welcome to iit pulse special session so
today we will discuss aldehydes and ketones
so first we will discuss ah you pack nomenclature and sometimes suppose you have this compound a ketone
so if you see the numbering of the longest chain
it comes like this one two three four five six seven eight and now if you take the
double one then it becomes six dash seven dash now the you pack nomenclature of this compound will be
so this will come as a substituent
so you have
to consider the longest chain and here this will be
so five group
there is a substitution
so five phenyl two octa known now if you put a hydroxy group here like this one one two three four five six seven eight and 6
dash 7 dash
so here also this is the longest chain
so you have to take this one only and
this group is hydroxymeth ethyl
so 5 1 hydroxy ethyl again two octanol or octane two one also is ok
now if you take this compound this compound what happens there are two carbonyl group here
so now you have to take this chain because here is the ketone group is there
so this
you have to take the numbering now one two three four five six seven and this is the substitute but
if you take this side then what happens this five gets the ah high position this profile could
comes alternatively if you take from this side one two three four five six seven okay i will draw again
so yes now if you take from this side
one two three four five six seven
so what will be the nomenclature because
this side it is coming three ah and this side it was coming five
so you have to take
this side only
so it will come three profile three profile now this is heptane
so heptane now two and six position keto group
is there
so hefted two six dion now if you take aldehyde this side
so what will be the nomenclature now this aldehyde group is the main group here and this is the longest chain one two three four five six seven eight
so this is the longest
chain and this side ketone group is there so in the chain you do not need the keto group
incorporation because this will be seven
so here what will be the nomenclature
so the nomenclature
will be five
so this is the acetyl group acetylene
so this nomenclature will be five five acetyl and this is the octanel
so this is the aldehyde
so five acetyl

octanal now we will see some chiral compound suppose this compound
so if this is in the racemic just to tell
the relative stereochemistry
so this is the cyclical ring one two three four
so trans hydroxy cyclohexane and one position the aldehyde
could be there
so one carbaldehyde and if this is only the chiral form then you
have to tell this stereochemistry will come 1 r 4r like this same thing four
hydroxy
so if it is the plus series only the chiral
one enantiomer is there then it will be like this one r four r you have to
draw carbolite like this one with child group
so i'll draw again ch3
so one two three four five
so that we will get the one
so what will be this stereo chemistry
so this is r
this is also r
so two r three r first we have to give the
chirality two r three are two ethyl three methyl penta null
so this is the u pack now we will discuss the reactivity reactivity as you know
carbonyl group is slightly basic
so this is weak base
so if you put acid what happens then
this carbonyl groups gets protonated and this is called activated carbonyl group
now this activated carbonyl group here you can
react weak nucleophiles because weak nucleophiles will not react with the
parent carbonyl
compound but will react with this activated carbonyl group weak nucleophile
files like r2
os that is alcohol water and then you can get point r to r o h
so this is called acetyls when it is with alcohol or hydrates
acetyl and with water its called hydrates
so we can discuss one example like acetone if you put h3o plus
so what
happens this groups get protonated and this is in the resonance form of this now
if you put water that is already
water is there then water will react now to get this one see
so there will be positive charge first and now after h minus liberal
so that's
so minus h plus you get the hydrate ok now now we will discuss acetals and
cyclic acetyls cyclic acetals are more stable then acyclic acetals like if you
react this ketone with ethylene diol in presence of h plus this you get
so this is the cyclic acetals and because of the stability there acts as a
protecting group
so this cyclic acetyls useful as protecting group potential group of aliens
and
ketones why because acetals will hydrolyze under acidic conditions but are
stable to strong bases and nucleophiles and they are easily formed also they are
easily formed aldehydes and ketones and we have already told they are
hydrolyzed
so it can be easily deprotected
so these properties are good and that is
that's why it is called ideal protecting group

