examples of Perkin condensation in the first example benzaldehyde reacts with propanoic anhydride in presence of sodium propanoate and when the reaction mixture is heated we get the product which is 2-methyl-3-phenyl prop-2-enoic acid in the second example furfural reacts with acetic anhydride in presence of sodium acetate and again when this reaction mixture is heated we get the product which is furfural acrylic acid so we have seen the Perkin condensation the reaction mechanism of Perkin condensation and the examples so i have completed with the module Perkin condensation. For more details you can refer this books. Thank you for watching my video and have a nice day