welcome to iit paal program today we will first
discuss physical properties of carbonyl compounds the simplest carbonyl compound
methanol thats why its polymer which
is called para formaldehyde it is solid and it is commercially available and
in the lab generally para formaldehyde is used   ethanol or acetaldehyde is a
volatile liquid and other aldehydes and ketones are
generally liquids at room temperature ketones are higher than
so a and this is due to molecular interaction due to arising out of dipole
dipole interaction
so in aldehydes and ketones this diper
dipole interaction is very significant on the other hand the boiling points
of aliens and ketones are lower than and this is due to absence of hydrogen
bonding which is present in alcohol
but not in aldehydes and ketone and that is why we can compare the
volume boiling points of alcohols and the aldi corresponding aldehydes and
ketones
so their molecular mass is around
58 to 60.

so similar molecular mass but they have different boiling points
so alcohols
is higher and this is due to hydrogen bonding and then they have dipole dipole
interaction and here here mainly the
van der waals force is there also the lower aldehydes and ketones
has been found to be soluble in water and this is due to hydrogen bonding with
water
so like this network is there and as this half students as this
substance increase the solubility decrease c because this is hydro fibic part
sorry hydrophobic and this is hydrophilic lower aldehydes have soft pungent
color pungent smell and as the the smell becomes more fragrant now we will
discuss some reactions and the most popular reaction
of alien ketone is nucleophilic philic addition reaction because carbonyl group
is a
electrophilic center and thus   different nickel files can react
with it
so what is the mechanism as we know that the carbonyl along
with the substituents are in planar and what happens the nucleophile nucleophile
approaches perpendicular to the plane and you get a tetradel intermediate and in
this process the carbonyl carbon here it is   s p two
so it changes its
hybridization from s p two to s p three and this intermediate is
called tetrahedral intermediate and generally this is the slow step so
we can write equilibrium this is slow   and rate determine step and this is
first now we will discuss about reactivity
so aldehydes are more reactive than ketones and it is due to two regions
both steric as well as electronic
so what is the static factor now if you
have two alkyl group then it increases the steric effect in the carbonyl also
electronic effect is that because we know that alkyl
groups have generally plus i   effect inductive effect so
it decreases the electron two alkyl groups the electrophilicity do
so what happens the carbonyl carbon in
ketone is becomes less electrophilic   because of this two plus i effect now we
will discuss benzaldehyde

and acetaldehyde reactivity
so which one will be more reactive
bench aldehyde and acetaldehyde
so generally aliphatic aldehydes are more reactive
so acetaldehyde more reactive than benzaldehyde
so what is the reason here
benzene head this aromatic
so if you teach resonance structure like this and this is called plus r effect
of phenyl group and due to plaster effect the electrophilicity
of the carbonyl group gets reduced ok now we will discuss some examples
of nucleophilic addition reactions and the first one is the hydrogen
cyanide addition
so examples generally the hydrogen cyanide additions to
carbonyl compound is slow but if you add some base then the more potent
cyanide nucleophile
is generated and that makes the reaction faster hmm similarly other nucleophiles
can be added like um sodium hydrogen sulphide and since it is a negative charge
resides on sulphur
so it is already a potent nucleophile and it can give
addition products with aldehydes and ketones
so since this sulfonic acid is more acidic
so it will displace it proton to the o
minus charge and you get this one and then after across work up or
acidic work up you get this one
so this compound is water soluble and this can be converted back to the
carbonyl compound by treatment with strong
so and the as this compound can
be converted to the carbonyl compound this process is used for the
purification of carbonyl compounds also the position of the equilibrium lies
right side for aldehydes and to the left side and this is due to steric region
so aldehyde and ketones generally react
with one molecule of monohydroxic alcohol because the terms are different first
i am doing reaction with aldehydes
then i will do with ketones and this mono alkoxy is called hemiacetal
so when one molecule of the mono hydric
alkali reacts it generates hemiacetal and then the hemiacetal reacts reacts
further to generate dial coxy compound and that is called that is called acetyl
do uh and generally you have to use anhydrous
acid thats like hcl gas
so because in this reaction water is eliminate and to drive
the equilibrium right side you have to treat you have to remove this water
either by
distillation or you can use molecular symbols and this distillation you can
do by dream stack apparatus or or molecular sieve similarly ketones also react
so the term for ketone is defined
so this is called hemi ketal and ketamine let discuss one example
so if the alcohol
has two hydroxyl that is called diol then you can single you can directly get
the ketal like if you treat a ketone with ethylene glycogen
so so ethylene glycol is a diol and with one molecule you can get the ketone
and as i told
you that if the water is removed here but if you treat this ketal or acetyl
with diluted cell
so if you put water dilution has water and that will hydrolyze