so now we will see some application
so many times what happen if you want to use a
reagent having an aldehyde group and that aldehyde should be protected acitate
and later it can be
deprotected like if you want to prepare this one from cyclohexanone how you
prepare this one
so if
you see this one if you disconnect here you need a nucleophile and this is the
electrophile and
you can start from this compound bromo because you need a nucleophile here and
the obvious is the
grignard one
so if you react this with magnesium then the aldehyde will react
so what you have to
do first you have to protect this aldehyde group and now if you put magnesium
ether then you get giganton now you can react with cyclohexanone
so after reaction with cyclohexanone and you
can do the hydrolysis you get this product similarly
so you can see here aldehyde group this
is keto aldehyde and the aldehyde group is untouched but the ketone group has
to be
reduced
so that is not possible with known reagents
so what you have to do you have to
protect the aldehyde
so this you have to put it now if you reduce sodium boroidite and then across
hydrolysis acid hydrolysis then you get the
aldehyde back
so here the acetal production can be done selectively on the aldehyde in
presence
of ketone
so some more examples of acetals like hydrolysis one it can be questioned
that if you do hydrolysis of this one what will be the product
so here if you put acid what happens
h plus one oxygen will be protonated and once the oxygen is protonated
this will open
so you get oxonium ion here which now water will attack
so and initially it will be protonated so this water after attack and then
this oxygen has to be protonated and then you get your diol plus bench and lead
so this is the question can be asked that if you
do the hydrolysis of this acetyls what you will get
so you will get benzaldehyde and one three
propane diol another questions can be asked that if you do pcc then h3o plus and
then ethanol and acidic condition
so if you do pcc pcc oxidize
alcohol to aldehyde
so first you get this one and now you have two groups double bonds
as well as the aldehyde
so you can consider a double bond as well as aldehyde both reacts or
we can do step wise also this is possible that this double bond reacts and
this aldehyde is
like this also you can think this product also possible the aldehyde hydrate
is formed and this
also forms

so any mechanism is fined and then then under acid condition what will happen
so under acid condition this which will react
to the aldehyde or this will react to the aldehyde hydrate here water will eliminate
and here this cyclic compound will form
so this is hemiacetal and now if you put ethanol rich plus
so in acidic condition the water will eliminate and you get this one so water will eliminate and then ethanol will react
so this is the acetal
so another application we can think that
so if you see the product structure here
aldehyde is intact and the double bond has to be diketone
so double bond we know the k minor four
alkaline condition it can give the diol and then chromium oxidation can give the
ketone but if you put the camera for then the aldehyde will be oxidized
so you
have to first the aldehyde has to be protected and now you can hear enough for h minus then you get his dials and pcc oxidation or cro3 or jones oxidation cro3 h plus and now the aqueous acid
so hydrolysis of the acetal will give you this aldehyde another reaction which is also
important that is the acetyl exchange
so if there is a hydroxyl group in the molecule
then it can makes intramolecular reaction and under acidic condition it can exchange
so one example we can see
so if you see there is a hydroxyl group here and
this is the acetal motif now if you put acid what will happen
so if you put acid you see we have
already discussed that how it gets protonated and the opens the ring
so it generates a oxonium
ion
so here also it generates faster auxinium ion
so like this protonated
so oxidium ion is formed and this alcohol is
there
so now one two three four five
so this intramolecular reaction will happen and you get
this compound after h plus liberation you get
so this oxygen is here so
this forms the acetyl here
so this is important that you have to careful
that when you have an alcohol in the molecule then under acidic condition it can do the exchange another reaction is this this is the inor lithar the inner lithar and the question is that h3o plus
what would be the product we can put the methanol up here
so in a lithar also if you put h plus it will react
like this
so earlier we have seen the acetal but here this conjugation is there
so a oxidium ion will form here also now water will add here now this photon will exchange
so it will go to the methoxy group and
so you get ketone first

so you get a ketone and what happen when ketone is formed then
the acidity of this hydrogen is increased
so this will under acidic
condition this will be protonated and water will eliminate
so you get this product
so alphabet unsaturated ketone will form
so aldol and kanye reactions
are also useful reaction we have already discussed
so now we will see some
application and intra molecular version also so intra molecular aldol that is
also useful reaction
so intra molecular aldol means in the two carbonyl
group will be in the same molecule like this one
so this is one five diketone system
or you can nomenclature this one two three four five six seven
so this is two six f10 dion now if you put sodium hydroxide
for aldol reaction what will happen
so you can see that this is a symmetrical molecule
and the enolate can form either
so this hydrogen or this hydrogen can be abstracted and makes in negative
charge and now this one if it
generates a negative charge if five h plus gets depotenated then you get this
one and if seven h plus
gets deprotonated then you get this one now if you see this one now if you want
to react here
so one two three four this will be four membering
so this is unstable on the other
hand if you see one two three four five six so here if it reacts then you get
six membering
so this will be the plausible path and now you get after reaction after this
attack you
get this one
so a six member linguist form o minus this is suppose one two three four five
six seven
so you see this is the seven six five four three two one
so this two
becomes now a quaternary center and now this is the aldol product after water
treatment is the aldol and if you heat it then the if you heat it the
dehydration will happen and you
get the alphabet unsaturated ketone
so this is ah one five keto systems now we can
discuss one for keto system also
so support this one
so this is one two three four five six
so two five two five hex and down
so here if you put the sodium hydroxide here this will get deprotonated here
also because
this will generate a three member ring but this will generate a five membered
and similarly you get this compound
so this ominous then h2 and then this
so five member ring will form now if you put one cycle that already
cyclic compound is there with a dicato system like this one
so here also this is one five one two three
four five and this is six ten member ring

