welcome to iit paal program we will continue the chapter aldehydes ketones and carboxylic acid today first we will talk about the structure of the carbonyl group so as you can see that carbon is two h two two p two hybridized and in carbonyl group carbon is sp2 hybridized so in sp2 hybridization as you can see in the ground state there are two s electron and two p electrons and in the excited states one electron jumps from s orbital to p orbital and after that hybridization occurs so each s p two orbital gets one electron and ana hybridized p orbital gets one electron so this s p two orbitals from sigma bonds whereas the unhybridized p orbitals makes the pi bonds and this pi bonds happens with the oxygen atom with the p orbital of the oxygen atom where also one electron resides and eventually the oxygen atom also is sp to hybridize so all these three sigma bonds stay in the one plane and thats why this atoms attach to the carbon atom also are co planar and this geometry is called tigerone or copalander and the pi electron cloud resides above and below the plane so now we will discuss about the polarity of the carbonyl group so in carbonyl group since oxygen is electronegative then carbon there is a delta minus in the oxygen atom and delta plus charge in the carbon atom so what happens this is do since there is a excess of electrons this oxygen atom is nucleophilic center and it can act as a lewis base and this carbon atom is electrophilic center and can act as a lewis acid center also there is a dipolar regenerating structure which explains that carbonyl high polarity which explains the high polarity of the carbonyl group now we will talk general procedure for the synthesis of aldehydes and ketones so do so first one is the oxidation oxidation of alcohols and this oxidation has been extensively discussed in unit 11.

so here the primary alcohols primary alcohols on oxidation gives aldehydes and secondary alcohols and there are variety of reagents which oxy acts as oxidizing agents for this kind of oxidation pcc pyridinium chloroquine and chromium trioxide in mineral acid or medium acid this is selective reagent for oxidation of alcohol to aldehydes so that further oxidation of aldehyde does not happen the second procedure is the dehydrogenation of alcohols so this is an industrial method and suitable for volatile alcohols and in this process the alcohols are passed through the silver or copper catalyst so another important method is the from hydrocarbons um and the first method is the ozonolysis this also has been discussed in unit 13 so in origin analysis what happens an alkene on reductive after treatment with ozone and a reductive workup gives two carbonyl compounds here you can get depending on the substituents either two aldehydes or two ketones are mixture of aldehydes and ketones do another method is the from alkalines so here here in alkyne if it is acetylene acetylene only gives acetylene but any other alkyne terminal alkyne or internal alkyne whatever it will give the ketone this also has been discussed i think unit 13 class 12.

so we will discuss some special preparation special preparation of aliens and first we will discuss from acyl chloride do this is the name reaction which is rosen mont reaction and it has been discovered in nineteen eighteen so here this acid colloid is used which is selectively reduced to aldine here barium sulphate is very important because it has a low surface area it reduces the activity of palladium also for do for some reactive acid colloid to reduce further the activity of parallelidium some poisons like thyodia quinoline etcetera are used nitriles are very important starting material for the synthesis of aldehyde and ketones we will first discuss the synthesis of aldehydes so here mild reduction happens with essential to an acl the iminium ion is formed and which hydrolyzed on hydrolysis gibb aldix this is the name reaction this is called stiffen reaction another procedure from nitriles is there c the full name of diver h is di isobutyl aluminum hydride and the structure is so two isobutyl group are attached to the aluminum and there is only single hydrogen so thats why it is milder than lithium aluminum hydride but it is stronger than sodium boroidite ah what will happen if you put one equivalent of divulge to nitriles so this evil is formed aldemin and this on hydrolysis give the aldehydes this is an important synthesis because if you have alpha beta unsaturated nitrides this also selectively gives the aldehydes there is no reduction of the double bond esters can also be used for the reduction using diverge and that also gives aldehydes but under special condition what is the special condition one equivalent divale h you have to use and toluene is the giant the solvent of choice here because if you use at room temperature then you will get some alcohol so what happens if you add one equivalent divulge this intermediate forms only one hydride delivery takes place and this is stable at low temperature and on hydrolysis this compound do so only on hydrolysis only the aldites it forms because if you excess hydride then this or will come out and then you will get the alcohol so we will discuss now special preparation of aromatic aldehydes