this ketal or acetyl to the carbonyl compound that's why this ketal and acetyl sometimes
acts as a protecting group for carbonyl groups because you can easily generate the
acetylene ketene as well as d protect it ok the fourth one will discuss
addition of gignal reagent and gignet addition gigner agent is
generally are we can present here r m g x
so gigners are very useful reaction and
you can generate really different alcohols from alleles and ketones and which has
been already discussed unit 11 plus 12 and in this addition we can get primary
secondary as well as tertiary alcohol depending on the choice of the carbonyl compound
so if you
use formaldehyde you get a arm primary alkaline and generally after reaction the
second step you have to treat with or aqueous workup or acid thick workup
so this is primary alcohol then any aldehyde other than formaldehyde
will give you secondary alcohol and a ketone
so this is an important method to generate different types of alcohols
from aldehydes and ketones and now we will discuss addition
of ammonia and its derivatives that can be present by n h to z nh
so and since in this reaction the
water is eliminated that's why this if you can remove the water then
this will drive the equilibrium to the right side and high yield of this product that
is called generally immune compounds you can gets and depending on the choice of z you can get
different immune derivatives like in the power point you can see if you treat the aldehydes and
ketones with ammonia you get that is called amine and when you treat with amine then you get
substituted amine which is called ship base similarly with hydroxyl amine if you treat you
get a c double bond n o h which is called oxime then if you treat with phenyl hydrogen then
you get phenyl hydrazone double bond in in ph and a special hydrogen which is true for
dinitrophenyl hydrogen and when you treat this with carbonyl compounding you get the hydrogen
which is called two four dinitrophenyl hydrogen ah which is shortly called two for dnp
and this is orange solid
so this is also useful for the test of aldehydes and ketones and
when semi carbohydrate are treated with aldehydes and ketones you get semi carbazole that is c
double bond n n h co n h 2 derivatives i am sorry that this nucleophilic there is a spelling
mistake the correct spell will be new clue
so one l should be there in all slides
now we will discuss some other reaction which is a reduction reaction
so first we will discuss conversion to alcohol and generally aldehydes will give primary

alcohol and ketones will give secondary alcohol
so if you treat aldehydes with sodium
borohydride or lithium aluminum hydride   these are two common hydride reagent
and this is generally more stronger
so depending on the other functional group
agent in the molecule you have to choose
so this will give primary alcohol and any ketone on the reaction will give secondary
alcohol and same reagent can be used here also now we will discuss another kind of
reaction that is conversion of conversion of carbonyl compounds to hydrocarbons
what is what does it mean that means that
ca this car keto group is converted to the ch2 group and generally it can be done by two ways
so first one is clementine reduction what has been done in this
method that zinc amalgam in presence of concentrated hcl with convert to the c h two denominators
so we will discuss what is the mechanism
so zinc generally takes parts in this reaction and
the carbonic compound first absorbed in the zinc
so this radical first formed and
then zinc oxide is eliminated and this is zinc carbinoid
so this has been
found to be an intermediate for this clementine   reduction and then h plus
comes from the concentrated acl
so the hydride hydrogen goes
there and zinc is plus one another hydrogen comes and zinc plus
two eliminated
so you get destroyed and it has been found that alcohol is not an
intermediate in this reaction because if you   put alcohol under this condition
alcohol do not give the products another method which is complementary to clevenson
because kilimanjaro reaction as you can see here   the acid condition is used and another
reaction that is volkswagen reduction there we will see basic condition is used
to generally hydrogen a hydrogen
hydrate is used and you get this one the hydrogen and then if you treat with koh
base and some solvent like ethylene glycol any this ah reaction needs also high temperature
generally above 150 degree centigrade   and then you get this one the hydrocarbon
so we will discuss
little bit about the mechanism
so this is clear the hydrogen is formed and then we discuss the mechanism
so what happens in base this proton gets eliminated and then a
resonance structure can be drawn like this and then in this ah carbine gets
proton from water   and you get or from the reaction medium
then hydrogen comes here and then then again base eliminates
another hydrogen and you get a nitrogen gas eliminated and
that drives the equilibrium to the   right side
so you get this
carbonar and then it gets water

so we stop here this chapter reaction you