so we can give the numbering like one two three four five six seven eight nine ten and now if
you put sodium hydroxide what will be the product like last time we have seen the acyclic case
the six member ring form here also the six hydrogen will be depotent on red and
this will react to the carbonyl group and this becomes a six member ring and this
also six membering
so this is quite stable
so two six members ring will form and this is the wattage
so 1 2 3 4 5 6 7 8 nine ten
so this is the one
carbon comes here now and this five two piece and carbonyl group
so now if you heat it
so the aldol
condensation product will form
so you get this linone
so another reaction that we
want to discuss the canister reaction that we know that this is a redox reaction and carbonyl groups carbonyl compounds having no alpha hydrogen will react and also strong base is required
so one question that came few
years back that if you put acetaldehyde and four equivalent formaldehyde under basic conditions that is q h condition what will be the product
so if you see
the acetaldehyde there are three alpha hydrogen is there and four equivalent of formaldehyde is
there
so three equivalent will participate in the aldol reaction and last equivalent we
will participate in the canister reaction
so at first you get this one one molecule reacts then another molecule comes now if you see this one here there is
no alpha hydrogen this is quaternary center no alpha hydrogen and now
the carrier reaction will happen and since formaldehyde is a small aldehyde and it does not have steric repulsion
so it is mainly acts as donor
so hydride will deliver will take
place
so sodium hydroxide will react with this then you go to this
so this right
so you get this is the product ch2oh
so this ch2h came from kanye arrow and another three came from the aldol
so this is the symmetrical molecule another reaction that you have studied that is the halogenation
so we will discuss
one example of domination
so what happens suppose if you see this ketone this is this after base you can generate a nucleophile here so this is nucleophilic center but when you put acid and bromine condition suppose
one equivalent then you get this on
so this center now electrophilic center
so earlier this one was a nucleophilic now

it is electrophilic and now you can do many nucleophiles you can react in this position like
if you react with this amine dimethyl i mean then you get this compound because diamond element does not reacts
with the carbonyl because this is the more reactive here and you get this now the question is how to get this compound in this case you have to disconnect here
and minus plus if you do then you get and if you put a plus plus is actually double
bond you can put and this is the iminium ion and under basic condition if you react acetophenone and in the seminium ion then you
can get this bond
so this is manic reaction ok now at last we will discuss ozonolysis
so ozonolysis of pollens is very important organolysis of pollens that we will discuss with some examples suppose if you do the wood
analysis then the reductive work of zinc acid you can give also acetic acid
so what will be the product
so you can
see there are three double bonds here here here and horizontally means you have to the double one you have to displace by two carbonyl group
so if you
give the carbonyl groups here now you can see here one carbonyl and here one carbonyl so
this is aldehyde sketone and now one carbonyl will come here
so there will be total
three molecules
so this is one molecule
so another this side aldehyde will come
this side again ketu and formaldehyde
so if you react poly in under horizontal
condition you get many carbonyl compounds
so this is useful reactions and
we can discuss some problems
so the problem is that beta midsin has no triple bond
so only double bond is there and its molecular formula is c
10 h 16 and when treated with stupid platinum 2 6 dimethyl octane is formed
so this is the 2 6 dimethyl octane tools okay this side one two three four five six seven eight so
this is the two six dimethyl octane is formed now when it is treated with ozone treatment with ozone followed by acidic zinc workup a is formed a is c5h6o3 acetone and two equivalence formaldehyde
so the question is what is the
structure of methine bitumen same
so you can see this framework is this now you have to put double
bond
so what will be the degree of unsaturation
so first you have to calculate the how many double
bonds will be present
so if you see this normal 10 10 carbon here
so this will be the c 10 h 22 and h minus
so degree of minus c 10 is 16.
6 hydrogen
so 86 and you have to divide by 2
so 6 by 2 is equal