so methyl benzene can be oxidized to aromatic
hydrides and this can be done by two ways first one do um chromium dioxide and acidic canadian mixture
so the first one will discuss first
oxidation with chromos chloride
so here what happens if you put methyl benzene like toluene here in presence of carbon
disulphide you get benzaldehyde and what is the mechanism
so this is called in reaction
first step may be in reaction
so in reaction like this the
double bond forms here and then this one and then a c l minus can come there are two possibilities either again
this sequence happens that is the in and two three sigma tropic with another chromoscoride and
then you can get this compound and this on hydrolysis give you earlier
alternatively we can think
that the a c l minus can depotenate this   and you can get directly earlier
so either possibility may happen
so chromium dioxide acidic and iodide also a good reagent for the oxidation of methyl benzene to benzene derivatives and the intermediate are believed to be similar like similar like chromoscolide reaction that this
intermediate is formed which on hydrolysis   gives aldehyde
so chromium trioxide
in acetic acid in acidic aniodide chromial acetate this forms and this is the active reagent
which reacts and may be similar   mechanism like in reaction and rearrangement like previous reaction this happens the second procedure is the to
so here also methyl benzenes are used and chlorine in presence of light benzyl chloride this is formed and this one hydrolysis the benzyl lead so
this is very important this is side chain   chlorination if you put chlorine and any other
lewis acid then the chlorination will happen   in the chain
so for selective chlorination
on the methyl group you have to put this   uv light and
so that the radical
method the coordination will happen benzenes can also be used for the synthesis of aromatic androids and there are various methods we
will discuss mainly two methods first one is the gattermann coach
so what is that which in this carbon monoxide   and acell is used another method we will
discuss little bit which is called bilsmeier hack here p o c l three d m
so for benzene it is understood
that you have to bring one   more carbon atom and this single carbon unit
like pure c 3 or the dmf that takes part   in this kind of reaction
so first we
will discuss gatterman koch reaction and here you have to put some catalyst also anhydrous and cl3
so this is friedel cup type reaction and this
is i as i told you previous slide that lewis   acid has been used if you want to functionalize
the benzene ring
so here this catalyst helps in   the fetal caviar
so what is the mechanism of this

reaction
so carbon monoxide can be drawn like this and then
so this is the active reagent that is generated
from lcl 3 and hcl from carbon monoxide and this   then does the fiddle cup
reaction
so fiddle
cup reaction mechanism is that this kind of and then minus h plus will give you
the product next we will discuss vilsmer hack reaction and here the reagents are
pocl3 and dmf um
so if you mix pure cl3 and dmf this species forms and this is the active
reagent which takes parts
in the fiddle cup reaction
so do
so first this have forms and
then iminium ion generated   and iminium ion on hydrolysis gives a dent
so we will discuss special preparation of ketones
so first one from nitriles or from acid
chlorides of course astron from acid chloride
so earlier we have seen acid colloid can be
synthesized it can be used for the synthesis   of aldehydes
so here we will see that acid
collide will be used for the synthesis of   ketones and here like gignet
reagent generally used and with cadmium chloride
so cadmium r two
r two cadmium is the active species here
so what happens first step is the
two r m g x this is gigner reagent b and then acid chlorides do
so this r two cadmium then reacts with
the acid chloride and r2 cadmium is milder   than gigna reagent
so that it stays in the ketone otherwise
otherwise tertiary alcohol if you treat it as   it chloride with gigna reagent
you get tertiary alcohol and earlier i told that nitriles can
be used also for the synthesis of   ketones
so we will discuss now and here always you need another r another
group like r here also nitro
so you have to   bring another group like r and that can
be ignored and it can get the ketones and this is here ketamine
so earlier
aldemine was formed now it is ketamine
so ketamine is formed and ketamine
on hydrolysis gives ketones and last one we will discuss that is from benzene
so from benzene we have
previously seen synthesis of   earlier its benzaldehydes or aromatic
aldehydes now we will see synthesis of ketones
so for the synthesis of ketones you can
do fiddle cave reaction with acid chloride it can be aliphatic acid chloride or
or aromatic acid chloride and in presence of catalyst
anidas aluminum chloride you get the ketone
so this is friedel craft reactions
so this is a powerful reaction   to get different aromatic compounds and now we
will conclude here the synthesis part you