to 3
so three double bonds will be present because this is the completely saturated
system c 10 h 22 is the 2 6 dimethyl octane and the unsaturation you have to calculate that
how many hydrogen divided by two
so there are six hydrogen is coming
so one double one
liver is two hydrogen when it is formed
so there are three three double bonds
are present and now you can see this is the two equivalence of formaldehyde so
two equivalence of formaldehyde means the terminal
so this means the terminal methyl group
should be considered here and if you see the acetone acetone structure
so this is the acetone
so acetone you can see this can come from this one because here the motif is there i said no
matter because here if you see this acetone will not come
so most likely there will be
double bonds
so there is a double bond here now if you consider that two equivalence of formaldehyde will form so
formalde will form only from the terminal one
so here now once you put a double one
so you have to put a double one here because this will give formaldehyde and also
here because this will give a formaldehyde
so this will be the structure
of the vitamix medicine and now what will be the structure of
a
so this will be beta medicine and structure of a will be
so if you do the
with analysis here here you get the aldehyde yeah you will get a keto and here you get a lead
so this is a c5 h6o3
so this is a and this is
beta means
so you have to see the small fraction first
so acetone you can
see this fragment can generate from here and formaldehyde from the terminal methyl groups
only
so in the terminal position you have to put the double bond and here you have to put a
double one
so we can discuss another problem
so this is also ctn a6 a16
so this is a and now it reacts with h2 platinum it just be when a is treated with ozone acidic zinc compound c and another product
so the question is what is the structure ok the
structures are given
so b structure is given
so this is b

so this is b b structure is given and also
c structure is given
so c structure is this
so this is the c
so this is the complete ah framework here now you
have to put the double bond
so here it is written that it doesn't when it is reacted with camino 4
it gives brown to precipitate chemin up for omega
so brown precipitate or p may not
so that means the
double bonds are present so unsaturation here also you have to calculate
so here also the unsaturation degree of unsaturation so
similarly c 10 h 22 minus 10 h 16 is equal to h 6 and that means six by two
is equal to three now structure of b is given
so b contains one cycle
so this cycle is a one
unsaturation
so number of double bonds will be three minus one
so this is with the cycle
so two
so two double bonds are present and this is the main aldehyde components are
coming
so if you see this one here you see this one two three four
so this is the four coming
and this one two three four five six
so if you connect one and six then you get a nice six member
ring
so first you have to connect one and six
so if you connect one and six what happens
so the alkene will be like this and this
so here you connect it now this one so
this is the one two three four five six
so what happens this one and six ah here you
put the double bond under original assist it will give this now this is the
carbonyl
group here and if you put a double bond here then the framework will be ready
so
the a structure reach
so structure of a is this because you have to put a double one
one carbon you have to bring
so c is this and another product
so if you do the original
here this will remain here italian but here if you terminal double bond we
have seen the formaldehyde
will form
so another compound will be formaldehyde now we discuss some common
examples of reductions oxidation
so this alloyide group can be compared
to the alkene and we know this conditions
so a zinc this is the chemical
clementine condition zinc amalgam is cl the acid is conditioned basic
condition the volcano that we know now the reduction we know sodium iodide or
lithium aluminum hydride and d will be
so here you have to put

a torsil group transit colloidal and then the o h group can be removed to the alkene
then lithium aluminum hydride or sodium boride another is this
 so these are not equilibrium
just the transformations alcohol to ldid say acid
 so the secondary alcohol is same the bc oxidation here is happening from acid to ketone they
from acid chloride to keto
 so what will be a this is regenman condition
h2 palladium bsf4 what will be b b can be pcc probably c she will be lithium aluminum
hydride or sodium boroidite what will be d
 so d next draw again this
 so a will be hydrogen palladium sulphate palladium bs support sorry palladium ba support
b will be pcc c will be lithium aluminum hydride or sodium chloride d will be c peroxide or h to
shear for oxidation what will be e you will be associated acid chloride
you can write f will be r dash mgbr then acidic water cup what will be g g will be two equivalent r dash l i d n h theta and what would be the h h you can put cube rate or cadmium
 so cube rate is
the most popular
 so thank you you